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GUIDEBOOK

for Policy and Legislative Development on Conservation and Sustainable Use of Freshwater Resources

Stephan C. McCaffrey
Gregory S. Weber

United Nations Environment Programme

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Stephen C. McCaffrey

Gregory S. Weber

Institute for Sustainable Development at Pacific/McGeorge

University of the Pacific, McGeorge School of Law Sacramento, California

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Tel.: +44 14 38748111
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For further information, please contact:

Environmental Law Branch
United Nations Environment Programme
P.O. Box 30552 Nairobi, Kenya
Tel.: +254 - 20 - 623478
Fax: +254 - 20 – 624324
E-mail: Sylvia.Bankobeza@unep.org
Web: www.unep.org/dpdl/law

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Message

The centrality of water in our lives—social, economic, political and spiritual—cannot be overestimated. Nearly every decision we make is directly linked to the use and availability of water. Water quality reveals everything, right or wrong, that we do. Its abundance is an indicator of social development. Its lack is an indicator of poverty. The new UNEP water policy and strategy—which has taken the organization away from sectoral approaches—recognizes this need. At its core lie three components: assessment, management and co-ordination of actions. All three components stress the cross-sectoral nature of water issues. UNEP has long been involved in the field of fresh and marine water and has developed a number of programmes and instruments, including legal, over the years.

Over the last quarter-century, we have become increasingly aware that the resources on which we rely are not boundless. The world's dependence on fossil fuels has focused the minds of many on the finite nature of our resource base. However, something much greater than the energy crisis faces us: the depletion and pollution of the planet's limited supply of fresh water. Its depletion in quantity and quality has profound social, economic and ecological effects. Water is a particularly vital resource. Without water, ecosystems are destroyed. Economic activities halt. People die.

Addressing water problems requires an inter-sectoral approach that recognizes the interlinkages—for example, between land and water, agriculture and water, technology and water, health and water—that affect water management. No single mechanism or approach will be enough. Policy packages using a mutually reinforcing mix of institutional and policy reform, and legal, economic and management instruments will be needed. One of the goals of the new UNEP water policy and strategy is to identify and promote the tools that will address the critical water issues facing humanity.

The water problems confronting us at the start of the 21st century can be solved. But we must have the will to deal with long-term environmental problems. We must be willing to invest in our future. This publication, designed to facilitate the work of policy makers and legal drafters in regard to conservation and sustainable use of freshwater resources is timely in view of the goals set in the Millennium Declaration and the targets embodied in the outcomes of the World Summit on Sustainable Development.

Klaus Toepfer
Executive Director
United Nations Environment Programme

Foreword

One of the major challenges of our time is how to manage our water resources in a sustainable way to cope with natural phenomena like climate change, droughts and floods as well as with human phenomena like the growing and competing demands on a limited supply of water resources. Concern about this challenge and strategies for addressing it have been expressed in a number of international events. In 1992 they were expressed through the Dublin Principles and the Rio Declaration on Environment and Development, as expressed in Chapter 18 of Agenda 21. These form the foundation of integrated water resources management (IWRM). At the turn of the new millennium the concern was expressed in a different manner.

In September 2000 189 world leaders adopted the Millennium Declaration through which they committed their nations to the Millennium Development Goals (MDGs). These goals seek to address extreme poverty by improving health and promoting peace, human rights, gender equality and environmental sustainability. It has become apparent that sustainable management and development of water resources is central to the attainment of the key goals of poverty eradication inherent in the MDGs.

These developments and the growing awareness of the significance of IWRM were carried further in 2002 at the World Summit on Sustainable Development (WSSD) that took place in Johannesburg. In paragraph 26 of the Plan of Implementation of this Summit, there is a call for the development of integrated water resources management and water efficiency plans by 2005; and this was to be done with support to developing countries, through a series of actions at all levels. One of these actions calls for the adoption of an integrated water basin approach together with the use of "the full range of policy instruments, including regulation, monitoring, voluntary measures, market and information-based tools, land-use management and cost recovery of water services, without cost recovery objectives becoming a barrier to access to safe water by poor people, and adopt". This call focuses on action within the scope of the first of the "three pillars" of IWRM which are: an *enabling environment of appropriate policies, strategies and legislation* for sustainable water resources development and management; the *institutional framework* through which the policies, strategies, and legislation can be implemented; and the *management instruments* that are required by these institutions to do their job.

The Plan of Implementation of the Summit Proceedings calls for support to the developing countries toward the 2005 goal. In response to this call, a number of donors and international institutions are rising up to the challenge of providing such help. For example, the Global Water Partnership (GWP) has initiated a series of publications on how to implement this WSSD recommendation. This **Guidebook for Policy and Legislative Development on Conservation and Sustainable Use of Freshwater Resources** is thus a timely addition by UNEP to this series of publications. It deals with an aspect of water resources management and development that is foundational. It provides guidelines on how build the IWRM pillar concerned with an *enabling environment of appropriate policies, strategies and legislation* for sustainable water resources development and management. It deals with the core and pressing issue of how to meet the WSSD recommendation on IWRM and water efficiency plans by 2005.

Meeting the deadline for this recommendation poses a massive challenge to professionals in developing countries as well as developed countries. In those countries that are without any water legislation, it calls for identifying the issues that must be included in water legislation, what fundamental principles should be reflected in new legislation, what to avoid and what to include in order to avoid pitfalls and be able to adapt examples of best practice to local situations. Countries with water legislation that follow a fragmented approach face different problems. They need to make a transition to the integrated approach. To this end, they need to know how to evaluate the adequacy of existing legislation to reflect the principles of IWRM and sustainable development to support the MDGs.

From where do professionals in such countries start? Where do they go for help? Ideally, what would have been most helpful to professionals in both types of countries would have been the availability of a "one-stop shop" where they could gain access to reference material that provides them with information on the principles to be followed as well as examples of how such principles have been applied in legislation under different circumstances in different countries.

It is just this type of help that is provided in this Guidebook. It provides the reader with a thorough analytical framework for the different policies and legislative instruments needed for sustainable management and development of national and international water resources. It is very rich in examples of actual legislation. It has about 130 examples drawn from over 20 countries from developing as well as the developed countries – from Africa, Europe, Asia, the United States of America, Russia, Latin America and others.

This Guidebook provides information not only on national legislation, but also on a number of international agreements and conventions that have been produced in recent years. Its scope is not limited to legal issues. It addresses such issues as the precautionary principle, adaptive management, and the importance of data collection and monitoring as instruments for sustainable development. It deals with the benefits of integrating all water resources statutes under a single law, and with the merits of bringing all aspects of water use and protection under a single piece of legislation. It also addresses issues of sustainable development of multiple natural resources embracing water resources, forest resources, land use, biological communities and mineral resources.

The language in the Guidebook is simple and straightforward. This makes it readable and useful to a wide range of audience such as legal draftsmen, water and natural resources sector professionals, university professors and students, as well as policy and decision makers. It is a very timely and useful resource to those interested in sustainable development and in the creation of an enabling environment for IWRM.

Albert M. Wright
Co-Coordinator
UN Task Force on Water and Sanitation

Introduction

Integrated water resource management (IWRM) incorporating an ecosystem approach is a key building block for achieving the water, sanitation and human settlement targets of the Millennium Development Goals. It is evident that there are inseparable and indisputable links between the protection and sustainable use of the natural environment, especially water resources, and the provision of environmentally sound sanitation services, the improvement of human settlements, public health and poverty reduction. This brings into focus the need for conservation and efficient use of available freshwater resources and making available best practice for widespread adoption and adaptation throughout the global community.

Because experience has shown that environmental issues need to be treated as an integral part of development, the Division of Policy Development and Law (DPDL) seeks to improve the policy delivery system by facilitating the change in the way policy is treated. Through technical and policy support it helps decision-makers improve the way policies work. Through partnerships, interactions between the environment and other development issues are cemented and through support for improved governance, better application of sound policy is promoted. In addition, through upgraded legal frameworks, it ensures consistency and equity in support of environment policies.

The UNEP Water Policy and Strategy focuses on the environmental aspects of freshwater, comprising rain-, surface- and ground waters, and coastal and marine waters. The importance of environmental aspects stems from the major roles of water in supporting ecosystem integrity and functioning, and in being a renewable resource vital for human economic and social well being. The vulnerability of ecosystems and communities to extreme events, such as floods and droughts and the impacts of water management measures –such as water infrastructure- on the environment are important environmental aspects to be considered.

These environmental aspects are interrelated and closely linked to the management of other natural resources, especially land, and are embedded in the technological, economic, social and institutional contexts of water resources management. Ecosystem functioning and productivity, and human health and wellbeing benefit from environmentally sustainable water resources management, which thus directly contributes to poverty alleviation. Ecosystem approaches also include the necessary links between river basin and coastal water resources management.

The Environmental Law Branch of DPDL contributes by developing appropriate legal tools to translate these policies into action through legal regulation, within the framework of the Programme for the Development and Periodic Review of Environmental Law for the First Decade of the Twenty-first Century (Montevideo Programme III). This Programme, adopted at the twenty first session of the UNEP Governing Council, provides a strong mandate to incorporate the legal dimensions fully into the ongoing water policy work at the national, regional and global levels, by encouraging the development of national and regional policies, action plans and, where appropriate, legal instruments for the conservation, protection,
regeneration, integrated management and maintenance of the quality and sustainable use of freshwater resources.

At the national level, the activities focus on providing assistance in developing and implementing national laws and policies relating to: conservation, protection, integrated management and sustainable use of fresh water resources, both surface water and groundwater, increasing access to safe drinking water, the provision of waste water treatment and sanitation, and the prevention of pollution of water resources resulting from e.g. agriculture as well as providing assistance, upon request, with the development and implementation of any national legislation needed to implement international obligations concerning the use protection and sustainable development of international watercourses.

At the regional and international levels, its activities focus on reviewing and analysing existing rules and regulations, including agreements relating to transboundary water issues, in order to determine the need for more elaborate principles or standards to ensure sustainable use and development of transboundary water resources and associated ecosystems and assisting, upon request, states in elaborating existing international rules and regulations, including agreements to advance sustainable use and development of transboundary water resources. This publication is primarily intended to assist policy makers and legal drafters in developing countries to obtain a basic understanding of the main elements to be taken into consideration when regulating the conservation and sustainable use of freshwater resources and the related comparative law dimensions.

I should like to express my deep appreciation of the excellent work that has been carried out by my colleagues in the Law Branch in conceptualising and designing this publication and to Professors Stephen McCaffrey and Gregory Weber for producing an outstanding publication. Finally, I wish to extend my gratitude to Professor Albert Wright, Co-chair of the Task Force on Water and sanitation of the Millennium Project commissioned by the Secretary General of the United Nations, for writing the Foreword to this publication and for his encouragement and support.

Bakary Kante
Director
Division of Policy Development and Law
United Nations Environment Programme

Preface

This book is intended to assist policy planners and those tasked with preparing legislation or regulations addressing the sustainable use of freshwater resources, whether nationally, regionally or locally. Thus it is designed to serve as a resource for anyone engaged in the development of water policies, whether within or outside government, as well as those responsible for drafting legislation. While lawyers in water ministries will often be the ones asked to perform the latter kind of work, the book is not written only for lawyers but also for others in government service who may be charged with these tasks.

The book first identifies issues of which the drafter should be aware in preparing water legislation, then provides examples of existing national legislation that addresses those issues. Of course, circumstances vary widely from country to country, and even within individual countries. Therefore, not all of the issues identified will be relevant for all countries. Further, certain issues will be of greater significance in some countries than in others. For example, water rich countries are likely to have different concerns from those of countries that are more arid. States in which manufacturing or extractive industries play a large role in the economy may wish to structure their water legislation differently than those for which the agricultural sector is dominant. Countries with significant international watercourses must factor this element into their planning and management processes, while those without such internationally shared water resources will not be concerned with this dimension. The drafter must bear these considerations in mind in preparing texts for the consideration of the relevant legislative body.

Each of the examples of existing legislation contained in the book is set forth in a text box following a brief analytical description of the issue in question. The examples may serve as models, or guides, which may be adapted to suit the needs and circumstances of the drafter's country. However, there are often a number of ways in which a particular problem can be addressed, and in fact has been addressed, in the legislation of different countries. Yet space constraints generally permit the reproduction in the book of only one illustrative provision for each issue or sub-issue. With a view to providing the user with information on, and the possibility of having access to, a number of other illustrative provisions as well, the book includes references in the text, a bibliography, and a CD ROM containing the full codes from which the samples were extracted.

As a final cautionary note, the authors have looked at laws from many different countries, from different continents, and from different legal systems. In addition to space limitations, both the large number of countries and the difficulty of obtaining translated texts of many nations' statutes have limited the number of countries whose laws are included in the excerpts set out in this Guidebook. There are undoubtedly many more examples of good legislative models. Users should therefore consider the excerpts reproduced as examples of possible approaches only, rather than as an exhaustive catalogue. They are offered as an invitation to explore further the topics of greatest interest to the reader.

The authors gratefully acknowledge the helpful assistance of Kim Clarke and Stephanie Braunstein of the Gordon D. Schaber Law Library at Pacific/McGeorge and the able research and technical assistance of James Herink, Pacific/McGeorge Class of 2005. The authors welcome feedback from users of this volume.

SMcC
GW
Institute for Sustainable Development at Pacific/McGeorge
University of the Pacific, McGeorge School of Law

Sacramento, California
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The Authors

Stephen C. McCaffrey is Distinguished Professor and Scholar at the University of the Pacific, McGeorge School of Law in Sacramento, California, USA. Professor McCaffrey served as a member of the International Law Commission of the United Nations (ILC) from 1982-1991 and chaired the Commission's 1987 Session. He was the ILC's Special Rapporteur on the Law of the Non-Navigational Uses of International Watercourses from 1985 until 1991, when the Commission provisionally adopted a full set of draft articles on the topic. The ILC's draft articles formed the basis for the 1997 United Nations Convention on the same subject. Among other activities, he served as Counsel to Slovakia in the *Gabcikovo-Nagymaros* case before the International Court of Justice and currently serves as Legal Counsel to the Nile River Basin Negotiating Committee. Professor McCaffrey's publications include *The Law of International Watercourses: Non-Navigational Uses* (Oxford University Press, 2001), and *International Environmental Law & Policy*, with Edith Brown Weiss, Daniel Magraw and others (Aspen, 1998).

Gregory S. Weber is Professor of Law at the University of the Pacific, McGeorge School of Law in Sacramento, California, USA. Along with Professor McCaffrey, he is a founder of the Institute for Sustainable Development at Pacific/McGeorge. For the last 5 years, he has also been an associate mediator and facilitator with the Center for Collaborative Policy, a joint project of Pacific/McGeorge and the California State University, Sacramento. Among other projects for the Center, he has spent the past three years consulting on a collaborative update to the California state water plan. He also serves as a dispute resolution consultant with an international NGO that is dedicated to the development and implementation of standards for sustainable forestry. Professor Weber has published extensively on California water resources law, and is co-author of *The Law of Hazardous Waste and Toxic Substances in a Nutshell* (West 1997.)

The Institute for Sustainable Development at Pacific/McGeorge was founded in the fall of 2003. It focuses on the development and application of law, policy and conflict-resolution processes for internationally-shared natural resources. Its initial emphasis is on the sustainable development of international water and forestry resources, with particular emphasis on multi-national, multi-stakeholder collaborative resource management and conflict resolution. The Institute also anticipates adding energy resources as its third area of emphasis, with an emphasis on renewable energy resources.The Institute for Sustainable Development at Pacific/McGeorge is the first of three institutes planned as part of the new Center for Global Business and Development at Pacific/McGeorge. The others will be an Institute for Global Business and Transactions, and an Institute on the Development of the Legal Infrastructure of the Global Economy.

Acknowledgement

The Guidebook for Policy and Legislative Development on Conservation and Sustainable Use of Freshwater Resources was prepared by Prof. Stephen C. McCaffrey and Prof. Gregory S. Weber of the Institute for Sustainable Development at Pacific/McGeorge University of the Pacific, McGeorge School of Law in Sacramento, California in collaboration with the staff of the Environmental Law Branch (ELB) of the Division of Policy Development and Law (DPDL) of UNEP. The draft publication was submitted for internal peer-review at UNEP

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Note on Terminology

In this book, the following terminological conventions have been followed:

1. The term *"water"* refers to freshwater unless otherwise indicated.

2. The terms *"state", "nation" or "country"* may each be used from time to time to refer to a *"state"*, as the latter term is used in international law.

3. The term *"legislature"* is sometimes used in a broad sense to refer to the relevant body having authority under the law of the state in question to enact laws, adopt regulations, and the like. Thus, the term includes parliaments, ministries, other national governmental units with these powers, as well as regional and local bodies having corresponding authority. (See also *ministry and agency.)*

4. The terms *"region," "regional,"* and *"local"* are used to refer to sub-national political subdivisions within a country, rather than a geographic region encompassing more than one country. For example, reference may be made to water regulations adopted on the "*national*, *regional* or *local level*." *"Regional"* generally connotes a broad subdivision that would ordinarily include multiple *"local"* subdivisions. Thus, *"regions"* can include *"states"* of a federation, *"departments*," and "*provinces.*" "*Local*" generally connotes a smaller subdivision, often at least partially under a regional government's authority. "*Local*" subdivisions can include cities, counties, and similar entities.

5. The terms *"ministry"* and *"agency"* are used interchangeably to refer to governmental bodies with authority to implement legislation. To the extent that these bodies have authority to issue binding regulations, they can also be said do exercise legislative authority. (See also *legislature*.)

6. The terms *"watershed," "catchment basin,"* and *"drainage basin"* are used interchangeably.

7. The terms *"water management activities"* and *"water development activities,"* and their analogous forms, encompass all intentional decisions over the use of a given set of water (or related) resources. They are meant to be value neutral terms that include economic, environmental and social uses. They also include both *"active"* management or development projects, i.e., those involving the investment of capital and labor, as well as *"passive"* activities, such as decisions to leave resources in a natural state.

8. The terms *"license"* and *"permit"* are used interchangeably to refer to a competent authority's formal written permission to divert from, or discharge into, a water body. In this Guidebook, they can include *"concessions," "contracts," "consents"* and similar permissions even though, in a given nation's laws, such terms generally indicate a specific subcategory of permissions.

9. The term *"water diversion"* includes withdrawals of water from both surface water and groundwater. It also includes in-stream storage of surface water behind dams or other artificial barriers, even if the water is not *"diverted"* from the watercourse.

10. In addition to actual deposits of pollutants into a water body, the term *"water discharge"* includes the filling of wetlands. It also includes the artificial recharge of a groundwater basin.

11. In text, the compound words *"groundwater," "freshwater,"* and *"waterworks"* are used. In statutory excerpts, the spelling used in the code, or the code translation, is used, whether that is one word or two.

I. Introduction: Water and its sustainable use

Drafting water legislation is a difficult task. This is so not only because of the variety and complexity of the issues that must be addressed but also because of the multifaceted context within which the legislation must operate. The present Introduction touches very briefly upon both subjects. It begins by identifying some of the most important aspects of the context within which water legislation operates, then surveys briefly the major issues and trends in national and international water policy and law.

1. The hydrologic cycle

It is important for one drafting water legislation to have a basic understanding of the behavior of water. The following paragraphs offer a concise, non-technical description of the water cycle and the components of a watercourse system. Key terms appear in italics the first time they are used.

Most freshwater on Earth is in constant motion in the *hydrologic cycle*. This expression refers to the process whereby water *evaporates* into the atmosphere and returns to Earth's surface through *condensation* and *precipitation*. Evaporation may occur from any wet surface. Most water evaporates from the oceans, since they cover about 70 per cent of the planet. But water may also evaporate from other bodies of water, such as lakes, reservoirs and rivers, as well as from moist soil and other surfaces. Considerable amounts of water vapor enter the atmosphere through transpiration and evaporation from vegetation in a process referred to as evapotranspiration. Thus crops, trees and other vegetation act as virtual "pumps", transferring water from the ground into the atmosphere. Scientists now understand that large-scale elimination of vegetation can actually affect local and regional climate patterns.

When water returns to land through precipitation it may either remain on the surface, as standing water or as runoff, or soak into the ground through infiltration. Runoff flows into streams, lakes and other forms of surface water, generally finding its way eventually into the ocean. Water entering the ground through infiltration may be held in the soil, to eventually return to the surface through capillary action and evaporate, or may percolate downward to become groundwater.

The area on the land surface where infiltration occurs is called the recharge area. This may lie a considerable distance from the place where groundwater is withdrawn or emerges naturally, for example, by flowing into a river, or emanating from the ground in the form of a spring.

The underground geologic structures containing water are often referred to as aquifers. These porous, water-bearing formations are composed of such material as sand, gravel or limestone. The water contained in these saturated, permeable layers of material is called groundwater. The upper surface of groundwater is the water table. Gravity pulls water downward in aquifers until it meets an impermeable layer of rock or clay. Aquifers are complex geologic structures, however; each one is unique. In places, impermeable layers of rock may occur both below and above porous layers.Water moves not only from Earth's surface to the atmosphere and back again, but also, in many cases, from the surface into the ground and back again to the surface. For example, considerable water seeps from streams through their beds into the ground, changing from surface water to groundwater. This groundwater may later rejoin the stream, emerge as a spring or flow underground into a lake or the ocean. The geologic characteristics of an aquifer will determine the direction and rate of its water's flow, but the water in virtually all aquifers receiving recharge through infiltration flows in some manner.

However, there are certain aquifers containing what is sometimes called confined groundwater, or fossil water, that do not interact with surface water or other aquifers. These are highly exceptional, however. In the vast majority of cases, surface water interacts with groundwater, and vice versa. It is therefore not advisable to regulate these forms of water separately.

In formulating water legislation it is obviously important to be aware of where sources of a country's freshwater are, or may be, located. Beginning at the global level, specialists estimate that just over three-quarters of all freshwater on Earth is frozen in polar ice-caps and glaciers and is inaccessible as a practical matter. Of the remainder, some 13 per cent is contained in deep aquifers located between 800 and 4,000 meters below the Earth's surface. An additional 10 per cent is found within 800 meters of ground level, and soil moisture makes up 0.18 per cent of the total.

Surface water accounts for a surprisingly small percentage of the total, with lakes holding 0.33 per cent and rivers only 0.004 per cent of the world's freshwater. Thus, if ice-caps and glaciers are excluded, groundwater constitutes approximately 97 per cent of the freshwater on Earth. Some two billion people, one-third of the global population, are dependant upon groundwater, much of which is drawn from shallow aquifers. Those living in rural areas often rely entirely upon groundwater.

These figures regarding the location of freshwater represent global averages. The situation in each country will differ. Nevertheless, the figures illustrate the effects of the behavior of water, in particular that much of it is pulled by gravity down into the ground. This is a hydrological fact, and will be true to some extent in every country. It underlines the importance of taking appropriate account of groundwater in the formulation of water law and policy.

A final characteristic of the world's water that is worth recalling is that it is unevenly distributed. Some geographic regions have more water than they can possibly use, others not enough. Governments, especially in developed countries, have sometimes responded to this phenomenon by transferring water from places where it is abundant to those where it is scarce. While water transfers may address needs of the present and short-term future, they may also have unforeseen and harmful longer-term effects on ecosystems and even human populations.

2. Constant supply, growing demand

An important feature of water is that it is constant in quantity. Earth's water supply has been the same for billions of years. It neither grows nor diminishes. How then can it be said, as it sometimes is, that the world is running out of water? The answer lies largely in intensified human demand for a finite supply. This is in large part due to population growth. The United Nations Population Division currently estimates that the world's population, which stood at 6 billion at the beginning of this century, is likely to reach almost 9 billion (8.9 billion) by 2050.

Even today, 1.1 billion people are without access to potable water and still more, 2.4 billion, lack adequate sanitation, according to the World Health Organization. About one-third of the global population lives in countries under moderate-to-high water stress. Studies have estimated that by the year 2015, nearly half the world's population will live in countries lacking sufficient water. Both the present situation and future trends counsel, therefore, that water planners and managers take into account the likelihood of increasing demand for water in the future.

It is not only growth in demand that affects the availability of water for human use, however. As discussed in Subsection 4, below, water must be of a quality that is appropriate for its intended use. Therefore, water quality and quantity are interrelated: water resources may be plentiful but unsuitable for human use because of contamination. This problem is becoming more serious, particularly in urban areas, where the world's growing population is increasingly concentrated. While around 30 per cent of the global population lived in cities in 1950, that proportion had risen to 50 per cent by 2000 and continues to rise. This imposes growing burdens on urban water infrastructure and managers, because of the difficulty of providing adequate supplies of water to growing urban populations and of disposing of the increasingly large quantities of wastewater city dwellers produce.

An additional factor that is less concrete but may have even more profound effects on water supplies is global climate change. It is important that this phenomenon be borne in mind by government officials responsible for water supply and sanitation. Scientists predict that climate change will mean not only higher temperatures but also rising sea levels, altered precipitation patterns, and an increase in extreme climatic events and storm surges, among other effects. All of these factors will impact the availability and quality of freshwater resources as well as human demand for freshwater. Water managers must accordingly ensure that they are taken into account in the planning and regulatory processes.

3. Water quality

The quality of the water available for human use has an important bearing on its quantity. Water that is contaminated may not be suitable for drinking without causing adverse health effects. Polluted water may also be inappropriate for other domestic uses, such as washing and subsistence farming, as well as for commercial agriculture and industrial uses requiring pure water. Principal sources of pollution include untreated sewage, agricultural run-off and chemical substances. These affect all forms of freshwater as well as brackish and salt water in coastal areas, threatening the health and livelihoods of people dependant upon them and degrading associated ecosystems.

The connection between sanitation and the domestic water supply bears emphasis. The lack of adequate sanitation is the primary cause of water contamination and water-related diseases, such as cholera, dengue fever, diarrhea and typhoid fever. Some 2.3 billion people are afflicted with these diseases each year. Children are particularly vulnerable since their immune systems are not fully developed. The poor are the most likely to have inadequate sanitation facilities and to suffer consequent adverse effects on their health and environment. It is thus not enough to address water supply alone, since the discharge of untreated wastewater will often continue to contaminate water supplies and will lead to the spread of water-related diseases.

It must also be borne in mind that substances deposited on land surfaces, for example fertilizers, pesticides and other chemicals used in agriculture, may make their

way into groundwater, depending on their persistence and the character of subterranean geologic structures. Water in streams that is polluted through waste discharges, agricultural runoff or by other sources may also enter aquifers through infiltration. Once contaminated, groundwater is very difficult to purify unless it is extracted and treated.

The quality of groundwater in coastal areas may also be affected by over-pumping, or mining. Mining of groundwater occurs when withdrawals exceed the average rate of replenishment. Because coastal aquifers are often geologically connected with the adjacent ocean, these withdrawals can cause sea water to be drawn into the aquifers, increasing the salinity of the freshwater they contain and making it unfit for many uses.

Water pollution is often placed in one of two categories, depending upon its origin. "Point source" pollution, as its name implies, enters the water supply from an individual source, such as a pipe that discharges domestic or industrial waste into a river. In contrast, "non-point source" pollution originates from diffuse sources, as in the case of agricultural runoff. Control of the latter form of pollution presents particular regulatory challenges, as discussed in Section II.C.9, below.

4. Water use & protection: different and potentially conflicting uses and different approaches to water conservation

Humans use freshwater in a wide variety of ways. Nevertheless, it is possible to identify several broad categories of uses for convenience:

- domestic uses
- industrial uses
- agricultural uses
- recreational uses
- navigational uses
- waste-disposal uses
- instream uses

While these categories are for the most part self-explanatory, a word about the last one mentioned may be in order. As the term implies, instream uses are uses or values relating to water in a watercourse. These range from fishing, conservation of fish and other aquatic life, and recreation, to safeguarding aesthetic values and preservation of aquatic ecosystems. The need to preserve minimum stream flows in order to ensure a supply of water of adequate quality and quantity to protect freshwater ecosystems, including both flora and fauna associated with those ecosystems, is increasingly recognized.

The above categories may be further subdivided. For example, domestic uses may be understood to include the use of water for drinking, washing, food preparation, sanitation, and subsistence farming, among other uses. Industrial uses may include not only those which make use of water in industrial processes but also the use of water to drive turbines in order to produce hydroelectric power. Other specific uses could fall under multiple categories. For example, the category of agricultural uses could be taken to refer to commercial or other large-scale agriculture, or to subsistence farming. For present purposes, however, agricultural uses are those of the former kind; subsistence farming is encompassed in the category of domestic uses. Likewise, fishing could be either a domestic use, if the fish were used to provide food for the household, or an industrial use, if the fish were sold commercially. And of course several of these kinds of uses could involve pollution of freshwater resources, a waste-disposal use.

With these qualifications in mind, however, the broad categories listed above will serve present purposes. Water planners, and those drafting water legislation, must bear in mind the potential for different uses of water to come into conflict with each other. Thus, for example, the use of water for drinking – which is the most important use in terms of human health and survival, as discussed above – would conflict with any other category of use that made the water unfit for drinking. Industrial, agricultural and waste disposal uses could potentially have this effect, especially in view of the relationship between surface water and groundwater discussed above. Some industrial uses themselves require water of a high level of purity and could also come into conflict with polluting uses. Depending on factors such as the pollutant involved and the distance from discharge to withdrawal, effluent from industry or untreated sewage could adversely affect water used for irrigation and would probably make water unfit for drinking and most other domestic uses. Instream uses will often be adversely affected by such activities as significant water withdrawals or pollution of water resources (e.g., by agricultural runoff or untreated industrial discharges or sewage). Viewed from a different perspective, legally protected instream uses can preclude new uses that would adversely affect them. Many more examples could be given of potential conflicts between and among different uses. (They are only "potential" because the uses that would otherwise conflict may not draw from, or affect, the same water resources.)

However, conflicts between different uses of water are not the only kinds of conflicting uses that must be addressed in water legislation. As is no doubt evident even from the few examples offered above, conflicts between uses of land and water must also be

confronted. As noted earlier, deforestation or other removals of vegetative cover can increase runoff, causing erosion of soil which can lead to increased turbidity of streams and sedimentation of their beds; sedimentation can, in turn, cause flooding and decrease infiltration of water from streams into aquifers. Uses of land that result in the direct or indirect discharge of sewage or other pollutants into water sources obviously affect the extent to which those sources are available for other uses. Agriculture is an example of such a land use, since agricultural run-off or return flows – that is, flows of water from fields into a stream or aquifer – may carry fertilizer and pesticide residues into water sources that are , or would otherwise be, used for other purposes. Uses of land that result in the direct or indirect discharge of untreated sewage or industrial effluent into water sources give rise to similar conflicts. Thus even land uses must be regulated in order to protect water quality.

The relationship between fresh, coastal and marine water resources must also be borne in mind. Nearly one-third of the world's population lives in coastal zones. Since most watercourse systems eventually drain into the sea, coastal residents bear the effects of freshwater management practices in the basins emptying into the areas in which they live. Thus freshwater systems, wetlands, and coastal and marine waters should be managed holistically. States in fact have an obligation not to cause pollution damage to the marine environment from land-based sources under both in the 1982 United Nations Convention on the Law of the Sea (articles 194 , 207 and 213) and various regional seas agreements. Estuaries, partly enclosed aquatic zones where seawater mixes with freshwater from rivers, deserve special attention by States in which they are located. These coastal areas provide sanctuaries, and breeding and feeding grounds for many important species and serve as nurseries for half of the living organisms in the world's oceans. However, their very location at the freshwater-salt water interface means that these highly productive ecosystems also make excellent harbors and are attractive sites for human settlements. Care must therefore be taken that the very characteristics of estuaries that support development of their surrounding areas do not result in their destruction by that same development. Also frequently neglected in planning and management processes, marshes and wetlands serve critical ecological functions, regulating water regimes, and providing habitats for flora and fauna, especially waterfowl, as well as important water purification services. They are often relied upon by local populations for food and even shelter, as well. In sum, holistic management of fresh, coastal and marine waters is necessary because their degradation threatens not only the health of important ecosystems but, at the same time, the livelihood of many people, especially the poor.

Governments have taken several different kinds of approaches to the protection and conservation of freshwater resources. The two most prominent are water quality standards and effluent limitations. The first approach prescribes a specific quality standard for a particular watercourse, effectively proscribing pollution that would cause water quality to fall below that standard. The second approach sets the quantity of pollutants that may be legally discharged from a specific source. While the two approaches are fundamentally different, they may be combined, as some states have done. Thus it is possible, for example, to rely principally upon effluent limitations but to calibrate them according to what is needed to meet overall water quality standards.

While law, policy and the literature concerning the protection of freshwater have traditionally focused on the control of pollution of water in rivers, lakes or aquifers, many experts have become convinced that it is essential to include the entire freshwater ecosystem in protection and preservation programs. We have already seen that various uses of land may affect water quality. The United Nations General Assembly has recognized what it called the urgency of developing and implementing water resource protection approaches based on the principle of integrated watershed management. The General Assembly underlined that these programs should recognize the interrelationship between water and land and provide for the preservation of aquatic ecosystems. Similarly, Agenda 21, the action plan for the implementation of sustainable development adopted at the United Nations Conference on Environment and Development, Rio de Janeiro, 1992, identifies the maintenance of the integrity of aquatic ecosystems, and their protection from degradation on a drainage basin basis, as the primary objective of freshwater management.

In summary, the protection of freshwater from pollution and the preservation of aquatic ecosystems are not ends in themselves, objectives that are appropriate only for rich countries. They can actually sustain and increase the quantity of water available for a variety of uses, from domestic to agricultural and industrial. As we have seen, safeguarding water supplies is a key objective of water resources management in today's increasingly water-stressed world.

5. Positive policy and legal actions undertaken at the international level bearing on sustainable management and protection of water resources

Increasing attention has been given to freshwater at the international level as nations and international organizations have become more conscious of the growing number of people who lack access to this vital resource. For example, at the Millennium Summit in the year 2000, world leaders included within their statement of Millennium Development Goals a commitment to reduce by half the proportion of people without sustainable access to safe drinking water. The World Summit on Sustainable Development, held in Johannesburg in 2002, adopted the same target, adding that the proportion of people without access to basic sanitation services should also be halved within the same period. The United Nations Secretary General, Kofi Annan, warned that: "Grave consequences lie ahead if we fail to meet these goals: the persistence and spread of deadly diseases, further damage to the global environment, threats to food security and stability itself." In what could be taken as a summary of his overall message he declared: "The world needs to improve its stewardship of water resources." [1]

In recognition of this need, the United Nations General Assembly adopted a resolution proclaiming 2003 the International Year of Freshwater. In the resolution, the General Assembly encouraged "all Member States, the United Nations system and all other actors to take advantage of the Year to increase awareness of the importance of freshwater and to promote action at the local, national, regional and international levels".

Increasing international concern over freshwater has been reflected in the convening of major conferences dealing with the subject during the first years of the new century and millennium. These include the Bonn International Conference on Freshwater (December 2001), the Second (March 2000) and Third (March 2003) World Water Forums, and the World Summit on Sustainable Development (WSSD) (Johannesburg, August 2002), which underlined the central role of water in sustainable development. The Johannesburg Plan of Implementation adopted at the WSSD called, among other things, for the development of integrated water resources management and water efficiency plans by 2005. The United Nations Commission on Sustainable Development decided at its 11th session (April 2003) to monitor progress and promote the further implementation of the water agenda in the first cycle of its new multi-year program of work.

The International Conference on Water and the Environment, a meeting of water specialists held in

Dublin, 26-31 January 1992, adopted The Dublin Statement on Water and Sustainable Development and a set of four Guiding Principles. The first of these principles reads as follows: "Fresh water is a finite and vulnerable resource, essential to sustain life, development and the environment." The other principles concern the need for a participatory approach to water development and management, the central role of women in the provision, management and safeguarding of water, and the need to recognize water as an economic good.

Perhaps the most comprehensive description of the action needed on the national level to safeguard freshwater resources is found in Chapter 18 of Agenda 21, the plan of action adopted at the United Nations Conference on Environment and Development, Rio de Janeiro, 3-14 June 1992. Entitled "Protection of the Quality and Supply of Freshwater Resources: Application of Integrated Approaches to the Development, Management and Use of Water Resources", Chapter 18 sets out the following program areas for the freshwater sector:

(a) Integrated water resources development and management;
(b) Water resources assessment;
(c) Protection of water resources, water quality and aquatic ecosystems;
(d) Drinking-water supply and sanitation;
(e) Water and sustainable urban development;
(f) Water for sustainable food production and rural development;
(g) Impacts of climate change on water resources.

The attention of users of this Guidebook is commended to Chapter 18, which cannot be discussed in detail here. Even the above list of program areas conveys a rather clear impression of the thrust of the approach taken, however. That approach will be briefly illustrated through the examples in the following paragraphs.

With regard to the first program area, the following elaboration is provided:

> "Integrated water resources management is basedon the perception of water as an integral part of the ecosystem, a natural resource and a social and economic good, whose quantity and quality determine the nature of its utilization. . . .In developing and using water resources, priority has to be given to the satisfaction of basic heeds and the safeguarding of ecosystems. Beyond these requirements, however, water users should be charged appropriately." [2]

1 Press Release, U.N. Doc. SG/SM/8554, 11 Dec. 2002.

2 Agenda 21, para. 18.8, p. 276.

With regard to Protection of water resources, water quality and aquatic ecosystems, Agenda 21 contains the following useful explanations and recommendations:

> "Freshwater is a unitary resource. Long-term development of global freshwater requires holistic management of resources and a recognition of the interconnectedness of the elements related to freshwater and freshwater quality. There are few regions of the world that are still exempt from problems of loss of potential sources of freshwater supply, degraded water quality and pollution of surface and groundwater sources. Major problems affecting the water quality of rivers and lakes arise, in variable order of importance according to different situations, from inadequately treated domestic sewage, inadequate controls on the discharges of industrial waste waters, loss and destruction of catchment areas, ill-considered siting of industrial plants, deforestation, uncontrolled shifting cultivation and poor agricultural practices. . . .

