CONSULTATION DRAFT

Towards a Policy for Water Resources Development and Management in the Asian and Pacific Region...

Issues and Opportunities

DISCUSSION PAPER
PREPARED FOR THE

INTERDEPARTMENTAL
WATER RESOURCES POLICY GROUP

ASIAN DEVELOPMENT BANK

AUGUST 1995

The purpose of this *issues and opportunities paper* is to facilitate consultation and discussion with Bank staff, Government, NGO and private sector representatives from the Bank's member countries, staff of international and bilateral agencies, and individual experts on the formulation of the Bank's policy on water resources development and management. The views expressed in the paper do therefore not necessarily reflect the current views and policy of the Asian Development Bank or those of its member country Governments.

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Towards a Policy for Water Resources Development and Management in the Asian and Pacific Region...

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A Discussion Paper

prepared for the

Interdepartmental Water Resources Policy Group
of the Asian Development Bank

by

M. Paul Mosley
Wouter T. Lincklaen Arriëns

August 1995

Preface

The need for better water resources development and management in most countries in the Asian and Pacific region is apparent. Water shortages are becoming more widespread every year and competition between different uses is increasing. Water quality is deteriorating, water ecosystems are being irreversibly disturbed, and watersheds seriously degraded. Water demand is growing unabated with the increasing population, and is further boosted by changing use patterns associated with economic development and urbanization. Demand outstrips supply in many areas in the region, and the shortages have increasingly severe economic, social and environmental effects. Droughts and floods continue to wreak havoc regularly throughout the region. The engineering and environmental costs of new source development projects are much higher than for existing projects. The process of project formulation and implementation has become much more complex. National policy environments, legal instruments, and institutional capabilities are often indecisive, outdated and fragmented when it comes to dealing with these complex water sector problems.

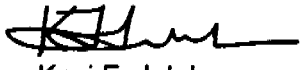
The need for a more holistic approach to water resources development and management has been successfully articulated and adopted in several international conferences in recent years, and consensus has been reached on key principles for water sector reform. Among them, demand management measures, increased water use efficiency, and decentralized management of the resource are being advocated as necessary complements to the investments in supply augmentation that will be required. Operationalizing and implementing these principles has, however, proved a daunting task to governments and external support agencies alike. Considerable time, effort, resources and, above all, government commitment are necessary to successfully implement them. Such commitment has yet to be mobilized in many countries in the region, and the high costs of inaction to the economy and the environment in the longer term have yet to be fully understood by technocrats, administrators, politicians and the water-using public.

In the Bank, a process of policy analysis on integrated water resources development and management has started, and is expected to lead to the preparation of a policy paper in 1996. An interdepartmental consultation effort commenced in 1993 under the guidance of Mr. Richard M. Bradley, then Director of the Agriculture Department. A group of interested staff joined to form the Interdepartmental Water Resources Policy Group, which oversaw the preparation of a first internal working paper in December 1993. Following the reorganization of the Bank in January 1995, the responsibility for the preparation of the water resources policy was entrusted to the Office of Environment and Social Development by the Management.

This *Issues and Opportunities* Discussion Paper is the first interim output of the Bank's reconstituted Interdepartmental Water Resources Group towards the preparation and adoption of a comprehensive policy on water resources development and management for the Asian and Pacific region. The Paper is meant to facilitate further discussion with Bank staff, and initiate consultation with stakeholders in a Bank policy on water resources development and management for the region, including representatives of the Bank's Developing Member Countries (DMCs), other Member Countries, External Support Agencies (ESAs) including the World Bank and UN system agencies, bilateral

donors, the private sector, NGOs, individual experts and other interested parties. The target readership of the Paper includes all representatives of these stakeholder groups, and their input in the policy formulation process will be important to ensure subsequent successful implementation.

I take this opportunity to express sincere appreciation to Mr. Theodore C. Patterson and Mr. Bradford Philips for having successfully initiated this important interdepartmental activity. I trust that, through distribution of this Discussion Paper, we will succeed in soliciting the comments, views, and input from a wide range of people who are concerned with the present status of water resources development and management in the Asian and Pacific region, and who are willing to join and advise us in facing the challenge of improving the management of this most precious common natural resource for the benefit of present and future generations.



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Chairman, Interdepartmental Water Resources Policy Group
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Acknowledgments

Numerous Bank staff and other people have contributed to the preparation of this Discussion Paper by sharing their ideas, views and concerns with me and with Paul Mosley. The purpose of the Paper is to draw more people into a discussion on defining the main issues and opportunities for water resources development and management in the Asian and Pacific region, and broaden the basis for the Bank's water resources policy formulation and implementation.

Invaluable comments and input were received from all members of the Bank's Interdepartmental Water Resources Group in the preparation of the Paper, and are gratefully acknowledged here. Strategic direction and encouraging support in the process of starting the policy analysis were given by many, including Cedric Saldanha, Jeremy Bird, Jan van Heeswijk, Brad Philips, Arthur McIntosh, M. Ashraf Malik, Pieter Smidt, Fred Mesch, Peter King, P.N. Fernando, Etienne Van De Walle, Bindu Lohani, Meeja Hamm, David Edwards, Yves Bellekens, Gordon Wilkinson, Barin Ganguli, Peter Wallum, Bong Koo Lee, Tsuneaki Yoshida, and others. Comments on the first draft of this Paper were also provided by R.C. May, J. Rockett, Alan Roach, Emile Gozali, Elisabetta Capannelli, Dorte Kabell, Prodipto Ghosh, Manoshi Mitra, Edvard Baardsen, Gordon Fox, Rinus Zijsvelt, Richard Simpson, and Rajat Nag. Dr. B.H. Wang provided beneficial assistance to the Bank in starting the policy analysis work in December 1993 with a first working paper.

The research team that started work in April 1995 on the review of Bank experience in water resources development and management included Frank Janer, Doris Avila, Arlene Tadle, Anneli Lagman, and myself. Guidance in the analysis was provided by Yves Bellekens, Etienne Van De Walle, George Whitlam, Peter King, Robert Dobias, and Piyasena Abeygunawardena. A summary of the review findings to date is included in an appendix to the Paper.

Exchange of experience with the World Bank started in May 1994 when very useful guidance was received from Guy Le Moigne, Gershon Feder, Jeremy Berkoff, Harald Frederiksen, Keith Oblitas, and others during a visit to Washington D.C. Special thanks go to Harald Frederiksen and Jeremy Berkoff who visited Manila in June 1995 to participate in the Bank's first staff seminar on water resources policy, and shared many insights from the World Bank's policy formulation exercise.

The Bank's first support to a national assessment of water resources management was given to Sri Lanka in 1993, in cooperation with USAID and the USAID-financed ISPAN program, and this Paper draws on that experience. The Government's effort, involving more than thirty agencies and organizations, was led by Faiz Mohideen, Palitha Muthukude, and H. Banduratne, and resulted in the preparation of a national action plan for comprehensive water resources management which was formally adopted by the Government in July 1995, including the establishment of a National Water Council. I want to acknowledge the useful advice received from the group of USAID/ISPAN experts in the US including Peter Reiss, Kathy Alison, and Peter Rogers, and the good cooperation with the USAID staff in Sri Lanka including Glen Anders, Gary Alex, Mohan Siribaddena, and David McCauley. With USAID assistance, the following experts were able to provide

beneficial assistance to the Sri Lankan team: Mardjono Notodihardjo from Indonesia, Ben Bagadion from the Philippines, Sacha Sethaputra from Thailand, and David Kennedy from California, USA. The Bank's TA advisers were M. Paul Mosley from New Zealand and Ib Lunde Rasmussen from Denmark.

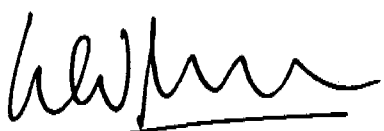
The discussion paper builds on the concept of capacity building in the water sector, and I want to acknowledge the invaluable inputs received during and after the UNDP-Netherlands Workshop on Capacity Building in the Water Sector in 1991, from Frank Hartvelt at UNDP, and Professors Wil Segeren and Guy Alaerts at IHE in Delft, the Netherlands.

In my work to start the water resources policy analysis, I have benefited from meeting and discussing with several experts, including Mme. Do Hong Phan and Professor Prachoom Chomchai, former Assistant Executive Agents of the Mekong Secretariat, Dr. Apichart Anukularmphai, Interim Secretary-General of the recently established Committee on Water Resources for the ASEAN region, Professor Asit Biswas of the IWRA's Committee on International Rivers and convener of the Asian Water Forum in January 1995 at AIT, and Eng. Barkhat Ali Luna from Pakistan.

I thank Professor M. Paul Mosley for his dedicated effort to assist the Bank in the preparation of this Paper, and for the pleasure of working together with him on the assignment in June 1995, and through daily email exchange after that.

A final word of sincere thanks goes to Frank Janer for his invaluable assistance and creativity in producing the Paper, and to Elvie Baudilla and Elisa Lacerona for their patient and pleasant secretarial assistance.

The Paper is a reflection of *work in progress* in the Bank. Any errors and possible misrepresentations in the text, facts and figures are regretted by the authors. Your comments on the Paper are welcome...



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List of Abbreviations

AIT	Asian Institute of Technology
ACC/ISGWR	Administrative Committee on Coordination: Intersecretariat Group for Water Resources
ADB	Asian Development Bank
ASEAN	Association of Southeast Asian Nations
BOO	Build-Operate-Own
BOT	Build-Operate-Transfer
CAP	Country Assistance Plan
CBO	Community-Based Organizations
DMC	Developing Member Country
DWSSD	Drinking Water Supply and Sanitation Decade
EIA	Environmental Impact Assessment
EIRR	Economic Internal Rate of Return
ESA	External Support Agencies
ESCAP	Economic and Social Commission for Asia and the Pacific
FAO	Food and Agriculture Organization
GDP	Gross Domestic Product
GEMS	Global Environmental Monitoring System
IEE	Initial Environmental Examination
IHE	International Institute for Hydraulic and Environmental Engineering
IIMI	International Irrigation Management Institute
IRRI	International Rice Research Institute
ISPAN	Irrigation Support Project for Asia and the Near East
IWRPG	Interdepartmental Water Resource Policy Group
MCM	Million Cubic Meters
MTSF	Medium-Term Strategic Framework
NGO	Non-Governmental Organization
NIC	Newly-Industrialized Country
O&M	Operation and Maintenance
OO	Operating Objectives
PEO	Post-Evaluations Office
PRC	People's Republic of China
SAARC	South Asian Association for Regional Cooperation
SDO	Strategic Development Objective
TQM	Total Quality Management
UNCED	United Nations Conference on Environment and Development
UNDP	United Nations Development Programme
UNEP	United Nations Environment Programme
UNESCO	United Nations Educational, Scientific and Cultural Organization
UNICEF	United Nations Children's Fund
USAID	U.S. Agency for International Development
WHYCOS	World Hydrological Cycle Observing System
WMO	World Meteorological Organization
WRD&M	Water Resources Development and Management
WSS	Water Supply and Sanitation

Chapter 1 Policy Formulation as a Process

1. This Discussion Paper has been prepared for the Bank's Interdepartmental Water Resources Policy Group to canvass the issues to be considered in the process of formulating a comprehensive Bank policy on water resources development and management for the Asian and Pacific Region.

2. The Paper draws on a variety of sources, notably:

- *Medium-Term Strategic Framework, 1995-98* (DAB, 1995);
- *Operations Manual* (DAB, 1992);
- The responses of Bank staff to a survey of experience in water resources projects, conducted in March 1995;
- An analysis of Bank experience in project formulation (internal IWRPG discussion paper *Project quality in the water sector,* June 1995);
- The report of the Bank's Task Force on Project Quality (DAB, 1994);
- Sector syntheses of postevaluation findings in the Water Supply and Sanitation, and Irrigation and Rural Development sectors, prepared by the Bank's Post-Evaluation Office (DAB, 1995);
- *Water Resources Management: a World Bank policy paper* (World Bank, 1993);
- *Water Resources Management in Asia, volumes 1 and 2* (World Bank Technical Paper 212, 1992); these documents have been a particularly valuable source of information, which has been drawn on extensively herein;
- *A Guide to the Formulation of Water Resources Strategy* (World Bank Technical Paper 263, 1994);
- *A Strategic Framework for Water in Asia* (USAID, Bureau for Asia and the Near East, February 1994);
- *Future Directions for Implementing Water Policy* (USAID-ISPAN, 1994);
- *Policy Working Paper for Water Resources Management*, unpublished internal draft, DAB, December 1993;
- *Agenda 21, chapter 18*, UN Conference on Environment and Development, June 1992;
- *The Dublin Statement and Report of the Conference*, International Conference on Water and the Environment, January 1992;
- *Capacity Building in the Water Sector*, Report of a UNDP-Netherlands Symposium at IHE, Delft, 1991.

3. The Bank's policy formulation process has been started on the understanding that the Bank should carefully analyze its own requirements, drawing on the experience of its own staff, and define an appropriate role in *water resources development and management* (WRD&M)[1] in the Asian and Pacific Region, based on the Bank's comparative advantages of its location and expertise in the region.

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[1] WRD&M is the abbreviation used throughout for Water Resources Development and Management. The term "water sector" is also used in the paper, to point to the urgent need for a more *holistic* understanding of water and related issues in many economic sectors and areas of human activity.

FORMULATE THE BANK'S WATER RESOURCES *POLICY*:

In consultation with stakeholders, define issues, opportunities, policy, and strategies, towards a Policy for Water Resources Development and Management in the Asian and Pacific Region...

(See main text of Issues and Opportunities Paper)

linked to

SUPPORT NATIONAL WATER SECTOR ASSESSMENTS, ASSISTANCE *STRATEGIES* AND COORDINATION:

Assist DMCs, using a National Water Sector Profile as common format for sector assessments, strategies, monitoring, regional exchange and cooperation, in cooperation with the World Bank and UN Agencies...

(See appendix for proposed National Water Sector Profile)

linked to

IMPROVE WATER SECTOR *PROJECTS*:

Improve design criteria based on all dimensions of project quality, build water sector institutional capacity, improve the linkages between monitoring, review, evaluation, and feedback; and expand operations based on prioritized needs...

(See appendix for analysis of Bank's water sector projects)

FOCUS OF THE POLICY PROCESS

Figure 1

4. The approach taken by the Bank's Interdepartmental Water Resources Group, and elaborated in this Paper, is that the process of policy analysis and formulation should focus on policy, strategies, and projects in an iterative way, recognizing them as interdependent elements, and that the stakeholders in a Bank policy for WRD&M should be fully consulted at an early stage in the process, to obtain their input and agree on priority needs and issues, to devise effective and *implementable* policy and strategies, and to build the necessary commitment and ownership for successful policy implementation. Following this approach, which is summarized in Figure 1, this Paper not only describes policy issues, but also looks into operational issues in projects. Two appendixes offer respectively a review of Bank experience in WRD&M project formulation over the years, and a tool for water sector analysis and strategy formulation in DMCs, in the proposed *National Water Sector Profile*.

5. The purpose of this Paper is to *initiate the discussion and consultation with stakeholders*, rather than to complete it. A process of consultation will draw successively on the expertise of staff in the Bank, and on representatives of the Bank's Developing Member Countries (DMCs), other Member Countries, External Support Agencies (ESAs) including the World Bank and UN system agencies, bilateral donors, the private sector, NGOs, individual experts and other interested parties. The target readership of this Discussion Paper includes representatives of all these stakeholder groups. The Paper does not claim to provide complete coverage of all issues - the volumes already written show this to be impracticable, and provide the interested reader with a wealth of additional detail. Rather, it has attempted to define key areas of WRD&M in which the Bank may wish to refine and more clearly enunciate its own policies.

6. The Paper presents a two-level hierarchy of *issues* based on review of the sources listed above. First, it recognizes eight major groups of issues, ranging from those of a global or regional nature and scope through to those concerning the status and usage of water resources in countries, to those which relate to operational issues in water sector projects. A ninth group highlights key elements of the Bank's overall Medium-Term Strategic Framework, which provides the context for Bank policy formulation in all sectors. Together, these nine groups are shown in Figure 2. Second, within each of the nine groups, a number of more specific sub-groups have been identified, within which particular issues can be placed and discussed. The relationships between the groups are complex, and the purpose of the groups is to facilitate analysis of the issues, rather than to organize or structure them. The sequence of the chapters dealing with these issue groups has no particular significance, and the chapters could be read in any order.

7. The present way of grouping the issues in this Paper reflects, to a certain extent, a focus on organization, capacity, and implementation constraints, rather than on conceptual and causal links and interrelationships. This is based on the understanding that many guiding policy principles for WRD&M have already been enunciated and adopted by experts, international organizations, and governments around the world in various international conferences over the last years. Most of these principles and recommendations are well described in many of the source documents to this Paper, including reports of the UNDP-Netherlands Symposium on Water Sector Capacity Building in Delft (1991), the Dublin International Conference on Water and the Environment (1992), the UNCED Conference in Rio de Janeiro (1992) leading to Agenda 21, the World Bank Policy Paper on Water Resources Management (1993), the USAID Strategic Framework on Water in Asia (1994), the USAID-ISPAN Workshop on Future Directions to Implementing Water Policy (1994), and

Towards a Policy for Water Resources Development and Management in the Asian and Pacific Region:

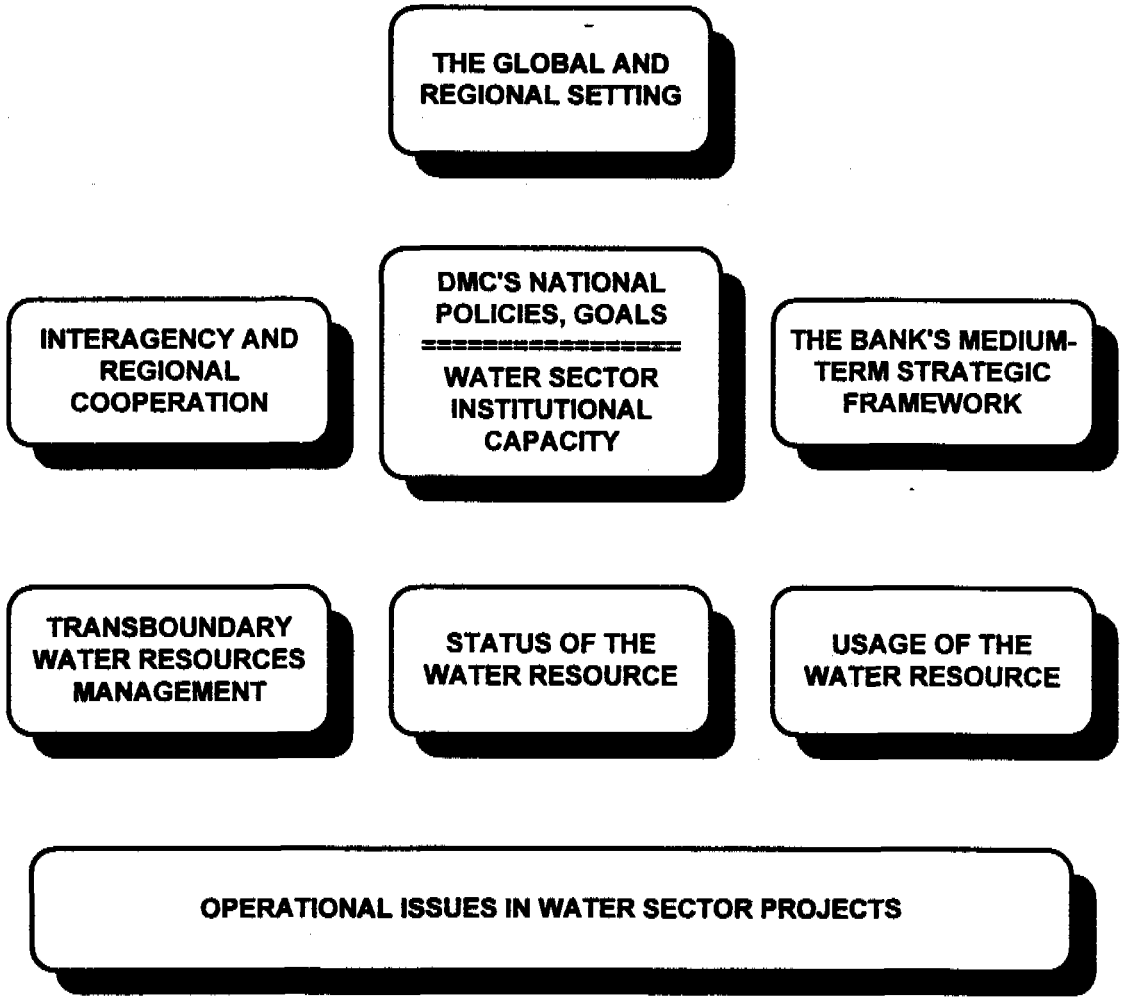


Figure 2

the World Bank Water Resources Seminar at Lansdowne (December 1994). Figure 3 highlights some of the accepted principles and recommendations.

8. Operationalizing and implementing the accepted policy principles for WRD&M has proved a daunting task to both governments and external support agencies (ESAs). This Paper suggests that, in the Asian and Pacific region, the Bank's policy formulation process in WRD&M should focus on identifying priority issues with stakeholders, and on adopting appropriate principles and recommendations which should then be *internalized* in the organizational setup and *operationalized* in the business processes of the Bank and its DMCs. The Paper poses that *operationalizing policy principles* in the region requires a process of consultation, coordination and, wherever possible, collaboration, with other ESAs, in a *regional* perspective, to make the best use of the limited resources of both the DMCs and ESAs. Depending on the commitment of the Bank, its DMCs, and development partners, to invest and engage in such a regional consultative process for WRD&M, an effective regional policy and strategy for water resources development and management can evolve, which the Bank is well placed to support.

9. The Bank's *opportunities* to help address the key issues in DMCs, and thereby make a significant contribution to improving WRD&M in the Asian and Pacific region, can be grouped at three interdependent levels which need to be reflected in its policy:

- National-level *policy dialogue*, leading to policy changes;
- Sector-level *capacity building*, leading to sector reform; and
- Project-level *investment*, leading to project results;

supported by

- Regional-level *coordination, exchange, and monitoring,* leading to cooperation, networking, and a more efficient use of external resources.

10. In the Bank, the Interdepartmental Water Resources Policy Group has started a process of systematic analysis of Bank experience in the sector[1], in an effort to analyze the Bank's evolving policy in WRD&M over the years based on the design of projects at approval, and to improve the quality of WRD&M projects. A summary of the findings to date is presented in Appendix 1, which shows the extent to which 38 semi-quantitative quality criteria/indicators, grouped in eight dimensions, have been included in the design of Bank-financed projects over the years. Chapter 9 of the Paper highlights the experience of incorporating these criteria in design and implementation in a qualitative way.

11. For the preparation of water sector assessments and country assistance strategies in WRD&M, and the design of monitoring of WRD&M systems in DMCs and across the region, the Bank's Interdepartmental Water Resources Policy Group has determined the need for a common format, preferably suitable for joint use with other external support agencies, which allows analysis in a systematic and comparable way, yet with adequate flexibility to incorporate country-specific situations, issues, and needs. The proposed *National Water Sector Profile*, presented in Appendix 2, was designed to meet these requirements. Its

[1] Previous analysis was conducted on a subsectoral basis, e.g. for irrigation, water supply, etc.

DELFT (1991)
promote improved policy environment, institutional strengthening and organizational development through long-term capacity building programs based on comprehensive sector assessments

DUBLIN (1992)
fresh water is a finite and vulnerable resource essential to sustain life, development and the environment; adopt participatory approach involving users, planners and policy makers at all levels (including lowest levels); recognize that water is an economic good and has an economic value in all its competing uses; women play a central role

AGENDA 21 (1992)
implement water allocation decisions through demand management, pricing mechanisms, and regulatory measures

WORLD BANK POLICY PAPER (1993)
adopt water policies that stress: comprehensive analytical frameworks, institutional and regulatory systems, incentives for providers and users, water-conserving technology, poverty alleviation, decentralization, participation by stakeholders, environmental protection, upgrading professional skills of providers, design of country programs, management of international watercourses, implementation capacity

ISPAN-USAID WATER POLICY IMPLEMENTATION IN ASIA (1994)
improve policy development and policy implementation processes; encourage accountability and stakeholder participation; improve donor and country consultation at regional level; support and fund research and pilot projects for sector reform; support information sharing, consensus building and user empowerment

LANSDOWNE (DEC 1994)
increase commitment of governments and donors to implement policies; increase adequate resource mobilization including time and staffing; improve understanding and dissemination of knowledge of effective solutions to match water demand and supply

Figure 3

outline provides for a sector analysis -- with performance indicators – as well as an appraisal, and for the formulation of, and agreement on, an agenda for action at the end.

12. The Paper attempts to regard all issues related to WRD&M in the context of the Bank's evolving *Medium-Term Strategic Framework* (MTSF). Reference to the MTSF is made in each section of the Paper, and a more comprehensive review of its main elements, the *Strategic Development Objectives* (SDOs), *Operating Objectives* (OOs), and *Key Operating Principles*, is presented in Chapter 10.

13. The organization of chapters in the Paper is as follows. Chapter 2 deals with the global and regional setting of WRD&M. Chapters 3 and 4 describe issues in the context of DMC national policies, goals and strategies, and the water sector's institutional capacity (based on the broad interpretation of *capacity* of Agenda 21). Chapters 5 and 6 review issues related to the status and usage of the water resource itself. Chapter 7 looks at the WRD&M issues particular to transboundary basins, both internationally and within countries. Chapter 8 highlights the interagency and regional cooperation issues related to the formulation of the Bank's policy in WRD&M. Chapter 9 looks into operational issues in the context of designing and implementing WRD&M projects. Chapter 10 presents the Bank's Medium-Term Strategic Framework as the context for any sectoral policy formulation in the Bank. Chapter 11 provides suggestions for an Agenda for Action to continue the policy formulation process.

Chapter 2 The Global and Regional Setting

A. Population Increase And Urban Growth

The population of Asia is projected to increase from 2.9 billion at present to 4.2 billion in 2025. The urban population is expected to increase from 35 percent of the total to 50 percent during the same period. These trends will place increasing stress on available water resources, as more water is required for food production, to support economic growth, and to provide municipal water supply and sanitation.

14. The population of Asia almost doubled between 1960 and 1990, to over 2.9 billion people (55 percent of the world total), and the urban population increased from about 15 percent of the total to 35 percent. The UN forecasts that the population of Asia will increase to 4.2 billion by 2025, 50 percent of whom will live in urban centers. Population growth on the scale projected can only be supported by income growth in association with industrialization in urban areas; rural development is not able to generate the wealth necessary to support increasing numbers of people at a stable or increasing standard of living.

15. In Asia at present, about 40 percent of cropland is irrigated, and produces up to 70 percent of the total food. Only 60 percent of urban populations and 40 percent of rural populations are served by safe drinking water supplies, and fewer have adequate sanitation. Pressure on water resources is, in many parts of the region, already severe. Not only are there growing numbers of people, but demand per person is also increasing, as a result of economic growth and rising incomes associated with urbanization. The consequences are becoming serious in many places. For example, land subsidence of 5-10 cm/y in some parts of Bangkok is a well-known result of excessive groundwater extraction, the rate of which has exceeded the safe rate by 60-70 percent; water imports from other catchments are a virtually inevitable requirement if future demand is to be met. Similarly, many Pacific Island communities, small though their populations may be, are close to or have reached the limit of their surface and ground water resources, but have few realistic alternatives other than collection of rainwater.

16. Water is essential to sustain human life - for drinking, hygiene, and food production - and is a basic raw material for many elements of a modern economy - electric power generation, sanitation, transport, manufacturing. While water resources are by no means fully utilized regionally, growth in demand will increasingly require major capital investment in impoundment and inter-basin transfer, redirection of resources to higher value uses, and increased efficiency of use. Agenda 21 (chapter 18) states that "the holistic management of freshwater as a finite and vulnerable resource ... is of paramount importance for action in the 1990s and beyond".

17. Addressing the water-related issues which arise from these trends is clearly consistent with the Bank's Strategic Development Objectives (SDO). Sustainable water resources development and management (WRD&M) is a crucial contributor to "Promoting economic growth" and "Protecting the environment". WRD&M is an area in which women

have a particular role to play, especially in rural areas and among the urban poor. Bank efforts in this area would therefore be consistent with "Improving the status of women".

18. There is a direct link between rapid and massive urbanization and scarcity of water in the required quantities and quality, as urban populations and industries expand and the per capita demand for water increases. Analysis of water-related sectors suggests that the Bank could consider giving particular recognition to the wider issues raised by urbanization in Asia, and establish an objective of "Enabling sustainable urban development". WRD&M would be central to such an objective, both because water is an essential requirement for urban communities and industries, and because water is so severely impacted by the side-effects of urbanization.

B. International interdependencies

The scale of investment needed in water-related projects will require substantial capital and technology inputs, on an international scale. The role of the Bank in arranging investment and transfer of knowledge and technology will need careful targeting, to capitalize on its comparative advantages. Also at the international scale, there are a number of river basins in the region which are shared by two or more countries. This has had significant impacts on the feasibility of achieving optimal and sustainable WRD&M, and the Bank's country focus may need to consider this international aspect of water resources.

19. Countries in the Asian and Pacific region display an immense range of economic, social, and geographical characteristics. The status of water resources is similarly diverse, from the deserts of interior PRC to the tropical islands of Indonesia. Hence, although some issues such as the rapid urbanization or over-extraction of groundwater affect many DMCs, other issues may be quite specific to particular countries. The Bank's approach for WRD&M will need to address the differences, as well as the similarities.

20. Water-related projects have typically accounted for 20-25 percent of total public investment, because of the capital- and technology-intensive nature of much of the associated infrastructure - dams, irrigation systems, water supply and waste treatment plants. For example, Pakistan has allocated between 8 and 24 percent of its total five year plan allocations to water development since 1955 (the proportion has been steadily been declining), mainly for construction of multi-purpose dams, barrages, link canals, irrigation systems, and flood control works. The country is presently considering large, multi-billion dollar investments such as the Ghazi-Barotha hydropower project ($2.2 billion). As the easiest sites for development are exploited, future developments will become increasingly expensive, and may also have increasing environmental and social costs which require mitigation. The financial resources required in the region, particularly to cater for future growth in demand, place water resources development firmly in the arena of major international financing.

21. The international nature of WRD&M is confirmed by its close linkages with trade - crops from irrigated agriculture, or manufactured textile goods produced using water as a raw or process material or energy source. Nevertheless, water has frequently been used as a means of supporting national independence, particularly through self-sufficiency in food. For instance, Viet Nam, among others, has invested heavily in extensive irrigation

schemes to attain self-sufficiency in food, in addition to providing rural employment. It has grown to the world's third largest exporter of rice, and appears to have a comparative advantage in paddy rice, partly due to its large labor force. However, not all countries have a comparative advantage in the crops grown to achieve food self-sufficiency. As water becomes increasingly scarce, the benefits that greater coordination at a regional level could bring may require serious consideration.

22. The Bank's aim of being a catalyst for and leveraging investment is very applicable to WRD&M, because of the massive flows of investment capital that are likely to be required. On the other hand, progressive extension of private sector investment into DMCs, especially as they industrialize, raises questions (addressed in the Bank's MTSF) about the long-term role of the Bank, given its small contribution to overall investment flows. Its strategy in WRD&M no doubt will be strongly guided by its overall strategy, as enunciated in the MTSF, to focus increasingly on its comparative advantages in policy advice, regional presence, and ability to act as a catalyst for multilateral investment.

23. Most of the Bank's DMCs share river basins with their neighbors. In some areas, disputes over water are a cause of conflict. In a few basins, notably the Indus, and the Mekong, agreements have been reached to manage water cooperatively. In others, no such agreements exist, so that sustainable management has been hindered, or development has not taken place. As regional groupings such as ASEAN and SAARC become more influential, international aspects of water management are likely to receive more consideration, to promote joint development for mutual and equitable benefit. The Bank's use of country-focused operations planning may need to take explicit account of the fact that water resources in many river basins are shared between countries.

24. As a non-political international entity in the region, the Bank is well placed to facilitate the achievement of agreement between DMCs on international water-related issues, and to complement the role of UN system agencies in this area. This role is consistent with the Bank's Operating Objective of "Regional cooperation". Because of the highly political nature of transboundary water issues, current Bank policy is to become involved as a facilitator only by the joint invitation of all riparian states, rather than at its own initiative. In implementing its policy in this area, the Bank has the opportunity to review its prior experience with respect to transboundary water issues, and identify approaches which have the greatest likelihood of success.

C. Economic Restructuring and Business Management

The development of market economies introduces an urgent need to identify the appropriate level and means of government participation and intervention in WRD&M. Innovations in business management practice are particularly applicable to water agencies, whether in the public or private sectors. Means of applying them in appropriate ways will be required, and the transfer of knowledge and technology among DMCs is an area in which the Bank could assist.

25. Worldwide, governments are restructuring economies to limit government intervention and participation in the economy, and to extend the role of the private sector. At the same time, an increased emphasis on quality assurance, flatter management structures, greater responsiveness to customers, and other management innovations are being adopted

in both private and public sector organizations. Such trends are also affecting water-related sectors in Asia and the Pacific - for example, sophisticated management information systems in Singapore, application of Build-Operate-Transfer (BOT) to water supply in Ho Chi Minh City, privatization of irrigation schemes in New Zealand, and restructuring of the electricity industry in Sri Lanka (which is heavily reliant on hydropower). Recent innovations in business management have the potential to significantly increase the efficiency of water sector entities. Techniques of management are largely transferable across organizations, but mechanisms of accountability (to political authority in the public sector and to shareholders for profits or net worth in the private sector) require modification when transferred from private to public sector environments.

26. Market failure is likely to occur in the water sector, because of the difficulty of internalizing environmental costs, and the monopolistic nature of large-scale water utilities and community irrigation systems. Economic theory suggests that government intervention, through appropriate policy and regulation, is required to deal with such market failures and ensure equity. The detailed nature of government intervention and the appropriate policy instruments would vary with the nature of the freshwater resources and the regulatory situation (e.g. a depletable versus non-depletable resource, domestic supply versus irrigation).

27. Public Choice Theory, and practical experience regarding the likelihood of Government failures, complement positive economic analysis in identifying government's proper role. This may include: (i) regulation of water (and sanitation) utilities and irrigation systems to ensure (near) average cost pricing to the utility/irrigation entity; (ii) regulation of withdrawals (quantity, timing) from, and effluent (quality, quantity) discharge into, rivers and surface water bodies to maintain instream flows/surface water stocks and water quality; (iii) provision of flood control and drainage services as non-excludable public goods without cost-recovery from users as a charge on the fiscal budget; (iv) regulation of groundwater extraction; (v) provision of groundwater recharge measures (e.g. through contour bunding) as a non-excludable public good; (vi) identifying "merit goods" and their targets among the various water supply and sanitation services (which are not also non-excludable public goods) and providing for their subsidy through the fiscal process; (vii) enacting and enforcing marine pollution regulations; and (vi) monitoring stocks, flows, and quality of water resources. Many other WRD&M activities are candidates for private or corporatized sector provision. However, the actual decisions would need to take account of the local situation, including the capabilities of candidate private and public sector entities. Experience in the region indicates the need for governments to maintain their role, and increase their capability, in water resources planning, allocation and data collection.

28. Several countries in the region have made very substantial progress in WRD&M, and have often developed solutions to water-related issues which are appropriate to their own circumstances. Such solutions may well be transferred to DMCs more readily than solutions applied in more developed countries outside the region. Korea and Singapore have very successful and comprehensive approaches to water management, while other countries have much to offer in a more specific way - Pakistan's experience in large-scale irrigation, for example, or the Philippines' approach to water law. WRD&M experience in Japan, PRC, Malaysia, Australia and New Zealand may also be useful to other countries in the region. Exchange of WRD&M information and experience between DMCs is an area in which the Bank could play an enlarged and very beneficial role, on a continuing basis.

29. Several of the Bank's Strategic Development Objectives (particularly "Promoting economic growth") and Operating Objectives are fully consistent with these opportunities in WRD&M. Water has, in many countries, traditionally been administered by public sector bodies as a public good, using highly bureaucratic and regulatory procedures. This area therefore offers particular scope for introducing modern management methods, and in some cases for corporatizing or privatizing the organizations involved. Hence, attention to WRD&M could achieve very significant improvements in management efficiency, and provide a particularly large return for the Bank's effort. The emphasis should, however, be on the application of private sector disciplines to WRD&M in DMCs for clearly understood and beneficial reasons. The Bank has good access to international management and economic innovations. It is able therefore to assist its DMCs in drawing on modern management thinking, to the extent that it is appropriate for their own governmental and economic circumstances.

30. As a leading development institution in the Asian and Pacific region, the Bank is well placed to advise its DMCs on the appropriate mix of public and private sector involvement in WRD&M, although it may have to further develop its capability in this area.

D. Agenda 21 and Sustainable Water Resources Management

31. Ongoing international efforts at the global and interregional level to improve water resources development and management, in the broader context of development and environment, are a source of strategic direction for WRD&M in the Asian and Pacific region.

32. Agenda 21, the principal document of the UN Conference on Environment and Development in 1992 (the "Earth Summit"), includes a chapter entitled "Protection of the quality and supply of freshwater sources: application of integrated approaches to the development and use of water resources." It provides a comprehensive set of recommendations for ensuring that water resources are developed and managed in support of the broader goal of sustainable development. The Conference Secretariat estimated the worldwide cost of implementing the recommendations of this chapter at approximately $55 billion per annum. The bulk of this is required for water supply, sanitation, and water resources management related to rural development, and a significant proportion will need to be sourced from the international community on grant or concessional terms.

33. One of the preparatory conferences for the UN Conference on Environment and Development was the International Conference on Water and the Environment (Dublin, 1992). The Dublin Statement established four principles, which have been widely adopted as guiding principles for subsequent discussion and planning: (i) fresh water is a finite and vulnerable resource, essential to sustain life, development and the environment; (ii) water development and management should be based on a participatory approach, involving users, planners, and policymakers at all levels; (iii) women play a central part in the provision, management and safeguarding of water; and (iv) water has an economic value in all its competing uses and should be recognized as an economic good.

34. These principles and the recommendations of the Dublin Conference underlie the objectives and recommendations of the "Freshwater chapter" of Agenda 21. They complement the well established notion, also advocated in Agenda 21, that WRD&M should be carried out in a holistic and integrated manner, in which ecological and socio-economic considerations are given appropriate weight. Agenda 21, and the concept of sustainable development that has been popularized by the Earth Summit, the Brundtland Commission, and other fora, have had a significant impact on the planning of international programs. For example, in the water sector, the WMO and UNESCO have oriented their Operational Hydrology Programme and International Hydrology Programme strongly towards the recommendations of Agenda 21. Other UN system agencies such as ESCAP and UNEP have used symposia and publications to assist developing countries to formulate strategies to implement the recommendations of Agenda 21 in WRD&M. At the same time, professional and scientific journals are publishing many articles on the application of sustainability concepts and principles to the water sector. Implementation of Agenda 21 will require an immense international effort, the scale of which is daunting. In addition to the need for large scale capital investment, there is a clear need for transfer of technology and knowledge to developing countries.

35. The "Freshwater chapter" of Agenda 21 defines the means of implementation in terms of financing, science and technology, human resources development, and capacity building. These areas are, to a significant extent, consistent with the Bank's emphases and Strategic Development Objectives. They do imply a need to enhance the scientific and technological resources of DMCs, in relation to, and in support, of investment in provision of infrastructure. The Bank is a participant and cofinancier in several initiatives in the Asian and Pacific region to boost the financing and implementation of Agenda 21 in countries of the region. The Bank should consider managing its policy formulation process for WRD&M as an integral part of these initiatives.

36. Other initiatives that have recently been taken at the global and inter-regional level to improve international cooperation and resource mobilization in WRD&M include the consultations to establish a World Water Council and the World Bank-UNDP initiative to merge existing subsectoral assistance programs in a Global Water Partnership. Also, at the USAID-sponsored workshop on future directions for implementing water policy in Asia in 1994, the importance of increasing regional cooperation and networking in WRD&M was emphasized.

37. The Bank's mandate and location will enable it to play a more instrumental role in supporting international exchange and cooperation in WRD&M among countries in the Asian and Pacific region, if its DMCs and other development partners so wish. The Bank is well situated and equipped to interface with institutions at the global and interregional level on WRD&M issues in the region. Participation by the Bank in the proposed World Water Council and in the Global Water Partnership should also be considered on the basis of its role in WRD&M in the region.

Chapter 3 DMC National Policies, Goals, and Strategies

A. Goals for Economic and Social Development and Protection of the Environment

National goals for economic and social development have significant, but frequently unrecognized, implications for water resources demand and allocation. This is particularly the case where a shift from an agricultural to an industrial base of the economy is sought, especially when a large proportion of the available resource has already been committed for irrigated agriculture. Strategic planning for water resources development and management is desirable at the national level to take account of cross-sectoral uses of water and investment capital, on a time scale of decades. Integrated water resources management is best undertaken at the river basin level, yet potentially has major institutional implications.

38. Many countries in Asia and the Pacific have set demanding goals for national development, which will have a significant - though often unrecognized - impact on water demand. Sri Lanka, for instance, has a national goal of becoming a Newly Industrialized Country by the year 2010; Viet Nam aims to achieve a 10-12 percent per annum growth in GDP. Such targets imply a significant reduction in the contribution of agriculture to the economy, and substantial increases in industrial activity, demand for water, and need for treatment of wastewater discharges. They also imply rising property and asset values, particularly in urban areas, and a potential for a dramatic increase in the risk of flood damage.

39. Water has been commonly used as a tool for achieving large scale national goals, such as self-sufficiency in food, or rural electrification. The Accelerated Mahaweli Development Program of Sri Lanka, for instance, aimed at achieving self-sufficiency in rice, even though Sri Lanka seems to have no strong comparative advantage in rice production, and the program had very significant macroeconomic consequences for the country. Similarly, other countries have developed water resources to enable reticulation of hydroelectricity to rural areas, as a matter of national policy. The use of capital intensive hydroelectricity, associated with the high costs of reticulation to rural areas, may however be financially less attractive than the use of diesel generating plants sited at villages, or biogas-powered plants. Water is a commodity of relatively low value, frequently with a high investment cost to develop it. Moreover, decisions taken today will have an impact decades, rather than years, in the future. Careful analysis of the economic and national political issues related to WRD&M is necessary to determine the optimum use of water and investment capital.

40. Water is an essential element of so much human activity that it should be - but commonly is not - explicitly considered as a resource which can be used to achieve, but might also constrain, national development goals. There are an increasing number of countries where water was formerly plentiful (demand was not constrained by limited supply), and was developed for uses which now - perhaps many decades later - constrain the use of water for more essential or higher value purposes. A typical example is that large-scale use of water for irrigated agriculture (which in Asia commonly accounts for 80 percent or more of a country's total water use) limits availability for urban water supply. For instance, in the

Philippines the country's most severe water-related problem is that of competition in the Pampanga River basin between irrigation and water supply to Metro Manila, with lesser conflicts with power generation, navigation and flushing during periods of low flow. This competition is being addressed by the Angat Reservoir Optimization Project, which will nearly double the water supply from the Reservoir. An inter-basin transfer project from the Umiray River will, if approved, also provide medium-term relief.

41. This example illustrates that WRD&M needs (i) to take a river basin perspective, so that uses in one part do not compromise those in another; (ii) to consider future demands over periods of decades, not years; and (iii) to take account of competition between uses (including non-use for maintenance of instream values), present and potential. In other words, integrated and comprehensive planning of water resources at a river basin scale is desirable - with flexibility to adjust to circumstances, as events inevitably diverge from projections. Investments in other sectors such as transport and power can have impacts on water resources, so that, ultimately, it may be necessary to utilize a regional planning rather than a simple river basin or resource planning approach.

42. The Bank's SDOs focus on environmentally sustainable economic and social development, at the national level. This provides the context within which a strategy for WRD&M must be formulated. At the same time, however, river basins are the most appropriate scale at which to undertake integrated management of water. In some countries, river basin "Master Plans" have been advocated and prepared; it should be noted that the role of such a plan can be very different, depending on the extent to which an economy is centrally planned or market led. In many cases, master plans have not been fully implemented because they were prepared primarily by technical staff, did not sufficiently address the need for a better regulatory framework and an enhanced institutional capacity, and typically did not involve financial, institutional, and political decision-makers and non-government stakeholders. In several countries, master planning was undertaken for subsectors such as water supply and sanitation. These plans, however, have typically not addressed the scarcity of the water resource as a whole, and did not take into account other uses.

43. The concept of a master plan reflects the need for a long-term view, with a time horizon of 40-50 years, although it may also imply a degree of inflexibility which is not appropriate. A national water resources planning exercise may be advocated in some countries, and the process of information gathering and analysis is likely to be of considerable benefit. However, such and exercise may not be necessary or a good use of limited technical and financial resources where water is scarce only in certain river basins. In such a case, planning and administration of the water resource may be focused simply on those river basins in which there are priority issues to be resolved. The entire approach of long-term, integrated, and cross-sectoral planning of WRD&M has major implications not just for institutional capacity, but for the numbers, responsibilities and interrelationships of agencies, at both national/federal and subnational levels, and for the process of ensuring appropriate participation from stakeholders at various levels. Water resources planning should be guided by the Principle of the Dublin Statement (International Conference on Water and the Environment, 1992) that decisions are to be taken *at the lowest appropriate level, with full public consultation and involvement of all users in the planning and implementation.*

B. National/Federal Policies On Public Administration

Currently favored approaches to public administration have much applicability to administration of water resources. Providing water services on a trading basis may be particularly appropriate, given the growing acceptance of water as "an economic good". However, water also has public and merit good attributes, which require continued government involvement in WRD&M, at the very least through effective regulation. "Appropriate policy" analysis, suited to developing country environments and drawing on successful DMC experience, and leading to staged implementation, is needed to capitalize on recent developments, and is an area in which the Bank can play an important role.

44. Water has commonly been administered by governments as a common property resource, but increasingly is recognized as an economic good which has certain public good characteristics. More to the point, most water services can be efficiently provided on a trading basis, like any other service delivery business. For example, hydroelectricity has been generated and sold by private companies for decades in Switzerland, and a number of countries, including France and UK, have more recently privatized water supply utilities.

45. Currently favored approaches to public administration, such as the need to separate policy, regulatory, operational and trading functions, or the desirability of devolving decision-making ability to the level of the community most directly affected by the decision, are appropriate for administration of water resources. As they are progressively adopted by DMCs, they can be applied to water-related activities such as domestic water supply - indeed, it is likely that such activities will be among the areas to which the new approaches will be first applied, since they so frequently can be readily conceived in terms of a business which provides a service to consumers.

46. There are many qualifiers on the applicability to DMCs of currently favored approaches in public administration. This is particularly so with respect to the application of principles and theories which barely have been tested in developed countries with substantially more human and financial resources, or very different cultures. There are strong arguments, and successful experience, for enabling autonomous and financially sound local organizations (private or publicly owned) to deliver "measurable services" such as water supply. Such organizations need to be financially sound, with sufficient management and financial skills, clear responsibilities, and freedom from political intervention. Because organizations such as water utilities often are monopolistic in nature, a strong regulatory framework is essential, including such elements as licensing, enforcement of standards, and monitoring. Priorities for WRD&M must, in the end, be set by the political process, subject to legal rights, and cannot be left entirely to the free market.

47. On the other hand, services which are "difficult to measure" and non-excludable, such as salinity or flood control, are most appropriately the responsibility of government. This is the case also for services which have poor financial sustainability, such as rural water supply, or provide public or merit goods such as ecosystem maintenance.

48. Innovations are most successful when introduced as part of a staged process, at a rate and in a way with which people can cope. The concept of *appropriate technology* is equally applicable to policy instruments - an understanding of the current political system

provides an essential basis for introducing new policies and approaches which those involved - from the most senior politician to the newest public servant - can see the purpose and benefit of. Application of new policy instruments is likely to be most effective when there is communication and understanding among all those involved, including elected representatives, administrators, technical people, and staff of External Support Agencies (ESAs).

49. Successful implementation in DMCs of new policies and administrative practices in water-related sectors will require substantial, long-term assistance in policy support and capacity building. This is recognized by the Bank's Operating Objectives (OO) for "policy support" and "capacity building for development management". The *process* of policy analysis, decisions, and implementation is itself essential to the achievement of sustainable results, as a well-executed process can provide widespread understanding and acceptance of new policies. A better understanding is needed of the policy-making process in which issues are moved from a public to a decision-making agenda, to actual decisions, legislation, and through a phase of *sustaining* the decisions to ensure their implementation. The OOs provide a sound basis for research, and for developing an integrated package of support which draws on the experience of the DMCs themselves, and other countries (both developed and developing) in which similar changes have been or are being made.

50. Significant international advances are being made in water-related policy analysis. The Bank can capitalize on these, to benefit its own operations and integrate them into its SDOs. The Bank will also be able to introduce new thinking to DMCs, where appropriate. The Bank's ability to access the highest levels of government enable it to inform senior officials, elected representatives, and other influential decision makers of key advances. The possibility to involve parliamentarians, e.g. members of a standing committee on natural resources and the environment, and non-governmental stakeholders in regular informal consultations on policy development in WRD&M should be considered.

51. The Bank's work in this area could focus on what might be called "appropriate policy analysis", analogous to appropriate technology. The term recognizes the needs of DMCs to change at a pace and in a direction which is appropriate to their national cultural and political characteristics, and specific sectoral needs. It also implies that policy developed in DMCs might be more applicable to other DMCs than that originating in developed countries. The Bank has a clear role in bringing together and transferring DMC experience and knowledge.

C. Property Rights And Ownership

It is important that property rights and ownership issues be dealt with based on an agreement of national goals and objectives for the use of the nation's water resources. Allocation and transfer of rights to use water, or to discharge into water, facilitate the efficient management of the resource. However, there are very significant issues relating to equity of access to water, particularly if tradeable rights are contemplated. Achieving economic efficiency and social equity in WRD&M in the DMC environment will require an astute combination of theory, experience, and defined needs, which the Bank is well placed to facilitate.

52. Water is commonly owned by the state, but rights to use the water may be allocated, by various mechanisms such as "prior rights", to users. Current thinking in natural resource economics places strong emphasis on the need for clearly defined and transferable property rights as a basis for sustainable resource management. Allocating private rights to a formerly common property resource such as a fishery is thought to provide an incentive for management which aims to sustain the resource in perpetuity. In theory, tradeable rights provide a mechanism to shift the rights to use a resource to an owner who can derive the highest possible value from the resource, while sustaining it.

53. One of the Principles of the Dublin Statement (International Conference on Water and the Environment, 1992), was that *Water has an economic value in all its competing uses and should be recognized as an economic good.* There are many issues related to ownership and transfer/sale of rights to use water, particularly as demand exceeds supply. These include, for example, the need for a distribution and monitoring system which enables measurement of the amounts of water received by different users; the impact of uncertain rights on willingness to invest; the ability of governments to reallocate water to (economically or socially) higher value uses; and mechanisms to ensure that community rights are safeguarded, for example to maintain freshwater fisheries and natural aquatic ecosystems. These issues extend also to land tenure, which is of major significance in terms of maintaining the condition of upstream catchments, and on irrigated lands where optimal use of the land holdings and water supply is sought.

54. While emphasizing the principle of water as an economic good, the Dublin Statement also referred to the right of all people to water for domestic purposes, at an affordable price. The question of equity must be given serious consideration as market-based principles are applied to water. There are at present few places where tradeable water rights are used, and a regulatory or political approach to allocating water seems generally to be favored. The equity issues associated with, for instance, transfer of water from rural to urban use, with all the implications for growing disparities between rural and urban standards of living and rural-urban migration, require very careful handling which elected representatives are unlikely to leave entirely to the free market.

55. Introduction of new approaches to ownership and allocation will be increasingly important in sustainably managing scarce water. There is tremendous scope for the Bank to synthesize and disseminate experience on the administration of water to achieve economic efficiency while safeguarding community interests and assuring social equity. This need is fully consistent with the Bank's SDOs and OOs; the Bank has a particular opportunity to combine practical experience, economic theory, and DMC needs to develop approaches to administration of water rights which are practical and appropriate.

D. Regulation, Economic Instruments, Public Awareness, and Education

The appropriate mix of regulatory and economic instruments in WRD&M in a developing country requires careful design, to produce an arrangement which is workable in the country's specific environment. Public awareness and education are very important, to ensure understanding and acceptance. Improved understanding also is particularly required among elected representatives and senior officials. This is possibly an area in which the Bank can exercise influence.

56. Increased private sector activity often requires enhanced regulatory capacity in public sector agencies, both to safeguard community interests in conservation of natural resources and environmental quality, and to ensure that pricing conforms to public objectives of equity, efficiency, and supply of merit goods. The regulatory regime may be at the spatial level of the resource or environmental entity to be conserved, or the area/region in which the water service is to be provided.

57. Instruments for regulation of water resources include: (i) Fiats: (Non-tradeable) quotas and permits for water use (including for pollution); mandated technologies (e.g. farming techniques, waste water treatment techniques); effluent discharge (quality) standards; and (ii) Incentives based instruments, involving: (a) trade in property rights (e.g. tradeable irrigation rights, groundwater permits); (b) pricing of a resource (e.g. long-run marginal cost (LRMC) pricing incorporating a "depletion premium"; indirect taxes to raise price above LRMC to raise fiscal revenues or for financing cross-subsidies; subsidies (fiscal or cross) to lower it below LRMC to meet equity or merit goods supply objectives, etc).

58. Numerous variants (and combinations) of these instruments are possible. A given level of resource conservation or environmental quality can, in principle, be attained at lower compliance cost by the use of incentives-based instruments as compared to fiats-based instruments. Of these, tradeable property rights may result in greater certainty in the level of conservation or environmental quality attained, but there may be uncertainty in price/revenues. However, other considerations which must be taken into account include administrative feasibility (monitoring and enforcement), transactions costs, and policy objectives other than reduced compliance cost (e.g. equity or supply of merit goods). As a result, the actual choice of policy instruments may be highly dependent on the type of water resource involved and the local situation. The Bank could have an important role in assisting the Governments of DMCs to design policy instruments which are appropriate to different WRD&M activities and for different types of water resources, and the institutions to implement those instruments.

59. The use of regulatory and economic instruments such as removal or provision of subsidies and taxes requires public information, understanding, and education, if they are to achieve the economic and social outcomes desired. People (including elected representatives and public officials) can only contribute effectively to policy development and implementation if they are informed and educated about the issues, options, and values at stake. As in so many aspects of natural resource management, achievement of an appropriate balance is required, which is responsive to changing circumstances, needs, and understanding.

60. As with administration of water rights, the design of appropriate sets of policy instruments is an area in which the Bank should have a special comparative advantage and role. The Bank's process for preparing Country Assistance Plans (CAP) provides a focus for a dynamic approach to policy analysis and implementation in each DMC. It reflects a need for policy to continually be updated in response to feedback and changing circumstances. The importance of information and education as a component of sustainable WRD&M is consistent with the Bank's SDO "Supporting human development".

E. Strategy for Integrated Water Resources Development and Management

To avoid the consequences of uncoordinated and ad hoc water resources development, the preparation of a strategy for WRD&M is advisable. Achieving the key objectives of Agenda 21 for water resources will require taking an integrated and cross-sectoral approach, at the national level. Matching the strategy with other favored approaches such as devolution of functions and encouragement of private enterprise presents many challenges.

61. Growing competition for water in many countries has brought a realization that a strategic approach to WRD&M is required, in which the competing demands are balanced and water is used in such a way that its economic and social value is maximized. Multi-purpose river basin development and water resource management has been practiced for many decades, in countries as diverse as Pakistan and New Zealand; however, many other countries and river basins have suffered the consequences of uncoordinated and ad hoc development of water. Two key objectives of Agenda 21 (chapter 18) are to (i) *promote a dynamic, interactive, iterative and multisectoral approach to water resources management, ... that integrates technical, socio-economic, environmental and human health considerations;* and (ii) *plan for sustainable and rational utilization, protection, conservation and management of water resources based on community needs and priorities within the framework of national economic development policy.* These objectives amount to implementing comprehensive strategies for WRD&M, which take full account of national/provincial socio-economic and environmental goals. Matching such an approach with a strong emphasis on private sector roles and corporatization/privatization of state-owned trading enterprises (as per the Bank's SDO "Promoting economic growth") presents some challenges.

62. An integrated, strategic approach to development will be very reliant on the national policy and financial/regulatory framework within which the decisions of individuals, firms, and state-owned enterprises seek to achieve not just their own goals, but also national goals. The Bank's present set of SDOs, OOs, and Key Operating Principles does not appear explicitly to include an integrated, strategic approach to development in any sector, or nationally. However, development of the necessary public sector capacity could be regarded as implicit. Explicit recognition may be desirable of the need for a strategic country approach to WRD&M, to guide Bank investment. The form which such an approach can appropriately take in different political and socio-economic environments will require considerable analysis, and the Bank has significant opportunity to facilitate transfer of experience among DMCs and from developed countries.

Chapter 4 DMC Water Sector Institutional Capacity

A. Water-Related Legislation and Regulations

Water-related legislation in many countries in the region needs revision to bring it into line with present and future requirements. Several countries already have experience in drafting natural and water resources management legislation, and the Bank could play a valuable role in promoting the provision of appropriate legal frameworks, facilitating transfer of knowledge among its Members.

63. Adequate legislation provides the basis for effective institutional arrangements for WRD&M. Many Asian countries have well-conceived legislation to provide a framework for water management. For example, the Philippines *Water Code* is in several respects a model of water law, while the Indonesian *Water Resources Development Law* provides a clear policy statement on ownership of water, priorities for its use, and measures to be used for water-related planning and management. Other countries have legal provisions which make less explicit arrangements for water. For example, Sri Lanka has an extensive body of law which has been constructed over many decades, and water-related matters are frequently dealt with in laws which address other issues. Thus, the Land Ordinance includes a brief subsection on water allocation which, in law, is a usable base for this issue, but has not been used in practice. In many countries, laws with relevance to water have been added to in piecemeal fashion over periods of years; their provisions overlap in some areas relevant to water management, leave gaps in others, and may introduce confusion and jurisdictional uncertainties which hinder consistent enforcement.

64. Associated with the need for adequate legislation is the need for legislators to be well informed about water-related issues. Because water resource development and management is a highly specialized area, particular effort is required to present materials to decision makers in a form that is easily used. The establishment of standing parliamentary committees on natural resources or the environment, and procedures for such committees to regularly meet with senior agency as well as nongovernmental representatives, including from academia, may be an appropriate mechanism to support the policy-making process and ensure continuity in the knowledge and understanding of legislators.

65. A sound legal foundation is as essential to achieving consistent and equitable management of water as a sound national policy environment. Each country's political, social and cultural conditions are so different that it may not be helpful to attempt to transfer legal arrangements from one to another. Nevertheless, there is much scope for the Bank's DMCs to learn from each other, and from countries outside the region which may have relevant experience or a similar legal base. In shared river basins, there are certain advantages in having similar approaches to water law, and transfer of experience from other parts of the world, particularly Europe, might assist the region's countries to identify opportunities which are appropriate for political conditions in the region.

66. The Bank could play a significant role in promoting consistent and comprehensive water law, through its OOs, especially "capacity building for development management". As the need for efficient and equitable allocation and administration of water

becomes urgent and widespread, the Bank will need to be assured that projects it helps to finance will be undertaken within an appropriate legal framework that addresses future rather than past conditions.

B. Public Sector Institutions with Water-Related Responsibilities

New models of public administration, such as separation of functions to remove conflicting goals, offer increased efficiencies in the water sector. An essential requirement is for enhanced autonomy, accountability and transparency of decision-making and financial management. Innovations in management practice also offer considerable opportunity for greater effectiveness in the water sector. They are appropriate not just for private enterprise, but also for public sector entities. These aspects of capacity building are fully consistent with the Bank's own Objectives. Major institutional changes require a careful approach which fully includes affected staff.

67. Public sector institutions in many countries, both developed and developing, are frequently regarded as inefficient and unresponsive to their customers. The Bank's postevaluation findings indicate that public water utilities in DMCs are frequently unable to collect user charges, and tolerate levels of unaccounted-for (non-revenue) water far in excess of those considered attainable. In parts of many cities, water supply is unreliable in quantity and quality and does not meet the needs of customers, including those who can least afford to purchase it from vendors or boil polluted water.

68. There are numerous reasons for the frequent inefficiency of public agencies, including conflicting objectives, inadequate financial resources, low salaries, poor staff training, unnecessarily bureaucratic procedures, confused jurisdictions, and so forth. The apparent deficiencies are frequently only symptoms of deeper seated causes - political interference, or inappropriate delegations, for example. A major deficiency in many agencies is that they have a range of functions which are incompatible - policy advice, regulation, design and construction, operation and maintenance, marketing of services. A key need is to ensure full accountability for and transparency of all decisions. In the case of water supply operations, a separation of policy making and administration functions will generally increase the efficiency of water supply operations. While policymaking can be effectively carried out by the government bureaucracy, efficient administration requires an efficient utility or private business.

69. Some of the major river basin development agencies, such as the Mahaweli Authority of Sri Lanka, have been responsible during the development phase for not only for infrastructure development but also for provision of social services such as roads, schools and policing. This may be very appropriate during construction of a major scheme, but development agencies often have been found to be ill-suited to efficient provision of services on a long-term, routine basis. Separation of incompatible functions into several agencies has been a favored solution to perceived public sector inefficiencies in a number of countries. The necessary changes have often been resisted by the agencies concerned, and agreement at the political level has not always been easy to achieve.

70. Private and public sector institutions in many developed countries are experimenting with and adopting modern management methods on an unprecedented scale. These include sophisticated quality management systems (e.g. Total Quality Management

TQM, or systems certified against the relevant international standard for Quality Management Systems, in the ISO 9000 series). Other innovations include extensive use of Management Information Systems, a strong emphasis on understanding and meeting customer requirements, sophisticated strategic planning and financial management procedures, performance-based remuneration, and so on. Engineering firms are in the forefront of this process, including a number of major firms operating in the region.

71. Many private firms in the newly industrialized countries (NIC) and DMCs of the region successfully compete internationally, and almost by definition must therefore have management of international standing. In principle, there is nothing to prevent widespread dissemination of management methods seeking *excellence* to water-related institutions, public or private, in the region. Indeed, water and hydroelectric power utilities in a number of countries already exhibit high quality management. Management development interventions, such as that carried out in the water supply sector in Sri Lanka, are able to deliver significant improvements when sustained over a period of years. Good management practice seems to be most readily introduced in sectors which can be operated on a trading basis, and where market disciplines and accountability can be applied. However, experience in countries such as Korea, Singapore and New Zealand show that administrative and regulatory agencies also can draw very beneficially on management innovations.

72. Many management innovations may appear faddish, such as "corporate re-engineering", or the introduction of "self-managing teams", but there is little doubt that (i) this upsurge in innovation is producing better products and services and enhanced financial performance, and (ii) the techniques are applicable to public and private sector institutions, including those in water-related sectors.

73. The Bank's SDOs and OOs recognize the urgent need for "capacity building" to improve management in DMC institutions, as well as in the Bank's own organization. Management interventions provide an effective approach to introducing organizational change, although results can be expected to take 2-3 years or more, in any organization. Interventions need to be "appropriate" to the culture, and in particular must address issues such as appointment and remuneration practices, as well as more obvious matters like organizational structure, staff training procedures, and accountabilities.

74. There is no shortage of expertise in the region, in designing and implementing organizational change. A particular need is to carry out change with the full understanding of the staff affected, and adequately to address staff concerns relating to the possibility of redundancy, loss of seniority, etc. Organizational change cannot be effectively achieved in isolation from national policies such as those relating to employment creation and the relative role of public and private sectors. Hence, DMCs and the Bank will need to implement capacity building in WRD&M institutions in the wider context of national economic and social policies.

C. Inter-Agency Coordination

Coordination among agencies with water-related responsibilities is essential, particularly as competition for water increases. Countries in the region have adopted a variety of models, although several are presently undergoing change, and not all are successful. The diversity indicates that no one model is appropriate in all

circumstances, and the Bank could play a useful role in facilitating the exchange of successful experience.

75. In many countries, the history of water resources development has led to primary responsibility for water being located in one agency, commonly an irrigation department or ministry of power, with water-related interests being dealt with also in other agencies. This is essentially the arrangement in, for instance, Indonesia, and the Solomon Islands. Nevertheless, fragmentation of responsibilities is also common, as has been the case in Thailand and Malaysia (although in the latter the federal Drainage and Irrigation Department plays a leading role). Where there is little or no competition for water, such an arrangement is tolerable, although it is frequently inefficient in terms of, for instance, data collection and dissemination. However, competition for water brings a much increased requirement for the different water-using interests to collaborate or - at the very least - communicate.

76. Many countries have arrangements for collaboration on water-related issues. These range from allocating responsibilities to a single agency, such as the Bureau of Water Resources in Papua New Guinea; establishing a national coordinating body like the National Water Resources Board of the Philippines; through to the National Water Resources Coordinating Committee in Thailand, which has largely advisory powers. A number of countries have very limited provision for coordination among agencies with interests in water, although several, such as Sri Lanka, are exploring the possibility of establishing improved coordinating mechanisms. On the other hand, both Australia and New Zealand have recently abolished their federal/national water resources councils, and have turned over responsibility for water resources management to state/regional governments.

77. Coordination is not always consistently successful. For example, Sri Lanka established a Water Resources Board several decades ago, which had wide powers for coordination, but it has subsequently restricted its activities to groundwater investigations. The diversity of arrangements in the region indicates that no one model is appropriate in all circumstances, and that change may be necessary in a given country, as conditions and needs evolve. An example of such change is the review presently being undertaken in the Philippines, at Presidential initiative, which has incorporated a Water Summit to heighten recognition of the country's water-related problems.

78. With some countries moving towards more coordination of water-related matters, and others towards less, it is clearly inadvisable to advocate a particular form or level of coordination. Nevertheless, it can be asserted that an "appropriate level" of inter-agency coordination is necessary in all countries - appropriate to the uses made of water, the nature and severity of competition between them, the size, resources and responsibilities of the agencies involved, the nature of water law and regulations, and so forth. Mechanisms for collaboration should ideally be related closely to national water policy and law; for example, Sri Lanka (with Technical Assistance from the Bank) is in process of establishing a National Water Council for a period of three years, which would be responsible for drawing up a National Water Policy and National Water Act, as well as providing a coordinating mechanism for other agencies and a focal point for reviewing institutional arrangements, pending the establishment of a longer-term and legally enacted arrangement.

79. The Bank's OO of "capacity building for development management", as well as elements of the SDO "promoting economic growth", implies a commitment to introducing coordination where that will improve the effectiveness and efficiency of public sector institutions and enterprises. An appropriate role for the Bank in this area is to encourage and facilitate the development of sustainable arrangements for coordination of WRD&M. Arrangements do not need to be permanent, and special initiatives, especially when started by the highest Government level, can make a significant contribution by creating impetus for analysis and action. There is no shortage of models on paper, but successfully functioning arrangements are less common; the Bank itself is also in process of developing mechanisms to coordinate its water-related work. Transfer of relevant experience between DMCs, from developed countries, and from other sectors (including private sector corporations, some of which manage to coordinate extremely diverse businesses), could significantly enhance integrated, multi-purpose water resources management in DMCs.

D. The Private Sector

Private enterprise is already very active in water resources development in the region, particularly in construction and provision of services. Non-profit entities such as farmer organizations are also well established in many places. There is considerable scope to further capitalize on private enterprise disciplines in WRD&M, particularly in management of the O&M of schemes. Increased private sector activity implies a need for better regulation, resource monitoring and other public sector activities. An appropriate mix of private and public will be required in each DMC, to maximize economic efficiency while achieving social equity. The policy analysis and institutional strengthening required is consistent with the Bank's objectives.

80. The high levels of efficiency and effectiveness which are achievable by private sector institutions have been demonstrated in many sectors of the economy, not just water. A number of governments, notably the Philippines and Sri Lanka, have corporatized or privatized state sector agencies, including some in water-related areas, such as water supply, irrigation, and hydroelectric power generation. Significant benefits can flow from corporatization of an agency, even if it remains state owned, because of the more aggressive management and the orientation towards profitability and customer satisfaction that should ensue. There can be even greater benefits from privatization, resulting from greater freedom from political interference; clearly defined objectives (including simple bottom-line profitability); ability to adopt less restrictive financial, remuneration and employment practices; opportunity to restructure, invest in new business, and divest non-core business; and others.

81. Public sector agencies can achieve the same advantages. Indeed, countries which have introduced private sector discipline and management to public sector institutions have found that their performance matches that of private enterprise, and that their profits (or reduced costs) benefit taxpayers rather than shareholders. A notable recent case is New Zealand, where comprehensive government restructuring has been associated with the introduction of management principles and mechanisms for accountability which are similar to those used in private enterprise.

82. There is already extensive involvement of the private sector in WRD&M in the region, particularly in engineering consultancy services, construction - including Build-Operate-Transfer (BOT) and Build-Operate-Own (BOO) approaches to power development -

and maintenance of infrastructure. Private enterprise provides much technology for water-related industry - for example, for tubewell construction. Private enterprise has been characteristic of water management for centuries, such as in the farmer-owned irrigation systems of Indonesia or Nepal. In Pakistan, the number of privately owned tubewells operated for irrigation reached 264,000 by 1989, and 80 percent of groundwater abstraction for irrigation was from private wells. The Government of Bangladesh, too, seeks to transfer its irrigation tubewells to the private sector. Private water supply systems for domestic and industrial purposes are increasingly common, particularly in major cities such as Bangkok and Jakarta, and indeed have become a major threat to groundwater resources, because of the difficulty of controlling extraction rates and enforcing regulations.