"The complex interconnectedness of freshwater systems demands that freshwater management be holistic (taking a catchment management approach) and based on a balanced consideration of the needs of people and the environment." [3]

The following categories of activities are recommended for implementation by all States in respect of this program area:

(a) Water resources protection and conservation;
(b) Water pollution prevention and control;
(c) Development and application of clean technology;
(d) Groundwater protection;
(e) Protection of aquatic ecosystems;
(f) Protection of freshwater living resources;
(g) Monitoring and surveillance of water resources and waters receiving wastes; and
(h) Development of national and international legal instruments that may be required to protect the quality of water resources, as appropriate. [4]

For each of these categories, a number of specific activities are recommended.

As a final illustration, Agenda 21 contains useful recommendations on activities and means of implementation with regard to the impacts of climate change on water resources. It observes that the Ministerial Declaration of the Second World Climate Conference, held in Geneva from 29 October to 7 November 1990, recognized that some of the most significant impacts of climate change were "its effects on the hydrologic cycle and on water management systems and, through these, on socio-economic systems."[5] The following three objectives are listed:

(a) To understand and quantify the threat of the impact of climate change on freshwater resources;
(b) To facilitate the implementation of effectivenational countermeasures, as and when threatening impact is seen as sufficiently confirmed to justify such action; and
(c) To study the potential impacts of climate change on areas prone to droughts and floods.[6]

Appropriate activities for implementing these objectives are recommended, including monitoring of the hydrologic regime, assessing the potential adverse effects of climate change on freshwater resources, assessing resulting social, economic and environmental impacts, developing and initiating response strategies, and developing agricultural activities based on brackish-water use, among other activities. It must be said that the degree of uncertainty regarding climate change that existed when Agenda 21 was adopted in 1992 has been reduced since that time through further work of the Intergovernmental Panel on Climate Change (IPCC). [7]

In recent years a number of treaties dealing with shared freshwater resources have been adopted on the global and regional levels. In 1997 the United Nations General Assembly adopted the United Nations Convention on the Law of the Non-Navigational Uses of International Watercourses. The UN Convention, which was negotiated on the basis of a draft prepared over many years by the UN International Law Commission, embodies substantive rules on the use and protection of international watercourses and procedural rules on such matters as prior notification and consultation regarding new projects and the sharing of data and information. Part II of the Convention includes provisions on equitable and reasonable utilization and on prevention of significant harm.

[3] Ibid., paras. 18.35, 18.36, p. 287.

[4] Ibid., para. 18.40, pp. 289-292.

[5] Ibid., para. 18.83, p. 311.

[6] Ibid., para. 18.84, p. 312.

[7] *See, in particular, the IPCC Third Assessment Report: Climate Change 2001, synthesis available at http://www.ipcc.ch/.*

Part IV of the Convention is devoted to Protection, Preservation and Management of international watercourses, and obligates parties to protect and preserve the ecosystems of international watercourses.

On the regional level, the UN Economic Commission for Europe (UNECE) has adopted two agreements of particular note concerning shared water resources. They are the 1992 Helsinki Convention on the Protection and Use of Transboundary Watercourses and International Lakes and its 1999 Protocol on Water and Health. Both agreements embody strong obligations to protect and preserve shared water resources in a way that does not endanger the health of the populations that rely upon them. The Revised Protocol on Shared Watercourses in the Southern African Development Community (SADC) of 2000 follows closely the 1997 UN Convention, adapting it as appropriate to the Southern African region, emphasizing in particular the need to maintain a proper balance between resource development and environmental protection. And the 1995 Agreement on the Cooperation for the Sustainable Development of the Mekong River Basin, as its title implies, deals with the use of the Mekong River by the parties in such a way as to promote sustainable development, among other matters.

The foregoing examples of agreements on shared freshwater resources are evidence of a realization on the part of governments that it is in their mutual interest to use, protect and develop international watercourses in a way that is both environmentally sustainable and fair vis-à-vis their co-riparians. These principles should be borne in mind by those tasked with drafting national water legislation, especially where the country concerned shares freshwater resources with other states.

6. Major trends and issues in national policies and legislation

As the foregoing paragraphs suggest, there are several trends and issues of note in national water policies and legislation. Turning first to trends, the most obvious and significant one is the incorporation of sustainable development into legislation concerning freshwater resources. Sustainable development may appear explicitly in relevant statutes or may be incorporated implicitly through an emphasis on the need to strike a proper balance between economic development and environmental protection. Other aspects of sustainable development, including a participatory approach to water management, transparency in public decision-making, and the need to ensure that minorities, women and children are not subject to discrimination, also figure in this trend.

An increasingly important aspect of the trend toward incorporation of sustainable development into national water legislation is that of conservation of freshwater resources. The rapidly declining supply of freshwater, on a per capita basis, coupled with increasing pollution and other forms of degradation, as well as the impact of global climate change, are leading governments to emphasize the need to conserve precious water resources and protect them against contamination. Conservation of these resources is all the more important in light of the recognition of and increasing attention being given to the human right to water, discussed in Subsection 3, above.

Another important trend is that of integrated water resources management. Countries are increasingly deciding to manage catchments holistically rather than on a piecemeal basis. This entails conducting an inventory of available water resources as well as such matters as the ecosystems within which they are situated and the uses that are made of the watercourses and the surrounding land. Surface and groundwater are then used and managed conjunctively, since they are usually interrelated, and water systems themselves are managed as an integral part of their drainage basins rather than as a separate resource. This avoids problems and inefficiencies created by separate and often conflicting regulatory regimes for different uses of water, and for uses of land and water.

A crucial aspect of environmental protection and natural resource management is impact assessment. The notion of environmental impact assessment (EIA), first introduced in the United States National Environmental Policy Act of 1969 (NEPA), is widely recognized as an indispensable element of legislation in these fields. In the simplest terms, the idea is to "look before you leap" in order to avoid unforeseen consequences of projects and activities that may appear harmless at first blush. This is an important part of the preventive approach to environmental protection. Impact assessments are often broadened to consider effects other than those on the environment, per se, such as those on groups that may be affected by the planned project or activity. Greater transparency and lessons learned from past projects have led the World Bank, for example, to develop and implement "Safeguard Policies" on the following topics: environmental assessment; natural habitats; forests; pest management; cultural property; involuntary resettlement; indigenous peoples; safety of dams; disputed areas; and international waterways. These policies provide a useful checklist of issues to include in impact assessments concerning proposed water projects or activities.

Finally, the need to achieve greater efficiency in light of growing water shortages is leading many governments to adopt various forms of water pricing and privatization of water services. Caution is clearly necessary to avoid pricing the poor out of water required to satisfy basic needs and to ensure that any rate increases resulting from service privatization are both affordable and linked to improvements in infrastructure and water services . But a number of countries, or local governments, have found that privatization, water pricing, or some combination of the two are required to provide the financing needed to solve public health problems caused by inadequate water supply and sanitation systems. They also realize, however, that it is essential to provide for the protection of the public interest in any contracts with private water companies.

II. Issues and subissues that should be addressed in a national legislative scheme for conservation & sustainable use of freshwater resources

There are nearly as many different approaches to codifying national water legislation as there are nations with water codes. There is no single, correct approach, no "one-size-fits-all" solution. Each country, of course, must address the issues that are most pressing for itself, in light of the unique circumstances facing it, and using the resources at its disposal.

Nevertheless, there are broad patterns that can be found by reviewing existing national codes. While these patterns can be parsed out into many degrees of refinement, for simplicity's sake, the following discussion divides the potential topics into five broad groups:

1. General Principles of Interpretation;
2. Planning for the Sustainable Development of Water Resources;
3. Implementing the Plan: Rights and Responsibilities of Water Users;
4. Implementing the Plan: Planning Construction, Financing, and Operation of Waterworks ; and
5. Transitional Provisions.

Collectively, within these five broad categories, nearly fifty specific issues frame the examples drawn from existing national legislation.

A. What general principles should govern the interpretation of the water code?

1. How might the code identify the legislators' aspirations?

a) Analytical description

Many, but by no means all, national water codes begin with general statements of the legislators' hopes, purposes or intents in enacting the accompanying legislation. These prefatory aspirational statements can run the gamut from a sentence or two to a page or more of text. While not essential legislative components, these statements can serve several purposes. Most importantly, they can memorialize the legislative body's general intent in enacting the legislation and communicate to present and future officials and citizens the fundamental concerns that led to the code's enactment. Such statements of intent are particularly useful when a code is first enacted or substantially amended. In addition, they can suggest to future interpreters of the code, whether from the public or the private sector, the spirit in which the code is meant to be interpreted.

Care should be given to ensuring that the legislative body recognizes the legal effect, if any, of these prefatory statements. In some legal systems, such aspirational statements have no binding legal effect upon courts or officials charged with the code's interpretation or implementation. In such cases, if the legislative body wishes that its intent and aspirations bind those who will interpret or implement the code, it should consider more formal enactment of these matters as "Important Principles." (See Section II. A. 3, below.)

b) Examples from National Legislation

Australia (New South Wales): *The objects of this Act are to provide for the sustainable and integrated management of the water sources of the State for the benefit of both present and future generations and, in particular:*

1. *to apply the principles of ecologically sustainable development, and*
2. *to protect, enhance and restore water sources, their associated ecosystems, ecological processes and biological diversity and their water quality, and*
3. *to recognize and foster the significant social and economic benefits to the State that result from the sustainable and efficient use of water, including:*

a. *benefits to the environment, and*
b. *benefits to urban communities, agriculture, fisheries, industry and recreation, and*
c. *benefits to culture and heritage, and*
d. *benefits to the Aboriginal people in relation to their spiritual, social, customary and economic use of land and water,*

4. *to recognize the role of the community, as a partner with government, in resolving issues relating to the management of water sources,*
5. *to provide for the orderly, efficient and equitable sharing of water from water sources,*
6. *to integrate the management of water sources with the management of other aspects of the environment, including the land, its soil, its native vegetation and its native fauna,*
7. *to encourage the sharing of responsibility for the sustainable and efficient use of water between the Government and water users,*
8. *to encourage best practice in the management and use of water.*

Mexico: …Exploit in a sustainable manner, preserve and, when applicable, restore soil, water and other natural resources in order to make that economic profit and the activities of society are consistent with the preservation of ecosystems…

South Africa: Recognizing that water is a scarce and unevenly distributed national resource which occurs in many different forms which are all part of a unitary, interdependent cycle;

Recognizing that while water is a natural resource that belongs to all people, the discriminatory laws and practices of the past have prevented equal access to water, and use of water resources; Acknowledging the National Government's overall responsibility for and authority over the nation's water resources and their use,including the equitable allocation of water for beneficial use,the redistribution of water, and international water matters;

Recognizing that the ultimate aim of water resource management is to achieve the sustainable use of water for the benefit of all users; Recognizing that the protection of the quality of water resources is necessary to ensure sustainability of the nation's water resources in the interests of all water users; and

Recognizing the need for the integrated management of all aspects of water resources and, where appropriate, the delegation of management functions to a regional or catchment level so as to enable everyone to participate [the following Code is enacted.]

2) How might critical terms be defined?

a) Analytical description

Nearly every national water code includes at least some definitions of critical terms. Some codes define only a handful of the most critical terms. Other codes, however, define fifty or more terms. The number of definitions correlates both with the overall complexity and comprehensiveness of the legislation, as well as the legislative body's need to integrate coherently different legislative enactments on related subjects. In addition, differences in the number of definitions among the different national codes may reflect national attitudes towards the role of the judiciary in interpreting legislation and the likelihood of litigation over particular provisions.

Where concepts of sustainable development are being formally introduced into national legislation for the first time, it is especially important to include some basic definitions. Absent such provisions, the chances of

favorable implementation and interpretation diminish markedly.

As anyone who has ever attempted to draft legislation will likely attest, perfect definitional precision is an elusive if not illusive goal. Indeed, in a few circumstances, precision is undesirable. In such occasions, drafters may need to leave terms somewhat vague in order either to obtain sufficient support for the legislation's passage or to give subsequent judicial or administrative interpreters sufficient flexibility to address unforeseen applications. Yet the effort to bring some coherence and consistency through definitional precision usually rewards the drafters with a deeper understanding of the legislative subject and leaves an important legacy for the legislation's future interpretation and implementation.

Definitional precision is especially important in two situations: when technical terms are used and when there is broad stakeholder participation in the development of legislation. Water legislation can easily encompass such widely differing technical areas as hydrology, ecology, engineering and economics. Accordingly, care should be taken to ensure that legal terms are either used consistently with their technical meanings from other disciplines or, if such is not the intention, that any departures from technical meanings are clearly indicated within the legislation itself. Review by technical experts is particularly appropriate for such terms.

In some ways, definitional precision is even more important when there is substantial non-expert, private sector stakeholder involvement in the development of water legislation. To the extent that such stakeholder involvement is part of a consensus-seeking collaboration between the public and private sectors, definitional precision can help ensure that apparent consensus is not illusory. Frequently, parties can agree to a solution to a water management problem only to find later on that their understanding of what was agreed differs markedly from other collaborators' understanding. Negotiation of relevant definitions can be an important and overlooked aspect to help ensure robust results from consensus-based agreements.

b) Examples from National Legislation

Aquifer: *(European Union): means a subsurface layer or layers of rock or other geological strata of sufficient porosity and permeability to allow either a significant flow of groundwater or the abstraction of significant quantities of groundwater.*

Best available techniques: (European Union): shall mean the most effective and advanced stage in the development of activities and their methods of operation which indicate the practical suitability of particular techniques for providing in principle the basis for emission limit values designed to prevent and, where that is not practicable, generally to reduce emissions and the impact on the environment as a whole:
- 'techniques` shall include both the technology used and the way in which the installation is designed, built, maintained, operated and decommissioned,
- 'available` techniques shall mean those developed on a scale which allows implementation in the relevant industrial sector, under economically and technically viable conditions, taking into consideration the costs and advantages, whether or not the techniques are used or produced inside the Member State in question, as long as they are reasonably accessible to the operator,
- 'best` shall mean most effective in achieving a high general level of protection of the environment as a whole.
In determining the best available techniques, special consideration should be given to the items listed in Annex IV.

Best practicable option: *(New Zealand): in relation to a discharge of a contaminant or an emission of noise, means the best method for preventing or minimizing the adverse effects on the environment having regard, among other things, to –*

1. *The nature of the discharge or emission and the sensitivity of the receiving environment to adverse effects and*
2. *The financial implications,and the effects on the environment,of that option when compared with other options; and*
3. *The current state of technical knowledge and the likelihood that the option can be successfully applied.*

Catchment area: *(Zimbabwe): the area which naturally drains into a dam, lake, reservoir, river or*

watercourse and from which the dam, lake, reservoir, river or watercourse receives surface or ground flow, which originates from rainfall.

Conservation: *(South Africa): in relation to a water resource means the efficient use and saving of water, achieved through measures such as water saving devices, water-efficient processes, water demand management and water rationing.*

Contaminant: *(New Zealand): includes any substance (including gases, [odorous compounds,] liquids, solids, and micro-organisms) or energy (excluding noise) or heat, that either by itself or in combination with the same, similar, or other substances, energy, or heat when discharged into water, changes or is likely to change the physical, chemical, or biological condition of water.*

Drainage work: *(Australia, New South Wales): means a work (such as a pump, pipe or channel) that is constructed or used for the purpose of draining water from land, including a reticulated system of such works, and includes all associated pipes, sluices, valves and equipment, but does not include: any sewage work, or any work declared by the regulations not to be a drainage work.*

Ecologically sustainable use: *(Australia, federal): of natural resources means use of the natural resources within their capacity to sustain natural processes while maintaining the life support systems of nature and ensuring that the benefit of the use to the present generation does not diminish the potential to meet the needs and aspirations of future generations.*

Environment: (New Zealand): includes –

1. *Ecosystems and their constituent parts, including people and communities; and*
2. *All natural and physical resources; and*
3. *Amenity values; and*
4. *The social, economic, aesthetic , and cultural conditions which affect the matters stated in paragraphs (1) to (3) of this definition or which are affected by those matters.*

*G**roundwater: (European Union):** means all water which is below the surface of the ground in the saturation zone and in direct contact with the ground or subsoil.*

Native title rights: (Australia, New South Wales): *means non exclusive rights to take and use water for personal, domestic and non commercial communal purposes (including the purposes of drinking, food preparation, washing, manufacturing traditional artifacts, watering domestic gardens, hunting, fishing and gathering and recreation, cultural and ceremonial purposes).*

Pollution: (Zimbabwe): *in relation to water, means such contamination or other alteration of the biological chemical or physical properties of the water, including changes in color, odor, taste, temperature or turbidity; or such discharge of any gaseous, liquid, solid or other substances into any water or public stream as will or is likely to create a nuisance or render the water, as the case may be, detrimental, harmful or injurious to the health, safety or welfare of the public or any section thereof or any consumer or user of the water or any birds, fish or other aquatic ecosystems, livestock or wild life.*

Reserve: (South Africa): *"Reserve'' means the quantity and quality of water required:*

1. *to satisfy basic human needs by securing a basic water supply, for people who are now or who will, in the reasonably near future, be:*

a. *relying upon;*
b. *taking water from; or*
c. *being supplied from, the relevant water resource; and*

2. *to protect aquatic ecosystems in order to secure ecologically sustainable development and use of the relevant water resource.*

Sewage work: (Australia, New South Wales): means a work (such as a pump, pipe or channel) that is constructed or used for the purpose of removing sewage or other waste matter from land, including a reticulated system of such works, and includes all associated pipes, sluices, valves and equipment, but does not include any work declared by the regulations not to be a sewage work.

Sustainable development: (Mexico): *The process assessable through environmental, economic and social criteria and indicators, which tends to improve life quality and productivity of people based upon appropriate measures for ecological balance preservation, environmental protection and exploitation of natural resources not endangering the satisfaction of the needs of future generations.*

Sustainable exploitation: (Mexico): *Use of natural resources respecting the functional integrity and load capabilities of the ecosystems to which such resources belong, for unlimited time periods.*

Waste: (South Africa): *includes any solid material or material that is suspended, dissolved or transported in water (including sediment) and which is spilled or deposited on land or into a water resource in such volume, composition or manner as to cause, or to be reasonably likely to cause, the water resource to be polluted.*

Water resource management: (Canada, federal): *the conservation, development and utilization of water resources and includes, with respect thereto, research, data collection and the maintaining of inventories, planning and the implementation of plans, and the control and regulation of water quantity and quality.*

Water works: (Zimbabwe): means-

1. *a borehole, canal, channel, embankment, filter, filterbed, pipeline, pumping plant, purification plant, plant for the generation of hydro-electric power, water storage works or well; or*
2. *any accessory, apparatus, appliance, fitting, machinery or other thing constructed, erected or used for or in connection with the abstraction, control, diversion, drainage, filtration, passage, purification, storage, supply or use of water, including effluent or waste water or the conservation of rainfall or the development of water power; or*
3. *any land occupied for or in connection with the abstraction, control, diversion, drainage, filtration, passage, purification, storage, supply or use of water, including effluent or waste water; or*
4. *any gauge post, measuring weir or other appliance erected or used for undertakings authorized by or in terms of this Act; and includes any area held, occupied or required for the purpose of irrigation.*

Wetland: (South Africa): *means land which is transitional between terrestrial and aquatic systems where the water table is usually at or near the surface,or the land is periodically covered with shallow water, and which land in normal circumstances supports or would support vegetation typically adapted to life in saturated soil.*

3. Which important principles should be set out initially?

a) Analytical description

The initial portion of this discussion (Section II. A. 1 [Aspirations], above) identified general legislative intents and aspirations. As noted above, such hortatory introductions can provide context and inspiration. They often, however, lack any binding legal significance.

Where a legislative body wishes to elevate aspiration to principle, it often does so by specifically codifying fundamental values to guide, indeed to control, the interpretation and implementation of its statutes. Sometimes these are set out in the initial sections or articles of the relevant enactment. Other times, they are embedded within the treatment of more specific topics. However set out, they can help avoid or resolve future conflicts by indicating relative priorities or preferences or setting out general requirements that supercede possibly conflicting specific provisions.

Three well-known examples of such general principles are the precautionary approach, the principle of avoided harm, and the polluter pays principle. The precautionary approach states that where the risk of potential harm from an action or course of conduct is great, decision makers should not wait to regulate that action until they have definitively established the magnitude and scope of that risk. The principle of avoided harm, found in most legal systems around the world, states that each person should use their property in a way that avoids foreseeable harm to others. And finally, the polluter pays principle states that those who cause pollution are responsible for its clean up or for indemnifying those who do the clean up.

As exemplified by the following examples, the range of these interpretive principles is great. In addition to the more general principles set out immediately below, more specific examples governing selection of allocation priorities and water management strategies are set out below. (See Sections II. B. 6 [Allocation Principles], II. B. 8 [Management Strategies], and II. C. 4 [Use Priorities], below.

b) Examples from National Legislation

Armenia: *The basic principles of management, use and protection of water resources and water systems in the Republic of Armenia are:*

1. *satisfaction of the basic vital needs of the present and future generations;*
2. *maintenance and increase of volumes of the national water reserve;*
3. *protection of aquatic and related ecosystems and their biological diversity as well as recognition of integrated and interconnected relations of land, air, water and biological diversity;*
4. *encouragement of efficient use of water resources for public interest;*
5. *acceptance of conjunctive and integrated management of ground and surface water resources;*
6. *taking into consideration the economic value of water in the procedures of use, allocation and protection of water resources. At the same time water is a heritage that shall be protected, conserved and used as such regarding the future generations' interest;*
7. *there is no alternative to water; it has environmental and economic value not only in case when it is used but also when it is not used. The economic value of water is mainly composed of the sum of drinking, environmental, energetic potential and agricultural values of water;*
8. *in order to make available the use of the minimum sufficient quantity and necessary quality of water for a consumer the regulated tariff is established based on the abated price of water scarcity;*
9. *in case if the determined size of regulated tariff is less than the value of calculated tariff, deficit of money entrance to the state budget from water use is envisaged in forms of subsidies or as tax privileges defined by the legislation of the Republic of Armenia. Alongside with increasing ability of water users to pay, the additional payments shall decrease and the size of regulated tariff shall be drawn to the value of calculated tariff;*
10. *recognition of importance of public participation and awareness in the processes of management and protection of water resources;*
11. *increasing the efficiency of water supply and wastewater systems;*
12. *water resources, water supply and wastewater systems are considered as objects of vital security and shall be protected in the order established by law and other legal acts;*
13. *prohibition of satisfaction of water users' needs at the expense of the ecological water releases.*

The primary requirements towards the protection of water resources are as follows:

1. *The use of water resources is permitted only in conditions of their protection and restoration;*
2. *The water resources are a constituent part of the ecosystem and the natural landscape, and their protection shall be stipulated by the maintenance of balance within the given ecosystem;*
3. *The water resources shall be subject to protection when used, as well as when not used;*
4. *If not used, the protection of water resources must maintain the balance and welfare in the given ecosystem completely when it comes to the water issue;*
5. *If used, the protection of water resources must maintain the balance in the given ecosystem;*
6. *Water resources shall be subject to protection from pollution, littering, infection and depletion;*
7. *Wastewater discharge shall be permitted only in conformance with the requirements of this Code, if a corresponding water use permit for such discharge is available;*
8. *No disturbance to water protection zones shall be allowed, unless otherwise provided by this Code;*
9. *Specific types of activities (including irrigation of land with wastewater, operation of industrial or commercial enterprises producing, using or storing solvents or chemicals, installation of refuse heaps for raw materials, substances, waste and other products and stuff accumulated during the economic operation process) may be restricted or prohibited in ground water protection zones;*
10. *Exploration wells, pressure wells suspended but still fit for use shall be subject to conservation or destruction;*
11. *Emission, outflow or burial of radioactive and toxic waste in water resources is prohibited. Explosion operations in water objects by using nuclear or other 48 technologies associated with the discharge of radioactive and toxic substances, is prohibited.*

In instances of violation of the requirements of this Article, the operation of the water object shall be restricted, suspended or prohibited in procedures set forth in the legislation.

Australia (federal): *The following principles are principles of ecologically sustainable development:*

1. *decision making processes should effectively integrate both long term and short term economic, environmental, social and equitable considerations;*
2. *if there are threats of serious or irreversible environmental damage, lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation;*
3. *the principle of inter generational equity—that the present generation should ensure that the health, diversity and productivity of the environment is maintained or enhanced for the benefit of future generations;*
4. *the conservation of biological diversity and ecological integrity should be a fundamental consideration in decision making;*
5. *improved valuation, pricing and incentive mechanisms should be promoted.*

The Minister must take account of the precautionary principle in making a decision listed in the table in subsection (3), to the extent he or she can do so consistently with the other provisions of this Act.
The precautionary principle is that lack of full scientific certainty should not be used as a reason for postponing a measure to prevent degradation of the environment where there are threats of serious or irreversible environmental damage.

Germany: *Everyone is required, when taking measures which could lead to an effect on a body of water, to use the care appropriate to the circumstances to avoid polluting the water or any other negative change in its properties to bring about economical use of the water in the interests of the water resources in order to maintain the efficiency of the water reserves and to avoid an increase and acceleration of water run-off.*

South Africa: This Chapter sets out the fundamental principles of the Act. Sustainability and equity are identified as central guiding principles in the protection, use, development, conservation, management and control of water resources. These guiding principles recognize the basic human needs of present and future generations, the need to protect water resources, the need to share some water resources with other countries, the need to promote social and economic development through the use of water and the need to establish suitable institutions in order to achieve the purpose of the Act.National Government,acting through the Minister, is responsible for the achievement of these fundamental principles in accordance with the Constitutional mandate for water reform. Being empowered to act on behalf of the nation, the Minister has the ultimate responsibility to fulfill certain obligations relating to the use, allocation and protection of and access to water resources. ….

4. Which waters should be included in the code?

a) Analytical description

A final introductory matter addressed by many codes involves the legislation's most fundamental scope: which waters are included? For example, does the code address all surface waters, including those found exclusively on privately owned land? Does it encompass wetlands? What about ephemeral, mineral or thermal springs? Watercourses shared with other nations? Water brought into the nation in containers? Recycled water? Enhanced precipitation resulting from cloud seeding? Water produced as a result of the extraction of petroleum? These are only some of the "waters" addressed by different codes.

Among those codes that address this issue, two different approaches exist. Some simply address these issues within their basic definitions. (See Section II. A. 2 [Definitions], above.) Others contain express provisions just on this issue.

However addressed, from a sustainable development perspective, the more comprehensive the waters addressed by the code, the better. The more comprehensive the code, the greater the options for integrated water resources managers to meet fundamental environmental and social values. At a minimum, it is vital that code drafters include surface and subsurface waters within the scope of their codes. Several places in the world, perhaps most notably the State of California, in the United States, still treat groundwater as if it were an entirely separate species of water beyond the scope of water regulators' authority. There certainly are some differences that justify groundwater specific legislation. For example, many codes have special provisions addressing well drilling that simply have no application to surface waterworks. (See Section II. C. 21 [Groundwater], below.) Modern hydrology, however, teaches that, with a very few exceptions, groundwater and surface water are each part of a single water system. Development of surface water inevitably impacts groundwater, and vice versa. Arbitrary separation of surface and groundwaters risks collapse of any integrated management program.

Where particular surface or subsurface waters have not previously been the subject of national water legislation, prior private rights to those waters may be impacted. A given legislature's authority to extend regulation to new subjects, and the public's obligation (if any) to compensate prior private rights holders, will turn on the particular constitution and statutes of that particular nation.

b) Examples from National Legislation

Albania: *"Water resources" comprise inland waters, maritime waters, surface and underground waters, hydrogeological formations and precipitation being under the jurisdiction and control of the Republic of Albania.*

Libya: *For purposes of the application of the provisions of the Act, water resources mean water which is, could be, or might be used for drinking, domestic, agricultural, industrial or recreational purposes, as a sources of chemical elements or substances, or for sanitary or other purposes, irrespective of whether such water is derived from a surface or subterranean source,from desalination,rain, flood or other similar sources.*

Mexico: *The provisions hereof are applicable to all national waters, whether surface or underground, as well as the national assets as indicated herein.*

B. How can water managers plan for sustainable water resources development?

Sustainable development involves the integration of economic, environmental, and social values, with consideration of the needs of both current and future generations. A tool to advance this multiple-value, multiple-generation integration is a national water plan or, as it is frequently called, "strategy." Such a plan, of course, is only a first step. The shelves of planning bodies around the world are littered with well-thought out but poorly supported, funded, or implemented plans. But it is an essential first step: without a well-thought out plan, any integration of water resources management strategies will be fortuitous and haphazard at best.

Well-thought out national water plans share elements of both strategic plans and master plans. Strategic planners generally ask some variant on a basic set of questions:

- Where are we now? (A description of current conditions.)
- Where are we going if no further action is taken? (One or more forecasts or scenarios of possible future circumstances.)
- Where do we want to be at the end of the planning horizon? (Goals.)
- How do we get there? (Management strategies and actions.)
- How do we measure our progress along the way? (Monitoring, adaptive management, periodic review.)

Master planners establish a framework to coordinate plans developed on more regional or local levels, or plans that address related resources. Indeed, one of the most important matters to be addressed in a national water strategy is the respective role for each of the different levels of government in that nation who share some responsibility for water resources management or development.

Legislation to promote integrated water resources planning runs the gamut from the simple to the complex. The simplest statutes create planning obligations on the part of one or more governmental authorities and describe generally the minimal contents of such plans. The more complex plans detail the obligations, the respective roles, the contents, the types of required public participation, and monitoring and revision processes. At a minimum, any national water planning legislation should address at least four critical questions: Who does the planning? How must the planning occur? What must the plans contain? And How will be plans be implemented?

1. Who Does the Planning? What are appropriate roles for national, regional, and local authorities in water resources planning?

a) Analytical description

Identification of "who does the planning" is a critical component of national water planning legislation. Ultimate national planning authority normally resides in either a designated national ministry, or in a specially created council of ministers. (These ministries, of course, are responsible to their country's supreme executive authority.) Depending upon the extent and types of water resources within a country, and upon a country's internal organization, planning responsibilities may also be assigned to one or more regional or local governmental bodies. In addition, legislation may identify the authorities and obligations of specific governmental officials.

Nations differ on the way they set out their provisions on the authority and obligations of the respective governmental entities and officials. Some nations set those out in a single set of provisions for each of the relevant entities. For example, these nations might group one or more statutes that specifically identify the powers of the responsible national ministry or minister. Other nations intersperse specific provisions identifying relevant authority throughout the code. These nations identify topic by topic within their codes the specific authorities and obligations of the respective entities and officials. Most combine the two approaches. These will have some general legislation on respective authorities and obligations, usually at the beginning of the statutes that address planning, followed by additional topic-specific legislation in subsequent portions of the code.

Assignment of authority and duties to specific governmental entities raises many issues of national governance that will differ markedly from country to country and are way beyond the scope of this Guidebook. However assigned, drafters need to address three key areas: a) coordination among authorities on different levels of government; b) coordination of water quantity and quality authority; and c) potential conflicts of interest between water planning authorities, public waterworks authorities, and water management authorities.

Where a code parses out water planning authority among different national ministries, or between national, regional, and local entities, it must delineate the process for coordination of the plans and resolution of differences. This is particularly important where different regions or localities are given substantial planning authority. In such cases, different regions or localities may be looking to the same limited water source to help achieve one or more of their plan's goals. They may be making fundamentally different and incompatible planning assumptions. They may be unable to adequately assess cumulative impacts on the national level. And some central authority needs to ensure that regions or localities are consistently applying national norms and criteria.

In some parts of the world, planning to meet water quality objectives and planning to meet water quantity objectives fall on different entities. Such a separation makes integrated resources planning much more difficult, and arbitrarily separates economic and social considerations from environmental considerations. Many countries avoid these problems with a unified planning and enforcement structure.

When considering the creation of public waterworks, however, the benefits of unification become less apparent. Where the same governmental authority is water planner, water regulator and a waterworks developer or operator, the balance among economic, environmental and social considerations may tilt toward the economic. The large capital investments and employment opportunities involved in many public waterworks projects raise the pressures on planners and regulators to minimize the social and environmental consequences of those projects. While the tension among economic, environmental and social values is inherent in all sustainable development planning, the balance is often skewed where the same agency both develops and regulates. At the very least, in such circumstances, the appearance of partiality is magnified and public confidence in governmental integrity may diminish. To minimize the appearance of partiality and reduce an inevitable tilt toward purely economic considerations, national water codes should separate the governmental bodies charged with planning and regulatory authority from those charged with developing and managing public waterworks.

b) Examples form National Legislation

Brazil: *In implementing the National Water Resources Policy, the Federal Executive Branch shall be responsible for the following:*

1. *Taking the measures necessary for implementing and operating the National Water Resources Management System;*
2. *Granting usage rights for water resources, and regulating and monitoring use,within its area of authority;*
3. *Implementing and managing the water resources information system on a national scale;*
4. *Promoting integration of water resources management and environmental management.*

The Federal Executive Branch shall establish by decree the authority responsible for awarding usage rights for water resources within the Federal jurisdiction.

In implementing National Water Resources Policy, the State and Federal District Executive Branches shall be responsible within their areas of jurisdiction:

1. *for granting usage rights for water resources and regulating and monitoring their uses;*
2. *for maintaining technical control over water supply works;*
3. *for implementing and managing the Water Resources Information System within the State and Federal District environment;*
4. *for promoting integrated management of water resources and environmental management.*

In implementing National Water Resources Policy, the Executive Branches of the Federal District and Municipalities shall promote the integration of local policies for basic health, use, occupation, and soil and environmental maintenance with Federal and State Water Resource Policies.

South Africa: *The national water resource strategy must:*

1. *set out the strategies, objectives, plans, guidelines and procedures of the Minister and institutional arrangements relating to the protection, use, development, conservation, management and control of water resources within the framework of existing relevant government policy in order to achieve:*

a. *the purpose of this Act; and*
b. *any compulsory national standards prescribed under section 9(1) of the Water Services Act, 1997 (Act No. 108 of 1997);*

2. *provide for at least:*

a. *the requirements of the Reserve and identify, where appropriate, water resources from which particular requirements must be met;*
b. *international rights and obligations;*
c. *actions to be taken to meet projected future water needs; and*
d. *water use of strategic importance;*

3. *establish water management areas and determine their boundaries;*
4. *contain estimates of present and future water requirements;*
5. *state the total quantity of water available within each water management area;*
6. *state water management area surpluses or deficits;*
7. *provide for inter-catchment water transfers between surplus water management areas and deficit water management areas;*
8. *set out principles relating to water conservation and water demand management;*
9. *state the objectives in respect of water quality to be achieved through the classification system for water resources provided for in this Act;*
10. *contain objectives for the establishment of institutions to undertake water resource management;*
11. *determine the inter-relationship between institutions involved in water resource management; and*
12. *promote the management of catchments within a water management area in a holistic and integrated manner.*

In determining a water management area in terms of subsection (1)(c), the Minister must take into account:

1. *watercourse catchment boundaries;*
2. *social and economic development patterns;*
3. *efficiency considerations; and*
4. *communal interests within the area in question*

Giving effect to national water resource strategy, the Minister, the Director-General, an organ of state and a water management institution must give effect to the national water resource strategy when exercising any

power or performing any duty in terms of this Act.

Spain: *The Basin Water Plans must including the following:*

1. *The inventory of water resources.*
2. *The existing and foreseeable uses and demands.*
3. *The priority and compatibility criteria and the order of preference of the various uses and utilizations.*
4. *The assignment and reservation of resources for current and future uses and demand and for environmental conservation or recovery.*
5. *Basic water quality characteristics and plans for waste water disposal.*
6. *The basic standards for improvements and transformations in irrigation to ensure the best overall use of the available water and land.*
7. *The protection perimeters and means of conserving and recovering the affected water and surroundings.*
8. *The forestry water and soil conservation programs to be carried out by the Administration.*
9. *Guidelines for replenishing and protecting aquifers.*
10. *The basic infrastructures required for the Plan.*
11. *The criteria for evaluating energy utilizations and the requirements for implementing them.*
12. *The requirements for studies, action, and structures in order to prevent and avoid damage due to floods, high waters, and other water phenomena.*

2. Who does the planning? What role should hydrological boundaries (e.g., catchment basins, drainage basins, and watersheds) play in delineating appropriate geographical units for plans?

a) Analytical description

In addition to identifying the appropriate governmental entity (or entities) that will shoulder planning authority and obligations, codes often determine the appropriate geographic scope of planning activities. Sometimes, plans are focused on a single body of water. Other times, the geographic boundaries may be based on nothing more than political boundaries. In such instances, the geographic boundary is usually coextensive with the political boundaries of one or more of the responsible planning authorities. Increasingly, however, countries are shifting from plans based on either individual watercourses or purely political boundaries to some version of watershed boundaries to demark a planning region's geographic boundaries.

Whether denominated watersheds, catchment basins, or drainage basins , the intent is the same. These devices allow planners to integrate multiple watercourses into a single hydrologically interrelated unit. The impacts of management activities in one part of a basin on resources or uses in another part of the same basin can be more easily identified and addressed when both are part of the same planning activity.

Some national codes simply direct the relevant planning authorities to base their actions on watershed boundaries. Others have created specific planning or management authorities with basin specific authority and obligations. In either case, where a particular basin involves a large number of interconnected watersheds, sub-basin planning is often appropriate. This is especially true if a particular subbasin has unique management challenges or opportunities that demand special attention.

b) Examples from National Legislation

Brazil: *The Watershed Committees shall have the following scope of activity:*

1. *An entire watershed;*
2. *A sub-watershed of the tributary of the basin's main water flow, or a tributary of that tributary; or*
3. *A group of contiguous watersheds.*

The Watershed Committee shall be responsible for the following within its scope of activity:

1. *Promoting debate on issues relating to water resources and defining the activities of the participating entities;*
2. *Arbitrating, in the first administrative instance, disputes relating to water resources;*
3. *Approving the Water Resources Plan for the watershed;*
4. *Monitoring execution of the Water Resources Plan for the watershed and suggesting the necessary measures to be taken for fulfillment of its goals;*

5. *Proposing to the National and the State Water Resources Councils accumulations, derivations, capture and emissions of low significance, for purposes of exemption from the mandatory award of usage rights for water resources, in accordance with the jurisdictions thereof;*
6. *Establishing the mechanisms for charging for the use of water resources and suggesting the amounts to be charged;*
7. *Establishing criteria to promote distribution of the costs of works involving multiple use, joint interest or collective interest.*
8. *The decisions of the Watershed Committees shall be subject to appeal to the National or State Water Resources Councils, in accordance with their areas of jurisdiction.*

Water Agencies shall perform the executive secretarial duties for the respective Watershed Committee or Committees.