83. Private enterprise investors prefer discrete (and, obviously, potentially profitable) investments such as water treatment plants, rather than investments which have higher risk and lower profit potential or are inherently more difficult to manage, such as sewerage networks. WRD&M in general has been a public sector activity in the region. It has suffered a variety of consequential deficiencies, such as an excessive focus on technical and engineering matters, a lack of interest in the users, and bureaucratic procedures. Experience has been that, in many countries, large-scale public irrigation schemes are unsustainable, because adequate funds for operation and maintenance are not forthcoming from the beneficiaries. Several reasons for this have been identified - poor service delivery for which the beneficiaries are not prepared to pay; lack of "ownership" of a scheme which users perceive was designed and built by the government with limited reference to their own wishes; inability to pay because of inadequate attention to market development for cash crops; a "dependency syndrome" that expects government to continue to pay all the bills. Many of the problems arise from institutional weaknesses.

84. The possibility is being strongly promoted that private enterprise should take a greater role in WRD&M, particularly in management of irrigation and possibly water supply schemes. There are few areas of WRD&M which cannot be delivered on a competitive trading basis - including provision of policy advice to governments. A corollary to increased private enterprise involvement, however, is the need for high quality public sector capabilities in contract management, regulation and law enforcement, and performance monitoring (including state of the environment reporting and/or natural resource accounting). In practice, the monopoly and service characteristics of water, and the weakness of regulatory agencies, will probably limit the application of privatization to water management in the region, except to irrigation management by non-profit entities owned by the farmers.

85. The Bank's SDO "promoting economic growth" envisages the creation of an appropriate mix of private and public sector involvement in the economy of each DMC. The aim is, in principle, to maximize economic efficiency and social equity, by taking advantage of the efficiencies associated with private enterprise management, and avoiding market failure in provision of public goods such as affordable sanitation. What is appropriate will vary from country to country, and with time in a given country, as circumstances evolve.

86. This objective is fully applicable to WRD&M, although the complex mix and nature of water-related activities, the simultaneous private and public good nature of water and many water services, and the already well-established set of institutions in the water sector make its achievement anything but straightforward. The Bank is well placed to assist DMCs in developing institutional arrangements which meet their needs and circumstances.

E. Empowerment and Participation of Stakeholders

The benefits of enabling users and other stakeholders to participate in WRD&M are now widely recognized. Women, as those frequently involved in water use at the household and village level, are particularly considered to require a more effective role. There are also significant costs in enhanced participation, including the length of additional time required, and logistical costs. The Bank is revising its policy on NGO participation, and has a Strategic Development Objective relating to the role of women. There are many other areas in which the Bank could facilitate the effective adoption of participatory methods in WRD&M

87. The desirability for all "stakeholder" groups of people with a direct interest or "stake" in the outcomes of development to be involved in the planning and decision-making process is increasingly acknowledged. Intended users/customers have an idea of their needs and wants which is frequently clearer than that of the supplier, even though probably expressed in a different way. They commonly also have ideas about how best to meet their needs which, at the very least, should be incorporated into service and product design. A frequently cited example relates to the provision of domestic water services, where the intended women users may have a view about the preferred location of taps which is completely different to that of a visiting engineer. Systematic application of the stakeholder participation paradigm to projects has only recently started, and it is increasingly evident that it has major consequences for the modalities in which projects are conceived, designed, and implemented. Its application commonly requires a longer preparation period with an associated higher preparation cost. A recent survey of World Bank projects showed the total number of staff weeks required for the design phase of participatory projects to be 10 percent to 15 percent higher than that needed for non-participatory projects.

88. The stakeholder paradigm assumes that project success requires the interests of all stakeholders to be sufficiently aligned during project formulation and implementation. The term "stakeholders" is mostly used to refer to "weaker" groups of project users and beneficiaries that need support/empowerment to become equal partners in project development, and those groups who seek to represent their interests. By definition, however, it includes all groups of people who have an interest in the project, including users, different government and non-government parties, and notably also the Bank missions involved in project identification, fact-finding, appraisal, and implementation review.

89. Different stakeholders have unequal influence over the decision-making process, and may have different, if not competing, interests. This may affect project design work, particularly in the context of poverty reduction, indigenous peoples, involuntary resettlement and women in development. The Bank's SDOs implicitly recognize this, and Bank practices such as those related to environmental and social impact analysis, and current policy making in the area of resettlement and indigenous peoples, attempt to reconcile these interests. There is potential for conflict between DMC political and government institutions -- with whom the Bank normally works -- and other stakeholders. Procedures for placing all stakeholders on an equitable footing will need to be carefully tailored to the needs of each DMC, while achieving the Bank's Objectives to the greatest extent possible.

90. Non-governmental organizations (NGOs), particularly environmental and social/rural development groups, bring perspectives which may differ radically from officials, or even other stakeholders. NGOs range in nature from the international NGOs such as Water-Aid, to national NGOs which operate only in a given country, and local "grassroots" organizations. At their best, they have many strengths, in particular their ability to work with and mobilize beneficiaries, and to be innovative in seeking efficient and culturally appropriate means of achieving their objectives. The Bank's *sector synthesis of postevaluation findings in the water supply and sanitation sector* concluded that a major lesson is the need to draw on local knowledge, and to give users and stakeholders a strong voice and real authority in the planning and management of water supply systems. This is already recognized by the Bank, as evidenced by the fact that the proportion of Bank-financed water sector projects which provided for NGO participation has risen from about 5 percent before 1985 to over 40 percent since 1990.

91. The Bank is revising its policy on NGO participation, to ensure that their local knowledge and skills are enabled to contribute fully to development in the region. It is important that the capabilities and aspirations of NGOs are realistically assessed. Their expertise and professionalism is increasing; many are able to mobilize and administer significant resources from local sources and developed countries; and their abilities are expanding beyond the traditional service delivery and rural development role which has been characteristic particularly of community-level NGOs (also known as Community-Based Organizations or CBOs). Nevertheless, many NGOs do not have the people, or the desire, to extend their activities into new areas or complex projects, or develop contractual relationships with the Government and the Bank. The Bank will probably achieve the best results by consulting and working in partnership with NGOs, and by supporting NGO capacity building and facilitating their collaboration with national governments.

92. The role of women in water management has been given particular recognition, notably in one of the principles of the International Conference on Water and the Environment. As "fetchers and carriers" of water, household managers, and the predominant users of water for domestic and sanitary purposes, women in developing countries at the very least have a right, as the principal customer for domestic water supply, to have input into the way it is delivered. While the role of women in domestic water management is well documented and accepted, their role in improving water management in irrigated agriculture, and in watershed management, is generally less understood and accepted. At the local level, simultaneous investment in water supply and economic activity development for women may multiply the development impact on the community, the family, and on women in particular.

93. Inclusion of all the relevant stakeholders in WRD&M may prove very time-consuming, whether for design and construction of a water supply project or for ongoing operation and maintenance of a flood mitigation system. Participation in a political or bureaucratic process such as a series of public hearings is not necessarily easy for members of the public. Public participation has a variety of costs in addition to time, which must be set against the benefits of improved decisions. These might include the costs of facilitating/administering the process, providing full information to all interested parties, and equipping them to participate (giving them the necessary resources and instruction, for instance). Experience in arranging stakeholder participation is growing quickly in many countries, particularly those with a well-established democratic process. The Bank has already provided technical assistance to facilitate process-oriented initiatives to improve

project design and implementation in this respect. The Bank would be well placed to assist DMCs in the development of approaches that integrate local concerns in river basin management and administration, creating transparency and encouraging cosharing of responsibilities and powers between service providers and water users.

94. Participatory institutional development in the DMCs is an important issue and involves resources as well as time on the part of the Bank and its partners. While the details would vary from country to country, a successful approach would require a good understanding of local institutions, shared belief and knowledge systems within communities, acceptable sets of rules that could be enforced among the users of common water resources, and constraints to the smooth functioning of the system.

95. The Bank has made a commitment, through its SDOs, to "improving the status of women". This can be taken as a commitment to assuring the participation of women in all aspects of the project cycle. There is no explicit commitment to promoting the participation of the wider community in decision-making or project design and implementation, but it is not inconsistent with the Bank's OOs. In water-related areas in particular, the participation of people with a direct interest should be actively promoted, both for equity reasons and to increase the probability of project success. There is much experience of and much has been written about the need for beneficiary and user participation in water projects, primarily for water supply and irrigation. Nevertheless, there is still considerable scope for developing and disseminating the practical aspects of arranging participation, particularly in different countries and for different stakeholder groups. The Bank can play a significant role in this, by facilitating the compilation and exchange of experience built up as an outcome of its activities and projects, those of other ESAs and NGOs, and the countries themselves.

F. Watershed Management

Watershed degradation is a serious concern throughout the region, because it represents the loss of a natural asset, the soil, leads to degradation of water resources and waterways downstream, and threatens investments in WRD&M. Integrated watershed management can mitigate the consequences, given adequate funding for the appropriate agencies. However, it needs to be dealt with in a broader socio-economic context, because many underlying causes of watershed degradation can only be resolved by poverty alleviation and employment creation.

96. Land and soil degradation is a serious cause for concern throughout the region, not simply for the loss of a natural asset and productive capacity that it represents, but also for the resulting impacts on water resources. Management practices to achieve sustainable land use are well established, although application to specific localities may require further investigation. The principal issues are political, social, and economic in nature. Governments are frequently reluctant to restrict encroachment of landless farmers onto forestland, because of the lack of alternative means of livelihood. In some countries, deforestation by illegal logging is known to have been carried out with the consent of elected representatives and the staff of natural resource management agencies, with consequent soil erosion and degradation of watersheds.

97. Integrated watershed management has the potential to avoid or mitigate such consequences, but has rarely been undertaken. Forestry, agricultural, and water resource

development and management ideally should proceed hand in hand, and be linked with political and socio-economic changes to remove the underlying causes of watershed degradation. However, measures to combat these underlying causes - lack of revenue with which to adequately fund agencies, or the clearance of forest land for cultivation by subsistence farmers - are extremely difficult for DMC governments to contemplate. In fact, they place WRD&M firmly in the wider framework of national social and economic policy, and progress in watershed management is unlikely without major progress in the other areas.

98. The Bank's SDOs are very consistent with the view that integrated water resources management, including integration with watershed and land use management, is an essential element of its business. Investment in water-related activities and projects whose sustainability is compromised by watershed degradation is ill-advised. Investment in watershed rehabilitation may have little chance of success in the absence of measures to reduce poverty and create alternative employment (away from the steep-sloping catchment areas) , or to improve the management of resource management agencies. There is a clear need for cross-sectoral coordination, not just at the DMC level but also with respect to the Bank's programming activities. This extends beyond water-related areas (hydro-electric power generation, irrigation, etc.) to forestry, rural development, capacity building in government agencies, etc., through the mechanism of the Country Assistance Plan.

G. Information on Water Resources Availability and Demand

Cost-effective WRD&M is dependent on the availability of good data, especially as scarcity requires increasingly sophisticated decisions. However, many governments are cutting back on data acquisition programs, and require substantial investment in their institutions and staff. Bilateral and multilateral technology transfer have assisted in the past, but often less than possible because of the use of inappropriate technology. The Bank could play a significant role in supporting technology transfer, perhaps through the technical agencies of the UN system.

99. WRD&M is heavily dependent on the availability of hydrological and other data and information bases whose quality, in terms of data accuracy, comprehensiveness, timeliness and other attributes meet the users' requirements. Hydrologists have developed many methods of designing and operating water resources systems with inadequate data, but nevertheless there may be significant costs because of the increased uncertainty implied by the use of inadequate data. Examples include money expended on constructing the Kirindi Oya, a reservoir in Sri Lanka which has not filled because runoff is less than designed for; or massive cost overruns to deal with ground conditions under the Clyde Dam, New Zealand, which were not identified by an inadequate geological survey.

100. Many countries have inadequate flood mitigation systems, partially because of a lack of real time data to provide warnings to floodplain residents and businesses.

101. Data on and projections of water demand have until recently received less attention. They represent the other side of the supply-demand relationship which has so much significance for water resource managers, but are commonly the weakest link in the design of water resource projects. Frequently, projects have not been designed using estimates of future demand which have acceptable levels of confidence. Without proper estimates of all likely demands, the return on the investment in some projects has been less

than expected, because water has been required for another higher-valued purpose. Bank post-evaluations also indicate that a number of water supply systems were underutilized, largely due to slower than expected growth in demand.

102. Many governments, especially in developing countries, are reducing expenditure on the maintenance of hydrological and other natural resources databases. Hence, just as the growing scarcity of water requires increasingly sophisticated decision making, the data needed to inform that decision making are becoming less available. The need for improved databases has been pressed upon governments by water resources specialists for many years, with limited results. In most countries, data acquisition and archiving programs have been sustained only where data can be directly associated with economic benefits such as power generation or flood mitigation. Certainly, for many purposes other than real-time operation and flood warning, data collection need continue only until the database provides the required analytical capability. However, data collection programs have normally been curtailed to achieve cost savings, without analysis of the true benefits as well as the costs of additional data. Methods are available which enable the objective estimation of the quantities of data required for specified purposes and levels of analytical confidence. They have been used recently to design efficient water resource monitoring programs in countries in the region, and further research is being carried out under the auspices of the WMO to improve these methods. Expenditure on data acquisition need not come solely from government sources; water users can also be required to provide for the information needed to ensure that their use meets specified conditions.

103. Agenda 21 identifies water resources assessment as one of the principal areas requiring attention in the freshwater sector. Some efforts are being made by WMO and UNESCO to develop relevant technology transfer programs, but resources have been limited. Bilateral agencies have provided substantial assistance to developing countries, including several of the Bank's DMCs. Too often, however, the assistance has been in the form of inappropriate technology, and either has not resulted in any lasting improvement in data, or has required substantial continuing assistance to maintain data collection programs. This has particularly been the case where electronic instrumentation has been provided, as in Papua New Guinea and the Solomon Islands.

104. Without much improved and expanded data acquisition programs, the Bank's SDO "protecting the environment" will not be achievable, and the SDO "promoting economic growth" will be achieved only with much reduced efficiency. It is therefore in the interests of the Bank and its DMCs to ensure that country capabilities to acquire and disseminate hydrological and other natural resource data match their WRD&M requirements. Data to support project design should ideally be available before actual design commences, and can be commenced at pre-feasibility stage, particularly if older data are already available. Systems required for real-time data acquisition for water resources management can be established during project implementation. In either case, the challenge is to maintain the capability for as long as required by water managers, often in the context of a river basin. This requires government commitment and funding, based on an objective justification of expenditure on data acquisition. Such commitment and funding will be easier to ensure if the agencies responsible for water resources management programs which require the data acquisition can be held accountable for the results of their programs.

105. The Bank has a role in ensuring that adequate data are available before a water-related project proceeds, and in convincing DMCs that continued data acquisition is required for ongoing water management. Most developing countries require substantial investment in their institutions, staff training, and instrumentation, to bring them up to the necessary standards. Collaboration with UN agencies and bilateral donors would be beneficial, to promote the use of appropriate technology.

H. The River Basin as a Natural Unit for Water Administration

River basins are the most appropriate unit for managing water resources, but in most countries the administrative boundaries do not take account of topographic or hydrological boundaries. Institutional strengthening might consider the possibility of redefining boundaries on hydrological lines.

106. Earlier sections have drawn attention to the desirability of strategies for WRD&M that focus on the river basin. It is widely agreed by water resource specialists that the river basin or watershed is the most appropriate basis for delimiting the boundaries of water resources management agencies. In some countries, water is administered by agencies which are defined on a watershed basis, such as the River Basin Conservancy Commissions established in several major river basins in China. In most countries, however, the administrative divisions cross the natural watershed boundaries, which particularly complicates the management of shared surface waters and aquifers. Among the best known examples is India, where individual states have experienced considerable difficulty in achieving cooperation in managing a water resource which often is limited and under heavy demand. In such circumstances, a specialized agency can be established which has representation from the different political entities and which is responsible for implementing water management agreements among them.

107. River basin organizations, where established, often have been given multiple roles and functions, e.g. that of basin planner (comprehensive planning), basin developer (investment, construction), basin manager (allocation, drought mitigation, flood control, dam safety, protection, conservation), basin enforcer or regulator (licensing, monitoring), and operator (operation and maintenance). Some of these functions may conflict, and are therefore difficult to combine in one organization. Conflicting functions, such as developer and regulator, and manager and operator, should be separated, and overlap of functions with other government agencies should be removed. The importance of monitoring, public information, and training functions of river basin organizations has not always been properly recognized, and may need to be built up.

108. As water management becomes increasingly sophisticated and includes inter-basin transfer, it becomes even more important that administrative arrangements take account of water flows and use. For example, administration of the Mahaweli Development includes not just the Mahaweli River basin but areas outside the basin which receive inter-basin transfers for power generation and irrigation. Bank assistance to DMCs in the area of institutional strengthening and restructuring, even where not directly related to water management, might bear in mind the importance of the watershed for WRD&M. A watershed-based approach to water management must be carefully integrated with land use management and urban planning, which are more rationally based on socio-economic

features rather than topographic boundaries. Integration of urban and land use management with watershed management presents significant challenges.

Chapter 5 Status of the Water Resource

A. Surface Water and Groundwater Supplies

Water scarcity, the gap between human demand for and the availability of water in the required quantities and qualities, is the fundamental issue in WRD&M. The supply of water in the region is limited and unevenly distributed in time and space; in many places demand essentially equals supply in the month of minimum flow, and only storage, water recovery and reuse, or demand management can affect this equation. Water quality degradation is an increasingly important issue, because it effectively modifies water availability for many uses. With increasing industrialization, this aspect of WRD&M will require more attention from the Bank and its DMCs.

109. The supply of fresh water in the region is limited and unevenly distributed in space and time. Rainfall ranges from virtually zero in the deserts of northwest China, to over 4,000 mm/y in coastal Myanmar. Most of the region receives highly seasonal or periodic rainfall; under such circumstances, a larger proportion tends to run to the sea in large flows that are not easily utilized without expensive storages. Consequently, water ranges from persistently scarce in the major deserts; seasonally scarce, with surpluses during the wet season, in monsoonal areas of southeast Asia; through to abundant in those areas which receive two monsoons, such as central Indonesia. At the other end of the scale, river basins which receive heavy cyclonic rainfall may experience devastating floods in their lower parts, as in the Ganges-Brahmaputra delta.

110. The quantity of water available is the first term in the equation "quantity minus demand = sufficiency or scarcity". From a human perspective, water is scarce where there is less of it than required for some purpose, however much or little there is in absolute terms. In Asia, the average availability of renewable water is 4,300 m^3/person/year, with a range from 1,500 m^3/person/year for Korea to over 66,000 m^3/person/year for Laos. The countries with water availability below the average include China, India, Pakistan, Sri Lanka, and Thailand. In comparison, Israel has a figure of 370 m^3/person/year; Singapore has 220 m^3/person/year. Both have made use of sophisticated technology to attempt to match demand with supply, although Israel has been mining groundwater, and Singapore imports water from Malaysia. Internationally, the lowest demand is approximately 130 m^3/person/year, in Algeria, Denmark, and Jordan. Such average figures have limited meaning, because demand per person varies widely between countries, depending on their degree and type of agricultural and industrial development, climate, and so forth. A fair level of *domestic* supply is estimated to be 35 m^3/person/year, or 100 - 150 l/person/day.

111. In most Asian countries, withdrawal is less than 20 percent of the renewable water resource on a national basis; only Thailand (29 percent) and Pakistan (51 percent) exceed this figure. However, withdrawals in the month of minimum mean flow (which is usually the time when water is needed most) much more frequently equal available water, so that there is no surplus at this most critical time of year. Only through storing water in impoundment during times of surplus and releasing it during low flow periods can the problem be dealt with. China and India already have been constrained from greater development of their resources by the lack of usable sites for creation of reservoir storages. Moreover, costs

of development tend to increase with time, as the best sites are exploited; major benefits might therefore be obtained from improved management of systems rather than construction of additional facilities.

112. Many users and communities are dependent on groundwater, the flow and availability of which are inherently more stable than of surface water. Regulation and conservation of groundwater present technical and administrative difficulties, because precise delineation of aquifers is difficult, and monitoring and control of extraction by large numbers of individually owned wells is not feasible. The economic consequences of non-action on the part of governments to improve the management of groundwater resources, if difficult to quantify, are without doubt significant, both in urban areas and irrigated rural areas. Few DMC governments have as yet shown the necessary commitment to invest in systematic monitoring of groundwater status and use in urban areas. The result in many places has been severe over-extraction and depletion of the resource in many cities in the region. In a number of cities such as Manila and Bangkok uncounted numbers of private wells are mining the groundwater in aquifers underlying the cities, causing ground subsidence and salt water intrusion from the coast.

113. In some agricultural areas, groundwater is being used to supplement surface waters, and to provide added flexibility and certainty to irrigated agriculture. This is the case, for example, in the Punjab Province in Pakistan, where there are more than a quarter of a million private tubewells, supplying an estimated 37 percent of the total irrigation water supply. There is opportunity to apply conjunctive use of groundwater and surface water in many areas. Even in the irrigated areas underlain by crystalline rocks in north-central Sri Lanka, for instance, it has been estimated that groundwater could be extracted in significant quantities with "agro-wells", to help to extend water supplies to "tailenders" in irrigation schemes. The non-regulated increase in such wells has, however, already caused a lowering of groundwater tables in some areas, with shallow wells for domestic purposes running dry.

114. An increasingly important aspect of water availability is the quality of water. Some uses demand high quality water, such as irrigation of certain fruits, or food and drink processing. Domestic uses require rather lower chemical/physical quality; human consumption ideally requires high bacteriological quality water, but domestic uses such as washing and bathing, which normally account for the greatest volume of water use, do not require high quality water. As demand increases, therefore, it becomes more necessary to consider the availability of waters having qualities appropriate for defined purposes, so that water of high quality is not used (or provided by unnecessary treatment) for purposes which do not require it.

115. A critical aspect of the quality of available water is the ease with which quality can be degraded by human activity, and the cost of enhancing it. Water quality is heavily degraded in much of the region, because of high population densities, industrialization, and the general lack of pollution control facilities. For example, the Huangpa River, which flows through the center of Shanghai, receives 3.4 million m^3/day of industrial and domestic waste, over 95 percent of which is untreated. The river is essentially dead. Of India's more than 3,000 towns and cities, only eight have complete sewerage and waste water treatment, and 210 have partial sewerage and treatment. Rivers such as the Ganges and Yamuna receive vast quantities of untreated effluent from factories and residential areas.

116. Agriculture also degrades the quality of both surface and groundwater over extensive areas, by introducing nutrients from fertilizers, pesticides, and salinity. These impacts effectively modify the availability of water, since without treatment the water may be a hazard to human health, or unusable for purposes which require high quality water. In addition, the biodiversity of aquatic ecosystems may be reduced, resources such as estuarine and coastal fisheries may be damaged, and toxic algal blooms may become more frequent and severe.

117. Water scarcity, the gap between human demand for and the availability of water in the required quantities and qualities, is the fundamental issue in WRD&M. Not much can be done about the natural occurrence of water; technologies such as cloudseeding and desalination might make a minor difference, but are affordable only by the wealthiest communities. The Bank can assist its DMCs to address water availability issues in a number of ways. In particular, it can facilitate the adoption of policies, technologies, and management practices which maintain or enhance the quality of natural waters (primarily by reducing pollution), and encourage water recovery and reuse.

B. Augmentation of Supply

Water sources have been fully developed in many parts of Asia, and demand continues to expand. Means of augmenting supply may therefore be required, if improved management of the resource and demand management are unable to bridge the gap. In addition to the "traditional" technologies of impoundment, less traditional methods such as increased use of low-volume delivery of potable water, domestic wastewater reuse, and industrial water conservation can assist. An important means of augmenting effective supply is by managing water quality to enable use for higher value purposes. These approaches to supply augmentation are very consistent with the Bank's objective of "protecting the environment".

118. In much of the region, the easily tapped and readily accessible water sources have been fully developed. Where untapped sources exist, their development involves higher costs than sources that are currently used. Meeting the increasing demand for water which is associated with expanding populations, agriculture, and industrial activity, will require substantial future investment to augment supply, or to make better use of existing supplies. Traditional approaches to augmentation include construction of storage reservoirs (to deal with seasonal scarcity), canal systems and inter-basin transfers of water, and groundwater extraction (which in many places has the nature of mining, at rates well in excess of recharge). These approaches also may be associated with increasing costs, in terms not just of the capital investment required but also of the social, political and environmental impacts.

119. There are other, less traditional, means of augmenting supply which will increasingly be necessary. These include use of rainwater collection tanks for domestic sanitation purposes, artificial groundwater recharge, and use of bottled water for drinking. Already, many people in urban areas purchase water from vendors for drinking and cooking; they are commonly among the poorest members of the community. On the other hand, bottled water is becoming increasingly fashionable among the middle classes, associated with growing suspicion of chemical treatment of public water supplies. Consumption represents less than 5 l/person/day (of high quality potable water) of the 100-150 l/person/day estimated to be a reasonable domestic requirement; there may be scope for developing

approaches to public water supply which rely on the wide acceptance of high quality water in small quantities, and the use of lower quality water for purposes that do not require it to be potable.

120. In other words, water availability can be modified or augmented by management of water quality. Technologies for management of urban wastewater and reduction of industrial pollution are available which are low-cost or no-cost, but they have received limited application in the region. Industrial water conservation can effectively increase water availability (by reducing the quantity of polluted effluent which renders the receiving waters unusable for some purposes), while at the same time reducing rates of extraction from existing water resources. Technologies for reclamation and reuse of water can also, in effect, increase water availability. For example, about 40 percent of effluents in municipal areas in Japan were, in 1986, reclaimed and distributed through dual supply systems, for reuse for purposes such as toilet flushing and urban irrigation. Some firms, particularly in the food processing industry and in businesses which use large quantities of water for washing or cooling, have achieved rates of water reclamation and reuse of 90 percent and more. Management of water losses presents a significant opportunity for financial savings. It can often postpone the need for major expenditure on water supply augmentation, thereby saving considerable capital sums.

121. Water use for municipal/domestic and industrial purposes is relatively small in comparison with agricultural uses, so increased use of technologies such as reuse will not necessarily make a major difference in terms of augmenting supply. Their greatest benefits are in terms of reducing costs, and reducing environmental impacts and pollution.

122. Forms of supply augmentation like water recovery and reuse are more consistent with aspects of the Bank's SDO "Protecting the environment" than others - particularly those which involve dams and interbasin transfers. There are also many ways in which they can complement the aim of encouraging private sector development, since a number of products and services could appropriately by supplied by private enterprise. Government action also may be needed, however, to create an environment in which water users would find it more cost-effective to use the type of measures referred to, rather than to continue to draw on natural surface or ground waters, or augment supplies by more traditional means.

C. Catchment Condition

Watershed degradation causes huge economic losses throughout the region, and can have a severe impact on water resources. Watershed rehabilitation and soil conservation measures are well developed, but an integrated approach to rehabilitation is necessary to ensure that the root causes of degradation, which are largely socio-economic and political in nature, are dealt with. The Bank's objectives relating to poverty alleviation and environmental protection provide a vehicle for addressing the biophysical phenomenon of watershed degradation.

123. Catchment degradation is a major problem in virtually every country in the region. Overgrazing, encroachment and the use of unsustainable agricultural practices, illegal timber extraction, forest removal for firewood, intensive agricultural development: all these are causes of accelerated soil erosion, sedimentation in river channels, canals and

reservoirs downstream, increased flood peaks, reduced low flows, and degraded water quality. Perhaps the best known example of accelerated erosion is the Loess Plateau of China; of the total 640,000 km^2, 156,000 km^2 are severely eroded. An estimated 1.6 billion tons/year is being removed, and the Yellow River is aggrading at a rate of 10 cm/year. In the Philippines, catchment degradation is estimated to cost the nation $0.5 billion per annum, as a result of loss of production and impacts on downstream areas. In Nepal, widespread catchment degradation as a result of indiscriminate tree felling for lumber and firewood, agricultural land encroachment, overgrazing, and generally poor land management has resulted in modified hydrologic regimes, increased sediment loads which have a serious impact on run-of-the-river irrigation schemes, and more frequent flooding of floodplain lands downstream. The monetary cost is indicated by a Government proposal for a Master Plan which would cost more than US$1.4 billion.

124. A wide range of techniques are available to arrest soil erosion, although they cannot return the lost productivity of the soil, and many decades may be required before the impacts on water quality and hydrological regime are controlled. The potential success of watershed rehabilitation and management is indicated by, for example, experience in Pakistan, where sedimentation in the Mangla Dam was reduced by 40 percent. However, technological solutions do not necessarily address the basic causes of soil erosion, which in many cases are related to population pressure on resources - fuelwood, timber for cash, or land for subsistence agriculture, as is the case in the Terai zone of Nepal, for example.

125. The foregoing emphasizes the need for an integrated approach to WRD&M which includes watershed management and soil conservation and - even more fundamental - measures to deal with the underlying causes of human behavior which lead to overexploitation of soils and vegetation. To invest large sums in flood protection or irrigation works in downstream areas when upper catchments are being denuded is a recipe for, at best, large recurrent expenditures for maintenance of the schemes.

126. The Bank's recent Policy on Forestry provides many relevant ideas on how to place watershed management onto a sustainable basis.

127. Another aspect of watershed management which is of great significance in a number of the region's countries is salinization of soils. This is a particular side-effect of irrigation; perhaps the best known example is Pakistan, where a series of Salinity Control and Rehabilitation Projects have included such measures as installation of tubewells, surface and subsurface drains to provide relief on 3.4 million ha of land affected by waterlogging and salinity.

128. The direct impacts of catchment degradation are biophysical in nature, and the Bank's SDO "Protecting the environment" includes a number of elements which will help to address them. However, the WRD&M issues that catchment degradation raises are principally institutional, political, and economic. The Bank's SDOs and OOs target some of the underlying causes of catchment degradation - population pressure and poverty, weak policy, and insufficient institutional capacity in land and forest management agencies. It is particularly important that an integrated, cross-sectoral approach is taken to projects to develop water resources, where degradation of upper catchments is already or may become significant.

D. Water-Related Diseases

Environmental health issues related to water are critical in much of the region, with high levels of morbidity and mortality from water-related diseases and resurgence of some diseases formerly thought to have been under control. Despite past massive expenditure on drinking water and sanitation programs, progress continues to be hindered by population growth and uncontrolled wastewater disposal. However, effective responses are possible, with the right policies, priorities, and will.

129. Environmental health issues related to water are critical in much of the region. In spite of the $12 billion expenditure during the International Drinking Water Supply and Sanitation Decade (IDWSSD), a large percentage of the region's population does not have access to safe drinking water and sanitation. The work during the Decade gave services to many millions of people, but because of population growth, the number without services was relatively unchanged. In 1990, an estimated 180 million in urban areas in Asia and 690 million in rural areas did not have safe water, and 270 million in urban areas and 970 million in rural areas did not have sanitation. Those communities which did receive coverage during the Decade may still have supplies which are not continuously available, or are at times contaminated because of inflow of polluted groundwater into pipes during periods of low pressure. The impacts of these shortcomings include a high incidence of waterborne and water-hygiene diseases, high infant mortality rates, and reduced worker productivity. For example, in Pakistan, it is estimated that 45 percent of childhood deaths and 25-30 percent of visits to dispensaries and hospitals are attributable to diarrheal dehydration.

130. The area of public health is in some ways an example of people having to "run hard merely to stay in the same place". Indeed, there have been some reversals with a resurgence of some diseases. The incidence of waterborne and water-hygiene diseases is, of course, related to population pressure and to the pollution of surface water and groundwater by untreated or inadequately treated effluent. Increasingly, pollution by industry and agriculture has an impact on human health, through introduction of toxic or carcinogenic chemicals, pesticides, nitrates, and so forth. A number of water-based diseases (passed through means other than ingestion) also are common in the region, including giardiasis, cholera, and guinea worm. Water-vector diseases include, in particular, malaria, which accounts for 20-30 percent of childhood deaths. Asia accounts for about three-quarters of globally recorded cases of malaria; globally, there are estimated to be about 120 million clinical cases each year, and 300 million carry the parasite. Schistosomiasis only occurs in a few locations, including areas of Mindanao in the Philippines and Khone Island in the Mekong River on the Lao-Cambodian border.

131. Developments intended to provide health benefits frequently have had negative impacts in other ways. For example, water supply projects without commensurate sanitation improvements have caused serious pollution downstream. Sewerage projects without adequate wastewater treatment or minimization also may worsen water pollution and associated health problems downstream from the beneficiaries.

132. Lessened human well-being can be related to water in ways other than through water-related diseases.. Most obvious is the displacement of resident populations by reservoir construction, which can have immense social and personal costs. A well-known example is the Sardar Sarovar Dam on the Narmada River, India. The dam will provide

1,200 MW of electricity, supply water to 40 million people, and irrigate 18,000 sq. km of land. On the other hand, it will require relocation of 100,000 people, and flood 240 sq. km of land. The Three Gorges Dam on the Yangtze River is an even larger-scale example. The project was estimated in 1990 to require $2.1 billion for resettlement, but such a figure is only a minimum estimate of the true cost, when the social and cultural costs to the individuals themselves are included.

133. The experience of the IDWSSD points to the immense challenge presented to the Bank, DMCs, and other agencies, in terms of achieving human health targets through provision of drinking water, sanitation and hygiene education. Progress is hindered by the rapid growth in human populations, particularly in urban and peri-urban areas, and degradation of the quality of water sources by their use for disposal of untreated wastewater and liquid effluents. Effective response is primarily a matter of public policy, priorities and will, since - as shown for example by Singapore and Korea - the necessary technology and experience with effective public information and awareness campaigns are available to countries in the region.

Chapter 6 Usage of the Water Resource

134. There is no clear relationship between water use and GDP, partly because water use per person tends to decline in developed countries where water efficient, high technology industries tend to replace those which require large volumes per unit of output. Water scarcity in countries in the region is likely to be associated with rapid population growth, which will require irrigation to enable increased food production, and rapid urbanization, which will put a stress on water availability in some watersheds and aquifers.

A. Water Demand and Competition among Alternative Uses

There is increasingly severe competition among extractive and consumptive uses of water, and with instream uses such as for salinity control. Most countries have priorities for allocating water; allocation rarely reflects the economic value of water, and noneconomic objectives take precedence. Competition for water will in the future be a serious constraint to sustainable economic growth; supply-side and demand-side approaches to resolving the issues will not provide simple answers, and a strategic, multi-sectoral approach to WRD&M will be required. The scale of what will be required is almost overwhelming, and the Bank's role as a "catalyst development institution" will be very appropriate to the need.

135. Many countries of the region are encountering increasingly severe competition between the various uses to which water is put, and to "non-use" or instream use for maintenance of river and estuarine ecosystems. The most common competition is between water withdrawal for irrigated agriculture, and water supply for industrial and domestic purposes. In India, Hyderabad (present population of 3.3 million, expected to be double by 2015) is in a drought-prone area, and a number of dams and barrages provide water for municipal and industrial supply, and for irrigation. The imbalance between water availability and the combined demand for water supply and irrigation is greatest in dry years. This is when farmers most need irrigation water, and the allocation of water to the city ahead of irrigation introduces a significant uncertainty to irrigators.