The Water Agencies shall have the same activity area as one or more Watershed Committees.

The Water Agencies shall be responsible for the following within their activity areas:

1. *Maintaining an updated balance of water resources availability in their activity area;*
2. *Maintaining a record of water resource users;*
3. *By delegation of the awarding authorities, charging for the use of water resources;*
4. *Analyzing and issuing opinions on projects and works to be financed with funds generated from charging for the use of water resources and remitting them to the financial institution responsible for the management of such funds;*
5. *Monitoring the financial administration of the funds collected through charging for the use of water resources in their areas of activity;*
6. *Managing the water resources information system in their areas of activity;*
7. *Entering into agreements and engaging financing and services for carrying out their duties;*
8. *Preparing the budget proposal and submitting it for evaluation by the respective Watershed Committee or Committees;*
9. *Undertaking the studies necessary for water resources management in their areas of activity;*
10. *Preparing the Water Resources Plan for evaluation by the respective Watershed Committee;*
11. *Proposing to the respective Watershed Committee or Committees the following:*

a. *The organization of water bodies into usage types,to be sent to the respective National or State Water Resources Councils, pursuant to the jurisdiction thereof;*
b. *The sums to be charged for the use of water resources;*
c. *The plan for investing the funds collected by charging for the use of water resources;*
d. *Distributing the cost of the works for multiple use, joint interest or collective interest.*

Mexico: *Following a decision by its Technical Council, the Commission shall establish basin councils to coordinate and liaise with the Commission, federal, state and municipal departments and agencies, and representatives of users of the hydrological basin in question, with a view to formulating and implementing programs and actions to improve water administration, development of water infrastructure and the respective services, and the preservation of basin resources. Within the scope of the basin councils, the Commission shall agree with the users on any temporary limitations to existing rights in the event of emergencies, extreme scarcity, over-exploitation or declaration of protected areas. In such circumstances, residential use shall have priority.*

South Africa: *A catchment management strategy must:*

1. *take into account the class of water resources and resource quality objectives, the requirements of the Reserve and, where applicable, international obligations;*
2. *not be in conflict with the national water resource strategy;*
3. *set out the strategies,objectives,plans,guidelines and procedures of the catchment management agency for the protection, use, development, conservation, management and control of water resources within its water management area;*
4. *take into account the geology, demography, land use, climate, vegetation and waterworks within its water management area;*
5. *contain water allocation plans which must set out principles for allocating water;*
6. *take account of any relevant national or regional plans prepared in terms of any other law;*
7. *enable the public to participate in managing the water resources within its water management area;*
8. *take into account the needs and expectations of existing and potential water users; and*
9. *set out the institutions to be established.*

The Minister and the catchment management agency concerned must give effect to any catchment management strategy established under this Part when exercising any power or performing any duty in terms of this Act.
Upon the establishment of a catchment management agency, the initial functions of a catchment management agency are:

1. *to investigate and advise interested persons on the protection, use, development, conservation, management and control of the water resources in its water management area;*
2. *to develop a catchment management strategy;*
3. *to co-ordinate the related activities of water users and of the water management institutions within its water management area;*
4. *to promote the co-ordination of its implementation with the implementation of any applicable development plan established; and*
5. *to promote community participation in the protection, use, development, conservation, management and control of the water resources in its water management area.*

A catchment management agency may raise any funds required by it for the purpose of exercising any of its powers and carrying out any of its duties in terms of this Act. A catchment management agency must be funded by:

1. *money appropriated by Parliament;*
2. *water use charges; and*
3. *money obtained from any other lawful source for the purpose of exercising its powers and carrying out its duties in terms of this Act.*

3. Who does the planning? How should public and private stakeholders be integrated into the planning process?

a) Analytical description

Arguably as important as the plan itself is the planning process. This is particularly true when the function of the plan is to promote sustainable development of natural resources. Sustainable development requires the intergenerational consideration of all interests—economic, environmental, and social. An effective way to ensure the consideration of all of those interests is the inclusion of representatives of those interests in the planning process itself.

Historically, in those processes that actively included representatives of these different interests, those representatives were drawn from other ministries or agencies. Experiences in a growing number of countries on several different continents, however, now suggest that the most robust solutions to water resources challenges are developed by resource planners collaborating with representatives of both public and private sector stakeholders. Such collaborations recognize that governmental ministries, often woefully short of resources, do not have a monopoly on ideas or even on information. In addition, they recognize that ministries can use effective public participation to further the acceptance of the plan itself. Greater public participation helps both the responsible ministries and the affected public. Such collaboration can help educate resource planners with information and ideas not otherwise known to them. In turn, it gives those planners an opportunity to help educate critical sectors of the public. In many cases, the public and private stakeholders can bring resources—time, talent, and money—not otherwise available to the planners. In addition, a planning process that is open to public scrutiny can increase public confidence that the full range of public interests were considered. And finally, the greater the development of consensus among resource planners and public and private stakeholders, the more likely the plan will be successfully implemented.

Stakeholders who should be included in the planning process generally include three different groups: those whose support is necessary for obtaining legislative or executive approval of the plan; those whose interests are likely to be most affected by the implementation of the plans; and those whose willing participation is most critical to that implementation. Typical public sector stakeholders are representatives of relevant ministries or agencies, regional or local governments, and public universities. Typical private sector stakeholders include farmers, ranchers, urban water suppliers, business organizations, water-dependent industries, social groups, and environmental organizations.

The encouragement of meaningful public involvement in resource planning processes brings with it its own set

of challenges. For example, professional resource planners and managers sometimes look with disdain at public participation in their work. They may see such participation as, at best, an uninformed and unnecessary intrusion into areas of their specialized knowledge or expertise. This is particularly true in nations that have not had a substantial history of direct public scrutiny of, or involvement in, ongoing governmental planning activities. In addition, many groups of stakeholders likely affected by a plan lack either the education, the organizational structure or the financial resources to participate meaningfully.

Other challenges come from the structure of the process itself. For example, all participants need to be clear about their roles and the rules of decision. This is especially true of consensus-seeking processes: participants need to know who the ultimate decision maker is, what "consensus" means, and how the ultimate decision maker will respond to a consensus based decision of the collaborative's participants. Finally, the more active or more consensus seeking is the public participation, the longer the process is likely to last.

These challenges should not deter legislatures from encouraging public-private collaboration in natural resource planning. Rather, they should simply help determine the particular types of collaboration that are appropriate to a given nation's circumstances.

A variety of legislative mechanisms exist to encourage public participation. The most basic approach includes simple notice of the existence of a draft plan or strategy, with the chance for oral or written comments. Most national water legislation offers at least this bare minimum. This degree of public participation does little to educate the public, to build public confidence in the process, or to build consensus for the results. A more substantial approach involves the creation of a Watershed Council or Advisory Committee, which may be consulted by the responsible planning ministry or agency. Many codes now require something along these lines. Indeed, they often indicate the particular stakeholders or stakeholder groups that need to be included. They do not, however, mandate the degree of interaction between ministry and committee. The most involved approaches involve professionally facilitated multi-year collaborative, consensus-seeking planning processes. While frequently employed as a matter of ministerial policy, they are not, however, currently mandated by law.

b) Examples from National Legislation

Australia (New South Wales): *There is to be a Water Advisory Council.The Water Advisory Council is to have at least 13, but not more than 20, members appointed by the Minister, of whom:*

1. *at least two are to be persons appointed to represent the interests of environmental protection groups, and*
2. *at least two are to be persons appointed to represent the interests of water user groups, and*
3. *at least two are to be persons appointed to represent the interests of local councils, and*
4. *at least one is to be a person having such technical qualifications in connection with environmental protection as the Minister considers appropriate for the functions to be exercised by the Council, and*
5. *at least one is to be a person having such qualifications in ecology as the Minister considers appropriate for the functions to be exercised by the Council, and*
6. *at least two are to be persons appointed to represent the interests of catchment management boards and trusts, and*
7. *at least two are to be Aboriginal persons appointed to represent the interests of Aboriginal persons, and*
8. *one is to be a person appointed as an independent chairperson for the Council.*

The regulations may make provision with respect to qualifications for appointment as a member of the Water Advisory Council. Schedule 6 has effect with respect to the constitution and procedure of the Water Advisory Council.

The principal functions of the Water Advisory Council are as follows:

1. *to review such draft management plans and implementation programs as the Minister refers to it for review,*
2. *to investigate matters affecting the management of the water sources throughout the State, including such matters as the Minister refers to it for investigation,*
3. *to report to the Minister on matters affecting the management of the water sources throughout the State, including such matters as the Minister refers to it for report,*
4. *to advise the Minister on matters affecting the management of the water sources throughout the State, including such matters as the Minister refers to it for advice.*

The Water Advisory Council has such other functions as are conferred or imposed on it by or under this or

any other Act or law. For the purpose of exercising its functions, the Water Advisory Council may consult with, and receive submissions from, other persons and bodies. It is the duty of the Water Advisory Council to exercise its functions consistently with the principles of ecologically sustainable development.

Mexico: *The Federal Government shall encourage a joint responsible participation from society in the planning, execution, evaluation and surveillance of the environmental and natural resources policy.*
For the purposes of the above Article, the Secretariat shall:

1. *Convoke, within the scope of the National System of Democratic Planning, organizations of workers, entrepreneurs , peasants, agricultural and livestock producers, fishing and forest organizations, agrarian communities, indigenous peoples, educational institutions, social organizations and nonprofit private organizations and other interested parties for them to express their opinion and proposals;*
2. *Enter into agreements with workers organizations and social groups for protecting the environment in the working places and housing development; with indigenous peoples,agrarian communities and other peasants organizations for establishing, administering and managing natural protected areas, and to further provide them with ecological advise in the activities related to the sustainable exploitation of natural resources; with business organizations, in the cases provided in this Law for environmental protection; with educational and academic institutions in order to conduct studies and research on this matter, with civil organizations and nonprofit private institutions to start joint ecological actions; as well as with social organizations and individuals interested in preserving and restoring the ecological balance to protect the environment;*
3. *Enter into agreements with the massive media in order to disseminate, disclose and promote information related to ecological balance preservation actions and environmental protection;*
4. *Promote awards for the most significant efforts of society to preserve and restore ecological balance and environmental protection;*
5. *Encourage the ecological awareness strengthening through the execution of joint actions with the community participation toward the preservation and improvement of the environment, the rational exploitation of natural resources and the suitable handling of waste. For such purpose, the Secretariat, in coordination with the corresponding States and Municipalities, may enter into joint collaboration agreements with urban and rural communities, as well as social organizations, and*
6. *Carry out actions and investments with the social and private sectors and academic institutions, social groups and organizations, indigenous peoples and other individuals or legal entities interested in preserving and restoring the ecological balance and environmental protection.*

The Secretariat shall create advisory bodies with the participation of public administration entities and agencies, academic institutions and social and business organizations. The duties of said bodies shall be consultancy, assessment and monitoring in the matter of environmental policy matters and may issue the opinions and make the remarks deemed appropriate. Their organization and operation shall conform to the agreements issued for such purpose by the Secretariat. In case the Secretariat has to solve an issue in respect to which the bodies mentioned in the above paragraph have already issued an opinion, the Secretariat shall express the causes for acceptance or rejection thereof.

4. How should planning occur? Which Resources Should be Included in Planning Efforts?

a) Analytical description

Traditional water resources planning addresses a wide range of water quantity and quality issues. These normally include uses for drinking water, irrigation, commerce and industry, navigation, water-based habitat (including fisheries, wetlands, waterfowl, and riparian habitat), water-based recreation, and hydropower. Somewhat broader planning efforts might include floodplain management, aesthetic interests, and cultural interests.

At a minimum, integrated water resources planning needs to address all of these water-focused uses within a given watershed. But sustainable development goals will be advanced even further if planners integrate resources management for all of a basin's natural resources.

Natural resources management has frequently proceeded resource by resource. In such approaches, there are separate plans for water resources, land resources, timber resources, mineral resources, wildlife resources, air resources, and the like. Often, there will be separate planning processes and separate planning authorities. The results can be duplication of effort, inconsistencies in the information used and the

planning assumptions, and missed opportunities for beneficial gains from multiple resource management.

Countries are increasingly recognizing the need to integrate land use and water use plans, at least in the context of urban or housing development. Some of the excerpts below illustrate statutes that require at least this much integration. But watershed planning offers planners the opportunity to consider the broadest range of land uses and their interconnection in a single planning process. While such plans normally have specific elements devoted to individual resources, the key is that all the resources are assessed collectively. Critical gaps in data or analysis that affect more than one resource can better be identified and limited financial resources better directed towards addressing those gaps that matter the most in that watershed. Potential conflicts in planning assumptions or proposals can be identified and addressed simultaneously. In such a process, the optimal mix of resources conservation and development can more easily be determined.

For example, a given watershed's water supply may be partially dependent upon an upstream forest's ability to capture runoff and release it more slowly. Timbering activities or construction of residences in the forest would inevitably impact downstream water quantity and quality. In addition, smoke from residential fireplaces or automobiles will impact air quality. A watershed plan that addresses both land and water resources within the context of a basin's overall natural resources will be better able to identify specific and cumulative impacts on these resources from all the actual or proposed activities within that watershed. It would also be able to determine whether other sites within that watershed are better used for timbering or residential construction.

There are challenges attendant to multi-resource watershed planning. For example, the planning processes are likely to take longer, as planners need to consider more resources simultaneously. And different government ministries, with different goals and constituencies, may compete for jurisdiction over specific portions of the plan. But there should be some economies of scale, as duplicative processes can be minimized. And public involvement can be more efficient, as interested stakeholders need not duplicate their own efforts to participate.

Most national water legislation does not require multi-resource watershed planning. Environmental review requirements for specific proposals do open the door toward consideration of multiple impacts. But these tend to be secondary considerations or afterthoughts. Water plans remain primarily focused on water. Drafters of new water legislation have the opportunity to break new ground by directing planners to include the broadest array of resources and uses within a given watershed.

b) Examples from National Legislation

Albania: *Urban plans and studies must take into account the water resources plans of the National Water Council.*

Armenia: *Water Basin Management Planning shall balance the interconnected relationship of all water users, including communities, power generation, industry, agriculture and environment.*
The interconnected ecosystems and landscapes shall be subject to protection for the purposes of improvement of water quantity and quality, as well as for preservation of relationship between soil, air, biological diversity and the waters.

United States of America (California):
(a) For the purposes of this section, the following definitions apply:
(1)"Subdivision" means a proposed residential development of more than 500 dwelling units, except that for a public water system that has fewer than 5,000 service connections, "subdivision" means any proposed residential development that would account for an increase of 10 percent or more in the number of the public water system's existing service connections.
(2) "Sufficient water supply" means the total water supplies available during normal, single-dry, and multiple-dry years within a 20-year projection that will meet the projected demand associated with the proposed subdivision, in addition to existing and planned future uses, including, but not limited to, agricultural and industrial uses. In determining "sufficient water supply," all of the following factors shall be considered:

(A) The availability of water supplies over a historical record of at least 20 years.
(B) The applicability of an urban water shortage contingency analysis prepared pursuant to Section

10632 of the Water Code that includes actions to be undertaken by the public water system in response to water supply shortages .

(C) The reduction in water supply allocated to a specific water use sector pursuant to a resolution or ordinance adopted, or a contract entered into, by the public water system, as long as that resolution, ordinance, or contract does not conflict with Section 354 of the Water Code.

(D) The amount of water that the water supplier can reasonably rely on receiving from other water supply projects, such as conjunctive use, reclaimed water, water conservation, and water transfer, including programs identified under federal, state, and local water initiatives such as CALFED and Colorado River tentative agreements, to the extent that these water supplies meet the criteria of subdivision (d).

(3) "Public water system" means the water supplier that is, or may become as a result of servicing the subdivision included in a tentative map pursuant to subdivision (b), a public water system, as defined in Section 10912 of the Water Code, that may supply water for a subdivision.

(b)

(1) The legislative body of a city or county or the advisory agency, to the extent that it is authorized by local ordinance to approve, conditionally approve, or disapprove the tentative map,shall include as a condition in any tentative map that includes a subdivision a requirement that a sufficient water supply shall be available. Proof of the availability of a sufficient water supply shall be requested by the subdivision applicant or local agency, at the discretion of the local agency, and shall be based on written verification from the applicable public water system within 90 days of a request.

(2) If the public water system fails to deliver the written verification as required by this section, the local agency or any other interested party may seek a writ of mandamus to compel the public water system to comply.

(3 If the written verification provided by the applicable public water system indicates that the public water system is unable to provide a sufficient water supply that will meet the projected demand associated with the proposed subdivision, then the local agency may make a finding, after consideration of the written verification by the applicable public water system, that additional water supplies not accounted for by the public water system are, or will be, available prior to completion of the subdivision that will satisfy the requirements of this section. This finding shall be made on the record and supported by substantial evidence.

(4) If the written verification is not provided by the public water system, notwithstanding the local agency or other interested party securing a writ of mandamus to compel compliance with this section, then the local agency may make a finding that sufficient water supplies are, or will be, available prior to completion of the subdivision that will satisfy the requirements of this section. This finding shall be made on the record and supported by substantial evidence.

(c) The applicable public water system's written verification of its ability or inability to provide a sufficient water supply that will meet the projected demand associated with the proposed subdivision as required by subdivision (b) shall be supported by substantial evidence. The substantial evidence may include, but is not limited to, any of the following:

(1) The public water system's most recently adopted urban water management plan adopted pursuant to Part 2.6 (commencing with Section 10610) of Division 6 of the Water Code.

(2) A water supply assessment that was completed pursuant to Part 2.10 (commencing with Section 10910) of Division 6 of the Water Code.

(3) Other information relating to the sufficiency of the water supply that contains analytical information that is substantially similar to the assessment required by Section 10635 of the Water Code.

(d) When the written verification pursuant to subdivision (b) relies on projected water supplies that are not currently available to the public water system, to provide a sufficient water supply to the subdivision, the

written verification as to those projected water supplies shall be based on all of the following elements, to the extent each is applicable:

(1) Written contracts or other proof of valid rights to the identified water supply that identify the terms and conditions under which the water will be available to serve the proposed subdivision.

(2) Copies of a capital outlay program for financing the delivery of a sufficient water supply that has been adopted by the applicable governing body.

(3) Securing of applicable federal, state, and local permits for construction of necessary infrastructure associated with supplying a sufficient water supply.

(4) Any necessary regulatory approvals that are required in order to be able to convey or deliver a sufficient water supply to the subdivision.

(e) If there is no public water system,the local agency shall make a written finding of sufficient water supply based on the evidentiary requirements of subdivisions (c) and (d) and identify the mechanism for providing water to the subdivision.

(f) In making any findings or determinations under this section, a local agency, or designated advisory agency, may work in conjunction with the project applicant and the public water system to secure water supplies sufficient to satisfy the demands of the proposed subdivision. If the local agency secures water supplies pursuant to this subdivision, which supplies are acceptable to and approved by the governing body of the public water system as suitable for delivery to customers, it shall work in conjunction with the public water system to implement a plan to deliver that water supply to satisfy the long- term demands of the proposed subdivision.

(g The written verification prepared under this section shall also include a description, to the extent that data is reasonably available based on published records maintained by federal and state agencies,and public records of local agencies, of the reasonably foreseeable impacts of the proposed subdivision on the availability of water resources for agricultural and industrial uses within the public water system's service area that are not currently receiving water from the public water system but are utilizing the same sources of water. To the extent that those reasonably foreseeable impacts have previously been evaluated in a document prepared pursuant to the California Environmental Quality Act (Division 13 (commencing with Section 21000 of the Public Resources Code) or the National Environmental Policy Act (Public Law 91-190) for the proposed subdivision, the public water system may utilize that information in preparing the written verification.

(h) Where a water supply for a proposed subdivision includes groundwater, the public water system serving the proposed subdivision shall evaluate, based on substantial evidence, the extent to which it or the landowner has the right to extract the additional groundwater needed to supply the proposed subdivision. Nothing in this subdivision is intended to modify state law with regard to groundwater rights.

(i) This section shall not apply to any residential project proposed for a site that is within an urbanized area and has been previously developed for urban uses, or where the immediate contiguous properties surrounding the residential project site are, or previously have been, developed for urban uses, or housing projects that are exclusively for very low and low-income households.

5. How should planning occur? How can Managers Assure the Adequate Collection and Analysis of Data?

a) Analytical description

Effective planning requires the collection and analysis of substantial amounts of data regarding current and possible resource uses. Good data and analysis are necessary to answer two strategic planning questions: "Where are we now?" and "Where are we going?" Absent such data and analysis, a plan's assumptions will be flawed, and its proposals likely ineffective or counterproductive.

Data collection and analysis, however, require the dedicated efforts of researchers and analysts from ministries and universities. Such efforts are often extensive, expensive, and may raise more questions than answers. And ultimately, even if better knowledge can be developed, perfect knowledge is not attainable. Planners thus spend their lives walking a tightrope between making assessments and proposals using the best information then available and delaying such assessments and proposals until better information is developed.

Adaptive management is one response to the tension between acting and waiting. (See Section II. B. 13 [Plan Review], below.) The "precautionary principle" is another. (See Section II. A. 3 [Important Principles], above.) Adaptive management recognizes that data development is an ongoing process. For example, decision makers can make monitoring requirements a condition for the approval of resource use or development proposals. Based on data developed from these monitoring activities, resource managers can refer to pre-established criteria that will trigger reassessments and possible redirection of development or management activities.

Many national water codes recognize the importance of these data collection and analysis activities. Legislation frequently mandates the development of data as part of the national water strategy. Legislation sometimes requires formal monitoring activities by water planners to assess the successes and failures of the strategy.

Of course, without ample funding, data collection and analysis requirements are meaningless. Planners and researchers frequently complain that when financial resources are tight, the first thing to suffer budget cuts is data collection. In comparison with governmental programs offering specific social services, data collection programs are seen as offering scant immediate return for the investment of public funds. By definition, however, sustainable development requires planners to include the resource needs of future generations. Without an ongoing commitment to develop adequate information about a nation's resources, future generations will inevitably be shortchanged.

Data collection activities can be seen as a partial surrogate for the needs of future generations. While the particular balance between present and future resource needs is a matter for each nation to decide based on that nation's values and circumstances, a wholesale evisceration of data development efforts skews the balance dramatically. One of the best things a national legislative body can do to encourage sustainable development of that nation's resources is to resist the temptation to eliminate or drastically scale back data collection activities.

Besides direct public funding of data collection and analysis, cash-strapped legislatures have three other tools to improve public understanding of their nation's natural resources. First, as noted above, a legislative requirement of comprehensive, multi-resource watershed planning can best identify those data gaps that are most critical to managing a particular watershed. (Section II. B. 4 [Resources to Include], above.) Scarce financial resources can more efficiently be allocated. Second, the legislatively mandated permit systems discussed below can require water users to provide specific data on their withdrawals and discharges or other resource impacts. (See Section II. C. 12 [Permitee's Rights and Duties], below.) Third, water users in general, and proponents or operators of waterworks in particular, can be assessed fees to fund data collection and analysis. (See Section II. C. 13 [Fees], below.)

b) Examples from National Legislation

Armenia: *The state authorized body for water resources monitoring shall be responsible for water resources monitoring according to the procedures established by the law. The order of providing information through Information systems of the State Water Cadastre shall be established by the Government. For inclusion in the Water Cadastre the monitoring shall provide data on:*

1. *Quantitative indices of water resources, including data on snow cover;*
2. *Qualitative indices of water resources;*
3. *Water resources use efficiency;*
4. *Results of anthropogenic impact on water resources, including pollution;*
5. *Wastewaters and composition and quantities of substances in them;*
6. *Rehabilitation of water resources;*
7. *Forecasts on floods, mudflows, droughts;*
8. *Protection zones of aquatic ecosystems and their status;*
9. *Atmospheric precipitation and atmospheric temperature regime;*
10. *Water use permits and water systems use permits;*
11. *mplementation of the National Water Program.*

Data of the State Water Cadastre shall be considered official. Information of the State Water Cadastre shall be freely accessible to the public in order to ensure proper management and conservation of water resources. The State Water Cadastre shall record water resource balance by separate water basins and nationally. The procedures for geological survey of ground waters,assessment of ground water resources,and the submission of data thereof to the State Water Cadastre shall be established by law. Each year, a comprehensive report on water resources monitoring shall be submitted by the state authorized monitoring body to the Water Resources Management and Protection Body and shall be integrated in the annual presentation on the implementation of the National Water Program. Recording of supplied waters is carried out by means of water meters, and in case of absence of such water meters, an alternative water recording procedure established by the Government shall be employed. Water meters shall be attested in procedures established by the legislation. In open beds, water metering observation points shall also be attested. Damages and deficiencies at water meters or water metering observation points shall be rectified in procedures set forth in the water supply contract. Prior to the rectification of damages and deficiencies at water meter or water metering observation point, the recording of water shall be carried out in recording procedures prescribed by the Government,which is based on the concept of the maximum quantity of water used by consumer and minimum cost recovery by supplier.

South Africa: *The Minister must establish national monitoring systems on water resources as soon as reasonably practicable. The systems must provide for the collection of appropriate data and information necessary to assess, among other matters:*

1. *the quantity of water in the various water resources;*
2. *the quality of water resources;*
3. *the use of water resources;*
4. *the rehabilitation of water resources;*
5. *compliance with resource quality objectives;*
6. *the health of aquatic ecosystems; and*
7. *atmospheric conditions which may influence water resources.*

The Minister must, after consultation with relevant:

1. *organs of state;*
2. *water management institutions; and*
3. *existing and potential users of water, establish mechanisms and procedures to co-ordinate the monitoring of water resources.*

The Minister must, as soon as reasonably practicable, establish national information systems regarding water resources. The information systems may include, among others:

1. *a hydrological information system;*
2. *a water resource quality information system;*
3. *a groundwater information system; and*
4. *a register of water use authorizations.*

The objectives of national information systems are:

1. *to store and provide data and information for the protection, sustainable use and management of water resources;*
2. *to provide information for the development and implementation of the national water resource strategy;*

and
3. to provide information to water management institutions, water users and the public:
a. for research and development;
b. for planning and environment impact assessments;
c. for public safety and disaster management; and
d. on the status of water resources.

6. How should planning occur? What basic principles should water managers employ in allocating water among competing uses?

a) Analytical description

Water legislation frequently prioritizes the allocation of water resources among competing uses. These allocations establish legislative frameworks within which planners can seek to optimize resource uses. They can also help reduce conflict and delay at the watershed planning level, as planners may not have to spend as much time working through often highly charged allocation issues. Often, these prioritizations focus solely on consumptive uses of a watershed's water resources. Those prioritizations that best advance sustainable development goals also include environmental and other non-consumptive uses within the allocations.

The legislation excerpted below focuses on allocation principles that specifically apply to watershed planning. Other sections excerpt legislation containing general principles governing water use (Section II. A. 3 [Important Principles], above) and principles applicable to specific licensing decisions (Section II. C. 4 [Use Priorities], below.)

b) Examples from National Legislation

Australia (New South Wales): *There are the following categories of access license:*
1. local water utility access licenses,
2. major utility access licenses,
3. domestic and stock access licenses,
4. regulated river (high security) access licenses,
5. regulated river (general security) access licenses,
6. regulated river (supplementary water) access licenses,
7. unregulated river access licenses,
8. aquifer access licenses,
9. estuarine water access licenses,
10. coastal water access licenses,
11. such other categories of access license as may be prescribed by the regulations.

For the purposes of this Act, the following priorities are to be observed in relation to access licenses:
1. local water utility access licenses, major utility access licenses and domestic and stock access licenses have priority over all other access licenses,
2. regulated river (high security) access licenses have priority over regulated river (general security) access licenses and regulated river (supplementary water) access licenses,
3. regulated river (general security) access licenses have priority over regulated river (supplementary water) access licenses.

If one access license (the higher priority license) has priority over another access license (the lower priority license), then if the water allocations under them have to be diminished, the water allocations of the higher priority license are to be diminished at a lesser rate than the water allocations of the lower priority license.

Philippines: *Between two or more appropriation of water from the same sources of supply, priority in time of appropriation shall give the better right, except that in times of emergency, the use of water for domestic and municipal purposes shall have a better fight over all other uses; Provided, That where water shortage is recurrent and the appropriator for municipal use has a lower priority in time of appropriation, them it shall be his duty to find an alternative source of supply in accordance with conditions prescribed by the Council. Priorities may be altered on grounds of greater beneficial use, multi-purpose use, and other similar grounds after due notice and hearing, subject to payment of compensation is proper cases.*

Spain: *The issuance of concessions shall observe the order of preference established in the applicable Basin*

Water Plan, with consideration for the need to protect and conserve water and its surroundings. All concessions are subject to forcible expropriation as provided in applicable general legislation for purposes of a different use in keeping with the order of preference established in the Basin Water Plan.If there is no order of preference, the following general principles shall apply:

1. *Supply to the populace, including the necessary amounts for small- consumer industries located in population centers and connected to the municipal system.*
2. *Irrigation and agricultural uses.*
3. *Industrial uses for power production.*
4. *Other industrial uses not included in the above items.*
5. *Aquaculture.*
6. *Recreational uses.*
7. *Boating and water transportation.*
8. *Other uses.*

Any order of priority established in the basin water plans shall always give preference to the use stated in item 1 of the above list.

In the event of incompatibility of uses in the same category, preference shall be given to the uses of greatest public or general use or those that introduce improved techniques entailing lower water consumption.

7. What should the plans contain? What goals should water managers set?

a) Analytical description

An essential element of strategic planning is a description of the plan's goals. In the language of strategic planners, a plan's goals answer the question, "Where do we want to be at the end of the planning horizon?"

Generally, the more specific the goals set for planners, the better the chance for reaching them. Most national legislation, however, does not identify specific management targets in anything other than the most general or qualitative terms. For example, a code might simply indicate that the goal of the national water management strategy is something like "to ensure adequate water for all beneficial uses including the environment." When stated in these terms, the "goals" are much more akin to aspirations (see Section II. A. 1 [Aspirations], above) or general interpretive principles (Section II. A. 3 [General Principles], above.) They lack any criteria, however, for measuring progress towards their attainment. For example, they do not indicate anything about the time in which such goals are to be met. Similarly, they do not indicate how planners will know when "adequate" has been attained. And they do nothing to indicate whether there are any relative priorities among "all beneficial uses including the environment." Do planners advance all such uses equally and simultaneously? Or do accumulated deficits in the status of some uses entitle those uses to extra attention, or earlier attention? If not all can be fully attained during the same planning period, are their interim targets for individual uses?

In contrast to such a generally stated objective, an example of a specific goal comes from the Millennium Development Goals. Those Goals aim to achieve, by 2015, a 50% reduction in the number of people without access to potable drinking. Similarly, the Clean Water Act of the United States set a goal of making that nation's watercourses "swimmable and fishable" by a specific date. Even where those goals are not fully met, they allow planners to develop benchmarks and strategies that can be implemented within the period provided. In addition, they give both planners and the public milestones to measure progress. And while the establishment of particular goals is paramountly a political process, drafters of legislation should provide examples to legislators to serve as models and placeholders.

It may be that some particular goals are too fact specific, too basin specific, or too time specific, to warrant enshrinement in national legislation. In such cases, they are best set by the appropriate ministerial or administrative bodies. But the national legislation can require the plans developed by these bodies to contain specific targets for each of the beneficial uses that are within the plan's scope.

b) Examples from National Legislation

European Union: *In making operational the programs of measures specified in the river basin management plans for surface waters:*

1. *Member States shall protect, enhance and restore all bodies of surface water, subject to the application of subparagraph (2) for artificial and heavily modified bodies of water, with the aim of achieving good surface water status at the latest 15 years after the date of entry into force of this Directive,in accordance with the provisions laid down in Annex V, subject to the application of extensions determined in accordance with paragraph 4 and to the application of paragraphs 5, 6 and 7 without prejudice to paragraph 8;*
2. *Member States shall protect and enhance all artificial and heavily modified bodies of water, with the aim of achieving good ecological potential and good surface water chemical status at the latest 15 years from the date of entry into force of this Directive, in accordance with the provisions laid down in Annex V, subject to the application of extensions determined in accordance with paragraph 4 and to the application of paragraphs 5, 6 and 7 without prejudice to paragraph 8;*
3. *Member States shall implement the necessary measures in accordance with Article 16(1) and (8), with the aim of progressively reducing pollution from priority substances and ceasing or phasing out emissions, discharges and losses of priority hazardous substances without prejudice to the relevant international agreements referred to in Article 1 for the parties concerned.*

Netherlands:

1. *Our Ministers shall draw up a national environmental policy plan…*
2. *The plan shall contain the main elements of the government's environmental policy…*
3. *These main elements shall include at least the following:*
   a. *the intended results in the relevant eight-year period – and, to the extent that this is capable of being indicated, the first four years – with regard to the quality of the various parts of the environment;*
   b. *the intended results in the relevant eight-year period – and, to the extent that this is capable of being indicated, the first four years – with regard to the prevention, limitation or remedying of the effects of human activities which pollute, impair or deplete the environment, including the intended results of the disposal of hazardous waste.*

Spain: *The goals of protecting the public water domain are as follows:*

1. *Prevent any degradation of the ecological condition and water pollution to arrive at a good overall condition.*
2. *Establish quality control programs in each water basin.*
3. *Impede the accumulation of toxic or dangerous substances in the subsoil that could pollute the groundwater.*
4. *Avoid any other accumulation that could cause degradation of the public water domain.*
5. *Restore the aquatic systems relating to the public water domain.*

Regulations shall establish the quality levels for the states of condition set forth in section a) and the deadlines for achieving them.

8. What should the plans contain? What principles or criteria should govern the selection of appropriate management strategies?

a) Analytical description

An essential element of any water management plan is the identification of the strategies that will be implemented. In strategic planning parlance, the plan's "goals" answer the question: "Where do we want to be at the end of the planning horizon?" Similarly, the plan's strategies answer the question, "How do we get there?"

As used here, a strategy connotes a set of specific management actions designed to meet one or more planning goals. For example, a strategy might involve a series of actions designed to increase the efficiency of urban or agricultural water use. These actions could include public education programs, incentives, subsidies, or mandatory use of specific technologies. Another strategy might be a series of actions to increase the amount of water in above-ground storage. These actions could include involve the use of groundwater in lieu of diversions from reservoirs, the re-operation of

existing reservoirs to allow the retention of more water at different times of the year, the enlargement of existing waterworks, or the construction of new ones.

The choice of appropriate management strategies often lies at the core of most plans. As such, these choices are often at the heart of disputes over the plan's contents. Occasionally, a legislative body will preempt some of those choices by indicating its own preferences for particular strategies. While not commonly found in parliamentary, assembly, or congressional level-legislation, such priorities are more frequently found at ministerial or agency-level regulations. Wherever found, they generally take one of three forms.

First, they may express a preference for a particular strategy. For example, preferences may expressed for all those strategies that increase efficient water use or increase the use of recycled water. Second, preferences may be expressed for particular tactics that might implement a given strategy. For example, to implement a strategy designed increase water efficiency, preferences may be expressed for the use of "best management practices." Finally, preferences might be expressed to those tactics that can implement multiple strategies. For example, a preference could be expressed for all those strategies that employ incentives or market forces, rather than subsidies or mandates.

Closely related to preferences are mandated criteria to evaluate strategies. For example, a legislative body may indicate that planners must evaluate the impact of given strategies on particular economic, environmental, or social interests. The decision on how to respond to the evaluation, however, is left to the planning authority.

b) Examples from National Legislation

People's Republic of China: *The state shall strictly carry out water saving and devote major efforts to implementing water saving measures, popularize new water–saving technologies and processes and develop water-saving industry, agriculture, and services, and establish a water-saving society. The people's governments at various levels shall adopt measures and strengthen the management of the economical use of water, set up a system of developing and popularizing water-saving technologies and foster and develop water-saving industries. Units and individuals shall have the obligations of economical use of water.*

People's governments at all levels shall promote water-saving irrigation methods and water-saving techniques, and take necessary measures of seepage control on agricultural water storage and delivery projects to raise efficiency of agricultural water use.

Advanced technologies, processes and equipment shall be introduced for industrial water use to increase the number of times of recycled water uses and raise the reutilization ratio of water.

The state shall gradually eliminate backward, high water consuming technologies, equipment and products, a specific name list of which shall be drawn up and announced by the comprehensive economy department under the State Council jointly with the department of water administration and other departments concerned under the State Council. Manufacturers, sellers or users in production and business operations shall stop manufacturing, selling and using the technologies, equipment and products on the list within the specified time.

Urban people's governments shall take effective measures suitable to local conditions to raise domestic water use efficiency by popularizing water-saving household facilities and reducing water leakage and losses of pipeline networks for urban water supply, and to raise the utilization ratio of recycled sewage water by strengthening concentrated treatment of municipal sewage and encouraging the use of recycled water.

Mexico: *The Federation, the States and the Federal District, within the scope of their respective jurisdictions, shall design, develop and apply economic instruments to encourage compliance with the environmental policy objectives, whereby the following shall be sought*

1. *To promote a change in the behavior of people who carry out industrial, commercial and service activities, in a manner that their interests be consistent with the group interests of environmental protection and sustainable development;*

2. *To encourage the inclusion of reliable and sufficient information regarding the consequences, benefits and environmental costs into the price system of the economy;*

3. To give incentives to the people who conduct actions for protection, preservation or restoration of ecological balance. The objectives shall also try to make that people damaging the environment, using improperly the natural resources or altering the ecosystems assume the corresponding costs;
4. To promote a higher social equity in the costs and distribution of benefits related to the environmental policy objectives, and
5. To encourage their use together with other environmental policy instruments, especially in connection with the compliance with thresholds or limits in the use of ecosystems, in such a way to guarantee the integrity and balance thereof and the health and welfare of population.

Economic instruments are considered those regulating and administrative mechanisms of fiscal, financial or market nature whereby the individuals assume the environmental benefits and costs generated by their economic activities, encouraging them to carry out activities in favor of the environment. Economic instruments of fiscal nature are considered those tax incentives encouraging compliance with the environmental policy objectives. These instruments shall not be established only for tax collection purposes. Financial instruments shall be credits, bonds, civil liability insurance, funds and trusts when their objectives are addressed to the preservation, protection, restoration or sustainable exploitation of natural resources and environment, as well as to the financing of programs, projects, studies and scientific and technological research for preserving the ecological balance and environmental protection. Market instruments shall be the concessions, authorizations, licenses and permits corresponding to pre-established volumes of pollutant emissions in the air, water or land, or establishing the limits for exploitation of natural resources or for construction at natural protected areas or in zones where the preservation and protection is considered relevant from an environmental point of view. Prerogatives derived from economic market instruments will be transferable, nontaxable and subject to the public interest and the sustainable exploitation of natural resources.

9. What should the plans contain? Should water systems be classified according to the types and extent of development permitted?

a) Analytical description

One strategy employed in many national water codes is a national water body classification system. Under these systems, different water bodies or even segments of particular watercourses, are classified according to permitted uses. National legislation may simply create two or more specific classes and leave it to the ministries or agencies to assign individual water bodies to a particular class. Alternatively, it may both create specific classes and also assign individual water bodies to a particular class. A good example of the latter is the National Wild and Scenic Rivers System of the United States.

In theory, a classification system is neutral as to its promotion of sustainable development. Its contribution, if any, depends partly upon the uses permitted by a given class, and partly upon the particular class to which a given water body is assigned. In practice, however, most water classification systems at least partially promote ecologically sustainable development values. Many of these systems, like the U.S. Wild and Scenic Rivers System, have been created in large part to ensure the reservation of some waters for their unique environmental or ecological significance. Other systems recognize at least implicitly that there may be a wide variety of consumptive and nonconsumptive uses on a given watercourse and that other non-permitted uses would interfere inappropriately with the existing balance. In any event, the widespread popularity of classification systems suggests that they offer water policymakers, water managers, and water users some clarity and some assurances.

Closely related to a classification system is the concept of a “reserve.” A reserve represents the minimum flows that must remain in a stream at any given time in order to meet environmental, recreational, aesthetic, or other values. Often these are expressed in order to protect fisheries and related habitat. At the parliamentary, assembly, or congressional level, the “reserve” is usually broadly defined. For example, a legislature might mandate that the owner of any dam release sufficient water to leave in good condition any fish below that dam. Or, it might simply require that planners or managers set a minimum stream flow. In either event, specific streamflows are generally set by such planners or managers, either in watershed plans, or when reviewing proposals for specific waterworks.

b) Exaples from National Legislation

Australia (New South Wales): *The Minister may, by order published in the Gazette, classify water sources for the purposes of this Act. Such an order may only be made with the concurrence of the Minister for the Environment. Water sources are to be classified as follows:*

1. *as to the extent to which they are at risk (that is, the extent to which harm to the water source or its dependent ecosystems is likely to occur),*
2. *as to the extent to which they are subject to stress (that is, the extent to which harm to the water source or its dependent ecosystems has occurred or is occurring),*
3. *as to the extent of their conservation value (that is, the extent to which their intrinsic value merits protection from risk and stress).*

The following classes of environmental water are recognized for the purposes of this Act:

1. *water that is committed for fundamental ecosystem health at all times, and may not be taken or used for other purposes (environmental health water),*
2. *water that is committed for specified environmental purposes at specified times or in specified circumstances,but may, at other times and in other circumstances,be taken and used for other purposes (supplementary environmental water),*
3. *water that, pursuant to an access license, is committed for specified environmental purposes, either generally or at specified times or in specified circumstances (adaptive environmental water).*

Rules for the identification, establishment and maintenance of each class of environmental water (environmental water rules) are to be established for all of the water sources in the State, by means of a management plan, as soon as practicable after the commencement of this Act.

Philippines: *After due notice and hearing when warranted by circumstances,minimum stream flows for rivers and streams and minimum water levels for lakes may be established by the Council under such conditions as may be necessary for the protection of the environment, control of pollution, navigation,prevention of salt damage, and general public use.Any watershed or any area of land adjacent to any surface water or overlying any ground water may be declared by the Department of Natural Resources as a protected area. Rules and regulations may be promulgated by such Department to prohibit or control such activities by the owners or occupants thereof within the protected area which may damage or cause the deterioration of the surface water or ground water or interfere with the investigation, use, control, protection, management or administration of such waters.*

South Africa: *As soon as is reasonably practicable, the Minister must prescribe a system for classifying water resources. The system for classifying water resources may:*

1. *establish guidelines and procedures for determining different classes of water resources;*
2. *in respect of each class of water resource:*
    a. *establish procedures for determining the Reserve;*
    b. *establish procedures which are designed to satisfy the water quality requirements of water users as far as is reasonably possible, without significantly altering the natural water quality characteristics of the resource;*
    c. *set out water uses for instream or land-based activities which activities must be regulated or prohibited in order to protect the water resource; and*
3. *provide for such other matters relating to the protection, use, development, conservation, management and control of water resources, as the Minister considers necessary.*

As soon as reasonably practicable after the Minister has prescribed a system for classifying water resources, the Minister must determine for all or part of every significant water resource:

1. *a class in accordance with the prescribed classification system; and*
2. *resource quality objectives based on the class determined in terms of paragraph (1).*

A notice must state the geographical area in respect of which the resource quality objectives will apply, the requirements for achieving the objectives, and the dates from which the objectives will apply. The objectives may relate to:

1. *the Reserve;*
2. *the instream flow;*
3. *the water level;*
4. *the presence and concentration of particular substances in the water;*

5. *the characteristics and quality of the water resource and the instream and riparian habitat;*
6. *the characteristics and distribution of aquatic biota;*
7. *the regulation or prohibition of instream or land-based activities which may affect the quantity of water in or quality of the water resource; and*
8. *any other characteristic of the water resource in question.*

Until a system for classifying water resources has been prescribed; or a class of a water resource or resource quality objectives has been determined, the Minister may, for all or part of a water resource make a preliminary determination of the class or resource quality objectives. A determination in terms of the above supersedes a preliminary determination.

United States: *It is hereby declared to be the policy of the United States that certain selected rivers of the Nation which, with their immediate environments, possess outstandingly remarkable scenic, recreational, geologic, fish and wildlife, historic, cultural, or other similar values, shall be preserved in free-flowing condition, and that they and their immediate environments shall be protected for the benefit and enjoyment of present and future generations. The Congress declares that the established national policy of dam and other construction at appropriate sections of the rivers of the United States needs to be complemented by a policy that would preserve other selected rivers or sections thereof in their free-flowing condition to protect the water quality of such rivers and to fulfill other vital national conservation purposes.*

10. What should the plans contain? How can water planners best prevent pollution or other water source quality deterioration?

a) Analytical description

An essential element of any water plan is a set of provisions to help prevent pollution or other water quality deterioration. These provisions recognize two fundamental principles of water management. First, water quality is as much a consideration in determining appropriate uses as water quantity. For example, without treatment, a given body of water might be useable for irrigation but insufficient for human consumption. Second, it is almost always cheaper to prevent pollution than it is to clean it up. Correspondingly, the failure to have water users account for any deterioration of water quality distorts the economic signals attendant to the water use and becomes a de facto public subsidy of the user's enterprise. (This is part of the wisdom behind the "polluter pays" principle described above. See Section II. A. 3 [General Principles], above.)

A wide range of approaches is taken to pollution prevention. Sometimes, the legislature itself sets specific water quality standards. This is seen in some of the European Community directives to member states. Much more often, legislatures direct planning or managing authorities to set water quality standards. Frequently, the legislatures also create a discharge permit system to implement the resulting standards.

In addition to these planning level statutes, statutes address pollution prevention in several other ways. For example, conditions imposed on water diversion permits often involve water quality considerations. (See Sections II. C. 6 [Environmental and Public Health] and II. C. 10 [Permitee's Rights and Duties], below.) Proponents of specific waterworks normally must examine the water quality impacts of their projects. (See Section II. D. 3 [Environmental and Social Review], below.) (Indeed, many waterworks, such as wastewater treatment plants, are specifically designed to prevent pollution.) And finally, legislation frequently imposes stiff civil and criminal penalties for specific acts that pollute. These can function as a deterrent as well as a punishment. (See Section II. C. 23 [Liabilities], below.)

b) Examples from National Legislation

Mexico: *The Commission shall determine the parameters to be complied with by discharges, the assimilation and dilution capacity of national bodies of water, and the amounts of pollutants they are able to tolerate, quality objectives and the timetables for attaining them, which it shall set out in declarations classifying national bodies of water, which, for the purposes of compliance, shall be published in the Diario Oficial de la Federación, as shall amendments to them. The declarations shall contain the following information:*
1.The boundaries of the classified body of water,

2. *The parameters to be complied with by discharges into the classified body of water, subject to the periods specified in the regulations to this Law,*
3. *The capacity of the classified body of water to dilute and assimilate pollutants,*
4. *The maximum discharge limits for analyzed pollutants, which form the basis for setting the individual requisites for discharges.*

New Zealand:

Class AE Water (being water managed for aquatic ecosystem purposes):

1. *The natural temperature of the water shall not be changed by more than 3º Celsius.*
   a. *The following shall not be allowed if they have an adverse effect on aquatic life:*
   b. *Any pH change:*
   c. *Any increase in the deposition of matter on the bed of the water body or coastal water:*
   d. *Any discharge of a contaminant into the water.*
2. *The concentration of dissolved oxygen shall exceed 80% of saturation concentration.*
3. *There shall be no undesirable biological growths as a result of any discharge of a contaminant into the water.*

Class F Water (being water managed for fishery purposes)—

1. *The natural temperature of the water—*
   a. *Shall not be changed by more than 3º Celsius; and*
   b. *Shall not exceed 25º Celsius.*
2. *The concentration of dissolved oxygen shall exceed 80% of saturation concentration.*
3. *Fish shall not be rendered unsuitable for human consumption by the presence of contaminants.*

Class FS Water (being water managed for fish spawning purposes)—

1. *The natural temperature of the water shall not be changed by more than 3º Celsius. The temperature of the water shall not adversely affect the spawning of the specified fish species during the spawning season.*
2. *The concentration of dissolved oxygen shall exceed 80% of saturation concentration.*
3. *There shall be no undesirable biological growths as a result of any discharge of a contaminant into the water.*

Class SG Water (being water managed for the gathering or cultivating of shellfish for human consumption)—

1. *The natural temperature of the water shall not be changed by more than 3º Celsius.*
2. *The concentration of dissolved oxygen shall exceed 80% of saturation concentration.*
3. *Aquatic organisms shall not be rendered unsuitable for human consumption by the presence of contaminants.*

Class CR Water (being water managed for contact recreation purposes)—

1. *The visual clarity of the water shall not be so low as to be unsuitable for bathing.*
2. *The water shall not be rendered unsuitable for bathing by the presence of contaminant.*
3. *There shall be no undesirable biological growths as a result of any discharge of a contaminant into the water.*

Class WS Water (being water managed for water supply purposes)—

1. *The pH of surface waters shall be within the range 6.0-9.0 units.*
2. *The concentration of dissolved oxygen in surface waters shall exceed 5 grams per cubic meter.*
3. *The water shall not be rendered unsuitable for treatment (equivalent to coagulation, filtration, and disinfection) for human consumption by the presence of contaminants.*
4. *The water shall not be tainted or contaminated so as to make it unpalatable or unsuitable for consumption by humans after treatment (equivalent to coagulation, filtration, and disinfection), or unsuitable for irrigation.*
5. *There shall be no undesirable biological growths as a result of any discharge of a contaminant into the water.*

Class I Water (being water managed for irrigation purposes)—

1. *The water shall not be tainted or contaminated so as to make it unsuitable for the irrigation of crops*

growing or likely to be grown in the area to be irrigated.

2. *There shall be no undesirable biological growths as a result of any discharge of a contaminant into the water.*

Class IA Water (being water managed for industrial abstraction)—

1. *The quality of the water shall not be altered in those characteristics which have a direct bearing upon its suitability for the specified industrial abstraction.*
2. *There shall be no undesirable biological growths as a result of any discharge of a contaminant into the water.*

Class NS Water (being water managed in its natural state)—The natural quality of the water shall not be altered.

Class A Water (being water managed for aesthetic purposes)—The quality of the water shall not be altered in those characteristics which have a direct bearing upon the specified aesthetic values.

Class C Water (being water managed for cultural purposes) —The quality of the water shall not be altered in those characteristics which have a direct bearing upon the specified cultural or spiritual values.

United States

(b) Effluent limitation guidelines

For the purpose of adopting or revising effluent limitations under this chapter the Administrator shall, after consultation with appropriate Federal and State agencies and other interested persons, publish within one year of October 18, 1972, regulations, providing guidelines for effluent limitations, and, at least annually thereafter, revise, if appropriate, such regulations. Such regulations shall--

(1)

(A) identify, in terms of amounts of constituents and chemical, physical, and biological characteristics of pollutants, the degree of effluent reduction attainable through the application of the best practicable control technology currently available for classes and categories of point sources (other than publicly owned treatment works); and

(B) specify factors to be taken into account in determining the control measures and practices to be applicable to point sources (other than publicly owned treatment works) within such categories or classes. Factors relating to the assessment of best practicable control technology currently available to comply with subsection (b)(1) of section 1311 of this title shall include consideration of the total cost of application of technology in relation to the effluent reduction benefits to be achieved from such application, and shall also take into account the age of equipment and facilities involved,the process employed,the engineering aspects of the application of various types of control techniques, process changes, non-water quality environmental impact (including energy requirements), and such other factors as the Administrator deems appropriate;

(2)

(A) identify, in terms of amounts of constituents and chemical, physical, and biological characteristics of pollutants, the degree of effluent reduction attainable through the application of the best control measures and practices achievable including treatment techniques, process and procedure innovations, operating methods, and other alternatives for classes and categories of point sources (other than publicly owned treatment works); and

(B) specify factors to be taken into account in determining the best measures and practices available to comply with subsection (b)(2) of section 1311 of this title to be applicable to any point source (other than publicly owned treatment works) within such categories or classes. Factors relating to the assessment of best available technology shall take into account the age of equipment and facilities involved, the process employed,the engineering aspects of the application of various types of control techniques,process changes, the cost of achieving such effluent reduction, non-water quality environmental impact (including energy requirements), and such other factors as the Administrator deems appropriate;

(3) identify control measures and practices available to eliminate the discharge of pollutants from categories and classes of point sources, taking into account the cost of achieving such elimination of the discharge of pollutants; and

(4)
(A) identify, in terms of amounts of constituents and chemical, physical, and biological characteristics of pollutants, the degree of effluent reduction attainable through the application of the best conventional pollutant control technology (including measures and practices) for classes and categories of point sources (other than publicly owned treatment works); and

(B) specify factors to be taken into account in determining the best conventional pollutant control technology measures and practices to comply with section 1311(b)(2)(E) of this title to be applicable to any point source (other than publicly owned treatment works) within such categories or classes. Factors relating to the assessment of best conventional pollutant control technology (including measures and practices) shall include consideration of the reasonableness of the relationship between the costs of attaining a reduction in effluents and the effluent reduction benefits derived, and the comparison of the cost and level of reduction of such pollutants from the discharge from publicly owned treatment works to the cost and level of reduction of such pollutants from a class or category of industrial sources, and shall take into account the age of equipment and facilities involved,the process employed,the engineering aspects of the application of various types of control techniques, process changes, non-water quality environmental impact (including energy requirements), and such other factors as the Administrator deems appropriate.

Zimbabwe: *Any person who discharges or disposes of:*

1. *any organic or inorganic matter, including water containing such matter, into a public stream or into any other surface water or ground water, whether directly or through drainage or seepage, so as to cause pollution of the public stream, other surface water or ground water, as the case may be; or*
2. *any effluent or waste water which has been produced by or results from the use of water for any purpose into a public stream or into any other surface water or ground water, whether directly or through drainage or seepage;*

shall be guilty of an offence, whether or not he acted intentionally and whether he was negligent or not, and shall be liable to a fine not exceeding one hundred thousand dollars or to imprisonment for a period not exceeding one year or to both such fine and such imprisonment.
Notwithstanding the above, the National Water Authority, upon an application by any interested person and subject to prescribed standards of quality and any operative outline plan, may-

1. *issue permits authorizing the discharge or disposal prohibited by subsection (1) of section sixty-eight and specifying the quantity and quality of the discharge or disposal concerned; and*
2. *subject to section seventy, impose such conditions on the permits as it thinks fit; and*
3. *impose such fee as may be prescribed in relation to the discharge or disposal concerned; and*
4. *amend or withdraw-*
   a. *a permit referred to in paragraph (1);*
   b. *conditions imposed in terms of paragraph (2);*
   c. *any fee payable in terms of paragraph (3).*

A fee imposed in terms of this section shall be-

1. *payable into the Water Fund established under the Zimbabwe National Water Authority Act.*
2. *accounted for separately under that Fund; and*
3. *applied to-*
   a. *the cleaning up of any water pollution acid the alleviation of its environmental effects; and*
   b. *research related to water pollution and its control.*

   [remainder deleted.]

11. What should the plans contain? What provisions should be made to prevent or respond to water emergencies, such as drought, flood, or sudden and extreme contamination?

a) Analytical description

The variability of precipitation that most nations face drives a substantial portion of water resources planning and management. Most plans contain some strategy to store water in wet seasons or wet years for use in dry seasons or dry years. Beyond the annual variability naturally associated with the water cycle, however, some nations are subject to precipitation extremes. These may involve too much water—flooding—or too little water—drought—or both.

In response, many countries require plans for these natural contingencies. Legislation in some countries simply requires such plans. Other countries legislate some required details of such plans. For example, some countries legislate principles for allocating water in droughts. Several countries simply authorize water managers to reallocate waters during droughts.

In addition to planning for natural contingencies, water managers must also consider the possibilities of sudden and extreme contamination of a water body. The likelihood and magnitude of such possible events rises in proportion to a nation's degree of industrialization, especially if those industries involve petroleum refining or chemical manufacturing. Even if the materials are not refined or manufactured within a given nation, their transport by road, rail, or water also presents risks.

In response to these risks, many industrialized countries now have legislative extensive contingency plans for emergency responses to a sudden extensive discharge of a contaminant. Those plans are sometimes financed by taxes on those industries most likely to cause such an event.

b) Examples from National Legislation

Australia (New South Wales): *Except while an order under a severe water shortage is in force, the following rules of distribution apply to the making of an available water determination:*

1. *the rules of priority established by section 58,*
2. *the provisions of any relevant bulk access regime,*
3. *the provisions of any relevant management plan,*
4. *the provisions of any relevant implementation program.*

If satisfied that there is a severe water shortage, either generally or in relation to a particular water management area or water source or particular class of water management areas or water sources, the Minister may, by order published in the Gazette, suspend the operation of the rules of distribution referred to above.

While an order under a severe water shortage is in force, the following rules of distribution apply to the making of an available water determination:

1. *first priority is to be given to:*
   a. the needs of major utilities, local water utilities, irrigation corporations, private irrigation boards and private water trusts (in relation to domestic water supplies), and
   b. the needs of persons exercising basic landholder rights,
2. *second priority is to be given to the needs of the environment,*
3. *third priority is to be given to:*
   a. the needs of major utilities and local water utilities (in relation to commercial water supplies), and
   b. in the case of regulated rivers, the needs of persons holding regulated river (high security) access licenses,
4. *fourth priority is to be given to:*
   a. *the needs of persons holding other categories of access licenses, and*
   b. *the needs of major utilities and local water utilities (otherwise than in relation to domestic and commercial water supplies).*

   Nothing in this section gives rise to a claim for compensation under section 87.

Norway: *For the purpose of this Act, acute pollution means significant pollution that occurs suddenly and that is not permitted in accordance with provisions set out in or issued pursuant to this Act.*

In the event of acute pollution or a danger of acute pollution, the nearest police authority shall be notified immediately. The duty to provide notification pursuant to the first paragraph rests with the person responsible

for the pollution. Other persons also have a duty to provide notification unless this is clearly unnecessary. The pollution control authority may lay down further provisions relating to the notification of acute pollution by regulations or by approval of a contingency plan pursuant to section 41. These may for example lay down that other authorities than the police shall be notified, and that the notification rules shall apply to Norwegian vessels regardless of where they are.

Any person engaged in any activity which may result in acute pollution shall provide the necessary emergency response system to prevent, detect, stop, remove and limit the impact of the pollution. The emergency response system shall be in reasonable proportion to the probability of acute pollution and the extent of the damage and nuisance that may arise.

The pollution control authority may by regulations or individual decision lay down further requirements relating to emergency response systems pursuant to the first paragraph.The emergency response system shall to the extent decided by the pollution control authority be adapted to the municipal and state emergency response systems for acute pollution.

The pollution control authority may by regulations or individual decision lay down that contingency plans shall be submitted for approval for any activity that may result in acute pollution. The plan shall provide guidelines for the action to be taken in the event of acute pollution and shall be updated as necessary. The pollution control authority may lay down further conditions for approval of contingency plans. These may include a requirement for a contingency plan to be coordinated with plans for the response to emergencies other than acute pollution. The pollution control authority may issue orders concerning changes to approved contingency plans and if necessary withdraw its approval.

The pollution control authority may order any person engaged in any activity that may result in acute pollution to cooperate in the provision of an emergency response system. Such orders may include a requirement to draw up a joint contingency plan pursuant to section 41 and to maintain emergency equipment jointly. The pollution control authority may require agreements on the establishment of separate emergency response organizations and other agreements on emergency response systems to be submitted for approval. If there is no agreement, the pollution control authority may make decisions concerning the organization of cooperation on emergency response systems and the distribution of the costs associated with such cooperation.

Municipalities shall provide for the necessary emergency response system to deal with minor incidents of acute pollution that may occur or cause damage within the municipality, and that are not covered by private emergency response systems pursuant to the above sections. The state shall provide for the necessary emergency response system to deal with major incidents of acute pollution that are not covered by municipal emergency response systems pursuant to the first paragraph above or by private emergency response systems pursuant to the above sections. The pollution control authority shall as far as possible ensure that private, municipal and state emergency response systems are coordinated in a national emergency response system.

The pollution control authority may require the submission of municipal contingency plans for approval and may by regulations or individual decision lay down further requirements for municipal emergency response systems. The pollution control authority may by regulations or individual decision order municipalities to cooperate in the provision of emergency response systems for acute pollution, and may make decisions concerning inter-municipal contingency plans and on how the costs shall be split between municipalities.

The King may appoint an action control group to deal with major accidents that may result in acute pollution. The group consists of representatives of the authorities involved and other persons appointed, and its task is to coordinate the efforts of the various authorities to deal with accidents. The group shall evaluate the measures taken by those responsible for dealing with an accident and if necessary wholly or partly assume command of the operation. The King will lay down provisions relating to the composition of the governmental action control group, how it is to be convened, its authority and its activities.

In the event of acute pollution or a risk of acute pollution, the person responsible shall in accordance with section 7 initiate measures to avoid or limit damage and nuisance. If the person responsible does not take adequate measures, the municipality concerned shall take steps to deal with the accident. The municipality

shall notify the state pollution control authority, which will provide the necessary assistance. In the event of major incidents involving acute pollution or a risk of acute pollution, the state pollution control authority may wholly or partly assume command of efforts to deal with the accident.

If there is extensive acute pollution or a risk of such pollution, the pollution control authority shall convene the governmental action control group pursuant to the above section.

During municipal operations pursuant to this chapter, any person that pursuant to the above has a duty to provide an emergency response system shall, if so ordered by the municipality, place at the disposal of the municipality equipment and personnel belonging to the private emergency response system pursuant to the above sections. On request, other municipalities shall provide assistance to the extent possible.

During state-run operations, any person that pursuant to section 40 has a duty to provide an emergency response system and any municipality shall, if so ordered by the pollution control authority, place at its disposal equipment and personnel belonging to emergency response systems pursuant to the above sections. If there is a risk of very serious pollution damage, any person may be ordered to provide materiel or personnel for the purpose of dealing with the accident.The provision of the second paragraph also applies to operations outside the borders of the realm. In such cases, the pollution control authority may also determine that equipment and personnel shall be placed at the disposal of the authorities of any other state to the extent otherwise provided by the second paragraph. Any public authority shall to the extent that it is compatible with its other tasks provide assistance in the event of extensive incidents involving acute pollution.Any person that has provided assistance pursuant to this section is entitled to remuneration in accordance with the provisions of the second paragraph of Sec. 75.

12. What should the plans contain? How should planners plan to manage resources that cross one or more international boundaries?

a) Analytical description

Around the world, there are 261 international drainage basins. More than 200 rivers are shared by two or more nations. How should a country that shares its water resources with another nation plan to use that portion of a water body within it or along its borders? In such instances, domestic law intersects with international law.

The full subject of the legal regimes governing international freshwater use and management, and their intersection with domestic law, is beyond the scope of this Guidebook. Several nations, however, do include in their national water codes directions regarding management of international resources. These nations generally direct their water planners to follow relevant treaties or to consult with water planners in their neighbors, or both.

b) Examples from National Legislation

Armenia: *The norms defined by the present Code are applied over the transboundary water resources originating within the territory of the Republic of Armenia before crossing the state frontier of the Republic of Armenia. The conditions of use and protection of transboundary water resources on the frontier of the Republic of Armenia shall be established by inter-state agreements and (or) treaties between the Republic of Armenia and neighboring countries. Solution of operational problems for joint use and protection of transboundary water resources shall be implemented by permanent inter-state committees. The composition of the Commission of the Republic of Armenia shall be approved by the Prime Minister of the Republic of Armenia.*

The Commission of the Republic of Armenia of Transboundary Water Resources, in cooperation with the corresponding Commissions of neighboring countries, has the following authorities and obligations in implementing the solution of operational problems regarding use and protection of transboundary water resources:

1. *Draws up and submits to the Government drafts of inter-state agreements;*
2. *Draws up and submits to the Government proposals on establishing joint permanent inter-state*

commissions for operation of transboundary water systems;

3. *Informs the authorized bodies of the Republic of Armenia in the established order on the transboundary impacts;*
4 *Presents the decisions of the Permanent Inter-State Committee to the Water Systems Management Body;*
5. *In the established order, submits to the authorized bodies of the Republic of Armenia the issues brought up at the Permanent Inter-State Committee, which are not regulated by inter-state agreements and (or) treaties, and require appropriate solutions;*
6. *In the established order, presents to the authorized bodies of the Republic of Armenia the disputes occurred in the Permanent Inter-State Committee.*

The Republic of Armenia guarantees the publicity of information regarding qualitative and quantitative indices of water in transboundary water resources, using conditions thereof, and the results of negotiations on them between the neighboring parties, measures towards prevention, limitation and reduction of transboundary impacts. The order of providing information shall be established by the Government.

Lithuania: *Bodies of water in border areas and the water resources thereof may be used and economic activities which may have an adverse effect on these bodies of water and their water resources may be carried out in compliance with the international treaties ratified by the Republic of Lithuania.*
In case the international treaties ratified by the Republic of Lithuania contain provisions different from those in this Law, the international treaties shall be applied.

13. What should the plans contain? How should plans be reviewed and adaptively managed?

a) Analytical description

Most national legislation on water planning envisions that planning will be updated regularly. Typically, the required planning intervals are five or seven years. Such a period is generally far shorter than the 10, 20, 30 or 50 year planning horizons that most water planners use. In effect, the statutorily required updates require planners to address the last strategic planning question: "how do we measure our progress along the way?"

To answer that question, planners need to develop a series of mileposts. These mileposts can test the robustness of the planning assumptions and measure the accomplishments in the plan's implementation. As noted above (see Section II. B. 5 [Adequate Data], above), adaptive management is one tool that planners can use to review their progress and make mid-course corrections.

b) Examples from National Legislation

Australia (New South Wales): *Subject to this section, a management plan has effect for 10 years from the date on which it is made. Within the fifth year after it was made, the Minister is to review each management plan for the purpose of ascertaining whether its provisions remain adequate and appropriate for ensuring the effective implementation of the water management principles. Such a review is to be conducted in consultation with the Minister for the Environment.*

The Minister is to ensure that a management plan is audited, at intervals of not more than 5 years, for the purpose of ascertaining whether its provisions are being given effect to. An audit under this section is to be carried out by an audit panel appointed by the Minister in consultation with the Water Management Committee where one exists. In setting terms of reference for the preparation of a management plan to replace an existing management plan, the Minister must have regard to the results of the most recent audit conducted under this section in relation to the existing management plan.

The principles of adaptive management should be applied, which should be responsive to monitoring and improvements in understanding of ecological water requirements.

European Union: *River basin management plans shall be reviewed and updated at the latest 15 years after the date of entry into force of this Directive and every six years thereafter. The first update of the river basin*

management plan and all subsequent updates shall also include:

1. *a summary of any changes or updates since the publication of the previous version of the river basin management plan;*
2. *an assessment of the progress made towards the achievement of the environmental objectives, including presentation of the monitoring results for the period of the previous plan in map form, and an explanation for any environmental objectives which have not been reached;*
3. *a summary of, and an explanation for, any measures foreseen in the earlier version of the river basin management plan which have not been undertaken;*
4. *a summary of any additional interim measures adopted under Article 11(5) since the publication of the previous version of the river basin management plan.*

14. How shall the plan be implemented? What power to make implementing regulations do resource management authorities have ?

a) Analytical description

Most water plans are implemented by a combination of a permit system for water users and dischargers and one or more publicly or privately financed waterworks. These subjects are each treated below. (See Sections II. C [Permit Systems] and II. D. [Waterworks], below.) This Section considers one other implementation tool: the promulgation of regulations to carry out statutory purposes.

Many countries give the ministry charged with water planning or management the authority to promulgate regulations to implement the broader statutory schemes. Most of the statutes that confer such regulatory authority do so simply, in a single short passage.

b) Examples from National Legislation

Mexico: *Producers,companies or business organizations may develop voluntary processes for environmental self-regulation through which they improve their environmental performance, respecting the legislation and regulations in force in the matter and promise to surpass or comply with higher levels, goals or benefits on environmental protection matters. The Secretariat at federal level shall induce or arrange:*

1. The development of appropriate productive processes consistent with the environment, as well as systems for a suitable protection and restoration in the matter agreed upon with industrial organizations, chambers of commerce and other productive activities, producers associations, organizations representing an area or region, scientific and technological research institutions and other interested organizations;

2. The compliance with voluntary standards or technical specifications on environmental matters being stricter than the Official Mexican Standards or including not provided therein, which shall be established by common consent with individuals or with associations or organizations representing them. For such purpose, the Secretariat may encourage the implementation of Official Mexican Standards pursuant to the facts established in the Federal Law on Metrology and Standardization (Ley Federal sobre Metrología y Normalización);

3. The implementation of certification systems for processes or products to induce consumption patterns being consistent with, or that preserve, improve or restore the environment, said systems shall respect the applicable provisions of the Federal Law on Metrology and Standardization (Ley Federal sobre Metrología y Normalización), and

4. Other actions encouraging companies to achieve objectives of the environmental policy and higher than those provided in the established environmental regulations.

Nepal: *His Majesty's Government may frame rules in order to carry out the objectives of this Act. Without prejudice to the generality of the powers conferred,His Majesty's Government may frame rules, in particular, on the following subjects:*

1. *Matters relating to drinking water, irrigation, navigation, industrial and recreational uses and matters related to similar uses of water resources.*
2. *Matters relating to conservation of water resources and the control of flood and soil erosion.*
3. *Matters relating to the conservation of environment.*
4. *Matters relating to fee, charges etc. payable to is Majesty's Government for the utilization of any service related to water resources.*
5. *Matters relating to the pollution prevention of water resources.*
6. *Methods of various uses of water resources.*
7. *Matters relating to the setting of standards of services, generated from the utilization of water resources.*
8. *Matters relating to accident caused by the utilization of water resources and enquiries into such matter and matters relating to compensation thereto.*
9 *Matters relating to users association and other matters related to users including protection and facilities to be provided to the users.*
10. *Other necessary matters relating to the development and utilization of the water resources.*

South Africa: *the Minister may make regulations:*

1. *limiting or restricting the purpose, manner or extent of water use;*
2. *requiring that the use of water from a water resource be monitored, measured and recorded;*
3. *requiring that any water use be registered with the responsible authority;*
4. *prescribing the outcome or effect which must be achieved by the installation and operation of any waterwork;*
5. *regulating the design, construction, installation, operation and maintenance of any waterwork, where it is necessary or desirable to monitor any water use or to protect a water resource;*
6. *requiring qualifications for and registration of persons authorized to design, construct, install, operate and maintain any waterwork, in order to protect the public and to safeguard human life and property;*
7. *regulating or prohibiting any activity in order to protect a water resource or instream or riparian habitat;*
8. *prescribing waste standards which specify the quantity, quality and temperature of waste which may be discharged or deposited into or allowed to enter a water resource;*
9. *prescribing the outcome or effect which must be achieved through management practices for the treatment of waste, or any class of waste, before it is discharged or deposited into or allowed to enter a water resource;*
10. *requiring that waste discharged or deposited into or allowed to enter a water resource be monitored and analyzed, and prescribing methods for such monitoring and analysis;*
11. *prescribing procedural requirements for license applications;*
12. *relating to transactions in respect of authorizations to use water, including but not limited to:*
    a. *the circumstances under which a transaction may be permitted;*
    b. *the conditions subject to which a transaction may take place; and*
    c. *the procedure to deal with a transaction;*
13. *prescribing methods for making a volumetric determination of water to be ascribed to a stream flow reduction activity for purposes of water use allocation and the imposition of charges;*
14. *prescribing procedures for the allocation of water by means of public tender or auction; and*
15. *prescribing:*
    a. *procedures for obtaining; and*
    b. *the required contents of, assessments of the likely effect which any proposed license may have on the quality of the water resource in question.*

Regulations made under the above subsection may:

1. *differentiate between different water resources and different classes of water resources;*
2. *differentiate between different geographical areas; and*
3. *create offences and prescribe penalties.*

Regulations made under the above subsections may contain:

1. *general provisions applicable to all waste; and*
2. *specific provisions applicable to waste with specific characteristics.*

When making regulations,the Minister must take into account all relevant considerations, including the need to:

1. *promote the economic and sustainable use of water;*
2. *conserve and protect water resources or, instream and riparian habitat;*
3. *prevent wasteful water use;*

4. facilitate the management of water use and waterworks;
5. facilitate the monitoring of water use and water resources; and
6. facilitate the imposition and recovery of charges.

C. Implementing the national water strategy: controlling diversions and discharges

A permit system underlies most national legislation designed to control diversions and discharges. Although the details differ widely among different national permit systems, they generally contain provisions on the following eight topics:

- Identification of the uses requiring a permit;
- Identification of the permitting authority and its powers;
- Description of the application requirements;
- Description of the application review process;
- Description of a permitee's rights and obligations;
- Identification of a permit's duration and conditions for renewal;
- Identification of the legal consequences for failure to obtain a permit and for violation of a permit's requirements;and
- Identification of the process for obtaining review of a permitting authority's decisions.

As addressed below, many codes add additional provisions on a wide range of topics.

1. What is the basis of public authority over water resources?

a) Analytical description

In any country, the particular methods available to implement a national water strategy depend on both the scope of governmental authority over water resources and the extent to which that country's laws protect existing private or communal rights to use water. Where a nation's constitutional and statutory provisions assert full national dominion over its water resources, all water users can be subsumed under the national diversion and discharge permit system. Where, however, a nation's constitution or statutes protect existing private or communal rights to use water, a variety of legal, practical, political, and financial challenges face limit the degree to which a permit system can implement the national water strategy.

For example, in some common law countries, including large portions of the United States, ownership of riparian lands includes with it the rights to use on those lands an equitable share of water taken from the adjoining water body. Because these rights are considered "part and parcel" of the adjoining land, they both pre-date the permitting systems and lie outside the permitting authority's jurisdiction.

The existence of such rights inevitably impacts the shape of the applicable water strategy. At a minimum, it increases the uncertainty that water planners, water managers, and other water users face, as riparian rights are generally unquantified and not subject to the monitoring and reporting provisions required of permit holders.

Of course, these riparian rights can be abolished or transformed by legislation, as has indeed happened in many jurisdictions. Such legislative action, however, would raise substantial political, legal, and practical challenges. Even assuming that these challenges can be answered, a financial challenge might also arise: under many constitutions, such legislation might trigger obligations to compensate the riparian rights holders of the abolished rights. In sum, in a country with such limits on sovereign authority and such pre-existing private rights, a permit system might still leave major portions of the national water strategy unfulfilled.

In response to issues like these, many nations have enacted specific provisions to address the scope of governmental authority over water, and the manner in which rights to use water may be obtained. Such provisions generally do two things. First, they assert some form of either national ownership of, sovereignty over, or fiduciary responsibility for most, if not all, the water found within its borders. (See also Section II. A. 4 [Included Waters], above.) Second, they restrict water rights to those recognized by the code. While many codes do allow some uses to occur without permits (see Section II. C. 2 [Uses Not Needing Permits], below), for the most part, these are minor. Most codes require formal permission from a competent governmental authority for water diversions or discharges.

b) Examples from National Legislation

Jordan: *All water resources available within the boundaries of the Kingdom, whether they are surface waters, regional waters, rivers or internal seas are considered State owned property and shall not be used or transferred except in compliance with this Law.*

Philippines: *The underlying principles of this code are:*
1. *All waters belong to the State.*
2. *All waters that belong to the state can not be the subject to acquisitive prescription.*

The following belong to the state:
1. *Rivers and their natural beds;*
2. *Continuous or intermittent waters of springs and brooks running in their natural beds and the beds themselves*
3. *Natural lakes and lagoons;*
4. *All other categories of surface waters such as water flowing over lands, water form rainfall whether natural or artificial, and water from agriculture runoff, seepage and drainage;*
5. *Atmospheric water;*
6. *subterranean or ground water; and*
7. *Seawater.*

The following waters found on private lands also belong to the States:
1 *Continuous or intermittent waters rising on such lands;*
2. *Lakes and lagoons naturally waters rising on such lands;*
3. *Rain water and falling on such lands;*
4. *Subterranean or ground waters; and,*
5. *Waters in swamps and marshes.*

South Africa: *As the public trustee of the nation's water resources the National Government, acting through the Minister, must ensure that water is protected, used, developed, conserved, managed and controlled in a sustainable and equitable manner, for the benefit of all persons and in accordance with its constitutional mandate. Without limiting the above, the Minister is ultimately responsible to ensure that water is allocated equitably and used beneficially in the public interest, while promoting environmental values. The National Government, acting through the Minister, has the power to regulate the use, flow and control of all water in the Republic.*

2. Are there some rights to use water that do not need a permit?

a) Analytical description

Many codes allow certain uses to occur without the need for an individual permit. These tend to be for a household's or a village's domestic uses, including drinking water, gardening and livestock watering. Other commonly exempt uses include firefighting and some types of water-based recreation.