136. The situation is similar in the Pampanga River basin of the Philippines, which provides water for the municipal supply to Manila. During normal years, water is available for irrigation in the catchment, but demands from Manila, and for power generation at Angat Dam, have highest priority during dry years, so that there is a severe impact on irrigators, such as in the drought of 1989. Similar competition between municipal uses and irrigation - which in the past has had priority for water and still accounts for up to 98 percent of total usage in some countries - is found in many other major cities in the region, including the capital cities of Bangkok, Beijing, Jakarta and Karachi. In Karachi, demand is projected to rise from 1.6 MCM/day at present to 7.6 MCM/day in 2010. Consideration is being given to using desalinization to supply water, while immense quantities of water are used for low-value irrigated agriculture in upstream areas. Although domestic demand is, in general, relatively small in volume terms, it tends to be constant through the year, and security of supply is important - in other words, tolerance of uncertainty is less for the urban users than for agricultural.

137. Irrigation is also increasingly in conflict with power generation, as mentioned with respect to the Angat Reservoir. The increasing difficulty of allocating water between irrigation and power generation in the Mahaweli Ganga scheme of Sri Lanka has prompted a search for ways of further enhancing existing procedures for water allocation in that country. A Bank-financed technical assistance project has helped to prepare a strategic framework for comprehensive water resources management, to address this and related issues.

138. Competition is not restricted to alternative types of use, but there is intense competition by the same types of users, particular irrigators. India has among the most severe difficulties with competition for water resources that are now fully utilized in several river basins. In the Cauvery, new projects in the upper reaches are being implemented by Karnataka state, depriving the delta area, Tamil Nadu's "rice bowl", of the water that it has received for centuries. A similar process is occurring in many river basins throughout the region, even where coordination in shared river basins is not an issue. It commonly results in net economic loss to the nation, because it tends to transfer water away from the inherently more fertile and efficiently cultivated deltaic tracts to less productive upstream lands. The latter, moreover, have a less reliable water supply, as a result of being located in smaller headwater catchment areas.

139. Increasingly, the need to leave water in rivers for various purposes, collectively known as instream uses, is constraining development for out-of-stream uses. In several rivers, water must be committed to preventing the saline front from advancing upriver from the coast; these include the Chao Phraya of Thailand, the Indus of Pakistan, the Mekong, and the Brahmaputra and Meghna, in the eastern part of the delta complex of Bangladesh.

140. In some rivers, instream flows must be maintained for river control purposes, in particular to carry sediment to the sea and control aggradation. An extreme example is the Yellow River, in which it is estimated that an average 20 billion m^3/year of sediment-laden water must be discharged to the sea during summer-autumn flood seasons. With planned diversions of 37 billion m^3/year (64 percent of mean annual flow) by the year 2000, and storage which is relatively limited for the year to year variability of flows experienced, it is expected that there will be increasing competition for water, particularly during drought years.

141. In the western part of the Ganges delta, water has been diverted by the Farraka Barrage to provide sediment flushing of the Hooghli, and maintain navigation at the port of Calcutta. As a result, the diminished flow in the Ganges has allowed the saline front at the delta to move inland, and there have been severe impacts on fisheries and navigation, as well as increasing difficulties in supplying water to a number of irrigation schemes. The desirability of retaining water in rivers to preserve estuarine/delta fisheries and navigation is a feature of several other systems, such as the Mekong, Red River of Viet Nam, and Irrawaddy of Myanmar; China, Thailand and Bangladesh in particular have already lost significant fishery and/or navigation benefits as a result of flow reduction caused by damming and diversion. The need for flushing flows to clean out severely polluted rivers exists in cities such as Jakarta. Here, effective flushing is estimated to require a flow of 28 m^3/s during the dry season, at a time when demand for other purposes is at its most intense.

142. Most if not all countries have established priorities for allocating water where there is competition. Many also have, but do not necessarily fully use, formal mechanisms for allocating rights to use water. A common merit order is domestic use, animal use, and

firefighting; instream allocations; irrigated agriculture; industrial supply; then power generation. Allocation commonly does not reflect the economic value of water, and social objectives take precedence. Furthermore, irrigated agriculture has already taken the greater part of the water resources of most Asian countries, and there has been massive investment in infrastructure. The process of reallocation to higher valued uses is not easy, nor politically popular among the rural populations which would be affected. The situation is in many places even less easy to manage because of the number of private abstractions, particularly from ground water.

143. Competition for water can only grow more intense. Growing populations, and rising standards of living and food consumption, will require agricultural production to increase over large areas, and the need to maintain and develop freshwater fisheries will become more critical. At the same time, rapidly growing cities will demand more water for domestic consumption, sanitation, industrial purposes, waste disposal, and - indirectly - for hydroelectricity generation. Only in Cambodia, Laos, Nepal, some of the islands of Indonesia, and Papua New Guinea is there a more limited prospect of competition for water in the next 10-15 years.

144. A key requirement is the capability for timely and sophisticated decision making, to make the best possible use of water. In theory, a market-led approach would enable water to be transferred to the highest value use, and this would be consistent with the Bank's cross-cutting priority of encouraging private sector development. In practice, there are few examples where such an approach has been used to allocate water between competing uses. Even in California, where competition between irrigated agriculture and urban supply has been dealt with by market mechanisms, it is not envisaged that such an approach could be applied on a significant scale for another twenty years. The alternative, government planning and management, has not been wholly successful in most countries, once competition became significant. In the region, only Singapore and Korea appear to have been able to deal equitably and successfully with competition for water, while avoiding severe degradation of the resource. Other countries have developed elements of the solution; the opportunity for mutual benefit through transfer of knowledge and experience is considerable.

145. Competition for water represents a serious limit on the ability of the Bank's DMCs to make progress on achieving economic growth, which is an outcome of the Bank's SDO of "Promoting economic growth". To enable this desired outcome to be achieved will require attention to the causes of and remedies for competition. In the past, attention has focused on "supply-side" solutions, like construction of new storage and diversion canals. The prospects for such solutions will decrease as associated social and environmental impacts increase and cause conflict with other SDOs, in particular "protecting the environment". Novel supply-side solutions such as wastewater reuse are technically and economically feasible, but increasingly demand-side measures will be required, as discussed below.

146. The key will be to simultaneously develop a strategic multi-sectoral and basin-wide approach to WRD&M; private and state sector enterprises which use efficient production technology; an equitable and well administered allocation and regulatory framework; international and interprovincial agreements where relevant; and accurate current information on and projections of water availability and demand. The scale of what is required is almost

overwhelming; the Bank's niche role as a "catalyst development institution" is very appropriate to the need.

147. Competition for water also represents an increasingly serious threat to equitable use of the resource, particularly for the poor who are in many cases already paying much more for water than the rich. Not only do the poor receive less water at a higher cost, the water they do receive is often of a lower quality. Likewise in irrigated agriculture, the richer farmers often benefit more from irrigation investments by receiving more water. In formulating a comprehensive policy for WRD&M, the Bank, and its DMCs, need to consider how existing project modalities in WRD&M are affecting the equitable use of the resource, and how future operations can be improved in this regard, to support the Banks SDO of "poverty reduction".

B. The Value of Water and Water Projects

The economic value of water for various uses is very different, and accurate valuation is increasingly important in a world of scarce water and investment capital. Opportunity costs and external costs in particular can make a significant difference to the acceptability of a project, but in the past have frequently not been included in appraisal. Economic efficiency is not the only or most important criterion in WRD&M, but accurate valuation of water enables transparency in decisionmaking and reveals the impact of subsidies introduced for social and political reasons. Improved methods of comprehensive cost-benefit analysis in the DMC project environment are required.

148. Accurate valuation of water is an important prerequisite for establishing the price of water and water services. The economic value of water for various alternative purposes is quite clearly very different, and there is growing interest in developing means to allocate water to the highest value uses, and to induce users to make the most efficient use of the resource. The opportunity costs or foregone benefits by using water for a particular project use are becoming more important in evaluating its relative merit, in an environment where water (and capital to develop the resource) is scarce and a number of alternative uses is possible.

149. There is recognition in the Bank and elsewhere of the need to improve the economic analysis of proposed investments in water. *Comprehensive* analysis of all benefits and costs, including external costs, of water resources developments seems rarely to have been carried out until recently. There are many nonmarket and nonmonetary costs of water use which, if included in an analysis, could significantly reduce the value of a given project. (External benefits seem to be less commonly experienced). For example, water quality degradation, deterioration of natural ecosystems and fisheries, loss of navigability, or displacement of people by reservoir construction can have serious non-monetary costs.

150. Non-monetary costs are not easy to accurately assess, however, particularly where non-commercial activities are involved such as subsistence fishing or collection of firewood from common land which is flooded by a reservoir. Nevertheless, methods are available, such as estimating the cost of treating polluted water to make it suitable for use downstream, or applying the contingent valuation technique of surveying the public's willingness to pay for retention of a natural ecosystem. As always, any innovative methods will need to be usable in the DMC and project environment for which they are intended.

151. Unanticipated consequences of water resources development have had a major impact on the net benefits of some projects. The tendency for irrigation to lead to waterlogging and salinization is particularly significant, and Pakistan's irrigation systems in the Indus basin are perhaps the most striking example. The government has had to implement an extensive program of Salinity Control and Reclamation Projects to ameliorate the effects over an area of 3.4 million ha, about one quarter of the country's irrigated land. The SCARP program has involved expensive and heavily subsidized activities of providing pumped drainage by tubewells, sometimes supplemented by subsurface tile drains. It has been estimated, nevertheless, that 19 percent of the total 16.2 million ha of irrigated agricultural land has been affected by salinity, and also that agricultural land is being lost to production more rapidly as a result of salinization than it is being gained by continued investment in new irrigation. Calculation of the value of water and water projects is clearly not straightforward in such circumstances. In Pakistan, the costs of salinity control through improved drainage should also be weighed against the benefits accrued in agriculture production from irrigation investments over a period of 130 years.

152. A particularly important aspect of water resources development is the health-related, intangible and other benefits, such as savings in women's time and possible reallocation to income-generating activities, and, in some cases, improvement of women's participation in community decisionmaking processes. Postevaluation work suggests that, because normal methods of measuring the benefits of water supply have not included health and other intangible benefits, water supply projects have been unfavorably compared with investments in other sectors. In addition, the delivered water has been undervalued, and underpriced. Techniques are being developed to estimate economic returns using information on consumers' willingness to pay, although these methods have a number of weaknesses which have to date reduced their practical application in project appraisal.

153. The Bank's postevaluation experience also indicates a need for cost-benefit analysis to be more accurate. Review of postevaluations of irrigation projects indicates that economic internal rates of return were generally below estimates made at project appraisal stage - that is, in effect, the value of water for irrigation was less than projected. A variety of reasons for this has been cited, including increased opportunity costs of water, shortfalls in the realization of project benefits such as cropping intensities, and lower output prices.

154. The Bank is actively reviewing and developing its methods for estimating the benefits and costs of water projects, and is about to start the application of economic analysis methods for water supply and sanitation projects on a trial basis, under a regional technical assistance project. Improved methods will assist the Bank and its DMCs to allocate scarce investment funds to projects (water-related or otherwise) which truly make the greatest contribution to national welfare in each country. By including economic, social, and environmental benefits and costs into comprehensive benefit-cost analysis of projects, the Bank can assist DMCs to establish the true value of water, and therefore to make optimal decisions on its development and management. Economic efficiency is not the only or even most important criterion used by the Bank's member countries in decision making. Social and political considerations, such as the desire to achieve national self-sufficiency in food staples, may outweigh economic issues. However, accurate valuation of water enables transparency in decision making to be achieved, and helps to reveal the impact of subsidies to some sectors of the economy or country.

155. The Bank's SDO "Promoting economic growth" envisages a number of ways in which economic restructuring will facilitate growth. Improved knowledge of the value of water will facilitate this, particularly with respect to policy on subsidies, tariffs, and market-led decisions.

C. Pricing of Water Services and Cost Recovery

Few countries in the region charge prices for water services which reflect their real value to the beneficiaries, or even their cost of provision. This commonly leads to over-consumption and depletion of water resources, or undermines the sustainability of water schemes by failing to provide sufficient income to cover operation and maintenance costs or capital repayments. Although the issue is widely recognized in the region, the Bank's DMCs are having limited success in introducing realistic charges for water services. Appropriate mechanisms are required which can be administered in the DMC environment, along with the strengthened institutions needed to consistently implement them.

156. Few countries in the region charge users for water at tariffs which approach the true economic value of water, or even its cost of provision. Other services, in particular drainage and flood control, are also normally subsidized, to achieve social and national development goals. Frequently, water - as a "gift from God" - is provided free of charge or at a price well below the direct cost of supply, even where the users are well able to pay. Commonly, noneconomic objectives such as national food self-sufficiency have taken priority in the Bank's DMCs over economic considerations, or over concern to maintain the resource for the future.

157. In some cases, it is not easy to identify specific users who can be charged for the use of the water, other than the taxpaying public as a whole. Thus, for example, water has been allocated to limit the loss of estuarine mangrove habitats and fisheries in the lower Indus, rather than utilize the flow entirely for irrigation. In this and similar cases, the value of water is incalculable, but is recognized by the administrative arrangements made.

158. Large differences between the value and price of water create the risk of abuse, by those involved in its use and administration. Effective exercise of regulatory powers is required in these circumstances, to ensure that the societal objectives set by government are achieved. The latter in turn requires that the societal objectives have been clearly defined. If they have not, then allocation of water may be arbitrary or subject to self-interest. Where low or zero prices are charged for water or water services, over-consumption and depletion of the resource are the inevitable result; examples are seen throughout the region. Very commonly, for instance, irrigation water is over-used by farmers at the head of systems, so that tailenders receive inadequate or unpredictable supplies (return flows notwithstanding), and in extreme cases have to revert to rainfed cropping. Admittedly, it is not easy to operate a system of volumetric pricing in irrigation systems without water measurement facilities, and in traditional rice-based systems where much of the water merely flows through a landholder's fields rather than being used there. Normally, a land tax or similar charge is applied (although frequently not paid) which is unrelated to the actual volume of water consumed.

159. An alternative is for farmers to pay "in kind", by contributing labor for maintenance of secondary and field level canals. As the market economy takes wider effect, however, this system of cooperative activity seems likely to decline, and a money-based alternative will become more common.

160. Overpumping of groundwater by industrial and residential consumers, unregulated and at the cost only of the electricity, has led to aquifer depletion and ground subsidence under a number of cities. Failure to regulate or to invoke the "user pays" approach to effluent disposal has led to severe pollution of water courses in cities from northeast China to Pakistan. A recent Bank study of the chemical industry in Pakistan indicated that only 3 percent of plants treated their wastes, and the rest disposed untreated wastewater directly into the natural watercourses.

161. The sustainability of water services is dependent on the availability of the financial resources to operate and maintain the service, and to prepare for replacement or further development. These resources can come from general taxation, but governments have been increasingly reluctant or unable to centrally fund operation and maintenance of water services. The Bank's Post-Evaluation Office has indicated that the central issue to financial viability of water utilities is cost recovery from users. Tariffs which reflect the full cost of providing the service, and the efficient billing and collection procedures required to recover costs, are a critical issue in nearly all DMCs, partly because of political resistance to tariffs which enable cost recovery. However, the adoption of business and management processes characteristic of trading enterprises or utilities is enabling water supply agencies to move towards sustainability, as in the case of the National Water Supply & Drainage Board of Sri Lanka, for example.

162. Many of the region's countries have no tradition of charging for irrigation water, although Sri Lanka and Indonesia have recently introduced irrigation service fees (in the case of Sri Lanka, almost wholly without success). India has a long history of water charges, but revenues return to the general budget rather than being applied to O&M of the irrigation system, and collection is very inefficient. In the Philippines, the National Irrigation Administration operates as a utility whose main source of revenue is irrigation service fees. There are a number of weaknesses in the arrangements, and collection is only on the order of 55 percent. The NIA is in financial difficulties, which has led to proposals for a major program of institutional strengthening, possibly including downsizing of its staff by about 30 percent. Nevertheless, the corporate structure of the NIA provides a model of the type of approach which might be successful in providing and managing the resources required for financial sustainability.

163. Issues relating to water pricing have been thoroughly discussed in recent years, particularly from the perspective of encouraging efficient use and providing resources for O&M. However, many of the Bank's DMCs are having little success in setting and collecting charges for water services which cover the cost of operating and maintaining the systems, let alone pay for past investment and provide capital for future investment. Consumer willingness and ability to pay charges, and the ability of agencies and utilities to collect charges, are frequently very low in DMCs, for a variety of reasons. In addition, governments in some DMCs are reluctant, for social and political reasons, to introduce water charges for all users. Success in obtaining public acceptance of charges, and consistent success in collecting them, may take many years to achieve. Meanwhile, there seems little

point in recommending measures which are appropriate in a developed country, but which do not reflect the reality of political and social conditions in a developing country. Nevertheless, in some small island countries, where water consumption is reaching the limit of readily available resources, water tariffs have been adjusted to cover full operating and maintenance costs. The effect on water consumption cannot yet be determined.

164. The opportunity for the Bank seems, as in several other areas, to assist DMCs in developing measures for water pricing which are suited to their own circumstances, and which therefore have the possibility of success. The Bank has access to current thinking on pricing mechanisms and administrative arrangements suitable for common property resources like water, and community services like water supply. It also has access to the experience of its DMCs about what works, what does not, and why. Consistent with its MTSF, the Bank can play a significant role in exchanging experience and information, introducing and testing appropriate mechanisms for charging for water services, and restructuring and strengthening the institutions involved.

D. Water Use Efficiency and Conservation

Measures to increase the technical efficiency of water use can have a significant impact in urban areas particularly, but may offer less prospect than often thought for reducing the imbalance between supply and demand in rural areas. Much has been written of the need to use pricing as an incentive for achieving increased economic efficiency of water use. Improved systems for revenue collection may assist in modifying usage. A key need is public information and education. Attempts to modify the behavior of water users through economic and noneconomic means must consider the political and social environment of legislators; an understanding of the environment assists in balancing political realism and efficiency of resource use.

165. The growing imbalance between water availability and demand must be met at least in part by more efficient use of water. The concept of efficiency of use encompasses technically more efficient methods of using water for a given purpose, such as irrigated agriculture, and economically more efficient use of water, which might require reallocation of water from a low value to a higher value purpose. The need to recognize the relative value of water for alternative uses, and the possibilities for encouraging reallocation to higher value uses using mechanisms such as pricing, have already been referred to in preceding sections.

166. In many places, available resources are already fully developed, at least during the dry season, and, in the technical sense referred to above, water use efficiency at the scale of the whole watershed is close to 100 percent (that is, no water reaches the sea, or only sufficient to maintain ecosystems or navigation). Where sufficient artificial storage is developed to store wet season inflows and release them later on, 100 percent efficiency can be approached year round. It is efficiency at the scale of the entire basin that is most significant. For example, in an irrigation scheme, excessive applications at the head of the system will produce return flow to the system or recharge to groundwater, and so be available to users further downstream. (This neglects associated problems of waterlogging and salinization, of the sort experienced in the Indus system). Technical efficiency measures at scheme level, such as canal lining or more careful control of applications, may therefore have little net effect on basin efficiency, other than through reduction of evaporation.

167. Measures to increase the efficiency of domestic and industrial water use are extensively employed in the more developed and water short countries of the region, particularly Singapore, Korea and Japan, and to a limited extent elsewhere. The methods include modern water-saving technology such as improved shower heads, efficient sprinkler systems for horticultural and domestic applications, and industrial processes which recover, recycle and reuse water rather than use continuous inflows of new water. Their advantage is two-fold; firstly, less water is required from the public water supply or from the private source (frequently groundwater pumped from an already over-exploited aquifer); secondly, less wastewater is produced which must be treated or (more likely) discharged to the local watercourse or shallow groundwater. (In some circumstances, it may be advantageous to discharge larger quantities of more dilute wastewater, but this is not a long-term preferred option).

168. In developing countries, the issue of water losses in urban areas is often as much a social as a technical problem, in regard to the illegal connections and "spaghetti" lines serving slum settlements. Appropriate solutions need to be found for the water supply authority to communicate and deal with the consumers, e.g. through zonal caretakers, to improve the efficiency of distribution and water use.

169. Where water is supplied at little or no cost, there is little incentive for users to increase their efficiency of water use. Much attention has therefore been focused on the use of water pricing or "polluter pays" charges to provide an incentive. Outside of those countries already mentioned, however, little progress seems to have been made in encouraging users to be more efficient. Water prices are generally too low to exert any control on usage, or are unrelated to usage (e.g. irrigation service charges levied on the basis of area cultivated rather than water used). Mechanisms for measuring water use, billing consumers, and recovering charges commonly have low effectiveness, with revenue typically only half of what it should be. Systems of charging for the right to discharge effluent are not used, and regulations for control of discharges are rarely enforced.

170. Countries in the region which have made the greatest advances in efficiency of water use have normally incorporated effective public education and information into their programs. Singapore is perhaps the most striking example, although it has the substantial advantage of a population concentrated in a small area and therefore readily reached by education programs. Korea is another example, and Australia and New Zealand, with much less dense populations, have also relied heavily on education of water users - domestic, agricultural, industrial, and institutional - to increase water use efficiencies.

171. Most governments in the region have chosen not to establish or enforce regulations on water use and waste discharge which reflect policies or legislation. There are many reasons for this, but the basic reason is a preference by governments to not implement policies which could be perceived as unfair, particularly to the poorer sections of the community, or inimical to economic growth and creation of employment opportunities. In these circumstances, it is unlikely that governments of DMCs will enthusiastically adopt water pricing as a means of encouraging greater technical efficiency of use, however compelling are the theoretical justifications and evidence from developed nations.

172. While government actions in water resources management may appear suboptimal from an economic perspective, from the broader socio-political perspective

adopted by legislators and decision makers, decisions are intended to balance the many conflicting pressures on a country's government. WRD&M is affected by these pressures as much as virtually any area of governmental activity, because of the implications of water use for public health, employment, social equity, environmental sustainability, and economic development.

173. The Bank's MTSF sees expanded Bank support in, *inter alia*, the formulation of public policy. This could make a significant contribution to developing effective incentives for increasing the efficiency of water use. An improved understanding of the total environment in which decisions related to water use are made, and of the mix of economic and non-economic instruments which can be used to modify behavior in different circumstances, would assist the Bank and its DMCs to design policies which balance political realism and efficiency of resource use.

Chapter 7 Transboundary Water Resources Management

A. International Basins

River basins which are shared between countries can present significant issues relating to coordination, and to making the best possible use of the shared resource. UN agencies have played a role in assisting riparian states to achieve functional agreements; the Bank's policy is one of willingness to facilitate such agreements only at the joint invitation of all riparian states involved.

174. A large number of rivers in Asia are shared by two or more countries. Three major rivers systems, the Indus, Ganges/Brahmaputra, and Mekong, have involved international issues relating to competition for water, or cooperation in water management. Only on the Indus has a functional treaty been signed between the riparian countries. The focus of the treaty was on settling water rights issues between India and Pakistan and, as such, may not have provided for the technically most efficient arrangements for infrastructure and water management. The Mekong Committee (Mekong River Commission since April 1995) has for almost four decades been successful in coordinating development and resolving riparian issues in the lower Mekong. With the new agreement signed in April 1995, cooperation is expected to increase which would enable full development of the Mekong's potential. In the Ganges, activities are uncoordinated and at times competitive, so that optimal, large scale WRD&M projects are effectively precluded. There are numerous smaller shared river basins. The urgency, and difficulty, of achieving cooperative agreements varies widely, but agreements should be reached well before there is conflict over shared water; this implies that both a long-term and a basin-wide perspective is required.

175. UN agencies have been involved in facilitating arrangements in shared river basins, such as UNDP collaboration with the Mekong River Commission. The Bank could also play a role as a facilitator, particularly since the need for cooperation is normally associated with water-related investment. Because of the political nature of water issues in shared river basins, and the Bank's policy to stay away from any political debates, it will not be involved in dealing with international river basins unless it is requested by all riparian states to assist them, as a group of countries.

B. Interstate and Interprovincial Basins

Shared water resources at subnational level present some of the same challenges as at the national or central level. Much effort has gone into arriving at workable - and not so workable - arrangements in shared river basins; the political realities do not assist in achieving efficient solutions. However, there is a great deal of experience in successfully managing shared water resources, and considerable scope for transferring this experience among DMCs.

176. A number of countries in the region have federal structures, and others have devolved government authority to provinces, which can exercise a certain degree of autonomy. These arrangements have exerted a considerable influence on WRD&M in several countries. Arrangements frequently include a clear allocation of responsibilities to

central and state/provincial agencies for particular aspects of management. For instance, in India, water management is a state subject, while in Sri Lanka, irrigation management is a "concurrent subject" with the provinces responsible for irrigation systems which lie wholly within the province, while the central agencies are responsible for inter-provincial schemes or those which use water from inter-provincial rivers.

177. The success of these arrangements varies from country to country, depending in particular on the strength and resourcing of the central agencies. There is a possibility of duplication of effort and competition between central and subnational agencies, and between the states/provinces. Nevertheless, the largely satisfactory *outcomes* of arrangements (which may themselves be rather unsatisfactory, with lack of coordination etc.) in countries such as Malaysia indicate that effective WRD&M is perfectly possible within a federal or otherwise devolved structure.

178. Nevertheless, WRD&M in river basins which are shared between states or provinces, and where water management is primarily a subnational responsibility, can present substantial challenges. Indian states, in particular, have invested substantial time and effort in negotiating agreements and coordinating development, but much scope still remains to make optimal use of water in shared basins.

179. The diversity of arrangements for managing water within countries in the region with devolved autonomies provides considerable scope for regional exchange of experience. In addition, of course, a number of developed countries have federal structures within which water resources are effectively managed - the USA, Australia and Germany, for example. Other countries do not have a federal structure but nevertheless have chosen to manage water at a subnational level, sometimes on the basis of river basins and at others within boundaries which have little or no hydrological meaning. All these provide opportunity for transferring experience in managing interstate/interprovincial waters, a function which ESCAP has already attempted in the region, but with limited success because of a very limited budget for water-related activities. The Bank's emphasis, through its OOs, on providing policy support and facilitating regional cooperation is very consistent with a possible role in assisting its DMCs to refine their approaches to management of interstate/interprovincial waters.

C. International Exchange of Information about Water Resources

Reliable data are essential for effective and sustainable WRD&M, but providing and disseminating data in shared river basins presents particular challenges. UN system agencies have done a considerable amount of work to promote appropriate levels of data availability but have been hindered by lack of resources. Collaboration in data acquisition and dissemination can be a significant facilitator of cooperation in other areas, and probably is in the interests of the Bank and its DMCs to actively promote.

180. Data are an essential requirement for WRD&M, and in particular for the cost-effective design and optimal operation of water resources projects in large river basins. Data from throughout a river basin are ideally required. In addition, data from neighboring river basins with similar climates are very valuable to design engineers, and to those responsible for operation of completed projects, particularly for flood mitigation. Uncertainty and design inefficiencies arise where countries, states, or provinces which share river basins and

aquifers do not share data, or are unable to do so because of incompatible archiving systems. The Mekong Committee is an excellent example of effective cooperation in data acquisition and exchange, over a long period.

181. Cooperation with respect to information sharing provides a first step towards collaboration in other, more contentious, areas. UN agencies have promoted collaboration in water resources development, which has extended to facilitation of transnational water resource management. UNESCO has provided continued support through its International Hydrological Programme; UNEP administers the GEMS-Water and other programs which acquire and disseminate water-related data. In Asia, ESCAP has provided a forum for exchange of knowledge, in particular through organizing periodic seminars at which countries can present their own experience in areas such as water quality monitoring.

182. Meteorological services in general have been more successful than hydrological services in arranging international collaboration. This is due to a significant extent to the work of the WMO, the UN system technical agency responsible for coordinating operational meteorology at the international scale. The WMO also has a program in operational hydrology, but this area of work has to date received less resources from the predominantly meteorological leadership of WMO.

183. UN agencies commonly have very limited budgets, and tend to work predominantly as catalysts for individual and joint action by UN Members and other ESAs. The WMO is presently developing a proposal, possibly with World Bank funding, to establish a World Hydrological Cycle Observing System WHYCOS, although initially in Africa, to alleviate some of the problems referred to above. Data and information of sufficient quantity and quality are necessary for efficient and sustainable management of water resources. The Bank therefore has a direct interest in ensuring adequate availability of data in the region, particularly in shared river basins, to support its investments in WRD&M. This could be achieved as part of the process of facilitating agreements on transnational waters, as a condition on or component of financing of projects in shared river basins, or through financial support of such initiatives as the WMO's WHYCOS.

Chapter 8 Interagency and Regional Cooperation

Lack of coordination among ESAs is a significant concern in WRD&M, because water is a requirement in so many areas of activity. The World Bank and UN agencies with water-related interests coordinate their WRD&M activities through an Inter-Secretariat Group for Water Resources, in which the Bank should also participate; a similar mechanism for the Asian and Pacific Region is needed to facilitate policy coordination, collaboration, information exchange, and targeting of effort and finances for WRD&M between the Bank, other ESAs, and DMCs. The participatory and consultative approach adopted by the Bank for its water resources policy formulation process provides an good starting point for the gradual evolution of such a policy and cooperation framework for WRD&M in the Asian and Pacific Region.

184. A number of ESAs, including World Bank and the bilateral aid agencies of member countries, finance WRD&M in the region. As the economic value of water becomes more apparent, steadily growing private sector financing of water-related activity can also be expected. There has been some coordination of this activity, largely on an informal basis; cases of unwarranted overlap and active competition between ESAs to provide finance also can be cited. As the focus shifts from financing tangible assets such as hydroelectric schemes to achieving much more broadly based outcomes such as poverty reduction and improved DMC policy environments, the danger of unintended conflict (e.g. non-complementary policies) between ESA activity increases. This is particularly the case in water-related sectors, because water is an element of and a requirement for so many areas of activity. As demand for a fixed amount of water increases, the possibility of conflict increases rapidly. For example, one agency can be financing a hydroelectricity scheme, while another is financing an irrigation scheme which requires the same water.

185. A number of UN agencies have significant roles in water-related areas. UNESCO and WMO have a direct interest, through their International Hydrology Programme and Operational Hydrology Programme; UNEP's responsibilities in environmental issues extend to water resources through its GEMS-Water program, elements of the Global Environment Fund, and so on. Other agencies, for example UNDP and FAO, are active in areas such as urban and agricultural development which are strongly linked to WRD&M, and also in water assessments and capacity building, while ESCAP has sought to collect, exchange and disseminate regional information and experience in WRD&M for many years. UNICEF's role in water supply and sanitation projects for the benefit of children and mothers is well known. IIMI is considering to expand its research focus to include water resources development and management, and IRRI is studying the bearing of increasingly scarce water resources on the production methods and systems of rice, the main food staple in most of the region.

186. The cost of coordination of all this inter-related activity need not be high. UN agencies with water-related responsibilities and the World Bank have a formal coordinating committee to ensure that each is aware of the activities of others. This committee, the Administrative Committee on Coordination: Inter-Secretariat Group for Water Resources (ACC/ISGWR), also is used to organize joint activity, where necessary. The Group meets annually, and also transmits information among members, particularly relating to their annual

planning and budgeting cycles. The formal mechanism facilitates, and is supplemented by, informal and more frequent contacts between staff.

187. A regional mechanism such as a coordinating committee for WRD&M could assist the Bank, other ESAs, and DMCs in harmonizing their policies, strategies and activities in the Asian and Pacific Region. This would be particularly helpful in facilitating timely collaboration at national and project level, and in conveying relevant information to mission leaders. Increasingly sophisticated Management Information Systems, electronic communication, and enhanced quality management and accountability procedures will provide the capability for the Bank to economically exchange information with other ESAs, and increasingly with DMC agencies also. Such coordination could cover all water-related activity within the Asian and Pacific region, activity within individual DMCs, or both.

188. Increased coordination with other ESAs would enable the Bank to more accurately target its effort and finances onto areas where it has comparative advantages, and can achieve the greatest results. It could also facilitate joint financing on a more regular basis, both in technical assistance and loan operations. Encouraging examples of such cooperation are the recent joint Bank-USAID financing of the *Institutional Assessment for Comprehensive Water Resources Management in Sri Lanka*, and the multi-donor sector review study on water resources in Viet Nam. Introduction of the proposed *National Water Sector Profile* is intended to facilitate cooperation with other ESAs, particularly the World Bank, UNDP and FAO, to jointly assist DMCs in conducting national assessments of WRD&M, appraise water "sector" performance, and agree on a common strategy for action.

189. The participatory and consultative process adopted by the Bank for its water resources policy formulation provides a good starting point for the gradual evolution of such a policy coordination and cooperation framework for WRD&M in the Asian and Pacific Region, including the exchange of information and experience.

Chapter 9 Operational Issues in Water Sector Projects

A. Project Conception: Consistency with the Bank's MTSF

The success of Bank-financed water-related projects has been considerably less than desirable, and a more outcome-driven approach to project evaluation should assist in addressing the issues. Conventional project planning, which tends to focus on single subsectors, will be increasingly inappropriate, and multi-purpose projects - although infrequent in the region for presumably good reasons - offer a means of making optimal use of water. New selection and performance criteria will be required.

190. Almost 20 percent of the Bank's lending has gone to investments in water-related areas, although it has declined substantially from about 30-35 percent of annual lending in the early 1980s to about 10 percent in the 1990s. Irrigation, drainage and flood control have accounted for about one half of the water-related loans, water supply and sanitation for about one quarter, and forestry, fishery and hydropower the remainder. Postevaluation indicates a less than satisfactory success rate, with 40 percent of Bank-financed irrigation and rural development projects rated as generally successful, and 65 percent of water supply and sanitation projects. (Degree of success is evaluated by a variety of indices such as EIRR. Success is therefore affected not only by matters related to the projects themselves, but also by external factors such as changes in the economic environment, international currency fluctuations, etc.).

191. Success in water resources management has been measured in a number of ways, including indices such as the reduction of non-revenue water. Development of the SDOs and OOs presented in the Medium-Term Strategic Framework will progressively introduce a new, more outcome-driven, approach to Bank investment, and a commensurate shift in the type of justifications and performance indicators that are used. It is possible that officials in DMCs may have some initial difficulty in accepting a mode of evaluation in which, say, the ability of a proposed investment to reduce poverty will be examined rather than, say, the ability to deliver water to the command area of an irrigation system.

192. The Interdepartmental Water Resources Policy Group has started a process of comprehensive analysis of Bank experience in WRD&M, including the selecting of better indicators of water-related project quality. A summary of the results to date, using a set of 38 semi-quantitative criteria of project design and implementation which are grouped in eight dimensions (planning, social, economic, institutional, environmental, technical, implementation, and information), is presented in Appendix 1. A representative sample of all Bank loans related to WRD&M has been analyzed against these criteria, reviewing whether and to what extent they were met during project design. The assumption is that the loan approvals with or without the criteria can be regarded as an approximate way to assess how Bank policies in WRD&M have evolved over the years.