These exemptions recognize that these uses, particularly the domestic uses, are likely to be traditional uses that date back centuries or even millennia. For such communal users, permit requirements would likely be seen as particularly mettlesome, if not outright irrelevant. And because these uses have existed for a long time, their impacts are likely already known and quite often are minor. Indeed, the very longevity of such traditional uses suggests that they may exemplify sustainability, at least at the local level.

While these exemptions may well reflect wise policy judgments by legislators, at some point, their impacts on a given water body may no longer be minor. At such a point, like the riparian rights described above (see Section II. C. 1 [Public Authority],) they will create gaps in planners' knowledge of ongoing water uses, and limits on managers' abilities to ensure the sustainable development of the affected watershed.

Legislators, planners and managers need to anticipate such situations. They need to identify ways to accommodate the traditional rights while assuring that planners and managers have the information and tools they need to ensure the watershed's overall sustainable development.

For example, legislators might identify some triggers or threshold levels when traditional uses become subject to specific requirements. These could start with simple

monitoring and reporting requirements, and perhaps phase in other obligations as uses or impacts increase. The provision of new equipment, such as pumps, whether paid from public funds or from development agency grants or loans, will likely be essential to assuring willing participation.

For their parts, planners and managers should simply start with dialogue to develop working relationships with the traditional users. Such dialogue will allow the professional planners and managers to share in the local understanding of the watershed and its interdependent resources. At the same time, planners and managers can begin to share their own ideas for how the users might obtain more benefits from the watershed's resources while assuring the sustainable integration of all the uses.

b) Examples from National Legislation

Albania: *Everyone has the right to use the surface water resources freely for drinking and other domestic necessities and for livestock watering without exceeding its use beyond individual and household needs and in compliance with relevant laws and plans of the basin councils. Everyone has the right to use banks freely for bathing and water sports. Everyone has the right to use precipitating waters falling on private land provided that water is not collected by artificial installations. The water authorities may restrict the free use of water over the all country or in particular areas during periods of water shortage, water quality damage or spread of waterborne diseases.*

Philippines: *The owner of the land where the water is found may use waters found on private lands, belonging to the States for domestic purposes without securing a permit, provided that such use shall be registered, when required by the Council. The Council, however, may regulate such use when there is wastage, or in times of emergency. Subject to the provisions of this Code, any person who captures or collects water by means of cisterns, tanks, or pools shall have exclusive control over such water and the right to dispose of the same.*
Subject to the provisions of this Code concerning the control, protection, conservation, and regulation of the appropriation and use of waters,any person may appropriate or use natural bodies of water without securing a water permit for any of the following.

1. *Appropriation of water by means of hand carried receptacles; and*
2. *Bathing or washing, watering or dipping of domestic or farm animals, and navigation of watercrafts or transportation of logs and other objects by flotation.*

3. What uses may be permitted?

a) Analytical description

When addressing diversions from a water body, water codes uniformly require permit holders and applicants to demonstrate that they are, or will be, putting the water to a "beneficial use." Some codes simply state that requirement generically. More frequently, codes list specific beneficial uses. Sometimes these lists are exclusive, other times they are merely illustrative.

Similarly, when addressing discharges into a water body, water codes identify the types of discharges that need a license. Some codes simply require permits for all discharges. Others provide exclusive or illustrative lists.

Legislators and regulators need to give attention to two water-related activities that sometimes escape traditional permitting systems. The statutory scheme needs to clarify that land drainage and wetland filling are within the permitting authorities'jurisdiction. These uses are at the interface of land use and water uses; their inclusion is an essential step towards an integrated water resource management system.

b) Examples from National Legislation

Russian Federation: *Purposes and Ways of Utilization of Bodies of Water Bodies of water may be utilized for the following purposes:*

1. *drinking, everyday and household water supply;*
2. *public health care; - power and other industries;*
3. *agriculture;*
4. *forestry;*
5. *hydropower industry;*
6. *recreation;*
7. *transport;*
8. *construction;*
9. *fire safety;*
10. *fishing industry;*
11. *hunting industry;*
12. *timber rafting;*
13. *extraction of minerals, peat and sapropel;*
14. *other purposes.*

Utilization of bodies of water may be effected with the withdrawal of water resources (intake of water) or without withdrawal of water resources (drainage, utilization as waterways, and the like). Bodies of water or part thereof may be made available for use to satisfy one or more purposes, to one or more users of water. The specific ways of utilization of bodies of water for certain purposes shall be determined by Federal laws, in conformity with water legislation of the Russian Federation.

4. Do some uses enjoy a priority over others?

a) Analytical description

Provisions addressing the prioritization of uses can appear in one or more of several areas in a water code. Some countries include them in the general principles with which they frame the interpretation or implementation of their codes. (See Section II. A. 3 [General Principles], above.) Others place them in their water planning sections. (See Section II. B. 6 [Allocation Principles], above.) Finally, others add them to the considerations governing review of specific permit applications.

As with much water legislation, these provisions can run the gamut from the simple to the complex. Commonly encountered provisions grant highest priorities to direct human consumption. As between competing applications with similarly valued uses, temporal priority may give the nod to one of the applicants. In such situations, the first filed application will prevail over subsequently filed applications.

Historically, water codes granted priorities solely for one or more types of diversions. More recently, codes have begun to include instream environmental uses within their priority systems. These recent steps should be continued and extended.

b) Examples from National Legislation

Australia (New South Wales): *There are the following categories of access license:*

1. *local water utility access licenses,*
2. *major utility access licenses,*
3. *domestic and stock access licenses,*
4. *regulated river (high security) access licenses,*
5. *regulated river (general security) access licenses,*
6. *regulated river (supplementary water) access licenses,*
7. *unregulated river access licenses,*
8. *aquifer access licenses,*
9. *estuarine water access licenses,*
10. *coastal water access licenses,*

11. such other categories of access license as may be prescribed by the regulations.
2. regulated river (high security) access licenses have priority over regulated river (general security) access licenses and regulated river (supplementary water) access licenses,
3. regulated river (general security) access licenses have priority over regulated river (supplementary water) access licenses.

If one access license (the higher priority license) has priority over another access license (the lower priority license), then if the water allocations under them have to be diminished, the water allocations of the higher priority license are to be diminished at a lesser rate than the water allocations of the lower priority license.
Except while an order under a severe water shortage is in force, the following rules of distribution apply to the making of an available water determination:
1. the rules of priority established by section 58,
2. the provisions of any relevant bulk access regime,
3. the provisions of any relevant management plan,
4. the provisions of any relevant implementation program.

If satisfied that there is a severe water shortage, either generally or in relation to a particular water management area or water source or particular class of water management areas or water sources, the Minister may, by order published in the Gazette, suspend the operation of the rules of distribution referred to above.
While an order under a severe water shortage is in force, the following rules of distribution apply to the making of an available water determination:
1. first priority is to be given to:
a. the needs of major utilities, local water utilities, irrigation corporations, private irrigation boards and private water trusts (in relation to domestic water supplies), and
b. the needs of persons exercising basic landholder rights,
2. second priority is to be given to the needs of the environment,
3. third priority is to be given to:
a. the needs of major utilities and local water utilities (in relation to commercial water supplies), and
b. in the case of regulated rivers, the needs of persons holding regulated river (high security) access licenses,
4. fourth priority is to be given to:
a the needs of persons holding other categories of access licenses, and
b. the needs of major utilities and local water utilities (otherwise than in relation to domestic and commercial water supplies).

***Canada (British Colombia):** Except as otherwise provided below, the respective rights exercisable under 2 licenses authorizing the diversion of water from the same stream have precedence in law according to the respective priorities of the dates from which the licenses take precedence as set out in them. The respective rights exercisable under 2 licenses taking precedence from the same date have precedence in law according to the ranking of the respective purposes for which water is authorized to be used under the licenses respectively, and the ranking of the several purposes for which water may be used under licenses are, from highest rank to lowest rank: domestic, waterworks, mineral trading, irrigation, mining, industrial, power, hydraulicking, storage, conservation, conveying and land improvement purposes. The rights exercisable under 2 licenses taking precedence from the same date and authorizing the diversion of water from the same stream for the same purpose have equal precedence in law.*

***Mexico:** In the issuance of grants, the Commission may decide to award certain waters on the basis of bidding, when various competing interests are anticipated. When water is not reserved in accordance with the above, the Commission may award the concession to the first applicant. If various applicants come forward simultaneously, the Commission may select the application that offers the best terms and conditions.*

5. What information must a permit applicant provide in its application?

a) Analytical description

Water codes differ in the degree of specificity with which they identify the required contents of an application to divert or discharge. Some simply require applicants to provide whatever information is required by the permitting authority's regulations. Others list specific required elements.

For those codes that do specify particular elements, of particular relevance to this Guidebook are those that require information on impacts on other uses. Most frequently, information is required about impacts on other water diverters. Increasingly, information is required about impacts on environmental values. Sometimes this is done by a simple cross-reference to documentation otherwise required by national environmental review legislation. Least frequent of all are requirements that an applicant address impacts on third parties other than other diverters.

A code's failure to require an applicant to supply environmental or third-party impact within the application packet itself does not, of course, mean that such impacts will not be considered. For starters, assuming sufficient authority (see Section II. B. 14 [Implementing Regulations], above) the responsible ministry may promulgate regulations to require such information within the application materials. In addition, environmental and third-party impacts will likely be considered during the ministry's review of the application. (See Sections II. C. 7 [Environmental and Public Health], and II. C. 8 [Social], below.) But inclusion of such requirements "up front," within the application packet itself, clarifies that these are matters that applicants must consider before they apply, not mere afterthoughts that might arise during the review. In addition, they make clear to the permitting authorities themselves the importance that the legislature puts on these values, and ensures that they will not be completely overlooked during the review.

b) Examples from National Legislation

Mexico: *The application for a concession must contain:*

1. *Name and address of applicant;*
2. *Basin, region and locality to which the application refers,*
3. *The site from which national water is to be extracted,*
4. *The volume of consumption required,*
5. *The initial use to which the water will be put, without prejudice to the second paragraph of Article 25,*
6. *The point of discharge, with the quantity and quality conditions,*
7. *The project of the works to be carried out or features of existing works for the extraction and use of the water, as well as those for discharge; and*
8. *The period for which the concession is sought.*

Mongolia: *Citizens, economic entities and organizations shall submit their requests for water use for commercial purposes to the Soum and Duureg Governors. The request provided for shall include the following items:*

1. *a map indicating the water source to be used and its location;*
2. *the amount of water to be used and duration of use;*
3. *an environmental impact assessment;*
4. *drawings and proposals for water facilities;*
5. *production capacity, as well as basic technical and economic indications.*

South Africa: *An application for a license for water use must:*

1. *be made in the form;*
2. *contain the information; and*
3. *be accompanied by the processing fee, determined by the responsible authority.*

A responsible authority:

1. *may, to the extent that it is reasonable to do so, require the applicant, at the applicant's expense, to*

obtain and provide it by a given date with:

a. *other information, in addition to the information contained in the application;*
b. *an assessment by a competent person of the likely effect of the proposed license on the resource quality; and*
c. *an independent review of the assessment furnished in terms of subparagraph (b), by a person acceptable to the responsible authority;*
2. *may conduct its own investigation on the likely effect of the proposed license on the protection, use, development, conservation, management and control of the water resource;*
3. *may invite written comments from any organ of state which or person who has an interest in the matter; and*
4. *must afford the applicant an opportunity to make representations on any aspect of the license application.*

A responsible authority may direct that any assessment under subsection (1)(b) must comply with the requirements contained in regulations made under section 26 of the Environment Conservation Act, 1989 (Act No. 73 of 1989).

6. How should National Water Strategy elements be considered in the permitting process?

a) Analytical description

Most countries that have a formal water planning process require consideration of plan elements by permitting authorities. Such a consideration would seem to be self-evident, since the permitting process is one of the principal governmental tools available to ensure that the plans are implemented. But as ministries get bureaucratized, work done in the planning department may not be given the requisite attention by the permitting department. This is especially true if the planners and the permitters are located in different parts of the country. It is even more likely to occur in countries where the water planning body is not the same ministry as the water permitting authority.

It is critical that planners and permitters "be on the same page." For the most part, water resource planners operate at a macro level: the big picture is their focus. In contrast, water permitters operate at a micro level: the specific application is their focus. These two perspectives, however, are interdependent; each has an essential role to play in directing the nation's sustainable development. A simple legislative requirement that permitting authorities reconcile their decisions with the plan's overall directions, explaining any inconsistencies, will help close the loop between the two activities.

b) Examples from National Legislation

Armenia: *When determining whether to issue a water use permit, the Water Resources Management and Protection Body shall use criteria including the:*

1. *Requirements of this Code The "National Water Policy", "National Water Program", relevant "Water Basin Management Plans" and other legal acts;*
2. *Direct and cumulative impacts of the proposed water use to the national water reserve, water quality and quantity;*
3. *Correspondence of the proposed water use with water allocation priorities and significance;*
4. *Potential impact of pending water use permit on the water use rights of existing water use permit holders;*
5. *Social, economic and environmental impacts;*
6. *Opinions resulting from public notification process;*
7. *Compliance with the international agreements of the Republic of Armenia.*

When considering applications for water use permits,the Water Resources Management and Protection Body shall consider the following criteria to establish priority and equitable allocation of limited water resources to competing stakeholders:

1. *The maintenance and enhancement of human welfare and ecological health shall be given the first priority (as indicated by the national water reserve) thus providing first priority of drinking water supply and sanitation;*
2. *Persons with a historic, non-extractive interest in the use of water resources within a natural stream-bed shall be given second priority;*

3. *Applications for water use providing maximum benefits for the public interest shall be given third priority; and,*
4. *Persons offering specific evidence of their taking active measures related to the efficient use of water and protection of water quality shall be given higher priority.*

All water application and extraction shall be used only for the purposes stated in the water use permit and not exceed the quantity reasonably required for efficient use as determined by the Water Resources Management and Protection Body All waters systems shall be used in a manner that ensure efficient water use.

Australia (Queensland): *In deciding whether to grant or refuse the application or the conditions for the water license, the chief executive must consider the following—*

1. *any water resource plan and resource operations plan that may apply to the license;*
2. *any information about the effects of taking, or interfering with, water on natural ecosystems;*
3. *any information about the effects of taking, or interfering with, water on the physical integrity of watercourses, lakes, springs or aquifers;*
4. *policies developed in consultation with local communities for the sustainable management of local water;*
5. *the sustainable resource management strategies and policies for the catchment, including, any relevant coastal zone;*
6. *the public interest.*

7. How should environmental and public health consequences of granting a permit be considered in the permitting process?

a) Analytical description

The principal purpose of waste discharge permits is to ensure that environmental and public health impacts are considered before a discharge may occur. By definition, then, codes that set up waste discharge permit systems require the consideration of such impacts. (See Section II. B. 10 [Pollution Prevention], above.) The relevant codes differ only in their degree of specificity. In many developed nations, especially those with substantial chemical manufacturing or petroleum refining, or industries with similar potentials to discharge large volumes of contaminants, code provisions tend to be very specific about the kinds and levels of pollutants that may be discharged and the circumstances in which discharges may occur. In addition, they tend to impose strict monitoring and reporting requirements, and frequently mandate the use of specific discharge control technologies. Moreover, industries with highly toxic discharges may be required to make contingency plans for clean-ups. (See Section II. B. 11 [Emergencies], above.) Other codes defer largely to the ministries to promulgate regulations.

For water diversion permits, the codes exhibit a wider range of requirements for the consideration of such impacts. As noted above, some statutes require the applicant to provide environmental information as part of the application package. In such cases, the code need do more than require the permitting authorities to ensure the adequacy of the information provided. Many codes, however, are noticeably silent about environmental and public health impacts of a proposed diversion. This may be in part because environmental review statutes not otherwise part of the water code may independently determine the scope of environmental matters that must be considered. Other codes require some consideration of such impacts. A few specify a variety of impacts that need to be addressed. Even this last group of statutes leaves substantial discretion to permitting authorities to determine the scope of the impacts that will be considered.

The preceding discussion has focused on negative environmental impacts of potential diversions or discharges. Permitting authorities should also consider any positive environmental benefits. For example, these might occur where diversions are used to restore wetlands or floodplain habitat, or to recharge overdrafted aquifers in danger of subsidence or loss of riparian vegetation. In addition, relative environmental benefits should be considered when a permitting authority is faced with competing applications.

b) Examples from National Legislation

Lithuania: *No permits for use of the water resources shall be issued if no measures are provided for sustainable use of water, for appropriate protection of water bodies from pollution, for ensuring suitable conditions for aquatic flora and fauna or if the interests of other users of water are violated. In submitting information to obtain a permit for the use of water resources a water user must estimate and indicate the amount of water needed by the subscribing users as well as the amount and pollution of waste water discharged by subscribing users.*

8. How should social consequences of granting a permit be considered in the permitting process?

a) Analytical description

Surprisingly few codes expressly require permitting authorities to consider the social impacts of proposed diversions or discharges. Most do require an assessment of impacts on other water users. But these impacts are generally limited to the impacts on the water quantity or quality available to other diverters. Other impacts on a community, however, may escape consideration.

Three examples can illustrate the wide range of potential community impacts. For example, a proposed diversion might impact an indigenous community's religious values or practices. Another might impact a subsistence economy. Finally, an existing diverter's request to change a use from an agricultural to an industrial use might impact the agricultural laborers and the families they feed.

In theory, these impacts could be considered under statutes that broadly require permitting authorities to "consider the impacts on others." But without specific direction from the legislature, permitting authorities may be reluctant to extend their review to such matters. In some cases, this reluctance might be overcome by provisions requiring public notice of a permit application and an opportunity for public comment. Assuming the impacted communities received the notice and were able to respond to it effectively, their voices might at least be heard by the permitting authorities. But under some statutes, permitting authorities might conclude that non-rights holders lacked standing to raise their concerns. And absent legislative direction, even willing permitting authorities lack any guidance on the relative importance of these impacts vis-à-vis other potential costs and benefits of a proposal.

The preceding discussion has focused on negative social impacts of potential diversions or discharges. Permitting authorities should also consider the positive social benefits, particularly on historically marginalized communities, of a particular application to divert or discharge. This is particularly true when the applicants are members of such communities.

Social considerations are as essential an element of sustainable development as economic and environmental considerations. Legislatures should formally recognize this by enacting statutes that integrate these values into the permit review process. A few countries do provide examples of how this might be done.

b) Examples from National Legislation

Philippines: *In determining whether to grant or deny an application,the Council shall consider the following: protests filed, if any; prior permits granted; the availability of water; the water supply need for beneficial use; possible adverse effects; land-use economics; and other relevant factors.*

South Africa: *In issuing a general authorization or license a responsible authority must take into account all relevant factors, including:*

1. *existing lawful water uses;*
2. *the need to redress the results of past racial and gender discrimination;*
3. *efficient and beneficial use of water in the public interest;*
4. *the socio-economic impact:*
   a. of the water use or uses if authorized; or
   b. of the failure to authorize the water use or uses;

Zimbabwe: *Whenever an order or other decision of a catchment council in respect of an application for a permit to use water for an irrigation scheme or any other matter is likely, in the opinion of the catchment*

council, substantially to affect the supply of water for primary purposes of the occupants of any Communal Land, the order or other decision shall not take effect unless the approval of the Minister responsible for the administration of the Communal Land Act (Chapter 20:04), has first been obtained.

9. How should use efficiency be considered in the permitting process?

a) Analytical description

Surprisingly few countries expressly make efficiency of an applicant's proposed use a specific criteria for the evaluation of an application to divert or discharge. For some countries, this absence may be explained by references found elsewhere in the code, such as in the general principles or in the planning provisions. (See Sections II. A. 3 [General Principles], II. B. 6 [Allocation Principles] and II. B. 8 [Management Strategies], above.) The importance of efficiency to sustainable development, however, warrants specific inclusion in the application review process. Statutes should specifically direct permitting authorities to not only consider efficiency within the application review process, but also to impose conditions upon successful applicants that can encourage even further efficiencies. (See Section II. C. 12 [Permitee's Rights and Duties], below.)

One area requires special attention. Where permitees voluntarily invest in water-saving equipment, techniques, or manufacturing processes, questions will arise over their entitlement, if any, to the water they have saved. Few codes address this issue. On the one hand, allowing the permitee to sell some or all of the saved water to another user provides an incentive for such voluntary investments. (See Section II. C. 17 [Changes in Use], below.) On the other hand, if that water is no longer needed for beneficial use, arguably it is not within the scope of the permission granted. Under this perspective, it should "return" to the watershed pending an application by the would-be transferee. Resolution of these issues will turn in large part on the value a country places on encouraging market-type incentives.

b) Examples from National Legislation

United States of America (Maryland):

(a) When applying for a new or expanded water appropriation permit or State financial assistance, public water systems shall include a description of best management practices currently in use, or to be implemented, for improving water conservation and the efficiency with which water is used, treated, stored, and transmitted. The application shall also include a schedule for the implementation of best management practices.

(b) Best management practices may include the following:

(1) Practices designed to measure the amount of water conveyed through the system's infrastructure to water users, such as universal metering;
(2) Audits of large-volume users;
(3) Reuse and recycling of water for nonpotable, nonresidential applications;
(4) Management of system pressure to reduce usage;
(5) Retrofit programs;
(6) Efficiency in landscape design and irrigation techniques;
(7) Wastewater reclamation and recycling programs;
(8) Fixture replacement programs;
(9) Water and wastewater pricing structures that encourage improved efficiency;
(10) Rebates and other financial incentives;
(11) An education program for users designed to promote increased efficiency conservation;and
(12) Promotion or adoption of local water-use ordinances that encourage water conservation.

10. How should public and private stakeholders be integrated into the permitting process?

a) Analytical description

Unlike the more extensive provisions addressing public participation in the water planning process (Section II. B. 3 [Stakeholder Involvement in Planning], above), far fewer provisions address stakeholder participation in the permitting process. As for private sector stakeholders, most codes require some form of public notice, but few require more than a newspaper advertisement or a written notice to potentially impacted rights holders. As for public sector stakeholders, some statutes identify the interested or affected ministries and other governmental entities who

need to be consulted on particular applications. But many leave it to regulations or to informal processes to identify the public entities who should be consulted.

As with planning processes (Section II. B. 3 [Stakeholder Involvement in Planning], above), stakeholder involvement in permitting decisions can be seen by both the permit applicant and the permitting authority as a time consuming distraction at best and an intrusion or disruption at worst. Yet many of the same benefits can accrue here as well, albeit on a more focused scale. Adequate stakeholder involvement can help ensure that the permitting authorities have considered relevant matters that may have been overlooked by the applicant or ministerial officials. Timely and well-founded objections can lead a permit applicant to reconceive the proposed diversion or discharge, often resulting in a project that better meets a wider range of interests. Finally, public participation in an open and transparent process can build public awareness of the regulatory challenges and opportunities and public confidence in the permitting authorities and the system itself. In turn, this public education and confidence can help ensure more thorough implementation of permit requirements.

b) Examples from National Legislation

Canada (British Colombia): *A person who applies for a license must comply with the directions of the comptroller or the regional water manager with respect to filing the application, giving notice of it by posting, service or publication and paying the prescribed fees.*
A licensee,riparian owner or applicant for a license who considers that his or her rights would be prejudiced by the granting of an application for a license may, within the prescribed time,file an objection to the granting of the application.The comptroller or the regional water manager has authority to decide whether or not the objection warrants a hearing, and he or she must notify the objector of his or her decision. If the comptroller or the regional water manager decides to hold a hearing, the applicant and objectors are entitled to be notified, to be heard and to be notified of his or her decision following the hearing.

South Africa: *A responsible authority may, at any stage of the application process, require the applicant:*

1 *to give suitable notice in newspapers and other media:*
   a. *describing the license applied for;*
   b. *stating that written objections may be lodged against the application before a specified date, which must be not less than 60 days after the last publication of the notice;*
   c. *giving an address where written objections must be lodged; and*
2. *containing such other particulars as the responsible authority may require;*
3. *to take such other steps as it may direct to bring the application to the attention of relevant organs of state, interested persons and the general public; and*
4. *to satisfy the responsible authority that the interests of any other person having an interest in the land will not be adversely affected.*

11. What elements should the permit contain?

a) Analytical description

Statutory treatment of required elements of a permit mirrors treatment of required elements of a permit application. (Section II. C. 5 [Permit Applications], above.) That is, some statutes are silent, some are general, and a few are detailed.

The example set forth below illustrates general permit terms. The next section addresses more specific conditions that may be imposed upon permitees. (Section II. C. 12 [Permitee's Rights and Duties], below.)

b) Examples from National Legislation

South Africa: *A license contemplated in this Chapter must specify:*

1. *the water use or uses for which it is issued;*
2. *the property or area in respect of which it is issued;*
3. *the person to whom it is issued;*
4. *the conditions subject to which it is issued;*
5. *the license period, which may not exceed forty years; and*
6. *the review periods during which the license may be reviewed under section 49, which must be at intervals of not more than five years.*

12. What are a permitee's rights and duties under the permit?

a) Analytical description

Statutes address a permitee's rights and duties in one or both of two ways. Some statutes detail the conditions that either can or must be imposed as permit conditions. Other statutes simply set out a permitee's general rights and duties. Many of the latter types of provisions may be set out as part of the code's general principles. (See Section II. A. 3 [General Principles], above.)

Where a permitting authority has developed permit-specific conditions on the time, place, or manner of diversion or discharge, or the uses that may be made of the diverted waters, these should be set out within the permit itself. Such express terms clarify for the permitee, the enforcement officials, the courts, and for the general public, the specific obligations imposed. Inclusion of any of the more general obligations imposed by the code probably does no real harm. While boilerplate language is frequently ignored, were a dispute to arise, it would be convenient for all to have a single statement of applicable code duties attached to the permit itself.

b) Examples from National Legislation

Germany: *The permit and the approval can be granted subject to the setting of terms and conditions for usage. Conditions shall also be permissible in order to prevent negative effects for third parties or to compensate for these. Furthermore conditions can also be used for the following, in particular:*

1. *to arrange for measures to monitor or to determine the condition prior to the usage and damage and negative effects resulting from usage,*
2. *to prescribe the commissioning of responsible plant delegates provided that the commissioning of a pollution control delegate is not prescribed under Article 21a or cannot be arranged,*
   a. *to arrange measures that are required to compensate for damage to the physical, chemical or biological properties of the water as a result of the usage,*
3. *to impose on the entrepreneur appropriate contributions to the costs for measures that a body under public law introduces or intends to introduce in order to prevent or compensate for damage to the general well-being associated with the usage.*

Russian Federation: *In the utilization of bodies of water, users of water shall have the following rights:*

1. *to effect water use in conformity with RF water legislation;*
2. *to obtain, in the established manner, information on the state of bodies of water required for effecting their activity;*
3. *to exercise other rights, as provided for by RF water legislation.*

Users of water shall have the duty:

1. *to make rational use of bodies of water, to comply with the conditions and requirements established in the water-use license and the contract for the use of a body of water;*
2. *to prevent violation of the rights of other users of water, and also infliction of harm on human health or damage on the natural environment;*
3. *to prevent a worsening in the quality of surface and subsurface waters, the habitat of denizens of the animal and vegetable kingdom, and also infliction of damage on economic and other facilities;*
4. *to maintain in a state of repair purification, hydrotechnical and other water-management structures and technical devices;*
5. *to inform, in the established manner, the respective organs of state power of accidents and other states of emergency having an influence on the condition of bodies of water;*
6. *to effect measures in due time on the prevention and removal of accidents and other states of emergency having an effect on the condition of bodies of water;*
7. *to abide by the rules of protection of human life on bodies of water;*
8. *to keep, in the established manner, records of waters taken in, utilized and drained, of the quantity of polluting substances therein, and also to conduct systematic observations of bodies of water and their water-protection zones, and to make available the aforesaid information free of charge and within the established periods to the expressly authorized state organ of administration in the utilization and protection of the water stock and, for subsurface bodies of water, also to the state organ of administration in the utilization and protection of the subsoil;*
9. *to make payments arising from the use of bodies of water in due time;*
10. *to comply with the established regime in the utilization of water-protection zones;*

11. to effect other measures in the protection of bodies of water;
12. to fulfill other duties, as provided for by RF water legislation.

13. What fees should permitees be charged for the right to di vert or discharge?

a) Analytical description

Two permit requirements involving financial matters deserve specific mention. One involves the fees charged to permitees. This section addresses that topic. The second involves the tariffs that permitees can charge their own customers. The following section addresses that topic. (Section II. C. 14 [Tariffs], below.) (Additional statutes deal with waterworks financing. They are addressed in Section II. D. 2 [Waterworks Financing], below.)

The fees charged permitees fall into two categories. The first involves application fees. These are best viewed as processing fees. They provide a revenue stream to the ministry to offset the staff costs associated with the permit review process. These fees modestly advance sustainable development goals by augmenting the ministry's budget. If, however, they are set too high, they may be counterproductive: water diverters or dischargers may simply choose to risk any consequences of noncompliance and ignore the permitting requirements entirely. A graduated fee schedule, based on the scope of the diversion or discharge, or the applicant's ability to pay, is one solution to this challenge.

Of more interest to sustainable development goals is the second category. These include fees that are charged permitees for the rights to divert or discharge themselves. Often these are assessed annually.

Diversion and discharge fees can promote sustainable development goals in several ways. For example, they provide an economic incentive for diverters or dischargers to use the water resources as efficiently as possible. This is especially true if the fees increase in proportion to the volume of water diverted or discharged. In addition, to the extent that these fees are allowed to be passed on to any ultimate consumers, similar incentives for efficient use arise. Finally, they can provide a substantial revenue stream to the public treasury. Such funds can be dedicated by statute to water resources planning activities, water management programs, or permit enforcement efforts.

As with license application fees, social equity values should be considered when diversion or discharge fees are set. That is, an applicant's ability to pay, its membership in a historically marginalized community, and the intended use are three factors that might justify at least a temporary reduction in diversion or discharge fees.

b) Examples from National Legislation

Armenia: *The baselines for water use permit fee shall be:*
1. *Volume, quality and regime of water withdrawn from the water resource;*
2. *Volume of manufactured production, rendered services, completed works that were performed without water intake from the water resource;*
3. *Used surface of the water resource;*
4. *Purposeful or non-purposeful use of the water resource based on the qualitative and quantitative water characteristics;*
5. *Volume and quality of wastewater discharges into the water;*

To increase water use efficiency and improve water quality, as well as to raise the interest of water users, the water use permit fees retained from individual water use permit holders can be different given such factors as:
1. *The quality of water withdrawn from and the discharged into the water resource in comparison with the quality of the water resource into which water is discharged, as well as the profit of the person holding water use permit;*
2. *The costs of monitoring;*
3. *The quantity of water withdrawn; and,*
4. *Possible impacts on the quality and quantity of the water and risks and restoration costs associated with it.*

Should water use be in the public interest and be it in conformity with the requirements of this Code, the Water Resources Management and Protection Body may propose to lower permit fees as necessary or otherwise offer financial assistance to promote economic development and investments. The environmental fees prescribed in this Code shall be based on:

1. The composition, quantity, quality and characteristics of discharged wastewaters;
2. The type and level of impact of wastewaters on water resources;
3. The ecological condition of the water resource accepting such wastewaters;
4. The required level of monitoring of water use.
A state duty shall be paid for acquiring a water use permit and water system use permit in the order and the amounts established by the law.

Canada (British Colombia): *The Lieutenant Governor in Council may, by regulation, establish a tariff of the fees, rentals and charges payable in respect of applications, petitions, claims, complaints, proceedings, licenses, approvals, permits and other things filed, applied for, taken or issued under this or any former Act, and in respect of water diverted or used from a stream,whether diverted under authority of a license or under a special or private Act or without authority. An applicant, petitioner, claimant,complainant and other person who files an application, petition, claim or complaint, or takes a proceeding under this Act, and a person holding a license, approval or permit, and a person who diverts or uses water from a stream is liable to the government for the fees, rentals and charges in respect of the application, petition, claim, complaint, proceeding, license, approval, permit, thing or water. The fees, rentals and charges must be paid to the comptroller and may be recovered by the comptroller by suit in a court of competent jurisdiction. The tariff may set the times of payment of fees, rentals and charges and make them subject to the imposition of interest at a prescribed rate and specified percentage additions on or from specified dates, and a tariff or part of it may be made retrospective to the extent of making it applicable from the beginning of the year in which it is established. The payment by a person or the acceptance by the comptroller of any rental in respect of a license, approval or permit does not prevent or delay the cancellation of the license, approval or permit on any ground except failure to pay rentals.*

14. Are there limits that should be put on the tariffs that permitees ma y charge for supplying water to others?

a) Analytical description

The complex subject of water rate and sewer rate regulation legislation goes far beyond the scope of this Guidebook. Nevertheless, its importance to sustainable development requires that it at least receive mention and an introductory example. Drafters will need to look to other sources for additional examples.

The tariffs or rates that water suppliers or wastewater treaters can charge their customers are closely connected both to the charges imposed on the initial diverters or the ultimate dischargers, and the methods available to finance the necessary waterworks. (See Sections II. C. 13 [Permit Fees], above, and II. D. 2 [Waterworks Financing], below.) If set too low, inefficient use will occur, as pricing signals do not adequately represent the true economic, environmental and social costs of the resource use. If set too high, however, artificial scarcity will result. Such an artificial scarcity will negatively impact economic and social values, and make it unnecessarily difficult to achieve the international Millennium Development Goal of achieving by 2015 a 50% reduction in the number of people without access to clean drinking water.

Ultimately, water or sewerage rates need to be set at a level that, overall, adequately allows recapture of the full costs—economic, environmental, and social—of the diversions or discharges and their related waterworks. And where private entities are providing the services, a reasonable return on investment will need to be allowed as well. At the same time, however, social equity considerations suggest some form of tiered water rates, tied both to level of use and ability to pay.

One example among many possible approaches is provided by South Africa's water supply legislation. Among the many provisions of this act is a provision designed to address social equity concerns and further the goal of providing its citizens with access to clean drinking water. It requires water suppliers to provide a limited amount of drinking water free to its customers. A graduated rate structure allows the recapture of this de facto subsidy by higher consuming users.

b) Examples from National Legislation

Armenia: *The principles of formation of regulated tariffs are the following:*
1. Establishment of service cost (including: justified operational and maintenance costs necessary for conducting the activity), ensuring of depreciation costs of the fixed assets;

2. *Ensuring opportunities for acquisition of reasonable profit;*
3. *Inclusion of loan service costs;*
4. *Establishment of minimum criteria for requested services;*
5. *Insuring quality of services through tariffs regulation and consumers ability to pay;*
6. *Differentiation of tariffs depending on consumption volumes, seasons of the year, hours of the day, and types of the services;*
7. *Inclusion of justified and necessary insurance expenses;*
8. *Conformity with the requirements of the National Water Program;*
9. *Inclusion of justified technological losses;*
10. *Inclusion of other justified and necessary expenses provided by the legislation;*
11. *Development of efficient water use and compliance with water standards incentives; and,*
12. *Development of incentives for providing high quality services.*

The tariffs may vary:

1. *Based on water basin distribution depending on the method of water supply;*
2. *Based on different water use groups (sub-groups),*
3. *Based on the qualitative parameters depending on classification of water resources.*

Water fees can be paid:

1. *By corresponding persons using the water system or a part thereof;*
2. *Directly by water users.*

The tariffs may have an incentive nature, depending on the efficiency of water use. The structure of tariffs and the main concepts of their establishment shall be defined by the National Water Program.

European Union:

1. *Member States shall take account of the principle of recovery of the costs of water services , including environmental and resource costs, having regard to the economic analysis conducted according to Annex III, and in accordance in particular with the polluter pays principle. Member States shall ensure by 2010*
   a. *that water-pricing policies provide adequate incentives for users to use water resources efficiently, and thereby contribute to the environmental objectives of this Directive,*
   b. *an adequate contribution of the different water uses,disaggregated into at least industry, households and agriculture, to the recovery of the costs of water services, based on the economic analysis conducted according to Annex III and taking account of the polluter pays principle.*
   Member States may in so doing have regard to the social, environmental and economic effects of the recovery as well as the geographic and climatic conditions of the region or regions affected.
2. *Member States shall report in the river basin management plans on the planned steps towards implementing paragraph 1 which will contribute to achieving the environmental objectives of this Directive and on the contribution made by the various water uses to the recovery of the costs of water services.*
3. *Nothing in this Article shall prevent the funding of particular preventive or remedial measures in order to achieve the objectives of this Directive.*
4. *Member States shall not be in breach of this Directive if they decide in accordance with established practices not to apply the provisions of paragraph 1, second sentence, and for that purpose the relevant provisions of paragraph 2, for a given water-use activity, where this does not compromise the purposes and the achievement of the objectives of this Directive. Member States shall report the reasons for not fully applying paragraph 1, second sentence, in the river basin management plans.*

South Africa: *The Minister may, with the concurrence of the Ministry of Finance, from time to time by notice in the Gazette, establish a pricing strategy for charges for any water use within the framework of existing relevant government policy. The pricing strategy may contain a strategy for setting water use charges:*

1. *for funding water resource management, including the related costs of:*
   a. *gathering information;*
   b. *monitoring water resources and their use;*
   c. *controlling water resources;*
   d. *water resource protection, including the discharge of waste and the protection of the Reserve; and*
   e *water conservation;*
2. *for funding water resource development and use of waterworks, including:*
   a. *the costs of investigation and planning;*

b. the costs of design and construction;
c. pre-financing of development;
d. the costs of operation and maintenance of waterworks;
e. a return on assets; and
f. the costs of water distribution; and

3. for achieving the equitable and efficient allocation of water.