193. The results shown in Appendix 1 for many of these criteria provide evidence of a significant shift in the way in which projects are being designed, which reflects evolving Bank policies and guidelines. For instance, the percentage of projects whose objectives included poverty reduction increased from 5 percent in 1981-85 to 42 percent in 1991-95.

The percentage of projects in which a water resources assessment considered water uses and demands other than those required by the project only increased from 9 percent in 1968-75 to 20 percent in 1991-95, however.

194. While the distinction between the conventional and outcome-oriented ways of expressing project results may seem subtle, the Bank's focus on outcomes represents a major shift in thinking which has brought considerable benefits elsewhere to firms and government agencies - and their customers - which have adopted it. The failure of some Bank-financed projects to achieve a fully satisfactory rating is at least partly associated with a focus on intermediate objectives which are *assumed* to provide the desired result. However, for example, construction of an irrigation canal may not guarantee that more farmers will receive water when they need it, much less that they will enjoy an enhanced quality of life. To achieve this may require a complete package of measures to achieve rural development, and the infrastructure may be only a small - but very tangible - element of the whole.

195. Moreover, if the goal is to maximize human welfare, additional investment in irrigated agriculture may be less cost-effective than investment in another aspect of WRD&M, such as sanitation in the mushrooming cities of Asia, or it may be better spent on an entirely different investment, such as improved transportation to facilitate the marketing of perishable crops rather than rice. Hence, conventional project planning which considers opportunities only in a single subsector such as domestic water supply, or is not conceived in terms of water availability and demand at the river basin scale, will become increasingly inappropriate.

196. Multi-purpose river basin projects are undoubtedly complex to design and implement, and have been rather infrequent in the region. For example, Indonesia has had a requirement for basin level planning for all uses of water since 1982, but plans which were drawn up have been rarely used to guide decisions. Pakistan, too, recognized in a 1956 Act of Parliament the need for "the unified and coordinated development of the water and power resources" of the country, but has achieved this to only a limited extent. As competition for water increases, increasingly sophisticated analysis and design will inevitably be required to make optimal use of the resource. Bank experience with multi-sectoral projects has not always been good, in part because of the difficulties of coordination in the Bank and in DMCs, and the substantial demands that complex projects make upon executing agencies. It will be important to examine in detail why multi-purpose projects have not always been successful, and to seek ways of reconciling such an approach with encouraging stakeholder participation and more community-based development. The recent development of State Water Resources Consolidation Projects in India, with World Bank assistance, offers useful experience of a more comprehensive packaging of WRD&M hardware and software investments.

197. Investments in "conventional" single purpose water projects such as irrigated agriculture or public water supply are in some ways inconsistent with the Bank's SDOs, which taken together aim to achieve sustainable development. Large scale, single purpose projects also are unlikely in future to provide the greatest possible return on the Bank's investment capital. With current notions of community participation, the role of women, and so forth, much analysis will be needed to arrive at approaches which are good investments in conventional terms and also meet the social and cultural criteria that increasingly are being used. A more holistic approach to project planning will, in other words, be necessary. New performance and decision criteria will be needed to evaluate competing investment

opportunities, in terms of the economic, social and environmental outcomes which are expressed in the Bank's SDOs and OOs. A start on this has been made, by analysis of project quality in the water sector in terms of semi-quantitative criteria/indicators of project design and implementation.

198. Associated with this evolving and more holistic approach to project conception will be a growing need to ensure coordination among the Bank's divisions which handle different aspects of WRD&M. Enhanced coordination will enable and facilitate the processing and implementation of multi-purpose projects which have a variety of water-related benefits. Such coordination was first attempted through an interdepartmental country water resources working group for Sri Lanka, established in 1993 to guide the formulation and implementation of a technical assistance project to carry out an institutional assessment of water resources management in that country. The World Bank also has gained some experience in coordination of operations through informal country water resources working groups, for instance for Indonesia, and has started a more formal arrangement in the case of India.

B. Project Conception: Consistency with DMC National Strategy

Achieving the goal of sustainable development will be a huge, expensive and complex task at both global and country level. WRD&M projects will need to be seen in the context of national goals; the Bank's Country Assistance Planning process provides a mechanism for achieving this.

199. The majority of the World's nations, including the Bank's member countries, have committed themselves to the goal of sustainable development, by signing Agenda 21. A number of nations have taken the next step towards sustainable development, by establishing national strategies to implement Agenda 21.

200. Achieving the goal of sustainable development will be a huge and expensive task on the global scale. Agenda 21 estimates the global annual cost in WRD&M alone to be $55 billion per annum to the year 2000. In effect, the Bank's SDOs aim to assist DMCs to achieve sustainable development, through providing support in specific areas. A comprehensive, planned and strategic approach to WRD&M will be one of the most important factors to contribute to the sustainable development of the Bank's DMCs.

201. Reference has already been made to the need to place WRD&M into the context of national strategies, and strategies and plans in other sectors of the economy. This is particularly applicable to specific water-related *projects*, also. For example, on the basis of its postevaluation of projects in irrigation and rural development, the Bank's Post-Evaluation Office has highlighted the need to adopt an integrated approach to water projects, which considers all sources and demands for water within entire river basins, and ensures that all competing uses are optimally and equitably served. Yet even during 1991-95, the objectives of less than one quarter of water-related projects approved were derived from a sector-wide strategy, and only one-fifth considered water uses and demands in and around the project area.

202. The Bank's Country Assistance Planning (CAP) approach provides a suitable mechanism for assisting DMCs to place project proposals into the broader context. Information on future demand for water will be particularly important in planning a program of

water-related developments. Planning at the river basin as well as national scale will also be necessary. The proposed "National Water Sector Profile" will contribute to this process. The Bank's contribution will not be only through the CAP process itself, but through assisting DMCs to develop their own institutional capacity to take an integrated approach to planning for sustainable development.

C. Project Design: Consideration of Alternatives

Project performance has not always been successful, for a wide variety of reasons ranging from inadequate preparation, inappropriate technology, insufficient consultation with beneficiaries, through to the effects of progressive slippage on implementation schedules. Postevaluation findings are a rich source of guidance on possible improvements; realistic and wide-ranging risk analysis can identify matters which could reduce project success. A more formal introduction of quality assurance procedures into all aspects of the Bank's operations would complement other changes that the Bank is introducing to its administrative and management practices.

203. Postevaluation findings for water-related projects funded by the Bank indicate that inadequate preparation, formulation, and design were major factors in unsatisfactory performance. Specific inadequacies cited in the *Sector synthesis of postevaluation findings in the irrigation and rural development sector* include lack of feasibility studies, inadequate consideration of the socioeconomic, cultural, institutional and biophysical characteristics of the area, and non-involvement of intended beneficiaries. The *Sector synthesis in the water supply and sanitation (WSS) sector* similarly emphasizes a need for greater flexibility in project design, for example by focusing on reducing water loss, wastage and illegal connections, or using the price responsiveness of consumers to manipulate demand, rather than investing in new supply capacity. There is similar scope for alternative approaches in the irrigated agriculture sector and for flood mitigation - such as non-structural measures like floodplain zoning and land use controls, or telemetered flood warning systems. As projects become more complex, to take account of social and environmental as well as economic objectives, the project design process will itself become more complex and demanding.

204. A key element of project design is the choice of technology. There are numerous examples of projects which have failed because the technology was too sophisticated, or spare parts were unavailable. The Sector synthesis in the WSS sector draws attention to the need to match technology with the resource base of target communities, to assure long term sustainability.

205. Time can become an important factor affecting the conception of water supply augmentation projects when conditions of water scarcity are intensifying and the quickest solution will be widely regarded as the best solution, regardless of whether it is the least-cost solution. Proper consideration of alternative solutions to water scarcity, such as purchasing water rights from farmers or reducing water losses in the network, requires early and pro-active intervention on the part of the government.

206. It is now "conventional wisdom" that project design should take careful account of the views and wishes of intended users and beneficiaries. The Bank's Post-Evaluation Office has found that shortfalls in the performance of Bank-financed projects can in many cases by partially explained by inadequate participation by beneficiaries.

Participation helps to ensure, for example, that accurate estimates of demand are available, facilities (such as public taps) are well located to maximize use, and beneficiaries look after project infrastructure and are committed to playing an effective role in O&M. Analysis of the Bank-financed projects indicates that, particularly since the late 1980s, more effort is being made to increase user/beneficiary participation, although there is as yet less evidence that improvements in project outputs have resulted. Efforts are now being made in many countries to include beneficiary participation in project planning - the recent introduction of water users groups in publicly owned irrigation schemes in Nepal is an example, although the process has not been easy, because of the need for government assistance in the establishment of the groups.

207. Postevaluation of water-related projects financed by the Bank indicates that shortcomings frequently have related to an assumption that project implementation and commissioning would proceed as planned, and to schedule. Experience has shown, however, that there is a high risk that this will not be the case; about half the irrigation and rural development projects experienced major changes to their original designs and scope during implementation.

208. Realistic risk analysis is an essential part of project design, including consideration of such factors as the availability and timing of counterpart funds, the capabilities of executing agencies and contractors, the reliability of data on which designs are based (including the deviation of actual from assured water supply), political and financial stability, and difficulties associated with land procurement. Failure to take account of risks has contributed to cost overruns or reduced achievements in many water-related projects.

209. The Bank is well aware of shortcomings in project outputs and outcomes, through the work of its Post-Evaluation Office. Sector and Country Syntheses of postevaluation findings are a rich source of guidance on ways of improving project design. Continual refinement of mechanisms to apply the lessons learned from postevaluation to project design will pay large dividends, in terms of ensuring that projects provide the intended outputs and outcomes. The lessons need to be applied to enhance both Bank-financed project management processes and DMC institutional capability, of course. Quality assurance processes are being widely introduced into private enterprise, including private sector banks, to provide a better, more cost-effective service. The Bank already has an excellent foundation, in its postevaluation procedures for example, which might be further developed to provide a comprehensive system for ensuring project quality.

210. The Bank has recently reintroduced the use of logical framework analysis to assist in project formulation. This tool assists in properly aligning the problem perceptions, interests, and incentives of stakeholder groups, and is most useful when developed consultatively.

D. Project Design: Economic, Social Impact, and Environmental Impact Analysis

Economic, social impact, and environmental impact analysis are key elements of project design and evaluation. Postevaluation results indicate opportunities for improvement, particularly in terms of considering nonmonetary aspects of projects in cost-benefit analysis. This points to the need to more closely integrate economic,

social and environmental analysis. Qualitative and equity aspects of project outcomes need particular attention, as they may warrant amendment to project design even if they do not change the underlying desirability of a project, evaluated in terms of expected economic growth rate or rate of return on investment. Most DMCs have requirements for environmental impact analysis, but analyses are not always carried out or taken account of. The limitations are normally institutional in nature. Capacity building in DMCs, and to an extent in the Bank itself, is required to ensure that effective analyses of projects are carried out.

211. The Bank's SDOs focus attention on economic, social, and environmental outcomes, and it clearly follows that projects should be designed and evaluated in those terms. Of course, this has been the case in the past, with economic analysis guiding decisions since the Bank was founded. More recently, environmental impact analysis (EIA) or initial environmental examination (IEE), and social analysis, have become part of the Bank's procedures for designing and evaluating projects. Over 80 percent of projects designed during 1991-95 have included an EIA or IEE, up from 5 percent during 1981-85. The proportion of water-related projects which included assessment and mitigation of socio-economic impacts rose from zero before 1980 to over 40 percent during 1991-95.

212. The Bank's policy is that the cost of necessary environmental and social impact mitigation should be included in project budgets. However, sectoral and country postevaluations indicate that there are opportunities for further enhancing the process. Thus, a study in 1994 of the methodology for reviewing economic impacts of irrigation projects in Nepal highlighted the need for the Bank to reexamine procedures for economic analysis, and synthesis of postevaluation findings in the water supply and sanitation sector suggests a need for a more comprehensive approach to cost-benefit analysis, in which rigorous attention is paid to nonmonetary consequences of investments. Within this general area, there are many specific points at issue, such as the choice of appropriate discount rates or the use of information on price-elasticity of demand for water services.

213. Postevaluation suggests a particular need for analysis of the qualitative and equity aspects of project outcomes. For instance, Bank experience with irrigation projects in Nepal shows a wide range of social and environmental results, both positive and negative, which may not alter the desirability of a project but may require amendment of the approach and design. Positive effects include the mitigation, by construction and rehabilitation of irrigation systems, of pressure to extend cultivation into fragile marginal lands, with a consequent benefit in terms of reduced deforestation and soil erosion. Negative effects include increased intercommunity conflict over allocating project benefits, increased land disputes, and the tendency for projects to benefit the better-off and leave relatively untouched the poorer people. One of the most common and serious adverse consequences of water supply projects is pollution by increased quantities of wastewater, because there has been no commensurate provision for wastewater treatment. The resulting social, human health and productivity, and ecological impacts have recently been stated to present one of the most serious constraints on the future growth of Jakarta, among other cities.

214. Economic, social and environmental impact analysis enables project designers to prevent or mitigate the negative aspects, and capitalize on and amplify the positive. Many DMCs now have legislative requirements to carry out environmental impact analysis of major projects, although a requirement for social impact analysis is less common.

These requirements are not always fully met, however, nor are the findings of the analyses necessarily taken into account. The reasons are commonly institutional in nature - inexperienced staff, weak controls on developers, lack of government commitment, or a lack of information and other resources.

215. The Bank's SDOs provide a decisive starting point for requiring comprehensive economic analysis, EIA/IEE, and Social Analysis for projects proposed for Bank funding. There is still scope for development in the Bank's internal capacity to carry out or evaluate the results of such analyses, even in the area of economic analysis. Most DMCs also require capacity building in these areas, even where EIA and Social Analysis are legally required. The Bank's OOs provide a vehicle for both introducing the necessary policies, legal instruments, and institutional capabilities for improved analyses where they are presently lacking, or supporting their enhancement where legal requirements already exist but are not fully observed.

E. Project Implementation: Institutional Analysis and Capacity Building

WRD&M project success has frequently been reduced because of limited capability of agencies and other entities involved in the project. Capacity building of agencies and beneficiaries is increasingly common, although most projects have been conceived as "hardware" investments. Many water sector systems are not sustainable, in part because users/beneficiaries are not able or willing to take responsibility for operation and maintenance, while government agencies do not have the resources to do so. While measures such as establishing farmers' organizations have had some successes, the presence of deteriorating schemes throughout the region points to the importance of other issues. The scope of capacity building to provide success, when other constraints have not been eliminated, needs examination.

216. Postevaluation has revealed numerous instances where limited capability of the various agencies and other entities involved in a WRD&M project has reduced the success of the project, delayed it, or made it more expensive. Difficulties range from unfamiliarity with Bank procedures on the part of executing agencies, a shortage of competent and motivated staff, through to a lack of coordination of multiple implementing agencies. Consultants play a crucial role throughout the process, also, and careful monitoring of their performance by the Bank or the Executing Agency is necessary.

217. Such institutional problems are, of course, the reason that the Bank's SDOs and OOs place some emphasis on capacity building. Indeed, most of the projects in, for example, the water supply and sanitation sector incorporate a capacity building element to strengthen the operational efficiency and financial management of the executing agencies. Since 1991, over 60 percent of projects included an institutional strengthening component based on a concerted plan to improve management capacity. Nevertheless, postevaluation indicated that these efforts have not always been successful, with water enterprises and management agencies often beset with staffing problems, particularly in positions where more highly paid positions in the private sector were available.

218. With the wide recognition of the necessity for beneficiary participation in all phases of project planning and implementation, it has become increasingly common for projects to include provision for equipping beneficiaries with the skills needed to participate

effectively. Nevertheless, most projects, particularly in areas such as irrigation development, have been conceived as engineering and "hardware" investments. Lower priority has been given to involving beneficiaries and enabling them both to participate in project implementation and to take significant responsibility for project operation after handover. There has been a significant increase - to over 50 percent since 1985 - in the proportion of water-related projects which had provision to increase the responsibility of beneficiaries to participate in water management, although these projects did not necessarily include capacity building.

219. The bottom line is the sustainability of water projects. Many irrigation and water supply systems are not sustainable, in part because users/beneficiaries are not able or willing to take responsibility for operation and maintenance. Of course, there are many other reasons. In Nepal, Philippines, Sri Lanka, and other countries, small village level schemes have been operated by farmers for centuries, clearly demonstrating the ability of farmers with no formal education to maintain the systems. On the other hand, some large government-owned schemes require rehabilitation less than ten years after construction. The principal reason, apart from poor quality construction, commonly seems to be the inability of the central government agency to commit sufficient resources to operation and maintenance, and the reluctance of farmers to pay for a service perceived as less than adequate, or a facility which they regard as having been built by, and the responsibility of, the Government.

220. Many tactics to improve sustainability have been proposed and tried; a common approach has been to set up farmers organizations or water users associations, which are responsible for operation and maintenance of secondary conveyances and field canals, and perhaps for collecting irrigation service fees to pay for operation and maintenance of main canals. It is important that such groups be established in the early stages of project conception and design, so that they can participate in all stages of the project and therefore develop a sense of ownership. Farmers' groups require high level management and technical skills if they are to successfully manage schemes. This is particularly so where water is scarce or delivery is unpredictable, so that stress and disagreement arise. Provision for training in the necessary skills is appropriately made at the project implementation stage, when the people involved can learn to work together under possibly less demanding or urgent circumstances. It is also appropriate that women be included in the process, since experience indicates that household responsibilities have frequently given women a head start in developing the negotiating and administrative skills needed.

221. The mobilization of local labor has been an effective mechanism to organize operation and maintenance in a multitude of irrigation schemes. However, there are signs that willingness to participate in cooperative activity is being eroded, as the market economy is extended. Alternatives are required, which can include fiscal mechanisms such as land tax, betterment tax, or fees; difficulties with enforcement and collection are commonly encountered with these, also, and the alternative, subsidization from general taxation, is increasingly unacceptable.

222. Capacity building, directed at both official agencies and beneficiaries/users, is an increasingly common component of Bank-financed projects. Successful outcomes are being observed, but it should also be said that deteriorating water schemes are widespread throughout the region, which indicates that the results of capacity building are not always

commensurate with the effort invested. Other issues are involved, such as a simple lack of resources, construction of schemes which were beyond the realistic ability of users to pay for them, and so on. The Bank may need to analyze the scope of capacity building and identify circumstances in which capacity building must be linked with the elimination of other constraints, to produce a successful outcome.

F. Project Commissioning, Arrangements for Handover and Operation

Adequate provision for operation of projects after handover is crucial for project sustainability. Many requirements are often overlooked, yet must be considered at project planning stage, and set in place before handover. These include the need to assure functional revenue collection capabilities, and the interest and ability of beneficiaries to operate or maintain facilities. Experience indicates that the Bank's present provisions are not always successful, and that design, and supervision and review of projects during implementation, need to consider a wider range of issues in preparation for commissioning.

223. However well designed and constructed, the sustainability of a project is dependent ultimately on the ability and resources of those responsible for its operation and maintenance. As already noted, there has been a significant increase in the proportion of Bank-funded projects which include institutional strengthening based on a concerted approach or strategy, to over 60 percent of projects since 1991. On the other hand, other arrangements which might help to assure sustainability after handover have been less common since 1991. These include provision for corporatization or privatization (19 percent), consideration of legal aspects of water management (26 percent), and measures for increased accountability of service providers (23 percent).

224. The Bank's postevaluation experience shows clearly that there have been many weaknesses in provision for operation after handover. A few examples include: inadequate organizational arrangements and manpower to control and reduce non-revenue water in water supply schemes; failure to establish functional billing and revenue collection capabilities; inadequate recurrent funding support from the government; lack of interest or ability of beneficiaries to operate or maintain facilities.

225. The Bank's Post-Evaluation Office, among others, has made numerous recommendations with respect to the preparations which are required to assure a successful handover of a project. These are summarized in a PEO statement that "lessons of experience confirm that institutional support and capacity building efforts are vital to the success of projects". In essence, it is necessary to make provision in project planning and design for all the preparations necessary to make the project a fully "going concern" at handover. Such actions as providing training to members of water users associations, setting up an adequate accounting and billing system, or setting in place a maintenance capability which has trained staff and a sufficient budget, must be carried out in the period leading up to handover, not afterwards.

226. The Bank presently ensures that there is provision in projects for some of the actions needed to establish them as going concerns at handover. The Bank's "*Handbook on management of project implementation*" refers to advice and training for operations staff, although they appear to be optional, and responsibility is stated to rest with the operating

agency. Nevertheless, experience is that such provisions are not always wholly successful. The Post-Evaluation Office has observed a need for more effective and multi-disciplinary Bank supervision of projects during implementation, and more comprehensive mid-term reviews, with more emphasis on non-financial aspects of projects.

G. Project Monitoring

A range of mechanisms for monitoring the performance of Bank operations and projects is in use. The choice of suitable performance indicators that reflect non-monetary and qualitative measures of success needs further development; measurements must start at project design stage, so that benchmark data can provide a baseline against which performance can be compared. Evaluation of performance must be followed by response, but mechanisms to arrange this seem less well developed in the Bank and DMCs. Management Information Systems could provide an ability to rapidly synthesize and analyze project performance.

227. The Bank has a range of instruments to evaluate the success and impacts of Bank operations. These include annually published *Asian Development Outlook* and *Key indicators of developing Asian and Pacific countries,* which provide a country overview of a predominantly financial and macroeconomic nature; the Benefit Monitoring and Evaluation process, for which a detailed *Handbook* is available; project completion reviews; and a range of postevaluation activities, synthesizing and reviewing project, sector and country experience, which identify lessons learned and recommend improvements in Bank and DMC processes.

228. The process and documentation for the newly developed Country Assistance Plan (CAP) provides an additional mechanism for assessing sectoral as well as national performance, in terms of output, efficiencies, productivity, equity, and sustainability. The assessment section of a CAP also considers the operational program in each DMC. Sectoral assessments may present difficulties with respect to water, since water-related matters will be considered in several economic sectors, and provision may be desirable for taking a cross-sectoral perspective, consistent with the need expressed in earlier sections for an integrated approach to WRD&M.

229. Principal issues relating to project performance relate to the choice of suitable indicators, and the effectiveness of response to findings, by the Bank and the DMC concerned.

230. Performance indicators currently used tend to be easily measured quantitative indicators, often of a financial nature. These include, for example, percentage of non-revenue water, cost overrun/underrun, number of projects, and EIRR. While some of these may provide "bottom-line" indicators of project success, they need to be supplemented by intermediate indicators which reflect, for instance, the success of including beneficiaries in project operation, or the impact of projects on the amount of time which women spend on fetching water. Such performance criteria are referred to in PEO syntheses, but in a qualitative way. The proposed *National Water Sector Profile* seeks to include a range of quantitative and semi-quantitative indicators which will facilitate the evaluation of sectoral WRD&M performance. It is necessary that the relevant indicators are selected at project

design stage, so that benchmark data can be collected against which performance will be compared.

231. There do not appear to be any formal mechanisms for Bank or country response to the findings of the various evaluation mechanisms. For example, the *Benefit Monitoring and Evaluation Handbook* includes no material on this aspect of evaluation. The new CAP process provides a vehicle for response, of course, particularly if the sectoral performance assessments include a forward-looking element. The *National Water Sector Profile* will also provide a vehicle to develop strategies in response to opportunities for improvement in WRD&M.

232. The Bank's Key Operating Principles "Quality and Excellence" and "Accountability for Results" focus attention on the need to evaluate *and respond to* performance. Many mechanisms are in place, or are currently being developed. Crucial to the entire process is the progressive development of the Bank's Management Information Systems. These will provide managers and staff with the ability to carry out rapid synthesis and analysis of the performance of investments.

233. Extension of the Key Operating Principles to DMCs may present greater challenges. In principle, it is the responsibility of executing and operating agencies and beneficiary/user organizations to respond to less than satisfactory performance of water projects, and institutional capacity building may assist their ability to do this, in some circumstances. However, performance against indicators such as "average and range of farmer cash incomes" may not be easily influenced once the project has been completed. The need for project conception and design to focus on social and environmental outcomes is strongly indicated.

Chapter 10 The Bank's Medium-Term Strategic Framework

A. Strategic Development Objectives

Existing policies and the Bank's Medium-Term Strategic Framework (MTSF) provide the starting point for developing policy in WRD&M. Taken together, the Strategic Development Objectives imply an overall objective of achieving sustainable development; the Outcome-oriented approach of the MTSF provides a major opportunity to change the approach to water-related operations. New evaluation methods and criteria for conceiving and selecting investments may need to be developed to deal with the non-monetary aspects of the SDOs.

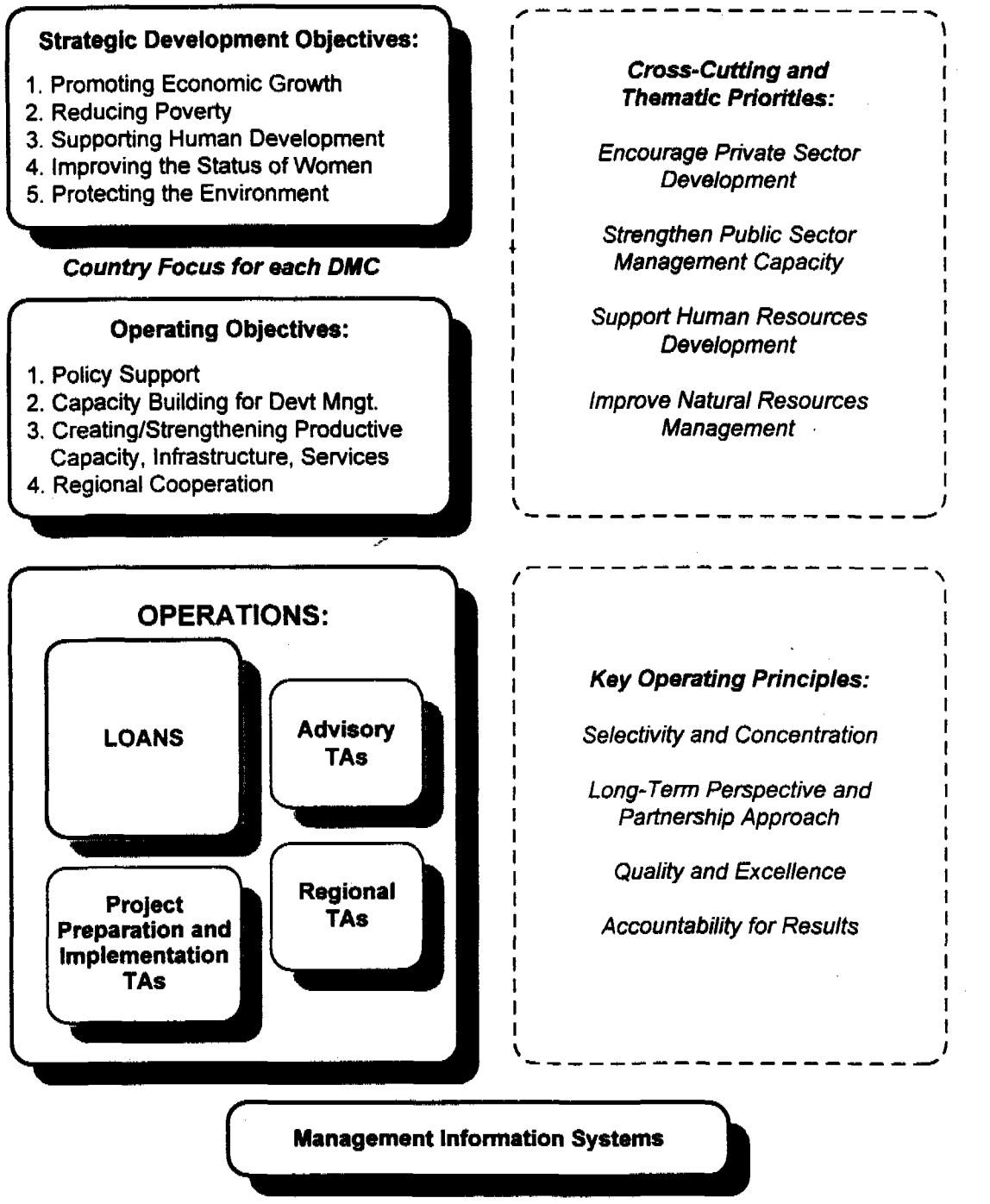
234. Everyday decisions made by Bank management and staff reflect the policies, written and unwritten, that already exist, both in water-related activities and in Bank operations in general. The *Operations Manual* states policies in water-related sectors such as rural development or water supply and sanitation, although it is not always clear what constitutes general policy and what is to be regarded as operational guidance. A review is being undertaken to distinguish more clearly between Bank policies, operational procedures, and guidelines on operational procedures.

235. The Bank's Medium-Term Strategic Framework (MTSF) for 1995-98 provides the context within which new policy for WRD&M should be developed. Bank investment proposals increasingly will be prepared with the specific aim of achieving the Bank's Strategic Development Objectives (SDOs); in effect, the five SDOs enunciate the Bank's overall policies with which policies in each area of investment should be consistent. In this environment, key issues are (i) the expected contribution to achievement of the Bank's SDOs by investments in WRD&M, in comparison with those in other sectors; and (ii) the need to focus on desired outcomes (e.g. reduced levels of poverty) rather than simply on expected project outputs (e.g. a specified area of farmland irrigated). When there is a focus on outcomes, the possible options become more numerous and diverse - a growing emphasis on demand management, conservation, and alternative technologies to provide energy and water services is an example of this.

236. Three of the SDOs (supporting human development, improving the status of women, protecting the environment) are inherently non-monetary in nature. A fourth (reducing poverty) is less related to monetary than to non-monetary aspects of the quality of life (although it is still strongly related to the SDO on promoting economic growth). New types of selection criteria and performance indicators will be required to evaluate project proposals in non-monetary terms which are relevant to the SDOs.

237. Balancing the five SDOs will bring new challenges, in particular "promoting economic growth" while "protecting the environment". In effect, to simultaneously achieve the five SDOs will approach sustainable development as defined by the Brundtland Commission.

238. Policy development in WRD&M does not take place in a vacuum, as Bank policies already exist, either explicitly or implicitly, both at the general level and for specific



THE BANK'S MEDIUM-TERM STRATEGIC FRAMEWORK

Figure 4

areas of water-related activity. The process will therefore include collation and review of existing policies (including those of DMCs, World Bank and other ESAs), as well as policy analysis starting from "first principles". The Bank's MTSF is a fundamental starting point for policy analysis in WRD&M.

239. The MTSF recognizes the principle of a country focus for Bank operations in each DMC, to optimally cater to the country-specific situation and needs. The Bank's Interdepartmental Water Resources Policy Group has already determined that the Bank's policy formulation in WRD&M needs to be complemented by specific country assistance strategies for each DMC, prepared on the basis of comprehensive analysis of WRD&M in each country.

240. The "outcome-oriented" approach signaled by the Bank's MTSF has the potential to transform the Bank's activity in WRD&M. The need for a significant change away from the "approval culture" of previous years has already been recognized and advocated by Bank management. This change will affect the way that individual staff see their responsibilities. To achieve such a change commonly requires several (2-4) years in organizations the size of the Bank, and consistent reinforcement by senior management staff. Training of existing staff is essential, and recruitment of new staff with different skills may be necessary. A progressive shift in the "reward system" of the Bank will be desirable, to encourage an orientation towards achieving the SDOs. Consistent adherence to the Bank's Key Operating Principles will be required.

B. Operating Objectives

The Bank's Operating Objectives provide a significant opportunity to develop new approaches to investment in WRD&M, particularly if water is considered as a key "sector". Policy analysis and development is an important area, and raises the issue of linkage and consistency between Bank, DMC (and other ESA's) policies in the area of WRD&M.

241. As with the Bank's SDOs, the *Operating Objectives* (OOs) will bring a fundamental change in the way in which Bank staff approach investment in WRD&M. The MTSF signals a shift in focus from project financing (even though this will continue to be the Bank's major operational instrument) to acting as a catalyst for policy reform and capacity building. This recognizes the declining proportion of total investment that the Bank can contribute to development in the region, and its potential comparative advantage in other areas, such as policy advice.

242. Implementation of the four OOs will provide a significant opportunity to develop new approaches to investment in WRD&M. They are particularly relevant to development and management of water resources. The MTSF notes that the Bank will target key sectors; it is appropriate that WRD&M should be included as one of these, because of its significance in so many areas of human activity. A progressive shift in the skills of Bank staff will be required, to equip them to effectively implement the OOs. There will be commensurate implications for training, recruitment, and reward policies.

243. The MTSF notes that monitorable performance measures will be required to support the adoption of the OOs. The proposed "National Water Sector Profile" (see

Appendix 2) is suggested as an tool to analyze the country-specific WRD&M situation in each DMC in a common format, including provisions for subsequent appraisal and monitoring of "sector" performance in WRD&M. It considers both outputs (relevant to OOs) and outcomes (relevant to SDOs).

244. The OO of "Policy support" implies that the Bank's own policy is, in effect, to assist DMCs in developing and implementing their own policies. Assistance may be provided by the Bank, or obtained from other DMCs or other sources, as appropriate. In any case, policy development is a continuing process, subject to review and revision, not a once-for-all activity. A key issue relates to the linkages between Bank, DMC (and other ESA's) policies. Basic consistency is evidently required, but at the same time each DMC needs to develop and "own" its own policies.

C. Human and Financial Resources, and Key Operating Principles

The Bank's Key Operating Principles are consistent with the improved administrative practices believed to be required in many DMC water sector institutions.

245. Some implications of adopting the SDOs and OOs for Bank operations have already been noted above. The MTSF makes clear that the evolving role of the Bank, with increased focus on policy development and capacity building, will involve new operating principles, revised business practices, strengthened accountability, a greater skills mix, and improved management information systems. The Key Operating Principles of the MTSF include: (i) selectivity and concentration, (ii) long-term perspective and partnership approach, (iii) quality and excellence, and (iv) accountability for results. These developments in the Bank are consistent with those that the Bank seeks to encourage in DMCs. Familiarity with them in their own working environment should assist Bank staff to advise their clients in DMC institutions.

246. The need for improved management information systems recognizes the need to link information on the performance of key sectors in countries across the region to the design of the Bank's program of operations, and to the effective use of the Bank's resources to support these operations. The water "sector" should be targeted as one of the Bank's key sectors for which investment in improved management information systems is well justified. The Bank currently seeks to conduct its operations with zero or minimal growth of its staff and financial resources to formulate, administer and evaluate projects and activities. Internalization of the Key Operating Principles, and the development of improved management information systems will be essential if quality outputs and outcomes are to be achieved in WRD&M.

Chapter 11 Suggestions for an Agenda for Action

247. This Paper deliberately stops short of recommending water resources policy, with the purpose of facilitating continued discussion among Bank staff on the issues and opportunities in WRD&M, and inviting input and starting discussion with the Bank's clients and development partners.

248. The Paper has argued that a Bank's policy in WRD&M should be formulated to address priority needs agreed through consultation, be oriented towards achievable strategies and projects to meet priority needs in the region, and build on the Bank's comparative advantages as a leading development institution in the Asian and Pacific region. The policy's formulation and implementation process should therefore involve various stakeholders in WRD&M in the region, and the policy paper to be prepared should have explicit agendas for action attached that have been discussed and agreed in the formulation process.

249. The first part of the policy formulation process, up to the approved policy, is presented in Figure 5. The next steps in the process, from country assistance strategies to implementation through policy dialogue, sector capacity building, and project investment, to improved sector performance and review of the policy, are presented in Figure 6. The Interdepartmental Water Resources Policy Group has recommended that these activities should be carried out as integral parts of a single process, and has recommended that the Bank accordingly allocate resources to support the process comprehensively, including support for policy analysis, consultations, and formulation; sector assessment work and strategy formulation work in DMCs; establishment of national and regional monitoring systems; guidelines, training, research; and regional exchange of information, experience, and cooperation in identified priority areas. The following sections provide some procedural suggestions to develop action agendas within the Bank, with DMCs, other ESAs, the private sector, and NGOs.

Actions in the Bank

250. All departments and offices concerned with WRD&M are represented in the Bank's Interdepartmental Water Resources Policy Group. Appendix 3 lists the membership of the Group. The Group's secretariat was established in the Office of Environment and Social Development. The involvement of numerous staff in policy analysis and discussion over the last months, and their inputs into the preparation of this Paper, are a demonstration of commitment to policy formulation in WRD&M. It is suggested that the process of interdepartmental cooperation in the policy analysis and formulation, which effectively commenced in March 1995, be continued on the basis of this discussion paper, e.g. through regular staff seminars focusing on issue groups and topics.

251. The involvement of staff in the operational departments (projects and programs) in the Group's work needs to be continued and expanded. Cooperation between the non-operational offices (Strategy and Policy Office, Office of Environment and Social Development, Post-Evaluation Office, and the Economics and Development

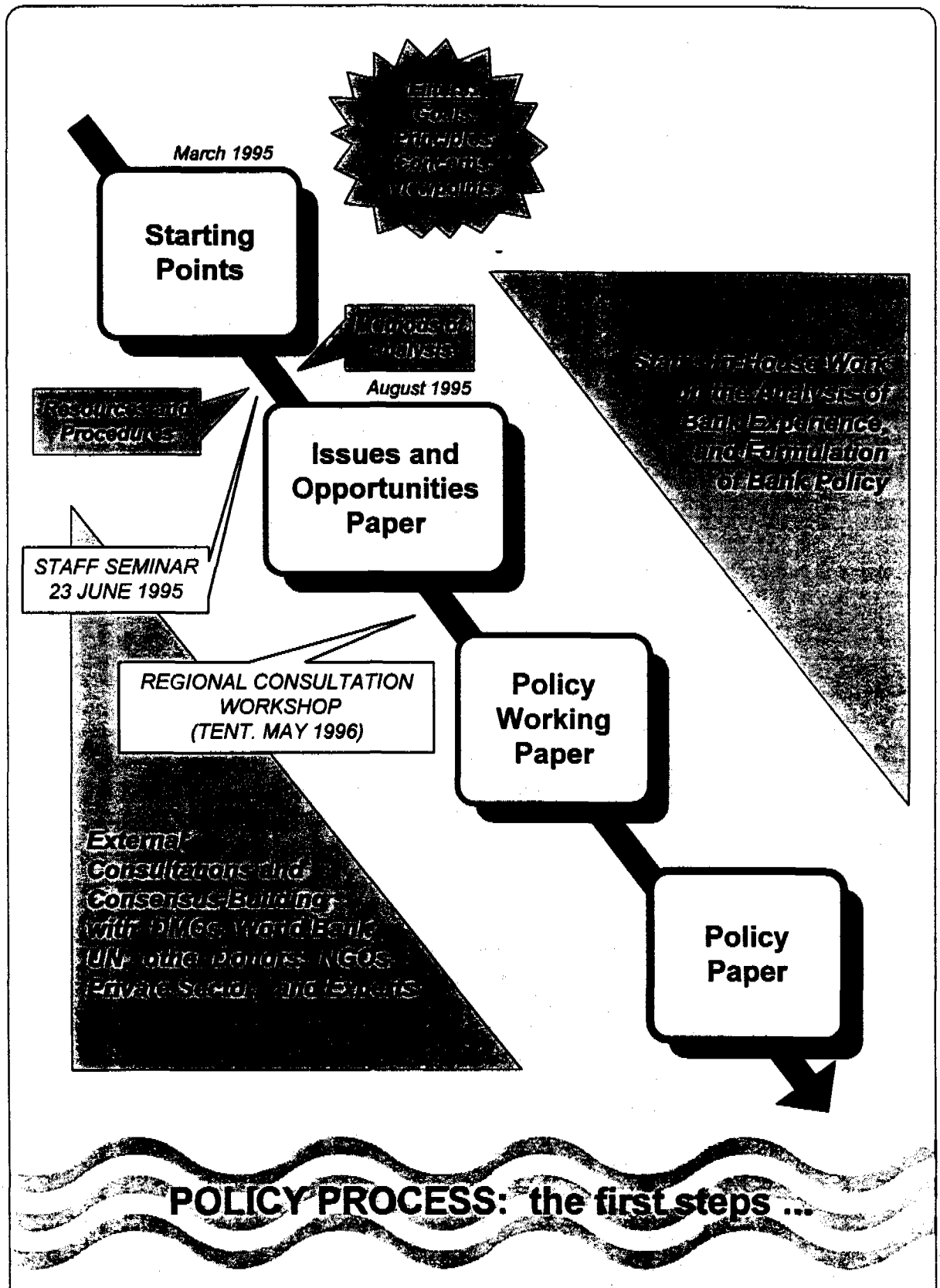

March 1995
Starting Points
August 1995
Issues and Opportunities Paper
STAFF SEMINAR
23 JUNE 1995
REGIONAL CONSULTATION
WORKSHOP
(TENT. MAY 1996)
Policy Working Paper
Policy Paper
POLICY PROCESS: the first steps ...

Figure 5

Resources Center) in policy analysis and research, and project evaluations and feedback, needs to be continued. The input of the Office of the General Counsel and of the Training and Development Division will be required from time to time in connection with legal aspects of WRD&M, and to guide and support WRD&M capacity building within the Bank.

252. Following the Bank's reorganization in January 1995, the projects divisions dealing with irrigation and water supply became part of the Agriculture and Social Sectors Departments (East and West). This will facilitate closer coordination in the formulation and implementation of WRD&M projects. The divisions dealing with hydropower and private sector development are located in other departments. Close cooperation in the identification and fact-finding stages of water projects will be increasingly important under the Bank's emerging WRD&M policy. It is suggested that such cooperation can in most cases be effectively achieved through regular meetings of *Country Water Resources Groups* (CWRGs) to be established for each DMC. Such Groups can be convened by the Programs Division concerned as informal working groups, meeting as and when required, to determine the need and strategy for WRD&M assistance and guide the formulation and administration of Bank-financed water sector operations in the country. The first such initiative was taken in 1993 for Sri Lanka, and has effectively guided the Bank-financed technical assistance to prepare an Action Plan for Comprehensive Water Resources Management in that country.

253. To support the Bank's water sector operations, it is suggested that the project database established by the Interdepartmental Water Resources Group Secretariat for policy analysis purposes should be continued and expanded into a management information system for the Bank's WRD&M operations, serving all Bank staff concerned with relevant information on the identification, formulation, implementation and evaluation of water-related projects.

254. Adoption of a comprehensive Bank policy on WRD&M should realistically be expected to result in a higher proportion of Bank lending to be directed to water-related projects, in view of the situation in the region and the challenges and issues outlined in this Paper. Part of the policy formulation challenge will be to determine what functions the Bank can most effectively perform to improve WRD&M in the region, in close coordination with other external support agencies, and then to develop its internal capacity accordingly. The resource implications of this capacity development need to be carefully considered.

255. The Interdepartmental Group is in the process of preparing a proposal for a regional technical assistance project to provide the necessary resources to extend consultations for the policy formulation outside the Bank, with DMCs, international agencies, NGOs, the private sector, and individual experts. A regional consultation workshop is planned prior to the preparation of the policy working paper.

Actions with DMCs

256. The Interdepartmental Water Resources Policy Group has recognized the need for more sector work in each DMC to assess the country-specific needs in WRD&M and formulate effective strategies to meet these needs. More work is also required on the compilation and analysis of country information throughout the region, to allow comparisons, exchange of experience and best practice, and the monitoring of

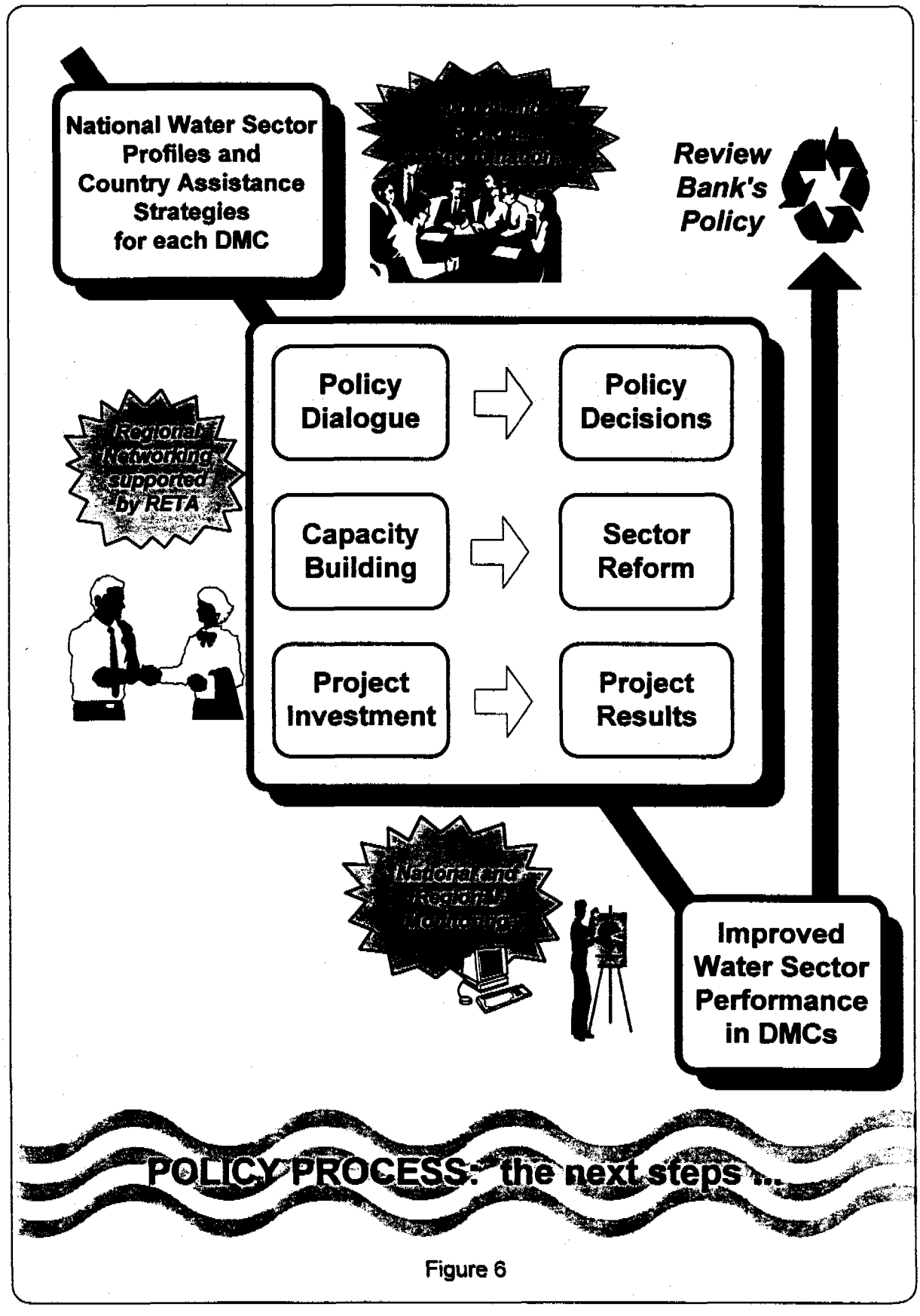

National Water Sector Profiles and Country Assistance Strategies for each DMC
Review Bank's Policy
Policy Dialogue
Policy Decisions
Capacity Building
Sector Reform
Project Investment
Project Results
Regional Networking supported by RETA
Improved Water Sector Performance in DMCs
POLICY PROCESS: the next steps ...

Figure 6

developments, and identification and analysis of trends in WRD&M in the region. The draft *National Water Sector Profile* was designed for this purpose.

257. It is suggested that the initial National Water Sector Profile design be finalized as soon as possible with comments from DMCs and international agencies, and that its approach and methodology be field-tested as part of the preparations for the regional consultation workshop prior to the preparation of the policy working paper.

Actions with other External Support Agencies

258. The Paper has argued that closer coordination and collaboration in the region between External Support Agencies (ESAs) will be an important factor in improving WRD&M, both at the level of policy coordination, strategy development in countries and subregions, and in the identification, design, and implementation of projects. Through regular regional consultations, the roles and functions of ESAs can become more complementary and mutually supportive, based on each agency's mandates and comparative advantages, thus leading to higher efficiencies in the use of both national and external financial and human resources. It is suggested that the Bank promote such consultations, and develop an agenda to continue improving and expanding its cooperation in WRD&M with the World Bank, UNDP and other UN system agencies, and research institutions. Further development of the *National Water Sector Profile* as a tool for sector assessments and assistance strategies can provide a practical opportunity for collaboration between the Bank, other ESAs and the DMC governments. It is important that such sector work lead to consensus among the parties involved at each step, towards an agreed agenda for action in each country.

259. In the search for better solutions to meet the WRD&M challenges in the region, there is also a need for a more systematic analysis of available knowledge, experience, techniques, and technology, and of requirements for their improvement. It is suggested that the Bank, in consultation with other ESAs, research and professional organizations in the region, develop an agenda for research and development in WRD&M. The scope of research will need to cover a wide range of topics, such as successful watershed management approaches, rapid river basin assessment techniques, resource valuation methods, effective stakeholder participation methods in basin management, geographic information systems for WRD&M, water conservation technology, low-cost groundwater monitoring systems, information and decision systems for real-time operations management in river basins, successful public awareness campaigns for water saving, etc.

Actions with the Private Sector

260. The Paper has argued that increased private sector involvement and investment will be necessary to meet the WRD&M challenges in the region. A better understanding is required how this can be achieved in each DMC, covering the following areas: (i) creating the right environment for private investment; (ii) promoting privatization and corporatization as a gradual process; (iii) ensuring quality, sustainability, and equity of privatized services; and (iv) strengthening research and development. It is suggested that the Bank, in consultation with representatives of the consulting sector and large investors/developers, develop an agenda to engage the private sector more effectively in WRD&M in the region.

Actions with NGOs

261. The Paper has argued that NGOs have an important role to play in WRD&M, and can make significant contributions in relation to beneficiary and stakeholder participation in the planning, development and management of water resources, both at the level of policy analysis and development, and in the identification, design, implementation, monitoring and evaluation of projects.

262. In project identification, NGOs can be sources of information or expertise on intended beneficiaries and on technical and institutional aspects of water-related activities. Existing NGO projects and approaches can be used as models in the development of larger-scale projects. During project design, NGOs can be sources of information and expertise at various levels and steps of project conception and preparation. They can be involved in various aspects of project implementation: with appropriate capacity, as executing or implementing agencies; as consultants or as sources of technical expertise; as advisors; as contractors or service providers; as participants in parallel activities, etc. They can also play various roles in the monitoring and evaluation of water-related activities. Lastly, NGOs can also participate in water-related activities as co-financiers, through financial contributions where possible, or through co-financing in kind.

263. It is suggested that the Bank, in consultation with selected NGOs, develop an agenda to expand its dialogue and cooperation with NGOs in the area of WRD&M, both at the policy and at the country strategy and project level, in a way that is appropriate to the situation and needs in each DMC.

Appendix 1

Project Quality in the Water Sector:

Summary of an Indicative Analysis of Bank Experience in Project Formulation

Project Quality in the Water Sector

- Summary of an Indicative Analysis of Bank Experience in Project Formulation -

1. The Bank's Interdepartmental Water Resources Policy Group has started a process of systematic analysis of Bank experience in WRD&M[1], in an effort to analyze the Bank's evolving policy in WRD&M over the years based on the design of projects at approval, and to improve the quality of WRD&M projects. The process started with the selection of a set of indicators of water-related project quality.

2. A summary of the results to date, using a set of 38 semi-quantitative criteria[2] of project design and implementation which are grouped in eight dimensions (planning, social, economic, institutional, environmental, technical, implementation, and information), is presented in this appendix. Chapter 9 of the Paper highlights the experience of incorporating these criteria in design and implementation in a qualitative way. The eight dimensions of project quality are highlighted in Figure 7.

3. A representative sample of all Bank loans related to WRD&M has been analyzed against the criteria, reviewing whether and to what extent the criteria were met during project design. The assumption is that the loan approvals with or without the criteria can be regarded as an approximate way to assess how Bank policies in WRD&M have evolved over the years.

4. The results shown for many of these criteria provide evidence of a significant shift in the way in which projects are being designed, which reflects evolving Bank policies and guidelines.

5. An overview of how the Bank's advisory technical assistance investments in WRD&M were directed to the eight dimensions of quality, is also included in this appendix.

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1 Previous analysis was conducted on a subsectoral basis, e.g. for irrigation, water supply, etc.

2 While the selected criteria are certainly relevant to the quality of WRD&M projects, the intention of the analysis team has not been to suggest that the incorporation of all 38 criteria is necessarily appropriate in the design of each single WRD&M project.

PLANNING
water resources sector strategy, sound project objectives, water assessments

SOCIAL
social surveys, mitigation measures, women, water users to manage the resource

ECONOMIC
opportunity cost, demand forecasting and willingness-to-pay, cost recovery for O&M and capital costs, clarify subsidies, improved revenue collection

INSTITUTIONAL
public sector management capacity, corporatization and privatization, NGOs, water rights, accountability of service providers

ENVIRONMENTAL
IEE, EIA, mitigation measures and cost, watershed protection, water quality, health

TECHNICAL
water scarcity assessment, water conservation, conjunctive use of surface and groundwater, integrated supply and disposal

IMPLEMENTATION
implementation risks, O&M capacity, interagency cooperation, gradual handover

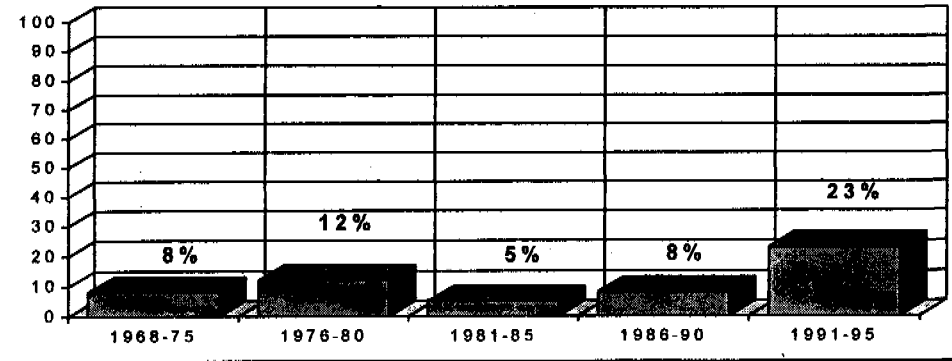
INFORMATION
monitoring outputs, benefits, and impacts, public information and awareness, allocation for post-completion monitoring

EIGHT DIMENSIONS OF PROJECT QUALITY

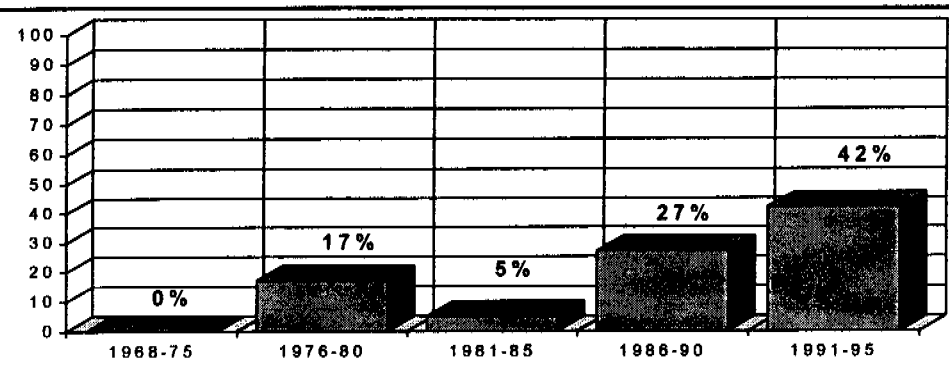
Figure 7

1. PLANNING DIMENSION

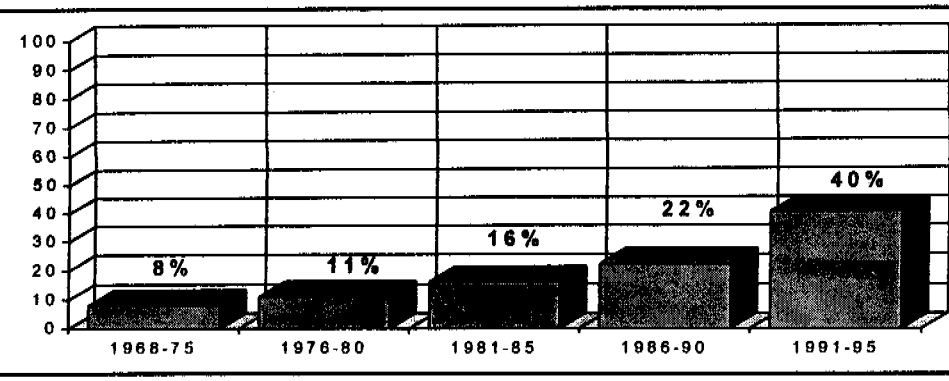
Percentage of water sector projects that met the following criteria during design



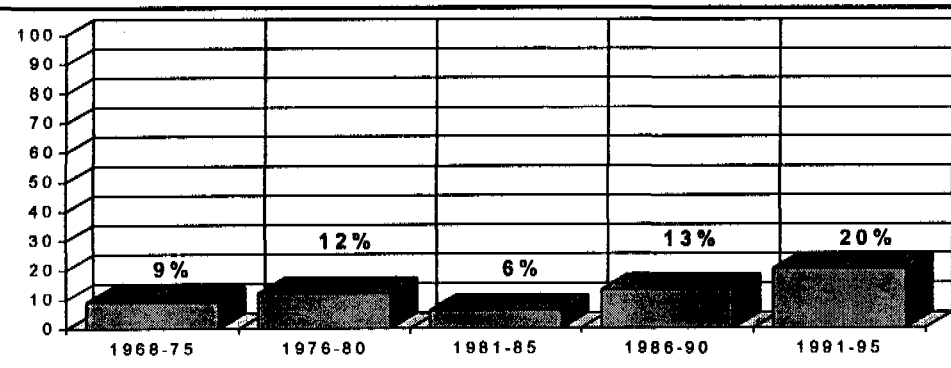
#1.1 Were the project objectives derived from a water resources strategy including other water uses?



#1.2 Did the project objectives include poverty reduction?



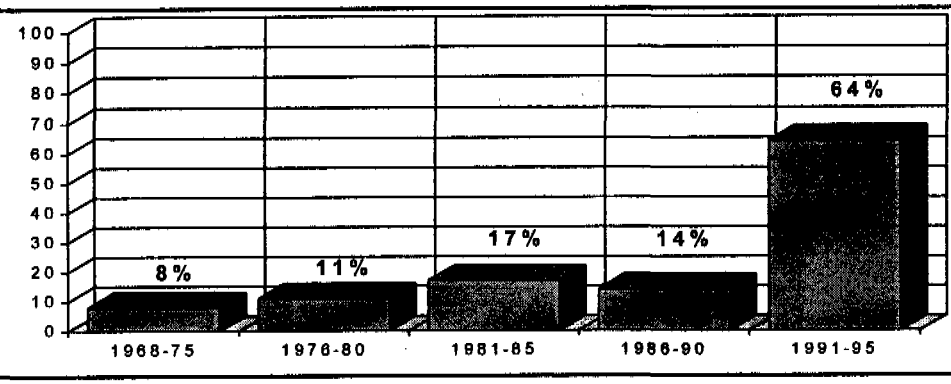
#1.3 Did the project objectives include environment protection?



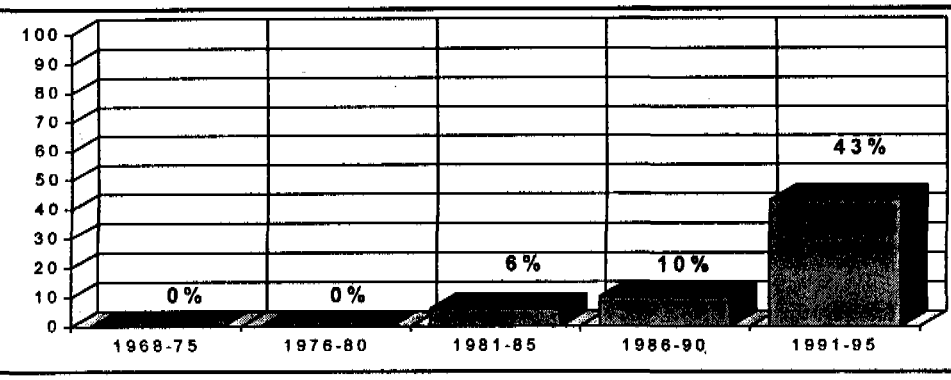
#1.4 Was a water resources assessment undertaken that looked at *other* water uses and demands in and around the project area?

2. SOCIAL DIMENSION

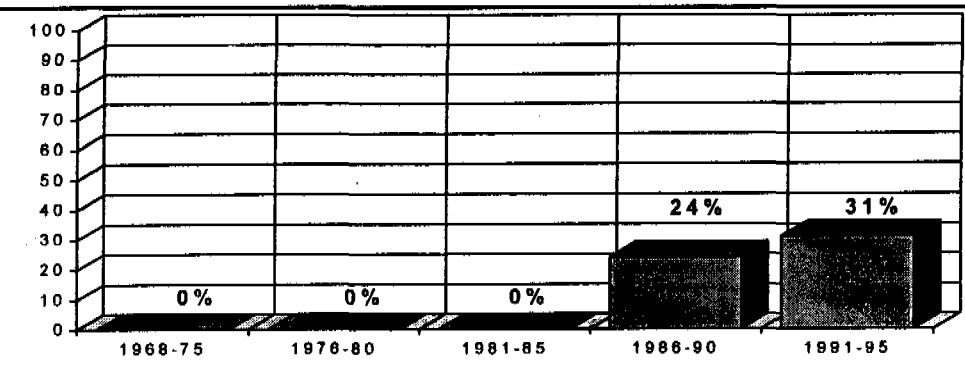
Percentage of water sector projects that met the following criteria during design



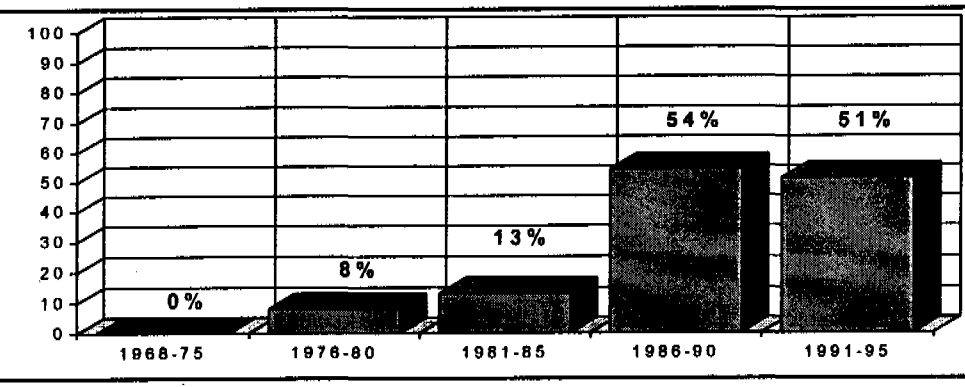
#2.1 Was a social survey and analysis carried out including identification of target/beneficiaries?



#2.2 Did the project include measures to mitigate adverse social-economic impact on affected people?



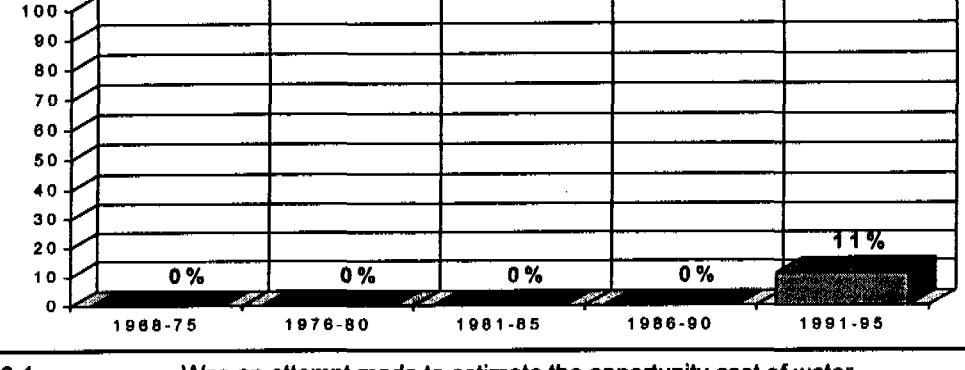
#2.3 Did the project include measures to *improve* the status, role and participation of women?



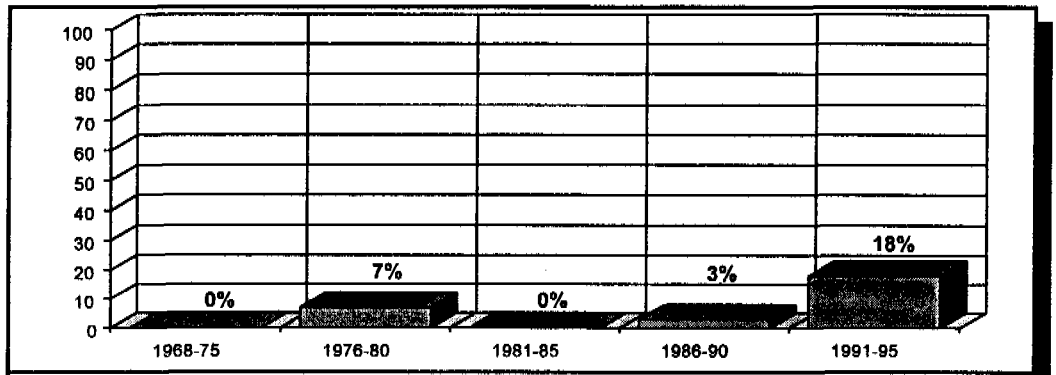
2.4 Did the project include measures to increase the responsibility of water users to manage the water resources at the local level?

3. ECONOMIC DIMENSION

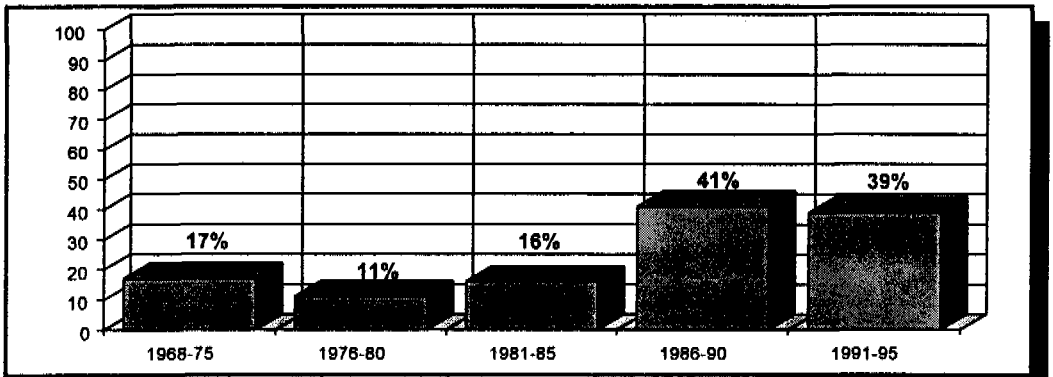
Percentage of water sector projects that met the following criteria during design



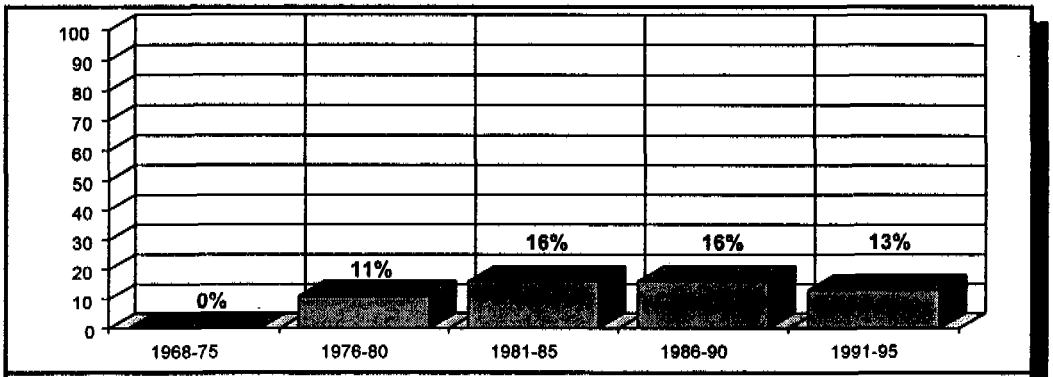
#3.1 Was an attempt made to estimate the opportunity cost of water in the project's economic analysis?



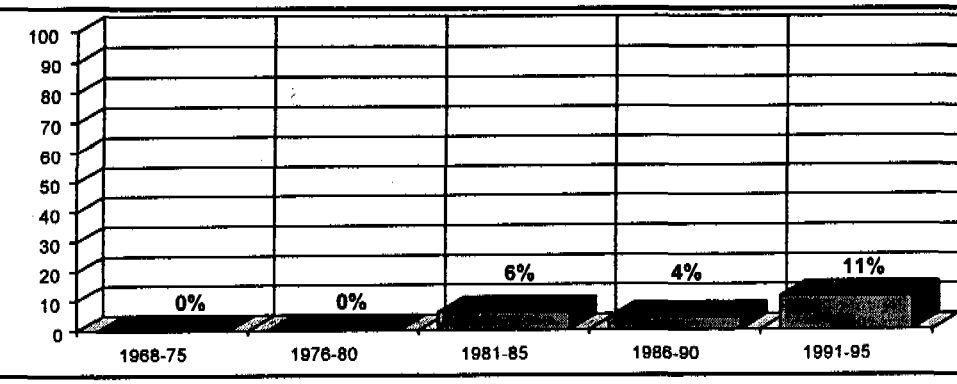
#3.2 Was an attempt made to analyze water demand and willingness-to-pay?