The pricing strategy may:

1. differentiate on an equitable basis between:
a. different types of geographic areas;
b. different categories of water use; and
c. different water users;
2. provide for charges to be paid by either an appropriate water management institution or consumers directly;
3. provide for the basis of establishing charges;
4. provide for a rebate for water returned to a water resource; and
5. provide on an equitable basis for some elements of the charges to be waived in respect of specific users for a specified period of time.

The pricing strategy may differentiate:

1. in respect of different geographic areas, on the basis of:
a. socio-economic aspects within the area in question;
b. the physical attributes of each area; and
c. the demographic attributes of each area;
2. in respect of different types of water uses, on the basis of:
a. the manner in which the water is taken, supplied, discharged or disposed of;
b. whether the use is consumptive or non-consumptive;
c. the assurance and reliability of supply and water quality;
d. the effect of return flows on a water resource;
e. the extent of the benefit to be derived from the development of a new water resource;
f. the class and resource quality objectives of the water resource in question; and
g. the required quality of the water to be used; and
3. in respect of different water users, on the basis of:
a. the extent of their water use;
b. the quantity of water returned by them to a water resource;
c. their economic circumstances; and
d. the statistical probability of the supply of water to them.

The pricing strategy may provide for a differential rate for waste discharges, taking into account:

1. the characteristics of the waste discharged;
2. the amount and quality of the waste discharged;
3. the nature and extent of the impact on a water resource caused by the waste discharged;
4. the extent of permitted deviation from prescribed waste standards or management practices; and
5. the required extent and nature of monitoring the water use.

In setting a pricing strategy for water use charges, the Minister:

1. must consider the class and resource quality objectives for different water resources;
2. may consider incentives and disincentives:
a. to promote the efficient use and beneficial use of water;
b. to reduce detrimental impacts on water resources; and
c. to prevent the waste of water; and
3. must consider measures necessary to support the establishment of tariffs by water services authorities in terms of section 10 of the Water Services Act, 1997 (Act No. 108 of 1997), and the use of lifeline tariffs and progressive block tariffs.

Before setting a pricing strategy for water use charges under subsection (1), the Minister must:

1. publish a notice in the Gazette:
a. setting out the proposed pricing strategy; and
b. inviting written comments to be submitted on the proposed strategy, specifying an address to which and a date before which the comments are to be submitted, which date may not be earlier than 90 days after publication of the notice;
2. consider what further steps, if any, are appropriate to bring the contents of the notice to the attention of

interested persons, and take those steps which the Minister considers to be appropriate; and

3. *consider all comments received on or before the date specified in the notice.*

Water use charges may be made within a specific water management area or on a national or regional basis and must be made in accordance with the pricing strategy for water use charges set by the Minister. Charges made within a specific water management area may be made by and are payable to the relevant water management institution. Charges made on a national or regional basis may be made by the Minister and are payable to the state and may be apportioned between different water management areas according to the extent of the specific benefits which each water management area derives or will derive from the water uses for which the charges are made. Any person liable to pay water charges to a water services institution as defined in the Water Services Act, 1997 (Act No. 108 of 1997), for water supply services or sanitation services may not be charged for those services in terms of this Act. No charge made under this Act may be of such a nature as to constitute the imposition of a tax, levy or duty.

The Minister may direct any water management institution to recover any charges for water use made by the Minister under the above section from water users within its water management area or area of operation, as the case may be. A water management institution which has been directed to recover any such charges may retain such portion of all charges recovered in order to recompense it for expenses and losses, as the Minister may allow. A water management institution which has been directed to recover any such charges is jointly and severally liable to the state with the water users concerned and may recover any amounts paid by it from the water users concerned.

Water use charges contemplated in this Chapter may only be made in respect of a water use to which a person is voluntarily committed and must bear a direct relationship to the water use in question. Any person registered in terms of a regulation (under section 26) or holding a license to use water must pay all charges imposed above in respect of that water use. If a water use charge is not paid interest is payable during the period of default at a rate determined from time to time by the Minister, with the concurrence of the Minister of Finance, by notice in the Gazette and the supply of water to the water user from a waterwork or the authorization to use water may be restricted or suspended until the charges,together with interest, have been paid. A person must be given an opportunity to make representations within a reasonable period on any proposed restriction or suspension before the restriction or suspension is imposed. Where there is a fixed charge, a restriction or suspension does not relieve a person of the obligation to pay the charges due for the period of the restriction or suspension. A person whose water use is restricted or suspended for any lawful reason may not later claim the water to which that person would otherwise have been entitled during the period of restriction or suspension.

A charge made in terms of the above, including any interest, is a charge on the land to which the water use relates and is recoverable from the current owner of the land without releasing any other person who may be liable for the charge. The Minister or relevant water management institution must, on written application by any person and within 30 days of the application, issue a certificate stating the amount of any unpaid water charges and any interest due in respect of any land. If a certificate is not issued within the period of 30 days, the provisions of subsection (1) cease to apply to that property, notwithstanding section 66.

15. What rights do permitted users have to access land owned by others in order to e xercise their water use rights?

a) Analytical description

Legislation in many countries addresses a permitee's rights to cross lands owned by others in order to access the water body where the permitted activities are to occur. Ultimately, the scope of these access rights is closely tied to a given nation's laws on servitudes or their equivalent.

b) Examples from National Legislation

Lithuania: *Legal and natural persons may engage in activities, related to the use and protection of water resources, on public land or privately owned land adjacent to a body of water according to the land servitudes and procedure established by the Law on Land and other legal acts.*

Zimbabwe: *In this Part-*

- *"interested party" means every owner of, and every holder of a real right in or lease of, land within the area on or over which a servitude is claimed in terms of section seventy-four;*
- *"permanent servitude" means a servitude other than a temporary servitude;*
- *"real right" means a real right registered in terms of the Deeds Registries Act (Chapter 20:15) or the Mines and Minerals Act (Chapter 21:05);*
- *"servitude" means a servitude of abutment, a servitude of passage, a servitude of purification or a servitude of storage;*
- *"servitude of abutment" means the right to occupy and use by means of water works ,and the necessary appurtenances and structures, the banks or bed of a public stream or land adjacent thereto or any other land belonging to another and includes the right of access to and over the area subject to such right of occupation and use, after giving such notice as is reasonable in the circumstances to the occupier thereof, for the purpose of constructing, inspecting, maintaining and operating the waterworks and the necessary appurtenances anti structures concerned or for any other purpose necessary for the effective enjoyment of the rights referred to in this definition;*
- *"servitude of passage" means the right to occupy and use so much land belonging to another as may be necessary for or incidental to the passage of water and includes the right-*
  a. *to construct such water works as may be necessary for such passage on such land and over, uncles or alongside other water works or to enlarge and extend existing water works; and*
  b. *of access to and over the area subject to such right of occupation and use after giving such notice as is reasonable in the circumstances to the occupier thereof, for the purpose of constructing, inspecting, maintaining and operating water works referred to in paragraph (a) or for any other purpose necessary for the effective enjoyment of the rights referred to in this definition;*
- *"servitude of purification" means the right to occupy and use so much land belonging to another as may be necessary for or incidental to the filtration and purification of water and processes incidental thereto and includes the right-*
  a. *to construct such water works as may be necessary for such filtration and purification; and*
  b. *of access to and over the area subject to such right or occupation and use, after giving such notice as is reasonable in the circumstances to the occupier thereof for the purpose of constructing, inspecting, maintaining and operating water works referred to in paragraph (a) or for any other purpose necessary for the effective enjoyment of the rights referred to in this definition;*
- *"servitude of storage" means the right to occupy and use land belonging to another by inundating it with water by means of water storage works together with such Land-*
  a. *contiguous to the land so inundated as may be required to be occupied and used by the holder of the servitude of storage for the purpose of preventing the pollution of the water stored by or in the water storage works; and*
  b. *adjacent to or near the land so inundated as may be required to be occupied and used for the purpose of passage, after giving such notice as is reasonable in the circumstances to the occupier thereof, for the purpose of cleansing and maintaining the water storage works or for any other purpose necessary for the effective enjoyment of the rights referred to in this definition;*
- *"temporary servitude" means a servitude with a duration of-*
  a. *a fixed number of years; or*
  b. *the period for which it is used for the purpose for which it is granted, with or without further specification of such duration.*

Subject to this part, any person-

1. *who holds a permit; or*
2. *who is entitled to control or supervise the use of any water; or*
3. *to whom the Minister, the National Water Authority or the Agricultural and Rural Development Authority has agreed to supply water from any water works acquired or constructed or to he acquired and constructed by the Minister, the National Water Authority or the Agricultural and Rural Development Authority.*

may, in terms of section seventy-five claim a permanent or temporary servitude. Any person who wishes to claim a permanent or temporary servitude in terms section seventy-five may, after giving such notice as is reasonable in the circumstances to the occupier of the land concerned, enter upon the premises, other than a dwelling-house thereon, for the purpose of obtaining the information required for compliance with that section.

Subject to this Part, a servitude shall be claimed by serving on every interested party notice in writing-

1. *requesting the servitude, which request shall specify-*
   a. *the locality and nature of any water works which it is proposed to construct; and*
   b. *the line of passage along which water is to be conducted or the locality in which water is to he stored or both such line and such locality; and*
   c. *the duration of the proposed servitude; and*
   d. *the quantity of gravel, rock, sand, soil, stone or wood, if any, required from the land concerned for the purpose of constructing water works or works incidental thereto; and*
   e. *that it is intended to register the proposed servitude against the title deeds of the land concerned; and*
   f. *that any agreement to such claim is required to be in writing;*
2. *inviting him, if he wishes to seek compensation in respect of any loss or deprivation of rights likely to result from the grant of the proposed servitude, to submit to the claimant, within a period of sixty days from the date of service of the notice or such longer period as a president of the Administrative Court may for good and sufficient reason allow, a statement in writing specifying in detail the nature of the loss or deprivation of rights likely to be caused to the interested party as a result of the grant.*

If an interested party referred to above does not, within a period of sixty days from the date of service of the notice referred to in that subsection or such longer period as a president of the Administrative Court may for good and sufficient reason have allowed agree in writing to the request referred to in paragraph (1) of that subsection for the registration of the proposed servitude against the title deeds of the land concerned, or agree is writing with the claimant on the right to compensation, if any, or the amount of compensation payable by the claimant or both, as the case may be, or lacks full legal capacity to agree to the request referred to in paragraph (1) of that subsection, the claimant shall lodge with the Registrar his claim or the issue of compensation or both his claim and the issue of compensation.

The owner of land subject to a servitude of passage may pass along the water works concerned any water to which he is entitled on payment of such proportion of the cost of constructing, enlarging, maintaining or repairing the water works and such other conditions as may be agreed or, failing agreement, as may be fixed by the Administrative Court. Provided that, if the servitude of passage has been acquired by the State or a local authority or any statutory body established or re-established directly by or under any enactment; and empowered or required by the enactment referred to above, to acquire the servitude of passage, the owner shall not be entitled so to participate in the benefit of the water works. A person who in terms of this Part constructs water works for the passage of water, which water works-

1. *prevent any owner of land from passing freely over or on to his land; or*
2. *obstruct the free circulation of water in the drainage or irrigation of any land or interfere with any mining operations thereon; shall construct, maintain and repair-*
   a. such bridges and other works as will make it convenient and safe to pass over or on to the land referred to in paragraph (1); or
   b. such aqueducts, culverts and other works as are necessary to secure the free circulation of water referred to in paragraph (2) or prevent interference with the mining referred to in that paragraph; unless he is exempted from the duty to do so by agreement or otherwise.

In exercising a servitude of passage across a road, the holder of the servitude of passage shall, after having obtained the consent of the road authority concerned, construct, maintain and repair such works as will prevent inconvenience or danger to members of the public using the road in accordance with the instructions of the Secretary. "Road" and "road authority" have the respective meanings given by section 3 of the Roads Act (Chapter 13:12).

Subject to any agreement or award by which the servitude concerned was acquired, a servitude of storage shall not deprive the owner, lessee or occupier of the land subject to the servitude of the use of any part of

the land, whether submerged or unsubmerged, provided that such use is not detrimental to the enjoyment of the servitude or storage. The holder of a servitude of storage shall before commencing the construction of the water storage works concerned, notify the owner of the land subject to the servitude of storage in writing of his intention to construct the water storage works and the provisions below. The owner of land subject to a servitude of storage may, before the construction of the water storage works concerned is commenced and on-

1. *payment to the holder of the servitude of storage of such share of the costs of constructing, enlarging, maintaining or repairing the water storage works; and*
2. *fulfillment of such conditions, other than the payment referred to in paragraph (1); as may be agreed or, failing agreement, as may be fixed by the Administrative Court, participate in the benefit of the water storage works in proportion to the share of the cost:*

Provided that, if the servitude of storage has been acquired by the State or a local authority or any statutory body, established or re-established directly by or under an enactment, including an Order in Council made in terms of the Rhodesia and Nyasaland Act, 1963, of the United Kingdom, and empowered or required by the enactment referred to above to acquire the servitude of storage; the owner shall not be entitled so to participate in the benefit of such water storage works.

Every servitude shall include a right to take gravel, rock, sand, soil, stone or wood from the land subject to the servitude for the purpose of maintaining or repairing arty waterworks thereon on payment to the owner of such land of such compensation as may be agreed or, failing agreement, as may be fixed by the Administrative Court, provided that no gravel, rock, sand, soil, stone or wood shall be taken from

1. *within a distance of five hundred meters of any afforested or cultivated lands, premises or other structures, mining works or quarries; or*
2. *forest land as defined in the Forest Act (Chapter 19:05);*

without the permission of the owner thereof. Notwithstanding anything contained above, the Administrative Court-

1. *may, if it considers that the permission of the owner concerned is being unreasonably withheld, authorize the taking of gravel, rock, sand, soil, stone or wood from*
   a. *within the distance referred to in paragraph (1) above; or*
   b. *forest land as defined in the Forest Act (Charter 19:05); and*
2. *shall determine what compensation, if any, is to be paid by tile holder of the servitude concerned to the owner referred to in paragraph (1) in respect of any loss or damage which stay result from any taking authorized ill terms of that paragraph.*

16. How long should permitted rights last?

a) Analytical description

The duration of a diversion or discharge permit involves four related issues. First, some countries require (or allow) a temporary or provisional permit before they issue a final permit. Second, regardless of the type of permit involved, a permit's maximum length is almost always set by the legislature as opposed to the ministry. Third, conduct that violates a permit's term or applicable law may cause the permit to expire early. And finally, many permits are renewable indefinitely. This section addresses the first two of these temporal issues. Succeeding sections separately address the last two issues. (See Sections II. C. 18 [Permit Renewal] and II. C. 19 [Permit Compliance], below.)

A few nations issue temporary or provisional licenses. In theory, such interim licenses could be used as a sort of trial or probationary period to assess whether the permit conditions adequately address the impacts of the diversion or discharge. In practice, however, the provisional nature of such rights discourages the substantial investment required by most permitees before any diversion or discharge occurs. For that reason, most nations simply issue a permit with the most appropriate conditions they can anticipate. For permits that expire in a relatively short time, except in cases of the most grievous failures to anticipate the existence or extent of a particular impact, permitting authorities are unlikely to intervene to impose new conditions. Instead, they will husband their staff resources, and wait until the permit is up for renewal to reassess the conditions initially imposed.

Instead, then, of creating a probationary period, provisional permits tend to allow a would-be diverter the opportunity to reserve water for a fixed period of time. So long as the diverter puts the water to beneficial use within the statutory requirement, that diverter's priority will be preserved.

As such, provisional licenses are a way to enforce the general requirement that water be put to beneficial use

or it may be allocated to another user. (See Section II. C. 19 [Permit Compliance], below.) Provisional rights holders must apply for a full license by the end of a fixed term. In their full license application, they must demonstrate that they have put water to beneficial use within the required term. As such, the burden of establishing beneficial use is shifted from compliance officers—who would otherwise have to prove that a full licensee was not putting water to a beneficial use—to permit applicants.

As for full licenses, a wide range of time periods are permitted. Periods less than five years are unusual. In some nations, licenses may last 25 years or longer, depending upon the type of activity involved. In others, licenses are effectively permanent.

There is no one best period for a license. In any given case, the most appropriate length will depend upon a variety of factors. Legislatures have several ways to account for this variety. For example, they can set different lengths for different types of activities. Alternatively, they can specify a maximum period, or a range of permissible periods, but give their permitting authorities the power to specify a particular term for each licensee. Or they could set presumptive terms, but let the permitting authorities vary those terms upward, or downward, as circumstances warrant.

In determining an appropriate term, different values point in different directions. Everything else being equal, longer terms protect investor backed expectations. The longer the time period, the longer investors have to recoup their investments and achieve a return. But longer terms can tie the hands of water planners and managers, and tax the resources of enforcement authorities. And while longer terms may address an individual investor's economic interests, if too long, they may be counterproductive for the watershed's overall economic interests. Longer permit periods can lock resources up for economic activities that, over time, become relatively lower-valued. (This might be partially addressed by provisions allowing some sort of a market for water licenses. See Section II. C. 17 [Transfers], below.]

Unless permits are issued with clauses that allow terms and conditions to be reexamined during the permit's terms, water planners and managers lose the ability to respond to new information about a watershed, or to require a diverter or discharger to attain new levels of efficiency or meet new sustainable development goals. Even where permit clauses allow the permitting authority to reexamine the permit's terms and conditions, the burden of establishing the need to adjust falls on the enforcement authorities. By requiring periodic renewal of a permit, the burden of updating the terms and conditions of a use shifts from the regulatory authorities to the permit holders. For example, as part of the renewal process, the permitting authorities, encouraged by the interested public, can require the permit holder to provide sufficient information to help the authority decide whether or how to update the terms and conditions. And, in an appropriate case, the expiration of a permit allows other potential uses to compete for the water.

b) Examples from National Legislation

***Armenia**: If a water use permit holder fails to make use of their water use permit allocated water use rights for three (3) consecutive years and no legal reason stops them from making use of their water rights, the water use permit and associated water use rights shall be considered abandoned and the water use permit null and void.In cases stipulated by this Code where a person is required to secure a water system use permit and such person within 1 year fails to secure the required water system use permit, the associated water use permit shall be null and void.*

Prior to the final approval of the "National Water Program," a water use permit may be valid for no more than three (3) years. In locations where a "Water Basin Management Plan" exists, a water use permit may be valid for a maximum of twenty-five (25) years. In locations where a "Water Basin Management Plan" does not exist, a water use permit may be valid for a maximum of five (5) years. If investment costs may warrant, and in case of positive conclusion of the National Water Council, the Water Resources Management and Protection Body based on the water basin management plans may allocate a water use permit for a longer duration not exceeding forty (40) years. A water use permit holder minimum 6 months prior to expiration of the permit term may renew water use permit by making a request to the Water Resources Management and Protection Body. If the terms and conditions of the permit have been upheld and the permit renewal does not contravene laws, other legal acts and water basin management plans, Water Resources Management and Protection Body shall renew the water use permit within the same terms and conditions.
A water system use permit shall not exceed twenty-five (25) years. In case where initial investment costs may

warrant, the Regulatory Commission may determine that the water system use permit may be for longer duration not exceeding forty (40) years. The water system use permit holder has a right to apply to the Regulatory Commission six (6) months prior to the water system use permit's expiration to renew a water system use permit. If the terms and conditions of the water system use permit have been upheld and the renewal does not contravene existing legislation and programs, the Regulatory Commission shall renew the water system use permit.

***Zimbabwe:** A catchment council may grant a provisional permit or a temporary hermit to use water for such period and subject to such conditions as may be specified in the provisional permit or temporary permit.*

17. How can permitees change the type or place of use, or transfer their rights to another user?

a) Analytical description

Anticipating that changed circumstances may trigger a permitee's desire to change the type or place of the permitted use, many statutory schemes authorize permit amendments. Most provide few details of what a permit holder must do to justify the change, leaving those to the permitting authorities.

Requests for amendments should trigger a level of review commensurate with the type and degree of change proposed. Changes in type of use, place of diversion, or place of use raise different issues. Some changes are simple and will not have any substantial new impacts; others may be akin to entirely new diversions or discharges.

Where a permitee seeks to transfer the permit to another user entirely, most water codes require the permitting authority's consent to the transfers. But, with only infrequent exception, the codes are silent about the matters the permitting authority must consider.

As with requests for amendments, the level of review of the transfer should depend upon the type and degree of change proposed. For example, a simple substitution of ownership of the permit, say by a new owner of the permitee's business, or a new farmer growing the same crops, with no change in the type of use, place of diversion, or place of use, should be allowed with a simple filing. Where, however, the transferee seeks to use the water in a different location, or to divert it from a different point, the likelihood of impacts increases. This is especially true if the proposed new place of use is in a different watershed entirely.

Two additional factors involve the duration of the transfer and the number of transfers in a given watershed. In some systems, transfers may be temporary or permanent. Permanent transfers are almost certainly going to have the greater potential for economic, environmental or social impacts. As such, temporary transfers often receive less aggressive review. But if temporary transfers can be renewed without triggering more aggressive review, the system can be gamed. To minimize such strategic behavior, legislative attention needs to be paid to the overall aggressiveness of review and the circumstances where "temporary" transfers may be renewed without triggering more aggressive review.

The number of proposed or ongoing transfers at any one time in a given basin raises concerns over cumulative impacts. The permitting authority needs to anticipate such impacts, particularly for short term transfers, as they are the ones least likely to be proposed with substantial time for thorough review. It also needs to find a way to allocate the mitigation of those cumulative impacts among all the transferors and transferees, not just the later filed applications.

Interbasin transfers present some of the most complicated issues. An initial issue involves the maximum amount of water conceivably available for transfer, i.e., before allowances for environmental or social impacts caused by the transfer. May the transferor transfer the right to divert the entire amount that the permit allows, or may the transfer involve only the water that the transferor would have consumed and not otherwise returned to the water body? Authorities generally follow the second alternative.

Second, if the diversions are going to occur downstream of the original point of diversion, how will the parties account for the evaporation or seepage losses that occur between the two points? Finally, how should the permitting authorities account for the environmental and socio-economic consequences in the watershed of origin of the lost opportunities to use that water? An environmental review can establish the extent of the environmental harms, the possible mitigation actions, and any remaining non-mitigable impacts. But the socio-economic impacts present different challenges. The transferor may be amply compensated for the loss of the use. But unless he or she invests the money in new employment generating ventures in the watershed of origin, that area's

economy will shrink. The most extreme example, popularized in the movie Chinatown, involves the collapse of the economy and environment of Owens Valley, California, following the purchase by the City of Los Angeles of virtually all of the water rights held by valley landowners. While this example is extreme, absent legislative direction, permitting authorities may believe that they lack the power to even consider, much less address such impacts.

Legislatures need to do two things to address these issues. First, they should require permitting authorities to consider such socio-economic impacts. Second, they should clarify the types of responses that the permitting authorities may make to proposed inter-basin transfers. In some cases, the socio-economic impacts may be so great as to justify denial of a transfer. In other cases, they may be adequately addressed through mitigation requirements. Alternatively, an ad valorem transfer fee could be imposed; the proceeds of this fee could be dedicated to local economic development or other public assistance to displaced workers and their families.

In recent years, countries in widely separated parts of the world have moved towards creating a market for voluntary water transfers. These efforts have sought to harness market forces to more efficiently allocate water. A rich and vigorous debate is occurring over the extent to which water should be treated as any other commodity, and the extent to which water is a unique public good. Drafters and policymakers interested in exploring these ideas further will find an ample and growing body of literature to draw upon.

b) Examples from National Legislation

Spain:

1. *Concessionaires or private water rights holders may temporarily transfer all or part of their water rights to another concessionaire or rights holder of equal or higher rank according to the preference order set forth in the water plan of the corresponding basin, or lacking this, Article 58 of this law with previous administrative authorization. The annual volume likely to be transferred in no case shall exceed that actually used by the transferor. Regulations shall establish the standards for computing the said annual volume, taking the average amount actually used during the span of years to be determined as a reference. If need be, this shall be corrected by the target amount fixed in the basin's water plan and the good use of water, provided that in no case a greater amount is transferred. Concessionaires or private water rights holders who are not part of a group may not transfer their water rights that have no such consideration.*

2. *The transfer agreements must be in writing and must be communicated to the Basin Agencies and User Communities which the transferor and transferee belong to by sending in a copy of the agreement within fifteen days from signing.When the transfers occur between members of the same User Community, they shall be deemed authorized provided that both parties exchange documents within one month from the notification made to the Basin Agency if the agency is not opposed and two months in the other cases. When the rights transfer involves an irrigation or agricultural use concession, the Basin Agency shall send the copy of the agreement to the appropriate Autonomous Region and Fishing and Food Ministry office so that they may issue an advance report within the scope of their respective responsibilities and within ten days.*

3. *The Basin Agency may refuse to authorize the transfer of water usage rights through a justified decision, issued and advised within the indicated deadline if it has a negatively affect on the operating procedures of the basin's resources, the rights of third parties, environmentally safe water levels, the state or conservation of aquatic ecosystems, or if it breaches some of the requirements of this article provided that it results in compensation for those affected. It may also exercise a preferential acquisition right of the supply of water to be transferred, saving the water from any private use.*

4. *Those acquiring transferred water rights shall assume the transferor's obligations to the Basin Agency with respect to water use.*

5. *Transferring water rights may entail a cash payment set by mutual agreement between both parties, which must be accurately specified in the contract. Regulations may set the maximum amount of said compensation.*

6. *The amount of water involved in the transfer shall be computed as an actual use of the transfer for the purpose of avoiding the possible nullity of the transferor's concession.*

7. *In the event of transfers between users of irrigation water, the contract must expressly identify the properties that the transferor is giving up for irrigation purposes or promises to irrigate to a lesser extent during the contractual period. It should also identify the properties that the acquirer shall irrigate with the transferred water.*

\8. *When the transfer requires using facilities or infrastructures owned by third parties, their use shall be arranged by free agreement between the parties.In the event the facilities or water infrastructure needed are owned by the Basin Agency or have been entrusted to it for their operation, the parties to the agreement must request that the procedures governing the use of said facilities or infrastructure be determined at the time they send in the contract to be approved. Likewise they must request that that the fees are fixed in accordance with current law. If the transfer agreed to, requires building new water facilities or infrastructure, the parties to the agreement must present the technical document which adequately defines said works or facilities at the time authorization is requested. When the transferred water is meant for household use, a report shall be submitted to the health authority on the water's suitability for this purpose. Authorization for the transfer agreement shall not in of itself result in a permit to use or build the infrastructure referred to in this section. The Basin Agency's decision on the use or building of the infrastructure referred to in the previous paragraph shall be independent of its decision to authorize or refuse the transfer agreement and it shall not be applied within the same deadlines referred to in the section 2 above.*

9. *Non-compliance with the requirements of this article shall be cause for cancellation of the transferor's water rights.*

10. *The Basin Agencies shall register the water rights transfer agreements in the Water Registry Book referred to in Article 72 in the form determined under regulations. Subsequently, they may also be registered in the Property Registry on the pages containing administrative concessions in question.*

11. *The Council of Ministers Accord when proposed by the Ministry of the Environment may set up centers for exchanging water use rights in the situations regulated by Articles 53, 54 and 56 of this law and in those others which shall be determined by regulation to concur with related causes. In this case, the Basin Agencies remain authorized to make public bids to acquire water use rights in order to subsequently transfer them to other users at the price offered by the same body. The accounting and registration of transactions made under this mandate shall be carried out separately from the other actions taken by the Basin Agency. The Autonomous Regions may urge the Basin Agencies to make the acquisitions referred to in the previous paragraph to achieve concrete ends for autonomous purposes within their jurisdictions.The acquisitions and disposals of water use rights made pursuant to this section must conform to principles of public notice and free competition and shall be fully carried out pursuant to the procedures and selection criteria set by regulation.*

12. *When the general interest so justifies, the Minister of the Environment may expressly authorize on a temporary and exceptional basis, transfers of water rights which do not meet the standards on usage priorities referred to in section 1.*

13. *The Water Administration's jurisdictions referred to in this article shall cover the water basins contained within one Autonomous Region.*

14. *Infrastructure that spans the territories of different water basins may only be used for transactions regulated in this article if the National Water Plan or the singular regulatory laws governing each water transfer have provided for such. In this case, the Ministry of the Environment shall be competent to authorize the use of these infrastructures and the sales agreement, it being understood that the sales applications will be rejected once the stipulated deadlines have expired without any administrative decision having been taken.*

Zimbabwe: *A permit shall, on the transfer of the piece of land to which it relates, pass to the new owner of the piece of land concerned. Subject to subsection (1) of section forty-four, no person shall cede, sell or otherwise alienate a permit except with the consent of the catchment council concerned, granted after consultation with the Secretary.*

18. Under what circumstances may a permitee renew its permitted activities?

a) Analytical description

Virtually all codes allow a permitee to renew the permit upon its expiration. As a practical matter, absent a history or permit violations, or extremely compelling circumstances, permitting authorities find it very difficult to prefer a new applicant over a renewal applicant. This is particularly true if the existing user has made a substantial financial investment in the facilities or businesses supported by the permit. No matter how clearly codes state—as they should—that no one has a vested right in a renewal, permitting authorities find it difficult to defeat the de facto, if not de jure, expectations of renewal.

Renewal periods do offer permitting authorities an opportunity to update their understanding of the permitee's operations and impacts, and identify any changed circumstances. In addition, they can assess the compatibility of the permitee's activities with the most recently updated watershed plan. Based on this review, permitting authorities can revise the terms and conditions of the permit.

b) Examples from National Legislation

New Zealand: *A consent authority may, in accordance with section 129, serve notice on a consent holder of its intention to review the conditions of a resource consent—*

1. *At any time [or times] specified for that purpose in the consent for any of the following purposes:*
   a. *To deal with any adverse effect on the environment which may arise from the exercise of the consent and which it is appropriate to deal with at a later stage; or*
   b. *To require a [holder of a discharge permit or a coastal permit to do something that would otherwise contravene section 15] [or 15B] to adopt the best practicable option to remove or reduce any adverse effect on the environment; or*
   c. *For any other purpose specified in the consent; or*

2. *In the case of a water, coastal,or discharge permit,when a regional plan has been made operative which sets rules relating to maximum or minimum levels or flows or rates of use of water, or minimum standards of water quality or air quality, or ranges of temperature or pressure of geothermal water, and in the regional council's opinion it is appropriate to review the conditions of the permit in order to enable the levels, flows, rates, or standards set by the rule to be met; or*
   a. *in the case of a water, coastal, or discharge permit, when relevant national environmental standards have been made under section 43; or*

3. *If the information made available to the consent authority by the applicant for the consent for the purposes of the application contained inaccuracies which materially influenced the decision made on the application and the effects of the exercise of the consent are such that it is necessary to apply more appropriate conditions.*

When reviewing the conditions of a resource consent, the consent authority or hearing committee set up under section 117 in respect of a permit for a restricted coastal activity—

1. *Shall have regard to the matters in section 104 and to whether the activity allowed by the consent will continue to be viable after the change; and*
2. *May have regard to the manner in which the consent has been used.*

Before changing the conditions of a discharge permit or a coastal permit to do something that would otherwise contravene section 15 (relating to the discharge of contaminants) [or 15B] to include a condition requiring the holder to adopt the best practicable option to remove or reduce any adverse effect on the environment, the consent authority shall be satisfied, in the particular circumstances and having regard to—

1. *The nature of the discharge and the receiving environment; and*

2. The financial implications for the applicant of including that condition; and
3. Other alternatives, including a condition requiring the observance of minimum standards of quality of the receiving environment—
that including that condition is the most efficient and effective means of removing or reducing that adverse effect.

South Africa: *A responsible authority may review a license only at the time periods stipulated for that purpose in the license. On reviewing a license, a responsible authority may amend any condition of the license, other than the period thereof, if:*
1. it is necessary or desirable to prevent deterioration or further deterioration of the quality of the water resource;
2. there is insufficient water in the water resource to accommodate all authorized water uses after allowing for the Reserve and international obligations; or
3. it is necessary or desirable to accommodate demands brought about by changes in socio-economic circumstances, and it is in the public interest to meet those demands.

An amendment contemplated in the above subsection may only be made if the conditions of other licenses for similar water use from the same water resource in the same vicinity, all as determined by the responsible authority, have also been amended in an equitable manner through a general review process. If an amendment of a license condition on review severely prejudices the economic viability of any undertaking in respect of which the license was issued, the provisions of section 22(6) to (10) apply. A responsible authority must afford the licensee an opportunity to be heard before amending any license condition on review.

A responsible authority may amend or substitute a license condition:
1. if the licensee or successor-in-title has consented to or requested the amendment or substitution;
2. to reflect one or more successors-in-title as new licensees; and
3. to change the description of the property to which the license applies, if the property described in the license has been subdivided or consolidated with other property.

The responsible authority may require the licensee:
1. to obtain the written consent of any affected person before amending or substituting the license; or
2. to make a formal application for the amendment or substitution in terms of section 52;
A responsible authority may only amend or substitute a license condition under this section if it is satisfied that:
1. the amendment or substitution will not have a significant detrimental impact on the water resource; and
2. the interests of any other person are not adversely affected, unless that person has consented thereto.

A licensee may, before the expiry date of a license, apply to the responsible authority for the renewal or amendment of the license. Unless an application for the renewal or amendment of a license is made in terms of section 50, it must:
1. be made in such form, contain such information and be accompanied by such processing fee as may be determined by the responsible authority; and
2. be dealt with according to the procedure as set out in section 41.
In considering an application to amend or renew a license, the responsible authority must have regard to the same matters which it was required to consider when deciding the initial application for that license.

A responsible authority may amend any condition of a license by agreement with the licensee.

19. How will regulatory authorities ensure that the permitee complies with the permit terms or other usage laws?

a) Analytical description

Legislatures can help ensure compliance in several ways. First and foremost, they can adequately fund the enforcement authorities. Enforcement authorities need to be adequately staffed, trained, equipped and paid. Beyond these most obvious measures, legislatures can easily ensure that ministry officers have sufficient authority to inspect a permitee's diversions or discharges. In addition, they can require permitees to monitor their activities, keep adequate records, and report periodically to the appropriate bodies. And, of course, backing all of the permit and other legal requirements is a meaningful possibility of administrative, civil or criminal sanctions. (See Section II. C. 23 [Liabilities], below.)

As for funding, there probably is not a ministry around the world that would not welcome additional funding. But as for the other traditional legislative methods of ensuring compliance, most codes contain a fairly standard array of such provisions. Of these provisions, those addressing monitoring, record keeping, and reporting duties are less frequently spelled out than those addressing inspection authority or sanctions.

In addition to these traditional coercive enforcement tools, legislatures can encourage voluntary compliance. Self-audits by permitees or certification of compliance by independent auditors are two methods that are enjoying increasing popularity in some parts of the world. These help uncover violations that might not otherwise come to light. In addition, those participating may pledge to operate at levels higher than required by law or permit.

Legislatures considering adopting these provisions need to decide what immunity, or lighter sanction, if any, a permitee who voluntarily and independently has its operations audited can receive for any violations its audit uncovers. Some consideration for the willingness to conduct such a voluntary compliance would give an incentive to others to do the same. At the same time, however, such audits present a real chance for abuse, when knowing violators claim protection for what their "voluntary" audit reveals.

b) Examples from National Legislation

Albania: *The permissions, authorizations- and-concessions maybe cancelled, suspended or restricted in case of failure to, comply with any specified condition or term. The water authorities can cancel, suspend or restrict permissions, authorizations and concessions when water resources are draining.*

The water authority has the power to impose the installation of equipments for controlling and measuring the water found on private land as well as the facilities required for accessing in such installations, for the preparatory work and construction; to control and insure putting into operation within the time frame specified in the permission. The water authority shall conduct periodical controls over the waterworks and objects. In order to do this, the authorized persons have the right to inspect works and objects and require related data and documentation.

Australia (New South Wales): *An authorized officer may enter any premises:*

1. *for the purpose of carrying out on those premises any work that by this Act the authorized officer is authorized to carry out on those premises, or*
2. *for the purpose of inspecting any water management works situated on the premises, or*
3. *for the purpose of monitoring the use of water on the premises, or*
4. *for the purpose of monitoring any controlled activity or aquifer interference activity occurring on the premises, or*
5. *for the purpose of carrying out any surveys for the purposes of this Act, or*
6. *for the purpose of taking measurements of any matter, or for reading any meter, for the purposes of this Act, or*
7. *for the purpose of investigating any alleged contravention of this Act or the regulations.*

Reasonable force may be used for the purpose of effecting entry. At all times while on premises under the power conferred by this section, an authorized officer must carry, and produce on demand, evidence of his or her authority to be on the premises. This section does not apply to any part of premises that are used exclusively for residential purposes.

An authorized officer may apply to an authorized justice for the issue of a search warrant if the authorized officer believes on reasonable grounds that a provision of this Act or the regulations is being or has been

contravened at any premises.An authorized justice to whom such an application is made may, if satisfied that there are reasonable grounds for doing so, issue a search warrant authorizing a named authorized officer to enter the premises and to exercise any of the authorized officer's functions under this Part. Part 3 of the Search Warrants Act 1985 applies to a search warrant issued under this section. In this section, authorized justice has the same meaning as it has in the Search Warrants Act 1985.

While on any premises lawfully entered, an authorized officer may do anything that the authorized officer considers necessary to be done for the purposes of this Act, including:

1. *inspecting any water management works situated on the premises, and*
2. *observing any controlled activities being carried out on the premises, and*
3. *measuring or sampling any water in any water management works or water source situated on the premises.*

An authorized officer may disassemble a water management work for the purpose of inspecting it but, in that event, must ensure that it is properly reassembled immediately after the inspection is completed. While on any premises lawfully entered, a person authorized by the Minister to take measures on the Minister's behalf for the purpose of giving effect to a direction under this Act may do anything that the person considers necessary to be done for that purpose.

In exercising a power under this Part, a person must do as little damage as possible. The Ministerial Corporation must compensate all interested parties for any damage caused by a person's exercise of a power to enter premises for the purposes of this Part (but not for any damage caused by a person's exercise of any other power) unless the occupier of the premises obstructed or hindered the person in the exercise of the power of entry.

20. Under what circumstances ma y regulatory authorities take for public use a water user's di version or discharge permit?

a) Analytical description

Several codes identify the circumstances when regulatory authorities may rescind a permit even though the permitee is in full compliance with all applicable terms, conditions, and other laws. Most frequently these occur in response to severe drought or a similar water emergency. (See Section II. B. 11 [Emergencies], above.) The relevant provisions usually also indicate whether the permitee shall receive compensation of the taking of the permit.

b) Examples from National Legislation

Australia (New South Wales):

1. *The Minister may, by notice in writing served on their holders, compulsorily acquire access licenses if of the opinion that, in the special circumstances of the case, the public interest requires their compulsory acquisition.*
2. *A person from whom an access license is compulsorily acquired under subsection (1) is entitled to compensation from the State for the market value of the license as at the time it was compulsorily acquired.*
3. *The amount of compensation payable is to be determined by agreement between the Minister and the person entitled to compensation or, if agreement cannot be reached, is to be determined by the Valuer General.*
4. *A person who is dissatisfied with the amount of compensation offered to the person under this section, or with any delay in the payment of compensation, may appeal to the Land and Environment Court.*
5. *The regulations may make provision for or with respect to the payment of compensation under this section.*
6. *Nothing in this section prevents the Ministerial Corporation from acquiring an access license by way of transfer.*

7. For the avoidance of doubt, it is declared that a reduction of the water entitlements and allocations under an access license as a consequence of a variation in the mandatory conditions of the license does not constitute the compulsory acquisition of an access license or any part of an access license.

Philippines: *All water permits are subject to modification or cancellation by the Council,after due notice and hearing,in favor of a project of greater beneficial use or for multi-purpose development,and a water permitee who suffers thereby shall be duly compensated by the entity or person in whose favor the cancellation was made.*

21. Are there special conditions that should apply only to groundwater?

a) Analytical description

Although groundwater should be fully subsumed within the permitting system, its unique characteristics frequently receive special legislative attention. Indeed, most codes contain one or more provisions applicable solely to groundwater. Most of these address well-drilling requirements. (See Section II. D. 7 [Well Drilling], below.) A few direct permitting authorities to evaluate possible subsidence in considering applications to drill.

Several more generically address the sustainable management of a groundwater basin. Of those that do, most urge adoption of a "safe yield." This term comports nicely with sustainable development principles, as it is usually defined to connote the amount of water that can be pumped indefinitely from an aquifer without causing negative effects. A better term might be "optimal yield." This term leaves open the possibility that in some circumstances, such as temporary severe water shortages, basin managers might conclude that withdrawals should increase beyond the long term "safe yield." Indeed, in some cases, where aquifers are hydrologically unconnected with surface water, it might even be appropriate to mine those aquifers. Such decisions should only be done as part of an overall watershed plan that ensures that any temporary wealth acquired from the groundwater mining is invested in ways that will ensure the basin's overall sustainable development.

b) Examples from National Legislation

People's Republic of China: *In areas where groundwater is overdrawn, the local people's government at or above the county level shall take measures to strictly control the mining of groundwater. In areas where groundwater is seriously overdrawn, area where groundwater mining is prohibited or restricted may be specified after the approval of the people's government of the province, autonomous region, or municipality directly under the Central Government. In the case that groundwater is withdrawn in coastal areas, scientific justification shall be conducted and measures be taken to prevent land subsidence and intrusion of seawater.*

Russian Federation: *Citizens and legal persons whose activity has or may have a damaging effect on the state of subsurface bodies of water shall have the duty to take measures to prevent the pollution, clogging and depletion of bodies of water and harmful effect of waters. Location of waste-burial places, waste dumps, cemeteries, cattle-burial grounds, and other units having an effect on the state of subsurface waters shall not be permitted in the catchment areas of subsurface bodies of water which are or which may be used for drinking, everyday and household water supply. Irrigation of lands with sewage (waste) waters, where this has or may have an effect on the state of subsurface bodies of water, shall be prohibited. Establishment and operation of wells,and also utilization of exhausted mineral deposits for the dumping of sewage and drainage waters shall be permitted with observance of the requirements specified in the present Code and in RF legislation on the subsoil. Boreholes, including gushers and prospecting holes, and also wells not fit for exploitation or whose use is terminated shall be subject to equipment with regulating devices,to conservation or liquidation, in the established manner. Where aquifers are opened up in the use of the subsoil, measures must be taken in the established manner to protect the subsurface bodies of water, with the fact reported to the organs of local self-government, to expressly authorized state organs in the protection of the natural environment, the state organ of administration in the use and protection of the subsoil, and the expressly authorized state organ of administration in the utilization and protection of the water stock. Extraction of subsurface waters in the mining of minerals, performance of works in water-level lowering, erection of structures or protection against the harmful effect of waters, and also in the building and operation of drainage systems n improved lands shall be permitted under a water-use license. In the setting, design,*

building, startup and operation of water-intake structures involving utilization of subsurface bodies of water, measures must be provided for to prevent the damaging effect thereof on surface bodies of water and on the natural environment.

22. How can public and private disputes over permit applications, performance, and rene wals be resolved?

a) Analytical description

Disagreements and disputes can arise at virtually every step of the regulatory process between virtually every participant in the process. Many if not most of these are resolved by dialogue and negotiation among the affected participants. For those that are not, participants can choose to acquiesce in an unfavorable decision, or appeal to a higher authority.

Virtually every code that has a permitting system provides some sort of official dispute resolution mechanism. Most frequently, formal legal review is provided in a court or specialized tribunal. The cost and complexity of these proceedings mean that they are likely to be reserved for only the most serious or intractable of disputes. Much less frequently, statutes direct an initial attempt at mediation of the dispute. Much greater use of mediation should be encouraged, especially well before a permit application is ready for final decision. In particular, the use of trained facilitators and mediators early in a likely-to-be contentious permitting process can help the participants better understand the issues and their underlying interests. Frequently, from this understanding can come the generation of solutions that better address the issues and meet the interests.

An adequate dispute resolution system is an essential part of a sustainable development program. In any program that attempts to integrate such diverse interests as economic, environmental, and social, conflict is inevitable. If managed correctly, from this conflict can spring deeper knowledge and creative solutions. Not all disputes are capable of a mediated or negotiated resolution; some are most appropriately resolved by a formal legal decision. But if the sole dispute resolution tool offered is formal legal action, available only after the dispute has festered in ignorance and anger, and where one party will win while the other will lose, many more-optimal solutions will be lost.

The dynamics and mechanics of facilitated or mediated resolutions of seemingly intractable public policy conflicts are beyond the scope of this Guidebook. But throughout the world, a body of mediators and facilitators who are trained to address these conflicts is growing. At a minimum, legislation should authorize permitting bodies to use outside mediators and facilitators; in addition, these ministries should be allowed to develop their own internal capacity to use such techniques when appropriate.

b) Examples from National Legislation

Armenia: *The Dispute Resolution Commission may resolve disputes arisen in the water relationship, which relate to water use permits. The Commission may use mediation to resolve disputes, and with the consent of all parties,serve as a binding arbitrator. Dispute Resolution Commission decisions shall not be mandatory and in case of non-compliance with them the matter shall be resolved in the judicial order. The members of the Dispute Resolution Commission shall be appointed by the decision of the Prime Minister of the Republic of Armenia. The Dispute Resolution Commission shall act in accordance with the regulation approved by the Prime Minister of the Republic of Armenia.*

Disputes in water relations and those related to water resources use and protection shall be resolved by the bodies authorized by the Government to regulate water relations according to a procedure established by the legislation, this Code and other legal acts.

Decisions of authorized bodies related to the enforcement of this Code may be appealed by a person (persons) concerned in a procedure established by the , this Code and other legal acts. Disputes evolved in water relations, except for the cases, when the Republic of Armenia shall act as a party, may be resolved by a Dispute Resolution Commission. In case of no consent is attained by the parties the disputes shall be resolved in a legal form.

Disputes evolved within operation of Water User Associations and Water User Association Unions shall be

resolved by a Board to regulate Water User Association and Water User Association Union. In case of no consent is attained by the parties the disputes shall be resolved in a legal form.

Disputes evolved over transboundary water resources use and protection shall be resolved pursuant to the norms established by international agreements.

Zimbabwe:

1. *For the purpose of hearing any appeal or matter referred to it in terms of this Act, the Administrative Court shall consist of a president of the Court and at least two assessors appointed in terms of subsection (2).*
2. *Subject to subsection (3), of the assessors referred to in subsection (1)-*
   a. one shall be appointed from a list of persons approved by the Chief Justice who are or have been Government water engineers for a period of not less than five years; and
   b. one shall be appointed from a list of persons who are not members of the Public Service nominated by the presidents of the Administrative Court and approved by the Chief Justice.

3. *Whenever the Administrative Court is required to hear and determine any matter the determination of which may require special knowledge not ordinarily possessed by an assessor referred to in paragraph (b) of subsection (2), the president of the Administrative Court may, after consultation with the Chief Justice, appoint a special assessor in lieu of or in addition to the assessor referred to in paragraph (b) of subsection (2).*

Any person who is aggrieved by any decision, direction, order or action of any authority in terms of this Act may appeal against the decision, direction, order or action to the Administrative Court in terms of this Part. A notice of appeal in terms of this section shall be lodged with the Registrar of the Administrative Court and the authority concerned within thirty days of the date of the decision, direction, order or action appealed against. On an appeal in terms of this section, the Administrative Court may confirm, vary or set aside the decision,direction,order or action appealed against or give such other decision as in its opinion the authority concerned ought to have given,and make such order as to costs as it thinks fit.The authority concerned shall comply with any decision of the Administrative Court made in terms of this section. The Administrative Court Act (Chapter 7:01) shall apply in relation to the procedure and powers of the Administrative Court on an appeal in terms of this Part. Where an appeal has been noted in terms of this Act, the decision, direction, order or action appealed against shall, notwithstanding the noting of the appeal, remain valid pending the determination of the matter by the Administrative Court.

23. What administrati ve, civil or criminal liabilities do water users or dischargers face for violating permit terms or other legal requirements?

a) Analytical description

Virtually every code sets up a series of consequences for proven violations of the permit terms and conditions or other legal requirements. These include administrative and criminal sanctions, and civil liability. Criminal sanctions are the most common. Also frequently seen are administrative sanctions—those imposable directly by an agency without need to resort to the courts. They usually include only fines and clean-up or restoration orders. Less common are specific provisions creating civil remedies.

***Australia (New South Wales)**: On the application of the Minister, the Land and Environment Court may grant an injunction directing a landholder to comply with a direction under this Part. Any person may bring proceedings in the Land and Environment Court for an order to remedy or restrain a breach of this Act or the regulations. Any such proceedings may be brought whether or not proceedings have been instituted for an offence against this Act or the regulations. Any such proceedings may be brought whether or not any right of the person has been or may be infringed by or as a consequence of the breach. Any such proceedings may be brought by a person on the person's own behalf or on behalf of another person (with their consent), or of a body corporate or unincorporate (with the consent of its committee or other controlling body), having like or common interests in those proceedings. Any person on whose behalf proceedings are brought is entitled to contribute to or provide for the payment of the legal costs and expenses incurred by the person bringing the proceedings. If the Court is satisfied that a breach has been committed or that a breach will, unless restrained by the order of the Court, be committed, it may make such orders as it thinks fit to remedy or restrain the breach. In this section, breach includes a threatened or apprehended breach.*

***Lithuania**: Natural persons shall be subject, under the laws of the Republic of Lithuania, to disciplinary, administrative or criminal prosecution if they:*

1. *use water resources without a permit when obtaining a permit is required;*
2. *violate the regime of hydrographical, hydrological or ichthyologic reserves;*
3. *approve documents of a project where there are no provisions for measures intended to minimize the adverse effects on water bodies and water resources when provisions for such measures are required;*
4. *do not implement measures for the protection of water provided for in the state programs and schemes for the use and protection of water resources or in the permits for the use of water resources;*
5. *construct, reconstruct, transfer and or accept the use of objects intended for economic or other activity by violating the procedures established by law;*
6. *pollute bodies of water or their basins with waste water which exceeds the limit values for polluting substances, and also the limit values determined by regulating documents, as well as pollute the waters thermally;*
7. *pollute bodies of water and their basins with household, industrial and other wastes, oil products, fertilizers, toxic chemicals, radioactive and other harmful substances by exceeding the standard limit values;*
8. *violate the water protection regime of bodies of water and water extraction sites;*
9. *violate the regime of the protection strips and areas of bodies of water and water extraction sites, litter the banks of surface water bodies;*
10. *violate the rules of accounting for the use of water, the rules of determination of the quality of discharges, the use and maintenance of waste treatment equipment, hydrotechnological facilities and reservoirs;*
11. *break the equipment or devices of hydrotechnological facilities, carry out hydrotechnological works without a permit;*
12. *ignore the established procedures for the supply of information on the use of water resources and protection, suppress information, do not supply it or distort it;*
13. *create obstacles for the state control of the use and protection of water resources and protection of hydrotechnological facilities, do not observe the inspectors' rightful instructions;*
14. *commit other violations of the legal acts on the use and protection of water, which may make them liable under the laws of the Republic of Lithuania.*

Legal and natural persons who have polluted waters or done other harm to water resources or to a body of water through illegal activities shall pay damages and bring the condition of the water to the required quality level, and shall eliminate the adverse effects of the illegal activity in the body of water. Upon violation of this Law, the damages done to the environment shall be estimated according to the techniques of estimation approved by the Government or by an institution authorized by the Government.

D. Implementing the national water strategy: how should private and public water supply and drainage works be financed, constructed, and safely and fairly operated?

1. Who may construct or operate public or private waterworks?

a) Analytical description

Many countries have extensive legislation governing such entities as irrigation corporations, private irrigation districts, private drainage boards, private water trusts, and similar associations. Regulation of public utilities is also extensive. Of course, it is also possible that a country or a political subdivision such as a county or city may decide to privatize its water services, that is, to allow them to be operated by a private enterprise. Some of the considerations relevant to such a decision are summarized in the Introduction, Section I.7.

b) Examples from National Legislation

Albania: *The construction of works and objects for using water resources and avoiding harmful effects of water shall be subject to administrative permissions or concession, when those are within framework of public services. The physical or judicial person, being the author of construction, will notify the water authorities that issued the permission or concession within fifteen days from completion of the work or object.*

Zimbabwe:

1. *Whenever he considers it desirable in the public interest to do so, the Minister may direct the National Water Authority to apply to a catchment council for a permit*
   a. *to conserve or use water for any purpose whatsoever;*
   b. *to construct any water works and to supply, on such terms and conditions as may be agreed with the Minister, water from such water works to any person requiring the water;*
   c. *to acquire any water works or a right to the use of water which has been granted to any person by virtue of a permit in terms of this Act or any other enactment, whether or not such right is being beneficially used.*
2. *The catchment council may accede to an application in terms of subsection (1) and grant the permit applied for subject to such conditions as it thinks fit to impose, or refuse such application.*
3. *Subject to subsection (5), the National Water Authority may-*
   a. *for the purposes of operating, inspecting or maintaining any water works referred to in subsection (1), enter upon the premises of any person in order to inspect those premises or anything thereon in order to carry out work connected with any property of the National Water Authority;*
   b. *take and use gravel, rock, sand, soil, stone, wood and other materials from, or drain, excavate or tunnel, any land.*
4. *Subject to subsection (5), the Minister may acquire any land capable of being irrigated from any water works referred to in subsection (1) and such other land as he may consider necessary to ensure that sound and economic farming methods are practiced on the land capable of being so irrigated.*
5. *Parts III, V and VII of the Land Acquisition Act (Chapter 20:10) shall apply, mutatis mutandis, to the exercise by the National Water Authority of its powers in terms of this section.*
6. *Whenever a catchment council has granted to the National Water Authority in terms of this section the permit to acquire or construct any water from water works and the National Water Authority has exercised the right granted by the permit, the sole rights to allocate water from the water works shall*
   a. *vest in the National Water Authority; and*
   b. *not be subject to control by the catchment council; notwithstanding that such water may be passed down a public stream from the water works to the consumers of the water.*
7. *Notwithstanding any agreement to the contrary entered into before the date of commencement of this Act concerning the allocation of any water from water works acquired or constructed by the former Regional Water Authority in accordance with rights granted in terms of any previous enactment, the Minister may, in consultation with the National Water Authority, authorize the reallocation of any such water in terms of this Act and fix a tariff of charges in respect of that water.*

8. The Minister or, with the consent of the Minister, the National Water Authority, may-
   a. cede to the Agricultural and Rural Development Authority; or
   b. authorize any person to exercise; any right granted in terms of this section on such conditions as he may fix.
9. Where a cession is made in terms of paragraph (a) of subsection (8)-
   a. the permit issued in terms of subsection (2) shall be binding on the Agricultural and Rural Development Authority, in so far as is applicable; and
   b. subsection (6) shall apply, mutatis mutandis,in relation to the right as if the reference to the National Water Authority in that subsection were a reference to the Agricultural and Rural Development Authority.

2. How should public or private waterworks and efforts to protect water resources be funded?

a) Analytical description

Waterworks and services, as well as protection and restoration of freshwater resources, are funded in a variety of ways. These include user fees, taxes or charges; use of funds formed of water-related fines to provide incentives for desired water use and protection practices; and governmental aid for development of techniques for reduction of the consumption and pollution of water.

b) Examples from National Legislation

Brazil: *The creation of a Water Agency shall be conditional upon satisfying the following requirement: financial feasibility ensured by charging for the use of water resources in its area of activity.*

Lithuania: *Legal and natural persons shall pay taxes on the use of water resources and their pollution under the Law on Taxes on the Use of Public Natural Resources, the Law on Taxes for Pollution of the Environment and other legal acts.*

Under law, the Government may reimburse the expenses incurred by legal or natural persons for water supply as well as the construction, use and maintenance of waste water treatment facilities.

According to the procedures established by the Government state aid may be granted in the form of subsidies or soft credits from the State Budget or the State Fund for Environmental Protection to legal and natural persons who are implementing new technologies, processes, facilities in production or other kinds of activity in order to substantially reduce the consumption and pollution of water. State aid may also be granted to legal and natural persons engaged in long-range research on the use and protection of water resources.

Mongolia: *The local budget income obtained from compensation for water law violations shall be spent on the elimination of damages caused, as well as for the encouragement and rewarding of water users which finance water reserves and quality protection activities with their own financial means and apply environmentally safe technologies.*

Russian Federation: *Payment of a charge for use of water shall be the basic principle of economic regulation of the utilization, restoration and protection of bodies of water. Economic regulation of the utilization, restoration and protection of bodies of water shall provide for the creation of the following systems:*
1. a system of payments arising from the use of bodies of water;
2. financing of the restoration and protection of bodies of water;
3. economic stimulation of rational utilization, restoration and protection of bodies of water.

3. What sort of r eview of environmental or social impacts should occur before a project is approved?

a) Analytical description

The principle that environmental and other kinds of impacts of proposed projects or activities should be assessed prior to their approval is one of the most important innovations in the fields of environmental and natural resources law in more than three decades. It is also important, of course, that the social impacts of planned projects be assessed, where the project or activity in question may entail such impacts. These could include such things as adverse effects upon cultural property or indigenous peoples, and the need to resettle groups of individuals. Economic impacts are usually considered separately, in a cost-benefit analysis relating to the proposal, but some Environmental Impact Assessment (EIA) legislation includes economic matters as well as other kinds of effects among impacts to be considered.

More recently, it has been realized that post-project monitoring and environmental audits are necessary in addition, in order to determine the extent to which the impacts foreseen in the assessment have materialized and were not mitigated or eliminated by any measures required as a condition of project approval. This is adaptive management at the project level, the counterpart to adaptive management at the national water strategy level. (See Section II. B. 13 [Plan Renewal], above.]

Different approaches have been taken to environmental assessment, in particular. One approach simply requires that an EIA be conducted and the public be allowed to comment upon, and sometimes challenge, its results. However, this approach does not require that the proposed project or activity have no, or only minor, environmental impacts in order for implementation of it to proceed. (Of course, certain kinds of adverse impacts might well be covered by other legislation.) Another approach, in contrast, would permit the project to go forward only if no significant non-mitigated environmental impacts were revealed by the EIA.

b) Examples from National Legislation

Australia (federal): *This Chapter deals with assessment and approval of actions that Part 3 prohibits without approval (controlled actions). (It does not deal with actions that a bilateral agreement declares not to need approval.) A person proposing to take an action, or a government body aware of the proposal, may refer the proposal to the Minister so he or she can decide:*

1. *whether his or her approval is needed to take the action; and*
2. *how to assess the impacts of the action to be able to make an informed decision whether or not to approve the action.*

An assessment may be done using:

1. *a process laid down under a bilateral agreement; or*
2. *a process specified in a declaration by the Minister; or*
3. *a process accredited by the Minister; or*
4. *preliminary documentation provided by the proponent; or*
5. *a public environment report; or*
6. *an environmental impact statement; or*
7. *a public inquiry.*

Once the report of the assessment is given to the Minister, he or she must decide whether or not to approve the action, and what conditions to attach to any approval.

In deciding whether or not to approve the taking of an action, and what conditions to attach to an approval, the Minister must consider the following, so far as they are not inconsistent with any other requirement of this Subdivision:

1. *matters relevant to any matter protected by a provision of Part 3 that the Minister has decided is a controlling provision for the action;*
2. *economic and social matters.*

In considering those matters, the Minister must take into account:

1. *the principles of ecologically sustainable development; and*
2. *the assessment report relating to the action; and*
3. *if the action was assessed under Division 5 or 6 of Part 8 (which deal with public environment reports and environmental impact statements)—the report or statement about the action finalized by the designated proponent; and*

4 if an inquiry was conducted under Division 7 of Part 8 in relation to the action—the report of the commissioners; and
5. any other information the Minister has on the relevant impacts of the action (including information in a report on the impacts of actions taken under a policy, plan or program under which the action is to be taken that was given to the Minister under an agreement under Part 10 (about strategic assessments)); and
6. any relevant comments given to the Minister by another Minister in accordance with an invitation under section 131.

In deciding whether or not to approve the taking of an action by a person, and what conditions to attach to an approval, the Minister may consider whether the person is a suitable person to be granted an approval, having regard to the person's history in relation to environmental matters. In deciding whether or not to approve the taking of an action, and what conditions to attach to an approval, the Minister must not consider any matters that the Minister is not required or permitted by this Subdivision to consider.

In deciding whether or not to approve for the purposes of section 12 or 15A the taking of an action, and what conditions to attach to such an approval, the Minister must not act inconsistently with Australia's obligations under the World Heritage Convention.

In deciding whether or not to approve for the purposes of section 16 or 17B the taking of an action,and what conditions to attach to such an approval, the Minister must not act inconsistently with Australia's obligations under the Ramsar Convention.

In deciding whether or not to approve for the purposes of a subsection of section 18 or section 18A the taking of an action, and what conditions to attach to such an approval, the Minister must not act inconsistently with:
1. Australia's obligations under: the Biodiversity Convention; or the Apia Convention; or CITES; or
2. a recovery plan or threat abatement plan.

In deciding whether or not to approve for the purposes of section 20 or 20A the taking of an action relating to a listed migratory species, and what conditions to attach to such an approval, the Minister must not act inconsistently with Australia's obligations under whichever of the following conventions and agreements because of which the species is listed:
1. the Bonn Convention;
2. CAMBA;
3. JAMBA;
4. an international agreement approved under subsection 209(4).

The Minister must not approve an action consisting of or involving the construction or operation of any of the following nuclear installations:
1. a nuclear fuel fabrication plant;
2. a nuclear power plant;
3. an enrichment plant;
4. a reprocessing facility.

***Mexico:** The environmental impact assessment is the procedure through which the Secretariat establishes the conditions to carry out the works and activities that may cause ecological imbalances or surpass the limits and conditions established in the applicable provisions to protect the environment and preserve and restore ecosystems, in order to avoid or reduce to the lowest point the negative effects for the environment. For such purpose, in the cases determined by the Regulations issued for the same purpose, the individuals or companies trying to conduct some of the following works or activities shall be required to have a prior authorization on environmental impact issued by the Secretariat:*
1. Hydraulic works, general means of communication, oil pipelines, gas pipelines, coal pipelines and multipurpose pipelines;
2. The oil, petrochemical, chemical, iron and steel, paper, sugar, cement and electrical industries;
3. Exploration, exploitation and extraction of minerals and substances reserved to the Federation in terms of the Mining Laws and Regulatory Law, Article 27 of the Constitution on Nuclear Matters;
4. The facilities for treatment, confinement or disposal of hazardous waste, as well as radioactive waste;
5. Forest exploitation in tropical rainforest and species of difficult regeneration;

6. *Forest plantations;*
7. *Changes in use of land in forest areas, as well as in jungles and arid areas;*
8. *Industrial parks where the execution of highly risky activities is anticipated;*
9. *Real estate developments affecting coastal ecosystems;*
10. *Works and activities in mangrove swamps, lakes, rivers, lagoons and tideland linked to the sea, as well as in littorals or federal areas;*
11. *Works in natural protected areas under Federal jurisdiction;*
12. *Fishing, aquatic or agricultural and livestock activities endangering the preservation of one or more species or causing damage to the ecosystems, and*
13. *Works or activities related to federal authority matters, which may cost important and irreparable ecological imbalances, damage to the public health or to the ecosystems, or surpass the limits and conditions established in the legal provisions related to the preservation of ecological balance and environmental protection.*

The Regulations of this Law shall determine the works or activities referred to in this Article that, due to their location, dimensions, characteristics or scope, do not cause important environmental impacts; do not cause or may cause ecological imbalances or surpass the limits and conditions established in the legal provisions related to the preservation of ecological balance and environmental protection, and therefore they must not be subject to the procedure of environmental impact assessment provided in this law.

For the purposes referred to in Section XIII of this Article, the Secretariat shall give notice to the interested parties regarding its decision in order for them to submit the corresponding work or activity to the procedure of environmental impact assessment, giving justification for that effect in order for them to submit the reports, experts reports and considerations they deem appropriate, within a period of time not greater than ten days. Once the documents of the interested parties have been received, the Secretariat, within a time period not greater than thirty days, shall inform the interested parties whether the submittal of an environmental impact statement is applicable or not, as well as the method and terms to conduct the same. In case the above time period has elapsed, and the Secretariat has not given a notice, this would imply that the submittal of an environmental impact statement is not needed.

To obtain the authorization referred to in Article 28 of this Law, the interested parties shall present to the Secretariat an environmental impact statement, which shall contain, at least, a description of the possible effects upon the ecosystem(s) that may suffer from damage due to the works or the activities in question, considering the group of elements forming such ecosystems, as well as preventive measures, mitigation measures and other measures necessary to avoid and reduce to the lowest level the negative effects for the environment. In case of activities considered as highly risky in terms of this Law, the statement shall include the corresponding risk analysis. If having submitted the environmental impact statement, the involved works or activities of the project are modified, the interested parties shall inform this fact to the Secretariat, and the Secretariat, within a time period of 10 days at the latest, shall give them notice informing whether it is necessary or not to submit additional information in order to assess the environmental effects such changes may cause in accordance with the provisions of this Law. The Regulations of this Law shall establish the content of the preventive report, as well as the characteristics and the modes of the environmental impact statements and the risk analysis.

Spain: *When carrying out a water project of general interest singularly affects the socioeconomic fabric of the municipal area where it is located, a territorial reparation plan shall be drawn up and carried out to compensate for the impact.*

4. How should legislation address provision of drinking water of adequate quality by public or private waterworks?

a) Analytical description

As discussed in the Introduction to this Guidebook (Section I.3), no one disputes that every individual should have access at least to sufficient water of adequate quality to satisfy basic needs. At the same time, it is also clear that many countries lack the capacity and resources to make this goal a reality for every member of their populations. Nevertheless, there is no dissent from the proposition that it should remain a goal. Further, international institutions and countries that are able to do so provide assistance and cooperation, especially of an economic and technical nature, to States facing challenges in this regard. When water services are privatized, legislation should ensure that the private water company provides water that is safe for those it serves to consume. Legislation should also take into account the close connection between safe water for domestic uses and adequate sanitation services. The lack of basic sanitation can frustrate efforts to ensure that people, especially children, consume water that is safe to drink.

Legislation in this area can take a variety of approaches, ranging from granting a right to water suitable for drinking and a corresponding duty of the water service to provide it, to setting quality standards for drinking water.

b) Examples from National Legislation

Libya: *Every person in the Socialist People's Libyan Arab Jamahiriya shall have the right to obtain water suitable for drinking and other legally authorized uses in sufficient quantity and at adequate pressure in accordance with sanitary norms and specifications and within the limits allowed by current economic and technical circumstances. Before delivering potable water to the consumer, the authorities responsible for its supply shall ensure that it has been purified, treated and tested to ascertain its quality and proper natural, chemical and organic composition.*

South Africa: *Everyone has a right of access to basic water supply and basic sanitation. Every water services institution must take reasonable measures to realize these rights. Every water services authority must, in its water services development plan, provide for measures to realize these rights. The rights mentioned in this section are subject to the limitations contained in this Act.*

The Minister may, from time to time, prescribe compulsory national standards relating to-

1. *the provision of water services;*
2. *the quality of water taken from or discharged into any water services or water resource system;*
3. *the effective and sustainable use of water resources for water services;*
4. *the nature, operation, sustainability, operational efficiency and economic viability of water services;*
5. *requirements for persons who install and operate water services works; and*
6. *the construction and functioning of water services works and consumer installations.*

The standards prescribed above may differentiate between-

1. *different users of water services; and*
2. *different geographic areas, taking into account, among other factors, the socio-economic and physical attributes of each area.*

In prescribing standards the Minister must consider-

1. *the need for everyone to have a reasonable quality of life;*
2. *the need for equitable access to water services;*
3. *the operational efficiency and economic viability of water services;*
4. *any norms and standards for applicable tariffs for water services;*
5. *any other laws or any standards set by other governmental authorities;*
6. *any guidelines recommended by official standard-setting institutions;*
7. *any impact which the water services might have on the environment; and*
8. *the obligations of the National Government as custodian of water resources.*

Every water service institution must comply with the standards prescribed above.
Every water services authority has a duty to all consumers or potential consumers in its area of jurisdiction

to progressively ensure efficient, affordable, economical and sustainable access to water services. This duty is subject to:

1. *the availability of resources;*
2. *the need for an equitable allocation of resources to all consumers and potential consumers within the authority's area of jurisdiction;*
3. *the need to regulate access to water services in an equitable way;*
4. *the duty of consumers to pay reasonable charges, which must be in accordance with any prescribed norms and standards for tariffs for water services;*
5. *the duty to conserve water resources;*
6. *the nature, topography, zoning and situation of the land in question; and*
7. *the right of the relevant water services authority to limit or discontinue the provision of water services if there is a failure to comply with reasonable conditions set for the provision of such services.*

In ensuring access to water services, a water services authority must take into account, among other factors:

1. *alternative ways of providing access to water services;*
2. *the need for regional efficiency;*
3. *the need to achieve benefit of scale;*
4. *the need for low costs;*
5. *the requirements of equity; and*
6. *the availability of resources from neighboring water services authorities.*

A water services authority may not unreasonably refuse or fail to give access to water services to a consumer or potential consumer in its area of jurisdiction. In emergency situations a water services authority must take reasonable steps to provide basic water supply and basic sanitation services to any person within its area of jurisdiction and may do so at the cost of that authority. A water services authority may impose reasonable limitations on the use of water services.

5. What role can water users associations and similar organizations play in the management of waterworks ?

a) Analytical description

Agenda 21, the action plan for sustainable development adopted at the United Nations Conference on Environment and Development held in Rio de Janeiro in 1992, notes that one of the ways in which States can improve integrated water resources management is to provide "Support to water-users groups to optimize local water resources management." These groups, or associations, are often composed of farmers in the same hydrologic unit or irrigation district who manage and operate portions of their irrigation system, including drainage aspects. Whether or not composed of farmers, they commonly have as an objective the achievement of optimum utilization through a participatory management process that gives members an incentive to use water efficiently.

Water users associations (WUAs) are generally thought to provide a number of potential benefits, both to their members and to the government. These include greater efficiency in water use, better maintained water facilities, empowerment and enhanced cohesion of communities, and reduction of financial and management burdens on government agencies. To these could be added increased likelihood that water will be used and managed in a sustainable manner and aquatic ecosystems will be protected, since it is in the self-interest of the WUA and its members to do so.

A number of legal instruments are typically considered necessary to establish WUAs. The first is the enabling law, which provides the authority to establish WUAs. This is the focus of the present section. Other instruments include the by-laws of the WUA, and an agreement between the public water agency and the WUA by which authority to manage aspects of the water system concerned is transferred to the WUA by the agency. A comparative study of legal frameworks for WUAs in six countries is referred to in the Bibliography.

b) Examples from National Legislation

Mexico: The rights to water for use on crop or livestock farms and forest holdings may be conveyed under the terms and conditions established in this Law and its regulations. In the case of irrigation units, districts or

systems, the conveyance of water rights shall be done in compliance with the terms of the regulations issued in this regard.
Concessions may be granted to:
1. *Individuals or bodies corporate for the individual use of national waters for agricultural purposes,*
2. *Bodies corporate, for the purpose of managing or operating an irrigation system or for the common use of national waters for agricultural purposes.*

Rural producers may freely form bodies corporate for the purpose of setting up systems to provide farm irrigation services to various users, for which purpose they may set up irrigation units under the terms of this Section. In this event, the concession of national water shall be granted to the bodies corporate formed by such users, who shall receive freely-convey certificates,in keeping with the regulations to this Law. Certificates shall not be compulsory in irrigation districts.
Individuals or bodies corporate may form a corporation and set up an irrigation unit for the purposes of:
1. *Building and operating its own infrastructure to provide irrigation services to its members;*
2. *Building irrigation works with co-investments from federal, state or municipal public resources, and taking charge of their operation, conservation and maintenance to provide irrigation services to its members,*
3. *Operating, conserving, maintaining and rehabilitating federal public irrigation infrastructure, whose use under concession they have applied for to the Commission.*

Philippines: *To promote better water conservation and usage for irrigation purposes, the merger of irrigation associations and the appropriation of waters by associations instead of by individuals shall be encouraged. No water permit shall be granted to an individual when his water requirement can be supplied through an irrigation association.*

Spain:
1. *The users of the water and other property within the public water domain of a single draw--off or concession may form User Communities. When the water is used primarily for irrigation, these will be called Irrigation Communities; otherwise, communities will be named according to the primary collective use of the water involved. Charters or Bylaws will be written and approved by the users and must be submitted to the Basin Agency for administrative approval. These Charters or Bylaws will regulate the organization of the user communities as well as their joint exploitation of the water property involved. The Basin Agency shall not deny approval of Charters and Bylaws or make changes to them without a prior ruling from the State Council.*
2. *User Communities using surface or groundwater whose use affects interests common to them all may form a General Community for the defense of the rights and the preservation and promotion of such interests.*
3. *Similarly, individual users and communities of users may, by agreement, form a Central User Board in order to protect their rights and interests against third parties and coordinate and monitor the joint use of their water supplies.*
4. *When the general benefit so requires, the Basin Agency may require the formation of the various types of user communities and Central Boards.*
5. *When conditions or the circumstances and characteristics of the water supply so require, or when the number of parties is small, community status may be replaced by the provisions of specific agreements, which must be approved by the Basin Agency.*

6. How can legislation ensure that surface waterworks, particularl y dams, are safely designed, constructed, and operated?

a) Analytical description

Impounded water can be a dangerous force as well as a force for good. Improperly designed or constructed impoundment facilities pose great danger of inundation to all those downstream of the impounded water. Small dams constructed on streams by private landowners may not pose the same hazards but can still disrupt the functioning of aquatic ecosystems and, if they fail, cause damage to other riparian water users downstream. Of course, any works that impound water, no matter what their size, will cause inundation upstream of the damming body, with possible adverse consequences for neighboring landowners, municipalities or other human settlements, and aquatic ecosystems.

For these reasons, many countries have enacted legislation on the safety of dams and reservoirs. Some of these statutes are quite short, others very extensive. At minimum, they vest authority in a competent governmental agency to regulate dams and provide for such works to be operated subject to applicable rules, regulations or permit requirements. More detailed legislation may set out such matters as requirements for commencing construction of impoundment facilities, qualifications of civil engineers required to design the facilities and certify their safety, requirements regarding the periodic inspection of dams, procedures in emergency situations relating to dams, and liability provisions. Some legislation contains separate provisions on small and large dams, in view of the different safety and other concerns applicable to facilities of varying sizes.

In the case of dams and other works on international watercourses, the 1997 U.N. Convention on the Law of the Non-Navigational Uses of International Watercourses requires states sharing such watercourses to "employ their best efforts to maintain and protect installations, facilities and other works related to an international watercourse."[1] It further requires those states to enter into consultations with any co-riparian state having reasonable grounds to believe that such planned or existing installations may expose it to a threat of significant adverse effects.

b) Examples from National Legislation

Philippines: *The impounding of water in ponds or reservoirs may be prohibited by the Council upon consultation with the Department of Health if it is dangerous to public health, or it may order that such pond or reservoirs be drained if such is necessary for the protection of public health.*
Waters of a stream may be stored in a reservoir by a permitee in such amount as will not prejudices the right of any permitee downstream. Whoever operates the reservoir shall, when required, release water for minimum stream flow. All reservoir operations shall be subject to rules and regulations issued by the Council or any proper government agency.
The operator of a dam for the storage of water may be required to employ an engineer possessing qualifications prescribed for the proper operations, maintenance and administration of the dam.