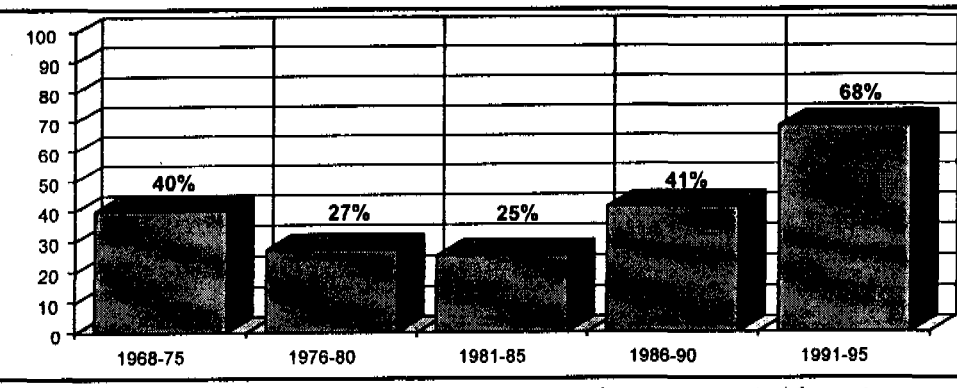
#3.3 Was provision made for full recovery of O&M costs?



#3.4 Was provision made for full recovery of capital costs?



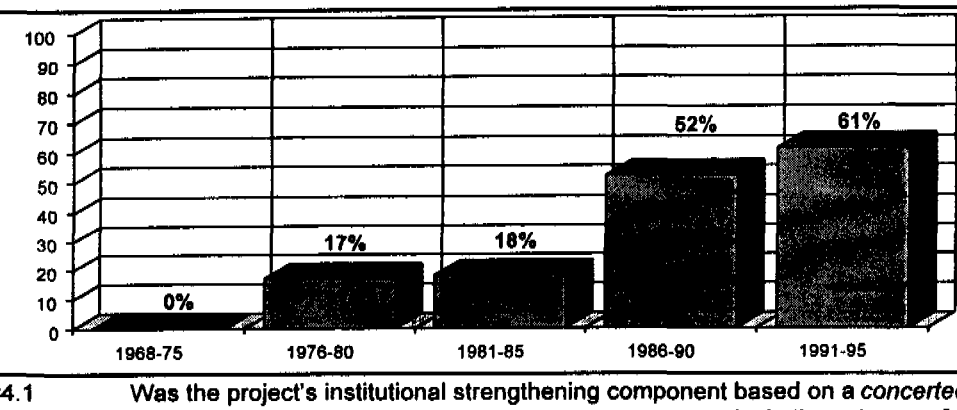
#3.5 Were subsidies explicitly measured in the financial and/or economic analysis?



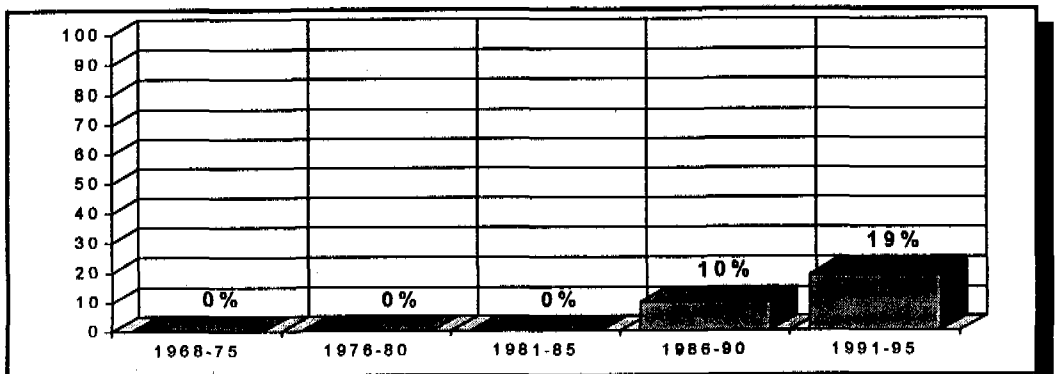
#3.6 Did the project include measures to *reduce* unaccounted-for water or improve the collection of user charges?

4. INSTITUTIONAL DIMENSION

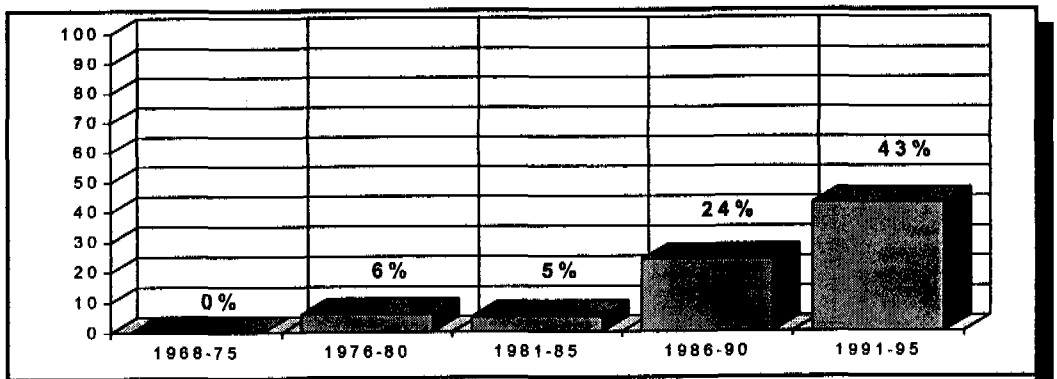
Percentage of water sector projects that met the following criteria during design



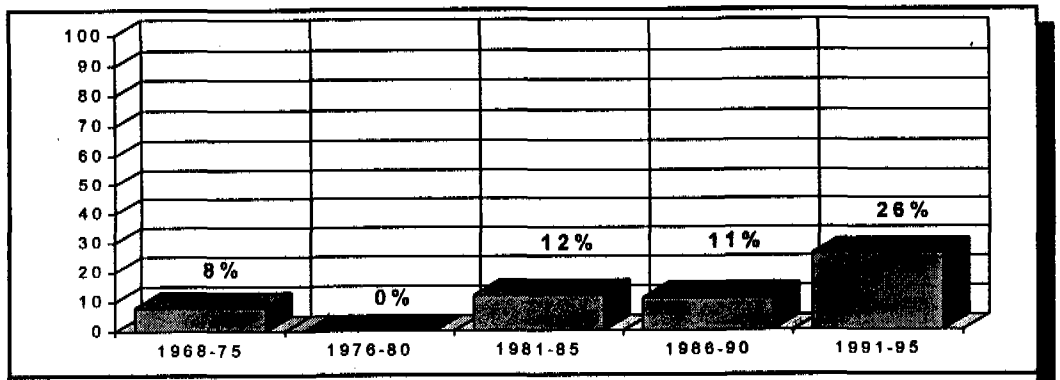
#4.1 Was the project's institutional strengthening component based on a *concerted plan* to improve the government's management capacity in the subsector?



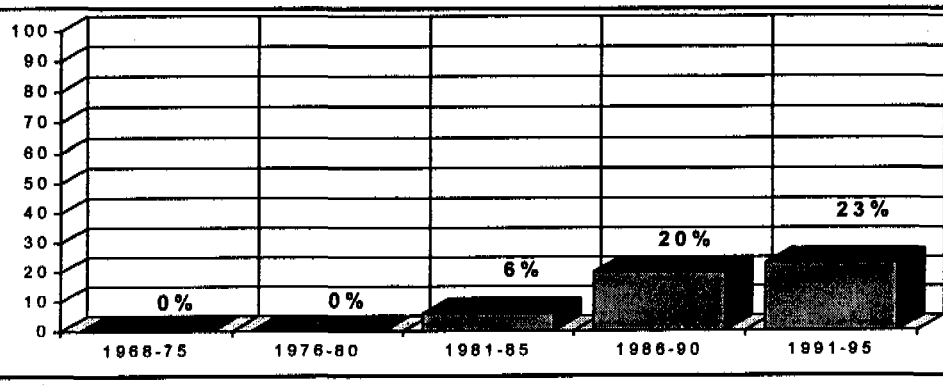
#4.2 Was provision made for corporatization or privatization of parts of the project services?



#4.3 Was provision made for NGOs to participate in the project?



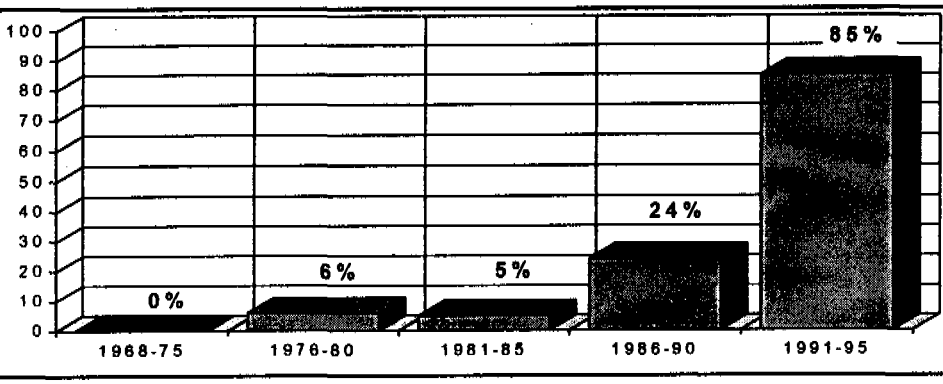
#4.4 Were legal aspects of water allocation, use and management specifically raised and addressed in the project?



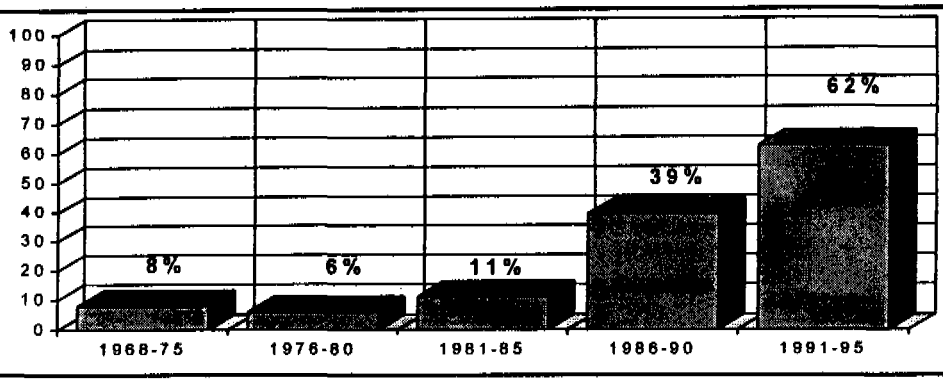
#4.5 Did the project include measures to increase the accountability of service providers to the users?

5. ENVIRONMENTAL DIMENSION

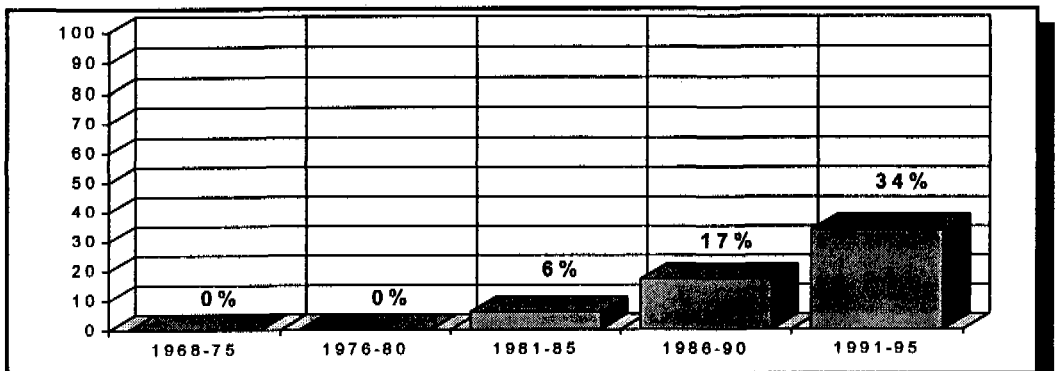
Percentage of water sector projects that met the following criteria during design



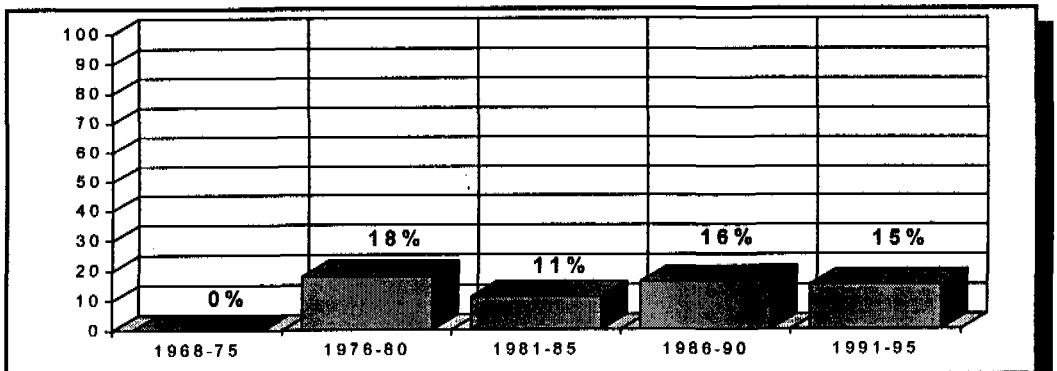
#5.1 Was an initial environmental examination or an environmental impact assessment carried out for the project?



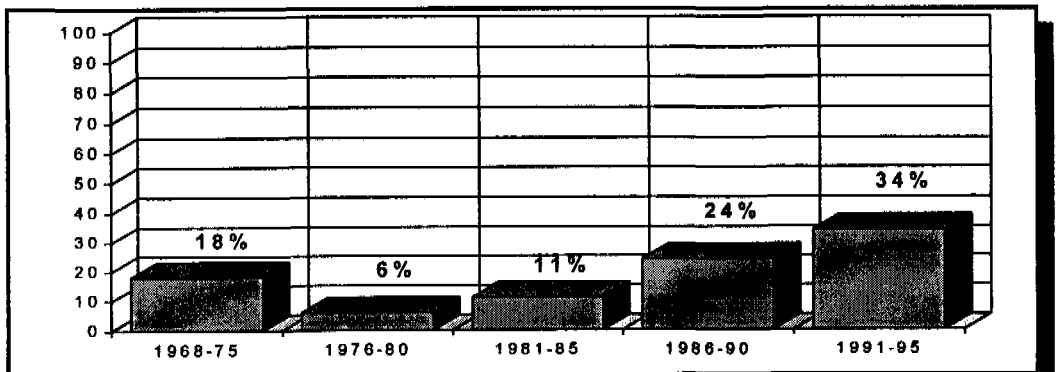
#5.2 Were environmental mitigation measures included in the project design?



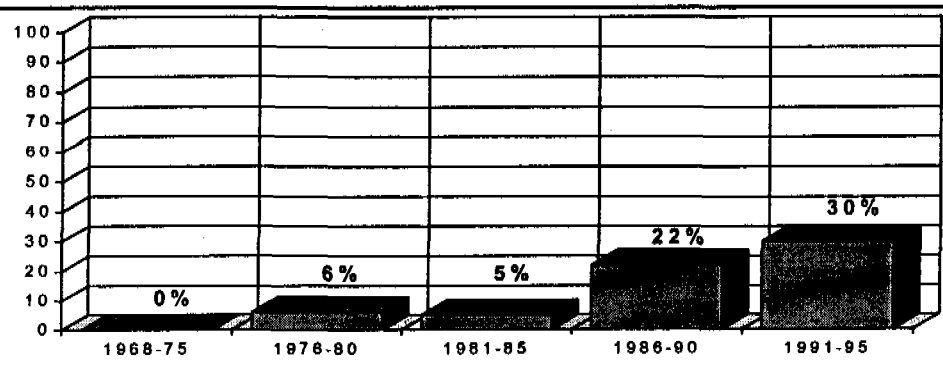
#5.3 Were environmental mitigation measures included in the project cost?



#5.4 Did the project include or arrange for protection of upstream watersheds?



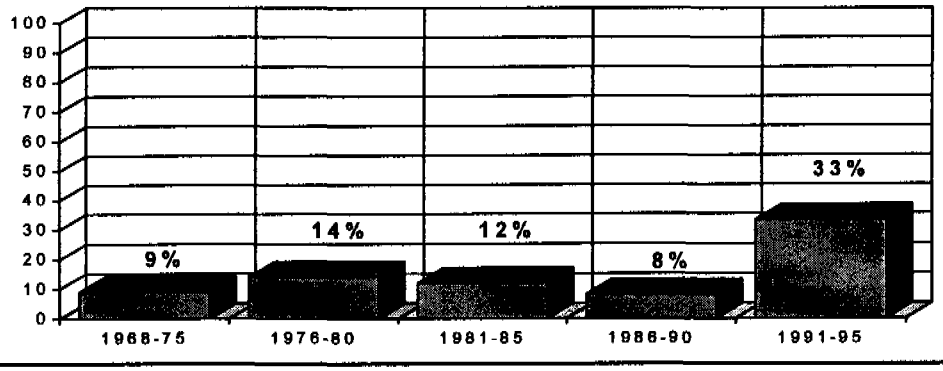
#5.5 Did the project include measures to maintain or improve ambient water quality?



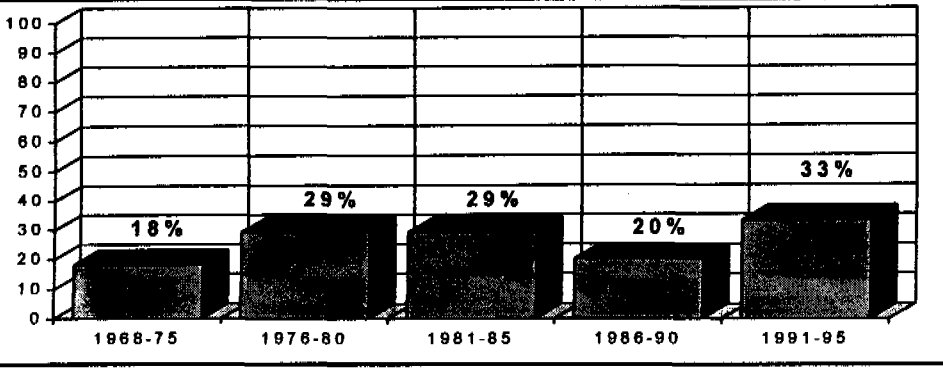
#5.6 Did the project include measures to maintain or improve water-related public health?

6. TECHNICAL DIMENSION

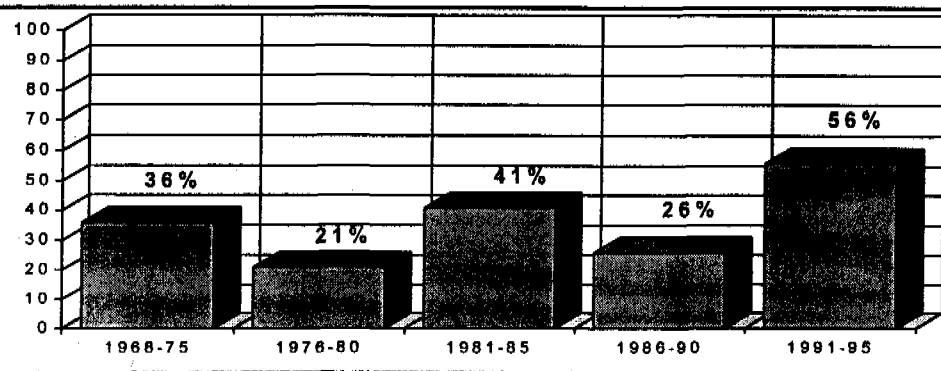
Percentage of water sector projects that met the following criteria during design



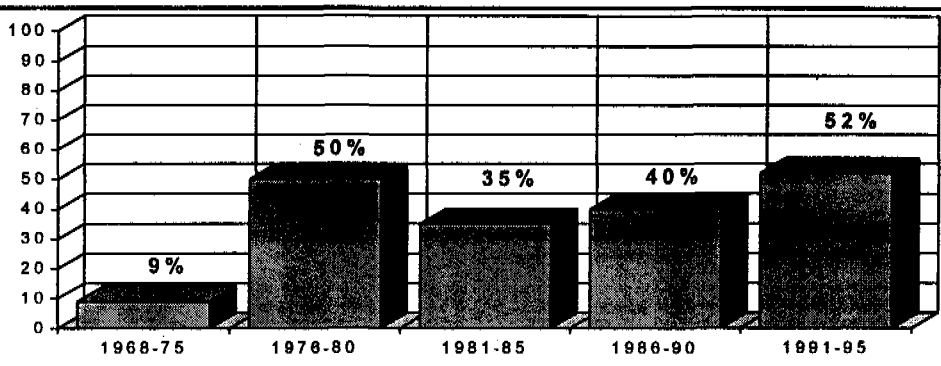
#6.1 Was the scarcity/adequacy of water supply established after checking other existing or planned water uses in the project area?



#6.2 Did the project include water conservation measures?



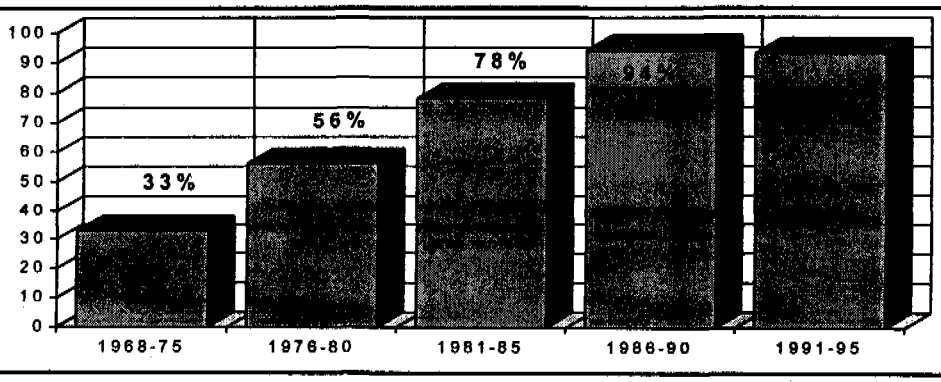
#6.3 Did the project address the issue of conjunctive use of surface and groundwater?



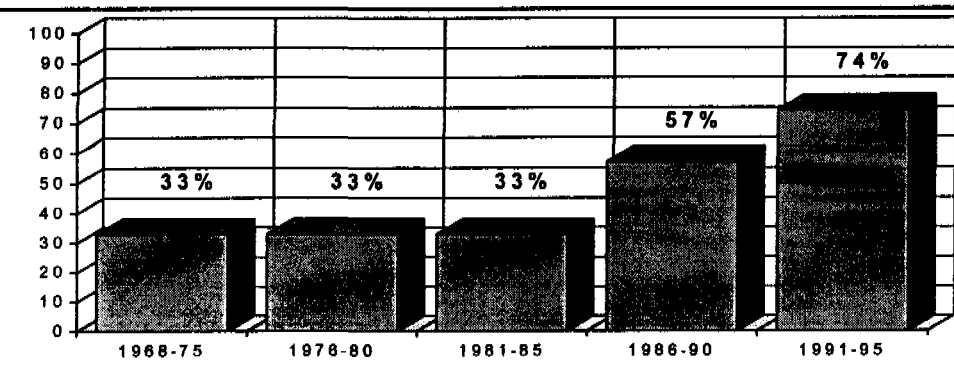
#6.4 Did the project treat drainage, wastewater disposal, or sanitation as integral parts of the project concept and design?

7. IMPLEMENTATION DIMENSION

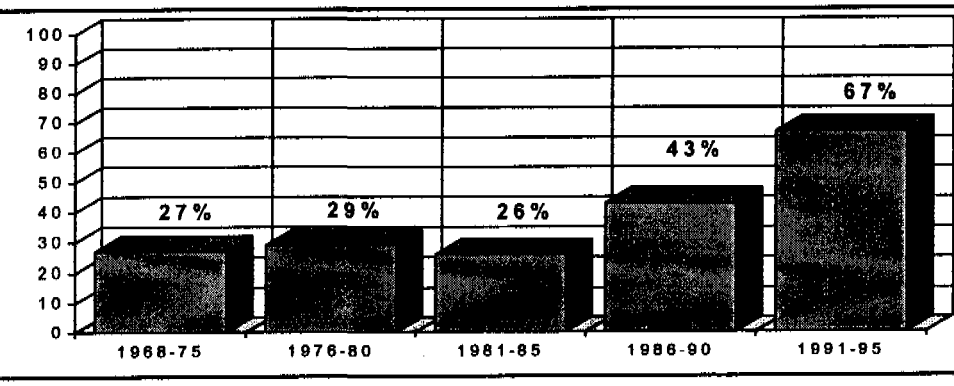
Percentage of water sector projects that met the following criteria during design



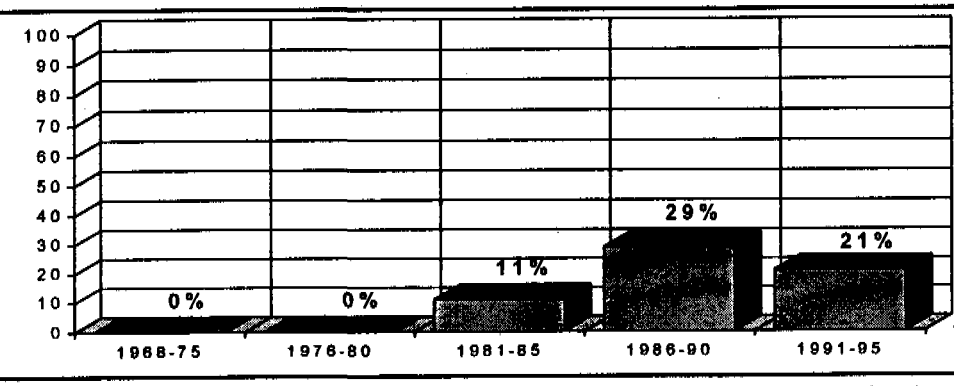
7.1 Were risks identified and assessed that could delay or jeopardize production of outputs and achievement of project objectives?



#7.2 Were O&M capacities specifically assessed and found adequate?



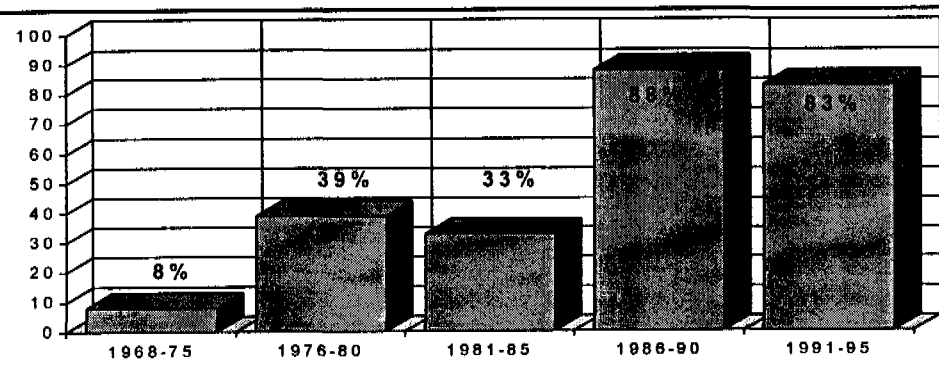
#7.3 Were *specific* arrangements made to improve inter-agency cooperation to achieve the project objectives?



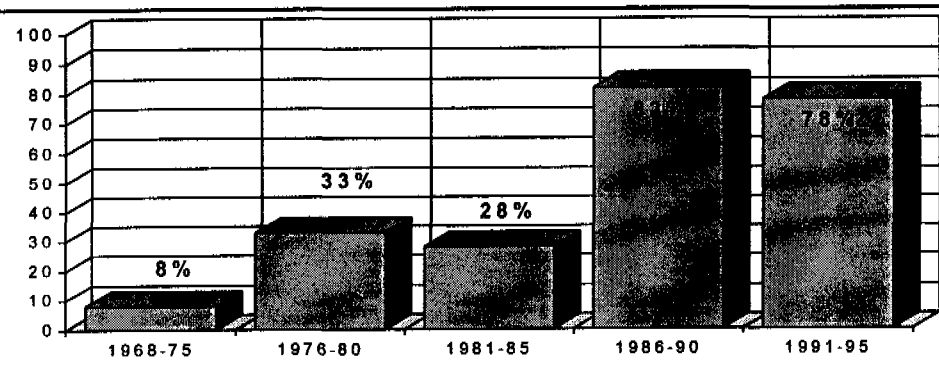
#7.4 Was a plan prepared for the *gradual* withdrawal and handover of project facilities after their commissioning?

8. INFORMATION DIMENSION

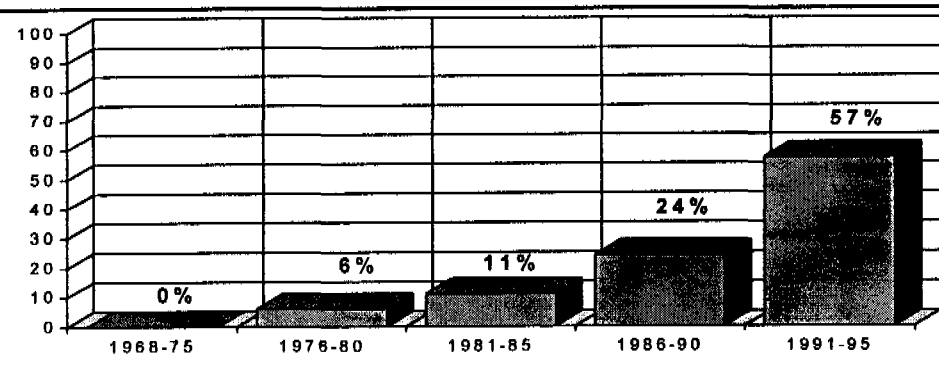
Percentage of water sector projects that met the following criteria during design



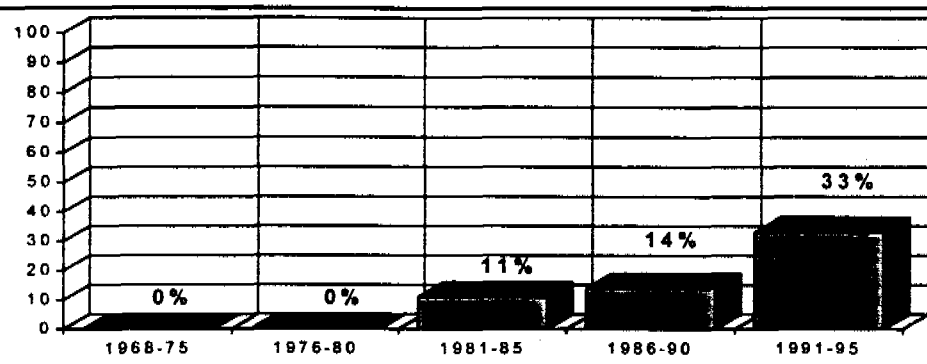
#8.1 Were provisions made to monitor the production of project outputs?



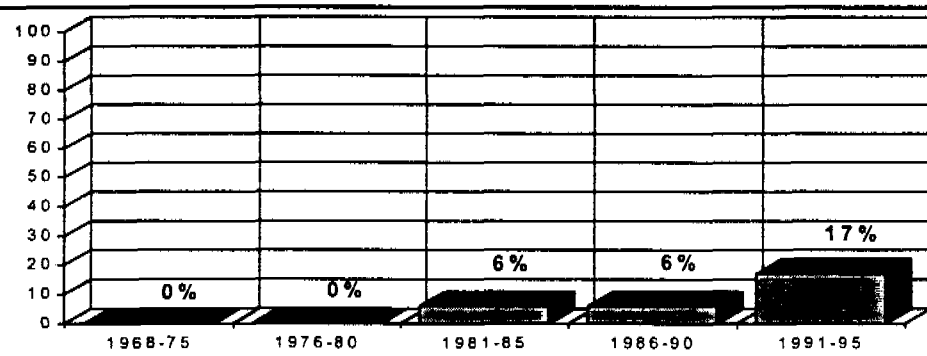
#8.2 Were provisions made to monitor the generation of project benefits and social-economic impacts?



#8.3 Were provisions made to monitor environmental impacts?

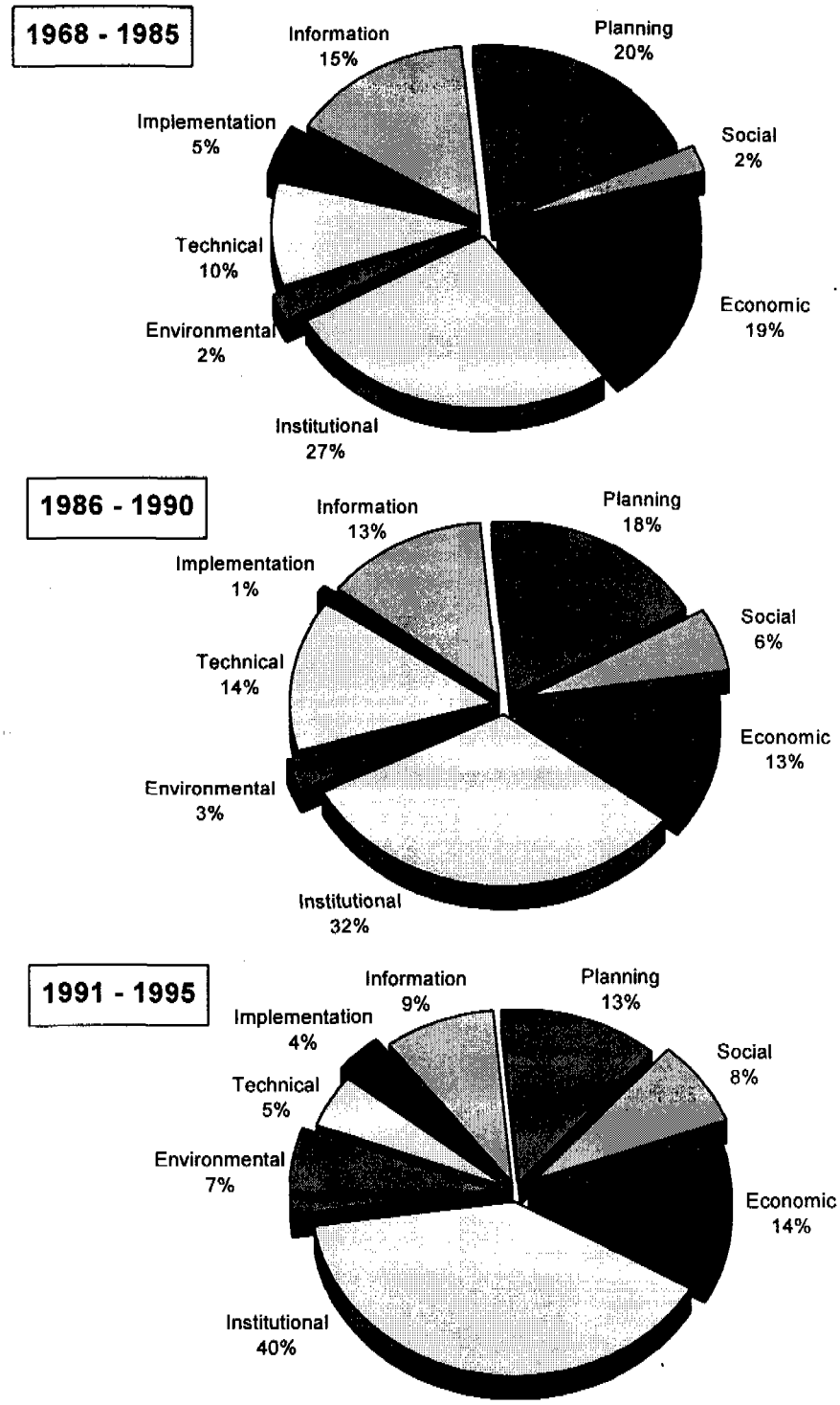


#8.4 Did the project include a public information or awareness creation component about water or natural resources or environment?



#8.5 Was a portion of the loan allocated for continued monitoring after project completion?

Advisory Technical Assistance in the Water Sector Directed to the Eight Dimensions of Project Quality



Appendix 2

National Water Sector Profile:

A Preliminary Outline with Performance Indicators

National Water Sector Profile

- A Preliminary Outline with Performance Indicators -

1. The Bank's medium-term strategic framework (MTSF) recognizes the principle of a country focus for Bank operations in each DMC, to optimally cater to the country-specific situation, issues, and needs. The Bank's Interdepartmental Water Group has determined that the Bank's policy formulation in water resources development and management (WRD&M) needs to be complemented by specific country assistance strategies for each DMC, prepared on the basis of comprehensive analysis of WRD&M in each country.

2. The MTSF notes that monitorable performance measures will be required to support the adoption of the Bank's *Operating Objectives*: policy support; capacity building for development management; creating and strengthening productive capacity, infrastructure, and services; and regional cooperation. The draft *National Water Sector Profile* outlined in this appendix is proposed as a tool to analyze the country-specific WRD&M situation in each DMC in a common format, including provisions for subsequent appraisal and monitoring of "sector" performance in WRD&M. It considers both outputs (relevant to the Bank's Operating Objectives) and outcomes (relevant to the Bank's Strategic Development Objectives).

3. Water has an almost uniquely cross-sectoral nature, and the Profile is intended to bring together information which otherwise might be spread across a variety of sources. Use of the term "water sector" implies that water-related or water-dependent areas of the economy and society - hydroelectricity, flood control and drainage, irrigated agriculture, domestic water supply and sanitation, industrial water uses, instream uses such as fisheries and navigation - should all be considered.

4. After testing, it is expected that the Profile can be effectively used in support of the Bank's Country Assistance Planning (CAP) process, to provide staff and managers with an overview of the status of water resources development and management (WRD&M) in the country, a performance appraisal, and an agenda for action. The focus is intended to be on the future: that is, the current status and future projections are of more interest than data on past events. It is expected that the Profile will be updated regularly, perhaps biannually, and the use of a set format is expected to facilitate the process and minimize the amount of work that is necessary. By maintaining the Profile in electronic form, frequent updating would be feasible, if required.

5. By providing information in a common format for all countries, Profiles should assist Bank officers to form an overview of the WRD&M "sector", to supplement the country focus of the CAP. This recognizes that, while there are certainly differences between countries, WRD&M issues can be approached in a very similar way in many parts of the region - particularly where countries share river basins. Analyses for the region as a whole could be obtained readily, by combining and comparing information from individual countries.

6. The introduction of the Profile is also intended to facilitate cooperation between the DMC agencies, the Bank, and other External Support Agencies (ESAs) involved in policy,

strategy, and capacity building, including particularly the World Bank and UNDP. The Profile format for analysis would allow for more effective and efficient ESA-Government cooperation through joint ESA missions to assist the DMC agencies in preparation of the Profile, including especially the performance appraisal section and the formulation of the agenda for action. This would also allow DMC agencies to deal with ESAs concerned with WRD&M in a more efficient manner.

7. The format is a combination of succinct text (in expandable text boxes), supplemented by tables which summarize the status of the sector using a variety of qualitative and quantitative indices or performance indicators. In each paragraph, material is provided on the current status, significant recent trends, and probable future developments. Comment should be provided on whether conditions are stable, improving, worsening; on the effectiveness and success of WRD&M in terms of meeting national needs; and on the sustainability of institutions and of the water resource itself. Although comprehensive in scope, the Profile is not intended to be exhaustive in details; to enable readers to examine specific issues, full referencing to source documents should be provided. The main structure of the Profile is presented on the next page.

8. Bank staff from the Projects and Programs Departments would commission and oversee the preparation of the Profile in each DMC in consultation with government agencies concerned, supported by consultants. The input expected from the Government agencies in the Profile would be commensurate with the existing capability, experience, and commitment in the DMC, and the aim would be that ownership of the Profile would be taken by the DMC Government as soon as possible, while the Bank would commit to assist in regular updating. The resources required for the preparation of the Profile in each DMC would, of course, depend on many factors, including the size of the country and the water resources investment program, the complexity of the water resources situation, the need to develop supporting profiles for subregions, etc.

9. The agreed outcome of the Profile -- the Agenda for Action -- would be expected to feed into the Country Assistance Planning Process, and the Profile preparation would take place separately (in advance) of the Bank's annual programming mission to the DMC. The Bank is considering the need for technical assistance to provide the necessary resources to prepare the Profiles in a number of selected DMCs on a trial basis. The Profile's focus on measurable indicators for water sector performance can be expected to sharpen further as the Bank's policy formulation work proceeds and priority issues are agreed.

MAIN SECTIONS OF THE NATIONAL WATER SECTOR PROFILE

Section 1. Country Overview

Section 2. National Policy Environment
- 2.1 National Development Goals
- 2.2 Water Resources Policy
- 2.3 Transnational and Subnational Relations

Section 3. Capacity for Water Resources Management
- 3.1 Legal Base
- 3.2 Institutional Base
- 3.3 Information Base
- 3.4 Training and Human Resources Development

Section 4. Water Resources Status
- 4.1 Water Resources and Watersheds: the Physical Base
- 4.2 Uses of Water
- 4.3 Community Values of Water
- 4.4 Supply, Demand, and Sustainability
- 4.5 Summary: Status and Trends

Section 5. Financial Resources
- 5.1 Sources of Funds
- 5.2 Annual Expenditure and Revenues
- 5.3 Return on Investment

Section 6. Appraisal
- 6.1 Water Sector Institutions
- 6.2 Water Resources and Watersheds
- 6.3 Uses of Water
- 6.4 Community Values of Water
- 6.5 Sustainability of Water Resources and Use
- 6.6 Financial Performance
- 6.7 Consistency with ESA Objectives (Bank and others)

Section 7. Agenda for Action

APPENDIXES:
1. References
2. Completed and Current Water-Related Projects
3. Summary of Lessons Learned from Completed Projects
4. Contact Persons
5. Maps of Priority River Basins
6. Data Appendixes

1. COUNTRY OVERVIEW

(Provide a basic "thumbnail" sketch of the country, with particular reference to its water resources and usage,describing different uses and their importance. Emphasize current and projected future conditions)

For the percentages below, indicate whether they are stable, increasing or decreasing.

Population (most recent figure)		Population (projected for 2020)	
Population growth rate (%)		*Urban population growth rate (%)*	
Urban population (most recent figure)		Urban population (projected for 2020)	
GNP (most recent figure)		Average per capita GNP	
Land area (sq. km)		Average population density	
Total water available (billion m^3/year)		Total water developed (billion m^3/year)	

Water Use, % of total:		Population access to:			
				safe water	sanitation
agriculture:	%				
industrial:	%	rural:	%	%	
domestic/municipal:	%	urban:	%	%	

Hydroelectricity:			
Potential (MW):	MW	Installed Capacity:	MW
Annual Production:	GWh	Percent of total electricity production:	%

2. NATIONAL POLICY ENVIRONMENT

(Describe the policy environment, present and likely future within which decisions relating to WRD&M and water-dependent areas of the economy are made.)

2.1 National Development Goals

For each subsection, describe national goals and policies which may have relevance to WRD&M and water-related sectors. Indicate any significant recent or likely developments (e.g. related to the political environment, increasing role of the private sector, growing awareness of environmental issues).

2.1.1 Economic

(Relevant National Goals and Policies)

✓	Water resource development and sustainable management are an integral part of national economic goals.	Fully	Partially	A little	Not at all
	Percentage of national investment allocated to water-related programs to achieve economic growth.	%			

2.1.2 Social/ Cultural

(Relevant National Goals and Policies)

✓	Water resource development and sustainable management are an integral part of national social /cultural goals.	Fully	Partially	A little	Not at all
	Percentage of national investment allocated to water-related programs to achieve social and cultural development.	%			

2.1.3 Environmental

(Relevant National Goals and Policies)

✓	Sustainable management and conservation of water and other aquatic resources are an integral part of national development goals.	Fully	Partially	A little	Not at all
	Percentage of national investment allocated to programs to achieve sustainable management and conservation of water and other aquatic resources	%			

2.1.4 Contribution By Water Sector

(Summarize how WRD&M and water-related sectors contribute to and are included in national goals and policies, particularly noting any recent trends in recognition)

✓	National development goals in other areas of the economy take account of water-related inputs.	Fully	Partially	A little	Not at all

2.2 Water Resources Policy

2.2.1 Policy

(Describe policies, explicit and implicit, national/federal and subnational, related to WRD&M; outline the processes/institutions involved in policy-making. Refer to their relevance to MTSF Strategic Objectives)

✓	A National Water Policy or equivalent policy instrument exists and is effectively administered.	Policy exists; fully effective	Policy exists Partially	Policy exists but ineffective	No policy

2.2.2 Goals and Priorities

(Describe explicitly stated goals for water resources development, particularly with respect to section 2.1 above. Indicate the priorities for WRD&M (de jure and de facto), particularly with respect to allocation among competing uses.)

✓	Goals for water resources are clearly defined and prioritised, responsibilities allocated, resources committed.	Goals exist; full provision to implement	Goals exist; partial provision to implement effective	Goals exist; no provision to implement	No goals or provision to implement

2.2.3 Strategies and Action Plan

(Indicate the existence of specific strategy and action plan for WRD&M, emphasizing recent developments and the effectiveness of mechanisms for implementation. Refer to ADB's MTSF Cross-cutting themes.)

✓	A Strategy and Action Plan for water resources are laid out, responsibilities allocated, and resources committed.	S&AP exist; full provision to implement	S&AP exist; partial provision to implement	S&AP exist; no provision to implement	No S&AP or provision to implement

2.3 Transnational and Subnational Relations

2.3.1 International Collaboration and Information

(Describe, where relevant, the existence and effectiveness of transnational arrangements for WRD&M in shared river basins).

✓	Cooperative agreements for WRD&M exist with other riparian countries, and mechanisms are in place to implement them on an ongoing basis.	Cooperation is fully effective	Agreements exist and are partially effective	Agreements exist but are ineffective	No agreements exist. There is no cooperation	There is active competition

2.3.2 Subnational Collaboration

(Describe, where relevant, the existence and effectiveness of subnational (i.e. inter-provincial or inter-state) arrangements for WRD&M).

✓	Cooperative agreements exist between sub-national entities with shared waters, and mechanisms are in place to implement them on an ongoing basis.	Cooperation is fully effective	Agreements exist and are partially effective	Agreements exist but are ineffective	No agreements exist. There is no cooperation	There is active competition

2.3.3 Collaboration with External Support Agencies (ESAs)

(Describe the extent of involvement in WRD&M of ESAs [UN system, development banks, bi-lateral ODA, NGO], and arrangements for achieving collaboration.

✓	Cooperative arrangements exist between ESAs, and they are implemented on an ongoing basis.	Cooperation is fully effective	Agreements exis and are partially effective	Agreements exist but are ineffective	No agreements exist. There is no cooperation.	There is active competition

3.0 CAPACITY FOR WATER RESOURCES MANAGEMENT

(This section describes national capacity, including law, institutions, information systems, arrangements for community participation etc., to manage water sustainably).

3.1 The Legal Base

(In these subsections, refer to the instruments themselves, to the agencies responsible for their use, and to the extent to which individuals and community/NGOs are enabled to participate)

3.1.1 Body of Water Law and Regulations

(Briefly describe the body of water-related law and regulations, with particular reference to its comprehensiveness and clarity)

Enactment	Date	Responsible Agency
Tabulate principal laws etc.		

3.1.2 Property Rights and Tenure

(Describe arrangements for ownership of surface and ground water, land, and rights to use water.)

Percentage of water users who have secure rights to their use	%
Percentage of cultivators of irrigated farmland who have secure tenure (own, lease) to the land	%

3.1.3 Water Allocation and Conflict

Describe mechanisms for allocating water to users, especially where there is competition, and for resolving conflicts among users and community interests (e.g. fishery maintenance):

	Legally binding procedures exist, with machinery to implement them, to allocate water and resolve any conflict between competing users and instream use of water	Procedures exist; full provision to implement	Procedures exist; partial provision to implement	Procedures exist; no provision to implement	There are no procedures
✓					

	1985	1995
Volume of abstractions from surface water covered by legally established rights	%	%
Volume of abstractions from groundwater covered by legally established rights	%	%
Volume of discharges to surface water covered by legally established rights	%	%
Volume of discharges to land/subsurface covered by legally established rights	%	%

3.1.4 Social and Environmental Impact Analysis

(Briefly describe statutory requirements for SIA and EIA, and the extent to which they have been/are implemented, and for what type of activities)

✓	Environmental impact analysis is carried out as an integral part of the design of water-related projects	Fully, for all projects	Fully, for major projects only	Partially, for major projects	Not at all
	Social impact analysis is carried out as an integral part of the design of water-related projects	Fully, for all projects	Fully, for major projects only	Partially, for major projects	Not at all

3.1.5 Enforcement

(Review the extent to which the instruments referred to in preceding subsections are implemented and enforced, with comment on relevant institutional and public interest issues.)

✓	Water-related legislation is enforced and other responsibilities are discharged by the designated agencies.	Fully	Partially	A little	Not at all

3.2 Institutional Base

(In 3.2.1 to 3.2.7, briefly describe the role and extent of participation of each actor in water resources management and the water sectors. Focus on their effectiveness, in terms of achieving goals and priorities in 2.2.2, and mention any measures that area being undertaken e.g. management interventions to change the situation)

3.2.1 Political System

3.2.2 National/federal and Subnational Institutions

(Provide a table of principal agencies and their responsibilities)

Organization	Responsibilities
List of principal water-related agencies	

✓	National/federal agencies have the technical, financial and management skills and resources required to implement water-related projects	Performance achieve best international standards	Performance achieves high standards in most areas	Performance is barely adequate	Performance is consistently inadequate
	National/federal agencies have the technical, financial and management skills and resources required to manage water resources	Performance achieve best international standards	Performance achieves high standards in most areas	Performance is barely adequate	Performance is consistently inadequate

3.2.3 Inter-agency Coordination

(Specify for national and subnational levels)

✓	Formal arrangements exist to ensure cooperation among water-related agencies at the national level, and they are implemented on an ongoing basis.	Formal arrangements are fully effective	Formal arrangements are partially effective	There is informal coordination	There is no coordination	There is active competition
✓	Formal arrangements exist to ensure cooperation among water-related agencies at subnational levels, and they are implemented on an ongoing basis.	Formal arrangements are fully effective	Formal arrangements are partially effective	There is informal coordination	There is no coordination	There is active competition

3.2.4 Community, NGO, and Other Stakeholder Participation

✓	Formal arrangements enable participation of users, CBOs/ NGOs, and other nongovernmental stakeholders in project design and implementation	Formal arrangements are fully effective	Formal arrangements are partially effective	There is informal participation	There is no partici-pation
	Formal arrangements enable participation of users, CBOs/ NGOs, and other nongovernmental stakeholders in water resource management	Formal arrangements are fully effective	Formal arrangements are partially effective	There is informal participation	There is no partici-pation

3.2.5 *Private Sector Participation*

✓	The country's private sector participates in water-related project design and implementation	Fully, with no restriction	Partially, and with some restrictions	A little, and/or with significant restrictions	Not at all
	The country's private sector participates in water resources management	Fully, with no restriction	Partially, and with some restrictions	A little, and/or with significant restrictions	Not at all
	The transnational private sector participates in water-related project design and implementation	Fully, with no restriction	Partially, and with some restrictions	A little, and/or with significant restrictions	Not at all
	The transnational private sector participates in water resources management	Fully, with no restriction	Partially, and with some restrictions	A little, and/or with significant restrictions	Not at all

3.3 The Information Base

3.3.1 Research and Development

(Describe the arrangements for and extent of R&D in WRD&M [including social, environmental, and economic as well as technical issues])

✓	The country's capability and resourcing in water-related R&D meet its information requirements WRD&M	Fully	Partially	A little	Not at all
	The country's capability and resourcing in allied areas of R&D (social, environmental etc.) meet its information requirements for WRD&M	Fully	Partially	A little	Not at all

3.3.2 Information Services

(Describe arrangements for acquiring, storing, and disseminating water-related information, including supply, demand, environmental/social/economic aspects and values)

✓	Hydrological and climatological databases meet the country's requirements for planning and design of water resources developments	Fully	Partially	A little	Not at all
	Environmental databases meet the country's requirements for planning and design of water resources developments	Fully	Partially	A little	Not at all
	Socio–economic databases meet the country's requirements for planning and design of water resources developments	Fully	Partially	A little	Not at all
	The country's capability and resourcing in hydrological and climatological services meets its requirements for operational management of water	Fully	Partially	A little	Not at all

3.4 Training and Human Resource Development

3.4.1 Public Sector Employees

(Describe the provision of relevant training [technical, management, financial etc.] for people employed in water resources management or water-dependent parts of the economy. Mention the existence of specific training programs, current or planned).

✓	Employees of public sector agencies receive or have received the training required to carry out their duties	All people are fully trained	Key people are fully trained; others have had basic training	Key people only have had basic training	People have received no recent specific training
	Water users and beneficiaries receive or have received the training required to participate in water resource management	All people are fully trained	Key people are fully trained; others have had basic training	Key people only have had basic training	People have received no recent specific training

3.4.2 Users and Beneficiaries

(Describe the provision of training [technical, management, financial etc.] for non-professionals involved in WRD&M or water-dependent parts of the economy)

3.4.3 Public Information

(Describe the provision of information to the public about water-related matters, particularly with reference to participation in decision making and water resource management.)

✓	Information resources about WRD&M are available to the public to aid their participation in planning and decision making	Extensive information resources are readily available	Limited official information supplements news media	Limited information is available via news media	No information is available through any medium

3.4.4 Education

(Describe provision for water-related and environmental education at primary, secondary and tertiary levels. Describe other water-related education, e.g. to encourage adoption of efficient water use practices or to demonstrate the value of water)

✓	Primary and secondary school syllabi include material on hydrological, environmental and related topics	Educational opportunities are readily available and comprehensive	Principal topics are covered thoroughly, others to a basic level	Only basic teaching in relevant topics is provided	No teaching in relevant topics is provided
	Primary and secondary school syllabi include material on hydrological, environmental and related topics	Educational opportunities are readily available and comprehensive	Principal topics are covered thoroughly, others to a basic level	Only basic teaching in relevant topics is provided	No teaching in relevant topics is provided
	Continuing education in the processes of water development and management is provided to the general public to aid their participation in planning and decision making	Educational opportunities are readily available and comprehensive	Principal topics are covered thoroughly, others to a basic level	Only basic teaching in relevant topics is provided	No teaching in relevant topics is provided

4.0 WATER RESOURCES STATUS

(This section describes the current status of the water resource and the extent and manner of its use [and non-use]. The focus should be on the relationship between supply and demand, summarized in section 4.4)

4.1 Water Resources and Watersheds: The Physical Base

(Where appropriate, provide country-wide averages, and data for representative and the most important watersheds, rivers etc., to provide quantitative and qualitative measures of status and trend

4.1.1 Watershed Management

for each of the percentages, also indicate whether stable, increasing or decreasing.	Severe impact	Moderate impact	Slight impact	No impact
Upper catchments affected by human-induced soil degradation/ erosion (% by area)				
Irrigated areas affected by salinization (% by area)				
Area of country affected by desertification (% by area)				

4.1.2 Surface Water Quality (quantity and quality)

(Provide information where available on water quality indices: dissolved oxygen, BOD, nitrate, phosphate, ammonium, heavy metals; provide an indication of whether the situation for each is stable, improving, or deteriorating).

for each of the percentages, indicate whether stable, increasing, or decreasing	Severe impact	Moderate impact	Slight impact	No impact
Percentage (by length) of rivers whose natural flow regimes are affected by human activity				
Percentage (by area) of wetlands whose natural flow regimes and/or water quality are adversely affected by human activity				
Percentage (by length) of rivers whose water quality is adversely affected by human activity				
Percentage (by surface area) of principal lakes whose water quality is adversely affected by human activity				

4.1.3 Freshwater Ecosystems

for each of the percentages, indicate whether stable, increasing, or decreasing	Severe impact	Moderate impact	Slight impact	No impact
Percentage (by length) of principal rivers whose aquatic ecosystems are affected by human activity				
Percentage (by length) of minor rivers and streams whose aquatic ecosystems are affected by human activity				
Percentage (by surface area) of principal lakes whose aquatic ecosystems are affected by human activity				

4.1.4 Floods (incidence and protection)

for each of the percentages, indicate whether stable, increasing, or decreasing	Severe impact	Moderate impact	Slight impact	No impact
Percentage (by area) of rural floodplains in which flooding adversely affects people and/or agricultural activities	%	%	%	%
Percentage (by area) of urbanized floodplains in which flooding adversely affect people, property and/or industry	%	%	%	%
Percentage (by area) of settled floodplains which have effective structural flood mitigation				%
Percentage (by area) of settled floodplains which have integrated structural and non-structural flood mitigation				%
Percentage (by area) of settled floodplains which have effective non-structural flood mitigation				%

4.1.5 Aquifers (quantity and quality)

for each of the percentages , indicate whether stable, increasing, or decreasing	Severe impact	Moderate impact	Slight impact	No impact
Percentage (by area) of aquifers in which water tables are drawn down by pumping				
Percentage (by area) of aquifers whose chemical water quality is adversely affected by human activity				
Percentage (by area) of aquifers whose biological water quality is adversely affected by human activity				

4.1.6 Estuarine and Coastal Zone

for each of the percentages, indicate whether stable, increasing, or decreasing	Severe impact	Moderate impact	Slight impact	No impact
Percentage (by length) of coastline whose aquatic ecosystems are adversely affected by human activity				
Percentage (by area) of estuaries in which the salt water interface has advanced inland as a result of human activity				
Percentage (by area) of estuaries whose natural flow regimes and/or water quality are adversely affected by human activity				
Percentage (by area) of estuaries whose aquatic ecosystems are adversely affected by human activity				

4.2 Uses of Water

(Where appropriate, provide country-wide averages, and data for representative and the most important watersheds, rivers etc., to provide quantitative and qualitative measures of status and trend. Make particular reference to goals etc. stated in sections 1.1.1 and 1.2.2)

4.2.1 Irrigated Agriculture (potential: demand: supply)

(for each of the percentages, indicate whether stable, increasing, or decreasing)	No. of schemes	Irrigated Area (ha and % of total irrigated area)	No of landholders	Cropping intensity (%)
Publicly (national/provincial) owned and managed irrigation systems				
Communally owned and managed irrigation systems				
Privately owned and managed irrigation systems				

Total irrigable area (ha)		*Irrigation water use* (MCM)	
Total irrigated area (ha)		Irrigation water use (% of total available water)	
Total irrigated area (% of total agric. area)		Value of agricultural production, irrigated area ($)	
Population depending on irrigated area (%)		Agricultural production, irrigated area (% of total agricultural production)	

4.2.2 Drainage for Agriculture

	No. of schemes	Drained area(ha)	No. of landholders
Publicly (national/provincial) owned and managed irrigation and/or drainage systems			
Communally owned and managed irrigation and/or drainage systems			
Privately owned and managed irrigation and/or drainage systems			

4.2.3 Electricity

(for each of the percentages, indicate whether stable, increasing, or decreasing)

Hydroelectricity generation(GWh)		Value of hydroelectricity generation ($)	
Hydroelectricity generation(% of total electricity generation)		Installed hydroelectricity capacity (MW)	
Hydroelectricity (% of total national energy use)		Hydroelectricity potential (MW)	
		Install hydroelectricity capacity (% of potential)	

4.2.4 Industrial Water

(for each of the percentages, indicate whether they are stable, increasing, or decreasing)

Estimated industrial water use from public supply (MCM and % of total)		Estimated industrial water use from private supply (MCM and % of total)	
Estimated industrial water use, recycled/reused (MCM and % of total)		Estimated industrial effluent, primary treated (MCM and % of total)	
Estimated industrial effluent, secondary or tertiary treated (MCM and % of total)		Estimated industrial effluent, untreated (MCM and % of total)	

4.2.5 Waste Treatment and Disposal

(for each of the percentages, indicate whether they are stable, increasing, or decreasing)	Primary treatment (MCM and % of total)	Secondary treatment (MCM and % of total)	Tertiary treatment (MCM and % of total)	Untreated (MCM and % of total)
Liquid effluent disposal to inland surface waters, all sources				
Liquid effluent disposal to estuaries, all sources				
Liquid effluent disposal to ocean, all sources				
Population served by effective sanitation (%)	Urban:		Rural:	

4.2.6 Transportation

(Include data on tonnages carried by water relative to total freight, extent of passenger transport by water, and numbers of people dependent on water transport for a livelihood. Mention any conflicts with other uses, particularly consumptive).

4.2.7 Fisheries and Instream Uses

(Include reference to subsistence and commercial fishing (including aquaculture), and to recreational and tourism values of water bodies. Provide information on the number of people dependent on fishing for a significant part of their protein, and the value of aquaculture and catches of unmanaged fish stocks. Mention any conflicts with other users which impact quantity or quality of water)

4.3 Community Values of Water

(make particular reference to equity issues such as rural-urban comparisons, to goals etc. stated in 2.1.2 and 2.2.2, and to projections of future demand)

4.3.1 Domestic Water Supply

(Include data on such indices as percent non-revenue water, rate of collection of bills, financial performance, number of employees)

(for each of the percentages, indicate whether stable, increasing, or decreasing)	Urban	Peri-urban	Rural
Population served by public piped water supply to house (%)			
Population served by public piped water supply (%)			
Population served by piped/covered sewerage (%)			
Population served by at least primary wastewater treatment (%)			

Production capacity of water treatment plants (MCM)		Capital value of water supply systems ($)	
Annual production (MCM)		Annual expenditure on O&M ($ / year)	
		Revenue from consumers ($ / year)	
Number of connections per employee		Non-revenue water (% of total production)	

4.3.2 Sanitation and Public Health

(Include data on such indices as incidence of water-borne and water-related diseases)

4.3.3 Employment Creation and Poverty

(Describe the extent and manner in which water resources are being developed to facilitate employment creation and poverty reduction)

4.3.4 Women's Participation

(Describe the extent and nature of women's participation in management of water resources, and whether/how water-related projects enhance such participation)

✓	Women are involved in the planning, design and implementation of water-related projects, through community consultation or CBOs/ NGOs	Fully	To a large extent	To a limited extent	Not at all
	Women are involved in management of water-related projects after handover, as members of CBOs	Fully	To a large extent	To a limited extent	Not at all
	Women are involved in the planning, design and implementation of water-related projects, as members of the professional staff of executing agencies	Fully	To a large extent	To a limited extent	Not at all

4.3.5 Indigenous People and Resettlement

(Describe how indigenous peoples have been affected by or benefited from water resource development, and the extent to which they participate in decision making. Refer to such matters as displacement of people by reservoir construction)

✓	Indigenous peoples are involved in the planning, design and implementation of water-related projects, where their traditional homelands or resources could possibly be affected	Fully	To a large extent	To a limited extent	Not at all
	Traditional knowledge is used in planning and design to enhance the sustainability and effectiveness of water-related projects	Fully	To a large extent	To a limited extent	Not at all

4.4 Supply, Demand and Sustainability

(The focus in this section should be on the extent to which the relationship between supply and demand, as outlined in the preceding section, is sustainable)

4.4.1 Competition Between Uses

(Summarize the extent and nature of competition between uses, starting with information on current conditions to judge areas which future competition is likely to be an issue. Comment on the effectiveness of measures to control competition)

Competing Water Uses: Consumption and Use

all figures should be given for the lowest mean monthly discharge, in MCM/month	Surface water consumption (MCM/month)	Groundwater consumption (MCM/month)	Return or run-of the-river flow (MCM/month)
Available surface water in the month of lowest mean monthly discharge			
Salinity control in lower river			
Hydroelectric power generation			
Irrigated agriculture			
Municipal/domestic water supply (including wastewater discharge)			
Industrial water supply and thermal power cooling water (including wastewater discharge)			
Freshwater/brackish water aquaculture (in river or estuary)			
Recreation; wild freshwater/brackish water fisheries			
River navigation			

Competing Water Uses: Interaction

0: *no competition* 1: *minor competition* 2: *moderate competition* 3: *severe competition* C: *complementary use*

	Salinity Control	Hydro-power	Irrigated agri-culture	Domestic water supply	Industrial water supply	Waste water disposal	Naviga-tion	Aqua-culture	Recrea-tion/ Fisheries
Salinity Control									
Hydropower									
Irrigated agriculture									
Domestic water supply									
Industrial water supply									
Waste water disposal									
Navigation									
Aquaculture									

4.4.2 Demand Management

(Describe how, in practice, demand is managed using, for example, economic instruments, public education programs, training of water user groups, regulatory interventions)

4.4.3 Augmentation of Supply

(Summarize, if possible in tabular form, measures for augmentation such as inter-basin diversion, reservoir storage, wastewater reuse, precipitation augmentation etc.)

4.5. Summary: Status and Trends

(Summarize, with a particular focus on balancing economic and social development with sustainable resource management, the current status of water resources and water use. Identify trends and issues, using a 25 year time horizon, and with a particular focus on watersheds and subregions in which there are likely to be the greatest needs)

5. FINANCIAL RESOURCES

(This section summarizes, largely in quantitative terms, the financial/economic aspects of water resources management and use.)

5.1 Source of Funds

(Outline the sources of funds during the last five years - government appropriation, private sector investment, ESAs, etc. - for water resources management and development)

Sources of investment funds for water resources development in the last five years

Estimate percentage of funds from each source, average over last two years	Govern-ment	Private sector	ADB loans	Other loans	ODA grants	NGO grants
Hydroelectric power generation						
Irrigated agriculture						
Municipal/ domestic water supply						
Industrial water supply						
Freshwater/ brackish water aquaculture						
River navigation						
Sewage and wastewater treatment						

5.2 Annual Expenditure and Revenues

(Review public sector expenditure (new construction, rehabilitation, operating and maintenance) and revenues for WRD&M and water-related uses. Describe aspects of project operation such as cost recovery from beneficiaries and labour inputs from beneficiaries)

List public sector expenditure ($/year average, last two years)	New construction	Rehabilitation	O&M	Revenue
Hydroelectric power generation				
Irrigated agriculture				
Municipal/ domestic water supply				
Industrial water supply				
Freshwater/ brackish water aquaculture				
River navigation				
Sewage and wastewater treatment				

5.3 Return on Investment

(Summarize the economic and social value of investments in the water sector, including for example the value of irrigated crops or reduction in hospitalisation for water-borne diseases)

6. APPRAISAL

(This section appraises the material presented in Sections 3,4 and 5, in terms of the national policies and goals described in Section 1. There should be a particular focus on identifying root causes of any shortcomings)

6.1 Water Sector Institutions

(Appraise the performance of institutional arrangements in Section 3, identifying aspects which limit their ability to achieve national policies and goals on a continuing basis)

6.2 Water Resources and Watersheds

(Assess whether the water resource - in terms of quantity and quality, and taking particular account of watershed condition - is able to support national goals for economic and social development. Indicate whether measures that are presently being taken, such as catchment rehabilitation or investment in new impoundments or wastewater treatment, are likely address the needs, and what additional steps might be required)

6.3 Uses of Water

(Review the current and projected uses of water, particularly from the perspective of competition for the resource and contribution to economic and social goals)

6.4 Community Values of Water

(Review the social and community values of water of water, particularly in terms of public health, poverty alleviation, equity issues, etc.)

6.5 Sustainability of Water Resources and Use

(Assess the future sustainability of productive and social/community uses of water in the context of resource availability. Consider at least the medium term (25 year) time scale; pay particular attention to periods (e.g. driest month) and locations and/or river basins in which stresses are or are likely to be greatest; make reference to measures that are being taken or planned)

6.6 Financial Performance

(Assess the financial performance of publicly owned water sector operations, in terms of such matters as the extent to which revenues cover O&M costs and capital repayments, return on investment, etc. Consider whether the operations are financially sustainable, and if not what measures may be necessary or possible)

6.7 Consistency with the Objectives of Asian Development Bank

(Assess the extent to which measures required to address issues identified in sections 6.1 to 6.6 match ADB's Strategic Development Objectives, Operating Objectives and Cross-cutting/thematic Priorities)

7. AGENDA FOR ACTION

(This section builds on Section 6, to identify key needs and opportunities for capacity building and for improved development and management of water resources, with a time horizon of 25 years. Opportunities for private sector involvement and NGO support should be included. The focus should be on the Strategic Development Objectives and Operating Objectives of the ADB; opportunities for other ESAs should also be identified, with a view to improving donor coordination. This Agenda, once agreed with the DMC government and other ESAs, will be included in ADB's CAP)

APPENDIXES

1. **References**
   (Provide references to relevant reports, published and unpublished, with details on where they may be obtained)

2. **Completed and current water-related projects**

3. **Summary of lessons learned from completed projects**
   (include information on the incorporation of quality dimensions in project design)

4. **Contact persons**
   (list persons who have relevant sector and country experience, with contact details)

5. **Map showing priority river basins and projects**

6. **Data appendixes**

Appendix 3

Departments and Offices Represented in the Bank's Interdepartmental Water Resources Policy Group

Departments and Offices Represented in the Interdepartmental Water Resources Policy Group

OESD	Office of Environment and Social Development (Chair and Secretary)
AED	Agriculture and Social Sectors Department (East)
AWD	Agriculture and Social Sectors Department (West)
IED	Infrastructure and Energy Department (East)
IWD	Infrastructure and Energy Department (West)
OPO	Office of Pacific Operations
SPO	Strategy and Policy Office
EDRC	Economics and Development Resources Center
PEO	Post-Evaluations Office
PED	Programs Department (East)
PWD	Programs Department (West)
PSG	Private Sector Group
OGC	Office of the General Counsel
BPTD	Budget, Personnel, and Management Services Department (Training Division)

Appendix 4

Selected References

Selected References

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