Zimbabwe:
1. Subject to Part IV, no person shall commence any dam works in respect of a small dam other than action referred to in section one hundred and nine or one hundred and ten, until the expiry of a period of thirty days after

a. an approved civil engineer or approved civil engineering technician has-
i. prepared a design, together with plans and specifications, of the proposed dam works; and
ii. certified the adequacy and safety of the proposed dam works and, in the case of modifications to an existing small dam, that the adequacy and safety of the small dam will not be prejudiced; and
b. the owner of the small dam has submitted to the Secretary in the prescribed manner, together with such fee as may be prescribed, such details of the design, plans and specifications prepared in terms of paragraph (a) as may be prescribed, together with the certificate of adequacy and safety referred to in subparagraph (ii) of that paragraph.

2. The Secretary may require the owner of the small dam concerned-
a. to provide such additional information; and
b. to modify such design, plans and specifications in such manner; and
c. to provide such additional certificates of adequacy and safety; as, and within such period as, the Secretary may specify.

3. A person who-
a. commences dam works in contravention of subsection (1); or
b. fails without reasonable excuse to comply with a requirement made in terms of subsection (2); or
c. being the owner of the small dam concerned, fails to ensure that the dam works in respect of the dam are completed in accordance with the details submitted in terms of subsection (1) and to the satisfaction of an approved civil engineer or approved civil engineering technician; shall be guilty of an offence and liable to fine not exceeding ten thousand dollars or to imprisonment for a period not exceeding six months or to both such fine and such imprisonment.

1 Art. 26, Installations, para. 1, U.N. Doc. A/RES/51/869, 21 May 1997, 36 ILM 700 (1997).

4. If during the execution of any dam works the owner of the small dam concerned wishes to modify the details submitted in terms of subsection (1), subsections (1), (2) and (3) shall apply, mutatis mutandis in respect of such modification.

1. Subject to Part IV, no person shall commence any dam works in respect of a large dam,other than action referred to in section one hundred and nine or one hundred and ten

a. until-

i. an approved civil engineer, assisted by such qualified engineers, geologists and other specialists as the Secretary in consultation with the National Water Authority may require, has prepared a design, together with plans and specifications, of the proposed dam works; and certified the adequacy and safety of the proposed dam works and, in the case of modifications to an existing small dam or large dam, that the adequacy and safety of the small dam or large dam will not be prejudiced; and

ii. the owner of the large dam has submitted to the Secretary in the prescribed manner, together with such fee as may be prescribed, such details of the design, plans and specifications prepared in terms of subparagraph (i) as may be prescribed, together with the certificate of adequacy and safety referred to in that subparagraph, and the Secretary has approved the details in writing; and

iii. the expiry of a period of ten days after the owner of the large dam has given notice in writing to the Secretary of the proposed commencement of the dam works; or

b. after the expiry of a period of twelve months from the date on which the Secretary approved the details referred to, in subparagraph (ii) of paragraph (a): Provided that the Secretary may, on the application in writing of the owner concerned, extend the period for such further period or periods in aggregate not exceeding thirty-six months as the Secretary may specify.

2. The Secretary may, before approving the details referred to in subparagraph (ii) of paragraph (a) of subsection (1), require the owner of the large dam concerned-

a. to cause such further investigations to be made; and

b. to provide such additional information; and

c. to modify the design, plans and specifications concerned in such manner; and

d. to provide such additional certificates of adequacy and safety; as, and within such period as, the Secretary may specify.

3. A person who commences dam works in contravention of subsection (1) shall be guilty of an offence and liable to a fine not exceeding ten thousand dollars or to imprisonment for a period not exceeding six months or to both such fine and such, imprisonment.

7. How can legislation ensure that wells are safely drilled and operated?

a) Analytical description

Because waterworks that involve groundwater pumping present unique health and safety challenges, many codes have specific provisions addressing well drilling, operation, and closure. These provisions are especially prominent in arid areas. Well drilling statutes are essential to any legislative scheme designed to protect groundwater quality from contamination. Depending upon the geology of a particular area, such contamination may come from a variety of surface or subterranean sources. Seepage of contaminants may occur if wells are improperly drilled.

Well drilling statutes may contain some or all of the following provisions: specific prohibitions against drilling in specific places or using specific equipment or method; standards for equipment and methods; permit requirements; inspection requirements; monitoring and recordkeeping requirements; and well capping and closure requirements. The last set of requirements can reduce the dangers that an abandoned well can pose for both aquifer contamination and human safety.

b) Examples from National Legislation

Jordan: *Everybody is hereby prohibited to commence drilling a well or extracting underground water, or changing the specifications of an existing well or drilling a substitute well unless a license to this effect in accordance with the provisions of this By-Law has been obtained.*

The licensee to drill a well should carry out under the supervision of the Authority a pumping test before

commencement of the utilization thereof, so that the well production capacity and the water quality may be determined, and an extraction license may be issued in which the allowed pumping quantity annually and the rates thereof is defined.This function should be completed within a period not exceeding six months from the date of the drilling completion. This period may be extended for justifying reasons by a decision of the Board on the submission of the Secretary General. Extraction of water without performing the pumping test shall constitute a contravention that shall entail a warning to the person who performed the drilling of the well, in order to rectify the violation within thirty days. If the violation continues the license shall be deemed ipso facto cancelled. The Authority thereupon in pursuance of the law shall backfill the well at the expense of the offender by administrative measures, without the need to issue any warning or notice.

Any one who is granted a license to extract underground water is hereby obligated to refrain from causing any water pollution or depletion, and to comply strictly with the conditions of the license.
The Secretary General may take any of the following measures:

1. *Backfill any well drilled without a license in pursuance of the provisions of this By-Law.*
2. *Backfill any well whose owner did not abide with the conditions of the license granted thereto.*

The offender shall bear the costs of rectifying the violations specified by clause (A) of this article. If the offender does not rectify the offence set out under clause (A) of this article, the licenses granted thereto shall be cancelled.

The application for a drilling-license shall be submitted on the form approved by the Authority, inclosing the supporting documents that are specified by the Secretary General's instructions issued for this purpose, inclosing therewith a recent real estate registration deed for the relevant plot of land. The Secretary General shall publish the application to obtain a drilling license in two local daily newspapers at the expense of the applicant. Any person with interest may file an objection in writing against this application to the Secretary General within 15 days of the publication provided he deposits a cash insurance of 50 Jordan Dinars un-refundable if the objection was rejected. After the study of the application and the recite of the sums due under the provisions of this By-Law, the Secretary General- on the expiry of the objection period shall present the application to the Board to take the appropriate decision. If the decision was an approval, the Minister issues the drilling license containing the extent of the permitted depth and any other conditions that govern the license. The license shall be valid for one year, renewable once for a similar period by a decision of the Minister on the submission of the Secretary General provided that a renewal application has been submitted prior to the expiry of the original license. The license shall be deemed cancelled if the drilling is not completed within the set out period.

The distance between a well and another shall be decided by a decision of the Board upon a submission of the Secretary General provided that such distance shall not be in any case less than one kilometer. Provided in this respect the rules in force governing the agricultural units in the Jordan Valley area are complied with.

It is hereby prohibited to issue a license to drill a new or a substitute well, or to deepen an existing well in spring areas unless the drilling site is not less than three km far from the nearest spring, provided that the applicant submits a written undertaking that the extracted water will not have an effect in any way on the average output of the spring. If it was proved that the average output of the spring has been affected or its natural flow has been halted,then the license shall be cancelled by a decision of the Board on the submission of the Secretary General who shall take the necessary measures to backfill the said well.
Licenses for deepening, cleaning or maintaining an existing well shall be granted by a Board decision in accordance with the following conditions:

1. *The existence of technical justifications confirmed by a report from a specialized and authorized engineering or geological office if the need arises.*
2. *The well depth should be fixed in the license provided it does not exceed the level of the water-layer where the well is drilled, and provided that the drilling does not affect the water layer utilized by the Authority for drinking purposes.*

owner of a well drilled and tested in accordance with the provisions of this By-Law should obtain before commencement of utilization thereof a license for water extraction issued by the Secretary General or delegatee containing the conditions that the licensee should comply with, including the following:

1. *The maximum amount of water that may be extracted from the well within a fixed period of time.*
2. *The purpose of water use.*
3. *The maximum area that may be irrigated from the water of the well licensed for agricultural purposes.*
4. *The installation, at the expense of the owner of the well, of a water-meter after it has been approved and stamped by the Authority. This condition should be complied with prior to the issuance of water extraction license.*
5. *Notification of the Authority within a period not exceeding 48 hours in case of non-function of the water-meter. The owner of the well shall reimburse the Authority for the fixed maintenance expenses. Of the water-meter*
6. *Refrainment from taking any measures that impede the flow of water from the well to water-meter directly for the measurement thereof.*
7. *Obligation by the licensee to pay to the Authority in time the prices fixed for the extracted water.*
8. *The keeping by the licensee of a register-approved by the Authority where all data relating to the well, and extraction process shall be registered regularly in accordance with instructions issued by the Authority. The competent Authority officials have the right to inspect this register.*

The water-meter referred to above shall be considered sufficient evidence on the extracted amount of water from time-to-time, unless the Authority finds the meter non-operative or has been manipulated with. In such cases, the water quantity shall be calculated in the light of the irrigated area, type of crop, or consumed electricity power and in accordance with rules adopted by the Board for this purpose in coordination with Ministry of Agriculture.

It is hereby prohibited to grant more than one drilling or extraction license for one plot of land. No drilling or extraction license may be granted to any person who has been previously given a valid drilling license unless he had commenced drilling work and completed same in accordance with of the previous license.

Every person is hereby prohibited to possess or use directly or indirectly a drilling rig unless he has obtained a license from the Authority in pursuance of the provisions of this By-Law. Every person is hereby prohibited to take on the job of well drilling unless after the obtainment of a license from the Authority. The license referred to above shall be issued by the Secretary General or the delegatee therefrom in accordance with the rules and conditions specified by the Board by virtue of instructions issued for this purpose.

The license is valid for one year and renewable for a similar period. Any person licensed to perform drilling works, maintenance, cleaning, testing or deepening of wells must make sure before the commencement of work that he has obtained a license to that effect in pursuance of the provisions of this By-Law.

The owners of drilling rigs that are used for petroleum exploration, soil tests or mining are hereby prohibited to perform drilling thereby for the purpose of extracting water, unless after the obtainment of a license to that effect in accordance with the provisions of this By-Law.
The competent departments in the Authority shall keep official records of rigs and drillers and all activities related to the profession of well drilling whereby technical and regulatory data and measures taken against the licensee are registered.

***Lithuania:** Drilled wells must be leak tight, while spouting drilled wells must be equipped with regulating devices. Drilled wells no longer suitable for use must be conserved or liquidated according to the procedure established by the Ministry for Environmental Protection and the Geological Service of Lithuania.*

E. How should the transition between this land and former land be pr ovided for?

1. Analytical description

New water legislation is often intended to cover the same subjects as existing legislation, or at least may affect the latter in some way. It is therefore common practice to include transitional provisions in the new legislation. These rules would normally provide for the new law to supersede the old or existing one, or at least for the new law to take precedence in the event that the two should come into conflict. Frequently the old or existing law is expressly repealed in the same act that contains the new law, or in a separate statute. Modern water legislation may cover many matters not included in older water laws, but which may be touched upon in other statutes, such as those on forests, mining, land use, fishing, and the like. Therefore, even if the old water law is expressly repealed it is advisable to include a provision in the new legislation regarding whether, in the event of inconsistency, that law takes precedence over all existing legislation, or only certain statutes.

Similar considerations apply to the laws and regulations of political subdivisions, many of which will need to be brought into line with the new water law. Permits for such activities as water use and the operation of installations may, likewise, need to be renewed in such a way as to ensure their compliance with the newly enacted legislation. The status of any agreements provided for in the former law – e.g., between different governmental entities or between governmental and private entities – should also be provided for in the new legislation. A final example of items States have addressed in transitional provisions concerns judicial or administrative proceedings under the former law that are ongoing when the new legislation becomes effective. The new law usually provides that these proceedings will continue to be governed by the former law.

2. Examples from National Legislation

Armenia: *The water Code of the Republic of Armenia shall become effective after 3 months of official publishing. The Water Code of the Republic of Armenia of 23 March, 1992, shall become null and void from the moment of enactment of this Code.*

Other legal acts containing legal norms in the area of water relations shall be adjusted to this Code before 1 July, 2004. Prior to their adjustment to this Code, all laws and other legal acts containing legal norms in the area of water relations shall be applied to the extent that they are not in conflict with this Code.All normative acts of the President of the Republic of Armenia, the Government of the Republic of Armenia, the Ministries and other government bodies, which regulate relationships that should be regulated only by law, pursuant to the Code, shall remain in effect until the enactment of the corresponding laws. This Code shall apply to such legal relationships containing legal norms in water relations, which evolved after the enactment of this Code, unless otherwise provided by this Code. This Code shall apply to the contractual and legal relationships containing legal norms in water relations, which evolved prior to the enactment of this Code, to the extent of such rights and responsibilities that will arise after the enactment of this Code. The norms of this Code relevant to the basis and consequences of nullification of transactions shall apply to such transactions where the claims of nullification shall be reviewed in court after the enactment of this Code, regardless of the date of execution of the corresponding transactions. Expiration and Renewal of Existing Water Use Permits All water use permits, contracts or other legal documents conveying water use rights issued prior to the date of enactment of this Code shall be harmonized with the requirements of this Code. By October 1st 2003, persons holding valid water use permits, water system use permits, contracts or other legal documents conveying water use rights may apply to the Water Resources Management and Protection Body and request a new water use permit be issued according to the terms of this legislation and based upon the rights conferred in the existing documents. Any existing permit shall be submitted to the Water Resources Management and Protection Body at the time of renewal. Expiration and Renewal of Existing Water System Use Permits Within two years (2) of enactment of this Law, persons holding valid non-competitive water supply system use rights shall obtain a new water system use permit issued according to the terms of this Code. In case of not getting a water system use permit for existing water system within the time period specified, the permits, contracts or other legal documents for non-competitive water supply shall be null and void.

Mexico:

1. *The present Decree shall become effective the day following publication in the Federal Official Gazette.*
2. *It is derogated the Law on the Exclusive Fishing Area of the Nation, published in the Federal Official Gazette on January 20, 1967, the Soil and Water Conservation Law published in such Gazette on July 6; 1946, as well as all legal provisions contrary to the provisions established in this Decree.*
3. *The States Governments, as well as the City Councils, shall adjust their laws, regulations, ordinances, police regulations and other applicable stipulations to the provisions established in this Decree.*
4. *The administrative proceedings and remedies related to the matters of the General Law of Ecological Balance and Environmental Protection, initiated before the effective date of this Decree, shall be processed and solved pursuant to the provisions in force at that time and other applicable provisions related to the matter involved.*
5. *The Federation, in coordination with the States and Municipal Authorities, as the case may be, shall enforce the provisions established in this Decree at a local level, in those matters where jurisdiction did not fall within that government levels before the effective date of this Decree, until issuance and amendment of the regulations mentioned in number 3.*
6. *The authorizations, permits, licenses and concessions granted before the effective date of this Decree, shall continue in force; and their extension of time shall be subject to the provisions of this Decree.*

Zimbabwe: *Notwithstanding any agreement to the contrary entered into before the date of commencement of this Act concerning the allocation of any water from water works acquired or constructed by the former Regional Water Authority in accordance with rights granted in terms of any previous enactment, the Minister may, in consultation with the National Water Authority, authorize the reallocation of any such water in terms of this Act and fix a tariff of charges in respect of that water.*

III. Fifteen important lessons learned

A wealth of lessons has been learned over the past several decades concerning the management of freshwater resources and, consequently, legislative approaches to regulating the management, use and protection of this vital resource. Some of these lessons derive from past experience, which has revealed the kinds of approaches that work well and those that have not performed up to expectations. Other lessons are based upon a better understanding of both the functioning of natural systems, of which water forms a critical part, and of how these systems serve to support human life and contribute to economic development. These latter lessons are thus based not so much on experience with actual water legislation, as on knowledge that did not exist when a number of water laws were drafted.

This Section will identify and discuss briefly a number of these lessons. It will begin with those of a general character and will then turn to ones that deal with more specific issues. Several of these lessons have been set out above in various sections of Part II. They are reiterated here both for the reader's convenience and to emphasize their importance.

A. General

Lessons of a general nature for the drafter of water legislation have to do with the overall approach, both in terms of substantive coverage and in relation to how to structure legislation which could cover all or most of the many different kinds of issues identified in Section II.

1. Manage freshwater for sustainable development

The World Commission on Environment and Development has defined sustainable development as "development that meets the needs of the present without compromising the ability of future generations to meet their own needs."[9] Sustainable development includes not only equity between generations (inter-generational equity) but also equity among members of Earth's, and individual countries', present populations (intra-generational equity). (See Lesson 6, below.) More generally, sustainable development entails taking care in managing freshwater resources to ensure that efforts to raise living standards do not compromise the sustainability of those resources and associated ecosystems over time. Economic development that degrades the resource base on which it directly or indirectly depends will be short-term development only, of benefit at most to present generations, but not to those in the future. The biosphere is remarkably resilient, but there are limits on its ability to absorb the effects of human activities. This is as true of freshwater systems as of other elements of the biosphere. Degradation of freshwater will threaten the livelihoods of many, but especially the poor.

2. Manage freshwater in a holistic manner: an ecosystem approac h

In the words of Agenda 21, "Freshwater is a unitary resource. Long-term development of global freshwater requires holistic management of resources and a recognition of the interconnectedness of the elements related to freshwater and freshwater quality."[10] Management of water resources is holistic when it is done on a catchment or drainage basin basis. This includes both land and water resources, since land use can have significant impacts on freshwater and related ecosystems, as noted in Section I. (See also Lesson 3, below.) A holistic approach also implies that water resources management will be integrated. Integrated water resources management (IWRM) takes into account not only the ecosystem of which water forms an integral part but also the many different human activities, both existing and proposed, that use and affect freshwater resources. It also has a technical component—the optimal operation of a watershed (or a region's) entire system of water diversion, storage, conveyance, treatment and discharge works.

At whatever level of consideration, holistic water management is a cornerstone of sustainable development because without it, gaps, overlaps and conflicts among different sectoral management and regulatory efforts are bound to occur, impairing their effectiveness. This may not only retard development but also degrade the resource base on which its sustainability depends. Thus water legislation should provide for a holistic, ecosystem approach to the management of water, sanitation and human settlements in order to ensure that efforts to raise standards of living and protect the environment will be sustainable over time.

3. Ideally, treat all matters concerning freshwater in a single, integrated water law

The lessons that have already been discussed have shown that sustainable development and holistic water management require an integrated approach to the stewardship of freshwater resources. Following such an approach in a coherent manner may be difficult if relevant laws are contained in scattered statutes. It is therefore preferable to treat, as far as practicable, all aspects of water use and protection in a single piece of legislation. There is a tendency in some recently enacted water legislation to follow this approach. The greater the integration of law, the greater the facilitation of holistic management, since all aspects of water regulation may be harmonized in one document. It also helps the drafter to avoid gaps, overlaps, inconsistencies and conflicts in the statutory scheme.

Several countries have gone beyond the integration of water resources statutes into a single law. They have enacted laws that address the sustainable development of multiple resources—e.g., water resources, forestry resources, land use, biological communities—in a single law. The same benefits that come from integration of all the laws governing a particular resource into a single law are multiplied by the integration of all the laws governing multiple natural resources into a single law.

4. Conserve water through rational urban development policies

There are well-known examples of large population centers that are located in arid areas, far from sources of freshwater. These cities have, typically, experienced unchecked growth over time and outstripped local water supplies. They have therefore been forced to transport water over long distances. This usually results in losses of water through evaporation and seepage, and often works to the serious detriment of ecosystems and even populations at the water's source. While there are well-recognized limits on the authority of governments to control where people live, this sort of situation should be anticipated and avoided wherever possible.

5. Make conservation and protection of freshwater resources a theme in water legislation

As is well known, growing numbers of people lack access to safe water (see Section I.3). It is therefore more important than ever that available water supplies be conserved and protected against contamination and degradation as well as unsustainable use and consumption. In order to be optimally effective, however, statutory requirements concerning conservation and protection of freshwater resources should not be confined to one section or chapter of water legislation. While it may be appropriate to devote a separate section to water pollution, for example, preservation and sustainable use of the resource should be addressed pervasively, so that gains in one sector are not cancelled out by losses in another.

6. Build in Ways to Collaborate with Stakeholders

As noted in Lesson 1 above, sustainable development involves not only inter-generational equity, but also intra-generational equity. The latter form of equity "would be aided by political systems that secure effective citizen participation in decision making and by greater democracy in international decision making." In the sector of freshwater, this implies a

9 Our Common Future, p. 8.

10 Agenda 21, chapter 18, para. 18.35, p. 287.

participatory approach to freshwater resources management – one that includes all stakeholders in relevant decision making processes.

Water code drafters should build into their codes opportunities for meaningful collaboration between water planners and managers, and interested public and private sector stakeholders. By harnessing the interest, the knowledge, the financial and staff resources, and the political support of stakeholders, water planning and management authorities can leverage their own limited ministerial resources. Among other benefits, such an approach allows those with knowledge of specific local needs and conditions to inform planning and management processes, helping to forestall potential future difficulties. It also fosters a sense of legitimacy of those processes and hence of ownership of the results they produce. Ultimately, it can help ensure a more robust solution to an area's planning and management challenges.

7. Recognize that integration is an ongoing process

Finally, water legislation should formally acknowledge that integration is an ongoing process. As knowledge about a watershed changes, as uses change, as users change, as facilities change, as climate changes, water resource manners will need to develop new responses that optimize a watershed's resource allocations. To ensure that water managers can respond appropriately as their understanding improves, water planning legislation should require monitoring and adaptive management through periodic reviews. Water use legislation should build into the permitting process regular reporting requirements and regular review and renewal periods. In addition, water permitting authorities should have the power to review a permitted use at any time if either circumstances or understanding changes substantially. Lastly, legislatures and ministries must remain alert to the impacts of governmental reorganization and budgeting changes on sound water resource management.

B. Specific Issues

1. Include impact assessment in project approval processes

Many countries today have legislation requiring the assessment of environmental and other impacts of proposed projects. Impact assessment is an integral part of the preventive approach to environmental protection and thus, sustainable development. In order to ensure that the possible impacts of proposed water projects and activities are assessed prior to their approval and implementation, water legislation should either (i) contain a separate provision requiring those proposing the projects to conduct an assessment of their possible impacts, or (ii) if there is a separate and generally applicable law on impact assessment, require that the proponent of the project or activity conduct an assessment in accordance with that law. The legislation could then provide that the results of the assessment would be taken into account in the approval process.

2. Do not treat groundwater and surface water separatel y

While there are differences between surface and groundwater that make some provisions applicable only to one water body and not the other, water codes should treat surface and groundwater as parts of a unified planning and permit system. This is especially important for aquifers that are hydrologically connected with a surface watercourse, as many are. In such circumstances, groundwater extraction and surface water diversion can have mutually reinforcing effects. These can be negative or positive. As examples of negative effects, groundwater pumping may induce greater surface water infiltration, thereby reducing the amount of surface water available for instream or consumptive uses. Groundwater pumping may also reduce the amount of water that discharges from an aquifer into a surface watercourse. By the same token, some surface water diversions can reduce the amount of water available for aquifer recharge. In contrast, careful integration of surface water diversion and storage with groundwater pumping and storage can yield net environmental and supply benefits to the overall watershed. Requiring all water rights holders to apply through the same permit system will help ensure that one person's right to pump or divert does not come at the expense of either the ecosystem or another water user.

3. Include all but de minimis domestic uses or customary uses in a permit system

There are still areas of the world where large groups of water users fall entirely outside of any permit system. This is most true in areas where riparian rights are recognized, or where groundwater pumping is unregulated, or where other appropriative rights that antedate the permit system are recognized. It is also true in areas where there are significant customary uses.

The existence of such unpermitted uses poses substantial challenges for both water planners and water regulators. Unless these users are required to submit usage reports, planners will lack data that may be crucial to watershed management. Permitting entities may lack authority to easily regulate these uses.

Ultimately, truly integrated water resources planning requires the inclusion of the broadest range of water uses possible within the planning and permit system. Customary or de minimis uses may appropriately be exempted from the planning and permit system as long as the volume and types of use remain de minimis. But where the impacts are or are likely to be significant, the legislature needs to bring such uses into the planning and permit system. Methods exist to make such transitions less harsh. These may include incentives; subsidies; phase-in periods; amortization periods; or special classes of permit rights. At some point, however, a country may need to make the determination that one or more classes of rights may need to be transformed into rights permitted under the code. Whether such transformations require the payment of compensation for the former rights holders is a matter for each country's laws and policies.

4. Do not separate water quantity planning from water quality planning

Planning for water quality and water quantity should be done by the same ministry or agency. Some jurisdictions assign water quantity planning to agencies that specialize in the construction of waterworks, and assign water quality planning to agencies that specialize in environmental enforcement. Such a division arbitrarily separates water quantity and quality, and can create unnecessary duplication of efforts or regulatory inefficiencies. In addition, it reinforces tendencies to relegate water quality to a secondary status, considered almost as an afterthought to proposals for large waterworks projects that otherwise build up their own momentum.

5. Do not fragment planning, permitting, and enforcement authority

As a corollary to the preceding suggestion, water planning, permitting and enforcement should be done by a single ministry or agency. Integration of these powers can best assure the most efficient use of regulatory resources, the easiest sharing of information developed from the different regulatory activities, and the minimization of inter-agency rivalries.

6. Keep public water regulators from being public water suppliers

Unlike the last two recommendations, which propose greater integration of resource management authority, this recommendation proposes a division of authority. Water planning, permitting and enforcement ministries should not also be water suppliers. Where a public agency is both regulating water uses, and is itself a regulated user, potential conflicts of interest abound. To ensure that proposed waterworks projects are consistent with water plans and meet economic, environmental, and social criteria, there needs to be an "arm's length" relationship between the regulating ministry and the regulated public water supply agency.

7. Water Planners should not confine themselves to conventional "Forecasting" tools when thinking about the future.

While water statutes should require comprehensive planning as a critical component of sustainable water resources development, planners should not be tied to a particular tool for the consideration of the future that a particular watershed faces. Too often, statutes mandate that planners make traditional forecasts of future "demands." Such forecasts, usually based on some variation of current trends, may well mislead decision makers and the affected public into thinking that these "forecasts" are "predictions." In addition, they often ignore the possibilities of important factors that are not necessarily trend based but can how powerful impacts on shaping the future. Planners around the world have developed many new ways of looking at the future, such as the creation of alternative future scenarios. Legislators should give planners the freedom to choose from a variety of planning tools.

8. Consider Efficiency Impr ovements

Finally, considerations of efficient water use should be given greater prominence in water planning and permitting. In many situations, investments in more efficient methods of water use, or more efficient technologies, can reduce the demands for water diversion and the needs for waste water discharge at a lower overall cost—economic, environmental, and social—than supply augmentation methods. Water planners and managers should identify the proper mix of incentives, subsidies, public waterworks, mandates or market forces that are the most appropriate method for their country to increase efficiency.

IV. Index and Bibliography

A. Index

B. Bibliography

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Appendix A: Agenda 21, Chapter 18

Chapter 18 - Protection of the Quality and Supply of Freshwater Resources: Application of Integrated Approaches to the Development, Management and Use of Water Resources

This is a final, advanced version of a chapter of Agenda 21, as adopted by the Plenary in Rio de Janeiro, on June 14, 1992. This document will be further edited, translated into the official languages, and published by the United Nations for the General Assembly this autumn.

INTRODUCTION

18.1. Freshwater resources are an essential component of the earth's hydrosphere and an indispensable part of all terrestrial ecosystems. The freshwater environment is characterized by the hydrological cycle, including floods and droughts, which in some regions have become more extreme and dramatic in their consequences. Global climate change and atmospheric pollution could also have an impact on freshwater resources and their availability and, through sea-level rise, threaten low-lying coastal areas and small island ecosystems.

18.2. Water is needed in all aspects of life. The general objective is to make certain that adequate supplies of water of good quality are maintained for the entire population of this planet, while preserving the hydrological, biological and chemical functions of ecosystems, adapting human activities within the capacity limits of nature and combating vectors of water-related diseases. Innovative technologies, including the improvement of indigenous technologies, are needed to fully utilize limited water resources and to safeguard those resources against pollution.

18.3. The widespread scarcity, gradual destruction and aggravated pollution of freshwater resources in many world regions, along with the progressive encroachment of incompatible activities, demand integrated water resources planning and management. Such integration must cover all types of interrelated freshwater bodies, including both surface water and groundwater, and duly consider water quantity and quality aspects. The multisectoral nature of water resources development in the context of socio-economic development must be recognized, as well as the multi-interest utilization of water resources for water supply and sanitation, agriculture, industry, urban development, hydropower generation, inland fisheries, transportation, recreation, low and flat lands management and other activities. Rational water utilization schemes for the development of surface and underground water-supply sources and other potential sources have to be supported by concurrent water conservation and wastage minimization measures. Priority, however, must be accorded to flood prevention and control measures, as well as sedimentation control, where required.

18.4. Transboundary water resources and their use are of great importance to riparian States. In this connection, cooperation among those States may be desirable in conformity with existing agreements and/or other relevant arrangements, taking into account the interests of all riparian States concerned.

18.5. The following programme areas are proposed for the freshwater sector:

(a) Integrated water resources development and management;
(b) Water resources assessment;
(c) Protection of water resources, water quality and aquatic ecosystems;
(d) Drinking-water supply and sanitation;
(e) Water and sustainable urban development;
(f) Water for sustainable food production and rural development;
(g) Impacts of climate change on water resources.

PROGRAMME AREAS

A. Integrated water resources development and management

Basis for action

18.6. The extent to which water resources development contributes to economic productivity and social well-being is not usually appreciated, although all social and economic activities rely heavily on the supply and quality of freshwater. As populations and economic activities grow, many countries are rapidly reaching conditions of water scarcity or facing limits to economic development. Water demands are increasing rapidly, with 70-80 per cent required for irrigation, less than 20 per cent for industry and a mere 6 per cent for domestic consumption. The holistic management of freshwater as a finite and vulnerable resource, and the integration of sectoral water plans and programmes within the framework of national economic and social policy, are of paramount importance for action in the 1990s and beyond. The fragmentation of responsibilities for water resources development among sectoral agencies is proving, however, to be an even greater impediment to promoting integrated water management than had been anticipated. Effective implementation and coordination mechanisms are required.

Objectives

18.7. The overall objective is to satisfy the freshwater needs of all countries for their sustainable development.
18.8. Integrated water resources management is based on the perception of water as an integral part of the ecosystem, a natural resource and a social and economic good, whose quantity and quality determine the nature of its utilization. To this end, water resources have to be protected, taking into account the functioning of aquatic ecosystems and the perenniality of the resource, in order to satisfy and reconcile needs for water in human activities. In developing and using water resources, priority has to be given to the satisfaction of basic needs and the safeguarding of ecosystems. Beyond these requirements, however, water users should be charged appropriately.

18.9. Integrated water resources management, including the integration of land- and water-related aspects, should be carried out at the level of the catchment basin or sub-basin. Four principal objectives should be pursued, as follows:

(a) To promote a dynamic, interactive, iterative and multisectoral approach to water resources management, including the identification and protection of potential sources of freshwater supply, that integrates technological, socio-economic, environmental and human health considerations;

(b) To plan for the 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;

(c) To design, implement and evaluate projects and programmes that are both economically efficient and socially appropriate within clearly defined strategies, based on an approach of full public participation, including that of women, youth, indigenous people, local communities, in water management policy-making and decision-making;

(d) To identify and strengthen or develop, as required, in particular in developing countries, the appropriate institutional, legal and financial mechanisms to ensure that water policy and its implementation are a catalyst for sustainable social progress and economic growth.

18.10. In the case of transboundary water resources, there is a need for riparian States to formulate water resources strategies, prepare water resources action programmes and consider, where appropriate, the harmonization of those strategies and action programmes.

18.11. All States, according to their capacity and available resources, and through bilateral or multilateral cooperation, including the United Nations and other relevant organizations as appropriate, could set the following targets:

(a) By the year 2000:

(i) To have designed and initiated costed and targeted national action programmes, and have put in place appropriate institutional structures and legal instruments;

(ii) To have established efficient water-use programmes to attain sustainable resource utilization patterns;

(b) By the year 2025:

(i) To have achieved subsectoral targets of all freshwater programme areas.

It is understood that the fulfilment of the targets quantified in (i) and (ii) above will depend upon new and additional financial resources that will be made available to developing countries in accordance with the relevant provisions of General Assembly resolution 44/228.

Activities

18.12. All States, according to their capacity and available resources, and through bilateral or multilateral cooperation, including the United Nations and other relevant organizations as appropriate, could implement the following activities to improve integrated water resources management:

(a) Formulation of costed and targeted national action plans and investment programmes;

(b) Integration of measures for the protection and conservation of potential sources of freshwater supply, including the inventorying of water resources, with land-use planning, forest resource utilization, protection of mountain slopes and riverbanks and other relevant development and conservation activities;

(c) Development of interactive databases, forecasting models, economic planning models and methods for water management and planning, including environmental impact assessment methods;

(d) Optimization of water resources allocation under physical and socio-economic constraints;

(e) Implementation of allocation decisions through

demand management, pricing mechanisms and regulatory measures;

(f) Flood and drought management, including risk analysis and environmental and social impact assessment;

(g) Promotion of schemes for rational water use through public awareness-raising, educational programmes and levying of water tariffs and other economic instruments;

(h) Mobilization of water resources, particularly in arid and semi-arid areas;

(i) Promotion of international scientific research cooperation on freshwater resources;

(j) Development of new and alternative sources of water-supply such as sea-water desalination, artificial groundwater recharge, use of marginal-quality water, waste-water reuse and water recycling; (k) Integration of water (including surface and underground water resources) quantity and quality management;

(l) Promotion of water conservation through improved water-use efficiency and wastage minimization schemes for all users, including the development of water-saving devices;

(m) Support to water-users groups to optimize local water resources management;

(n) Development of public participatory techniques and their implementation in decision-making, particularly the enhancement of the role of women in water resources planning and management;

(o) Development and strengthening, as appropriate, of cooperation, including mechanisms where appropriate, at all levels concerned, namely:

(i) At the lowest appropriate level, delegation of water resources management, generally, to such a level, in accordance with national legislation, including decentralization of government services to local authorities, private enterprises and communities;

(ii) At the national level, integrated water resources planning and management in the framework of the national planning process and, where appropriate, establishment of independent regulation and monitoring of freshwater, based on national legislation and economic measures;

(iii) At the regional level, consideration, where appropriate, of the harmonization of national strategies and action programmes;

(iv) At the global level, improved delineation of responsibilities, division of labour and coordination of international organizations and programmes, including facilitating discussions and sharing of experiences in areas related to water resources management;

(p) Dissemination of information, including operational guidelines, and promotion of education for water users, including the consideration by the United Nations of a World Water Day.

Means of implementation

(a) Financing and cost evaluation

18.13. The Conference secretariat has estimated the average total annual cost (1993-2000) of implementing the activities of this programme to be about $115 million from the international community on grant or concessional terms. These are indicative and order of magnitude estimates only and have not been reviewed by Governments. Actual costs and financial terms, including any that are non-concessional, will depend upon, inter alia, the specific strategies and programmes Governments decide upon for implementation.

(b) Scientific and technological means

18.14. The development of interactive databases, forecasting methods and economic planning models appropriate to the task of managing water resources in an efficient and sustainable manner will require the application of new techniques such as geographical information systems and expert systems to gather, assimilate, analyse and display multisectoral information and to optimize decision-making. In addition, the development of new and alternative sources of water-supply and low-cost water technologies will require innovative applied research. This will involve the transfer, adaptation and diffusion of new techniques and technology among developing countries, as well as the development of endogenous capacity, for the purpose of being able to deal with the added dimension of integrating engineering, economic, environmental and social aspects of water resources management and predicting the effects in terms of human impact.

18.15. Pursuant to the recognition of water as a social and economic good, the various available options for charging water users (including domestic, urban, industrial and agricultural water-user groups) have to be

further evaluated and field-tested. Further development is required for economic instruments that take into account opportunity costs and environmental externalities. Field studies on the willingness to pay should be conducted in rural and urban situations.

18.16. Water resources development and management should be planned in an integrated manner, taking into account long-term planning needs as well as those with narrower horizons, that is to say, they should incorporate environmental, economic and social considerations based on the principle of sustainability; include the requirements of all users as well as those relating to the prevention and mitigation of water-related hazards; and constitute an integral part of the socio-economic development planning process. A prerequisite for the sustainable management of water as a scarce vulnerable resource is the obligation to acknowledge in all planning and development its full costs. Planning considerations should reflect benefits investment, environmental protection and operation costs, as well as the opportunity costs reflecting the most valuable alternative use of water. Actual charging need not necessarily burden all beneficiaries with the consequences of those considerations. Charging mechanisms should, however, reflect as far as possible both the true cost of water when used as an economic good and the ability of the communities to pay.

18.17. The role of water as a social, economic and life-sustaining good should be reflected in demand management mechanisms and implemented through water conservation and reuse, resource assessment and financial instruments.

18.18. The setting afresh of priorities for private and public investment strategies should take into account (a) maximum utilization of existing projects, through maintenance, rehabilitation and optimal operation; (b) new or alternative clean technologies; and (c) environmentally and socially benign hydropower.

(c) Human resources development

18.19. The delegation of water resources management to the lowest appropriate level necessitates educating and training water management staff at all levels and ensuring that women participate equally in the education and training programmes. Particular emphasis has to be placed on the introduction of public participatory techniques, including enhancement of the role of women, youth, indigenous people and local communities. Skills related to various water management functions have to be developed by municipal government and water authorities, as well as in the private sector, local/national non-governmental organizations, cooperatives, corporations and other water-user groups. Education of the public regarding the importance of water and its proper management is also needed.

18.20. To implement these principles, communities need to have adequate capacities. Those who establish the framework for water development and management at any level, whether international, national or local, need to ensure that the means exist to build those capacities. The means will vary from case to case. They usually include:

(a) Awareness-creation programmes, including mobilizing commitment and support at all levels and initiating global and local action to promote such programmes;

(b) Training of water managers at all levels so that they have an appropriate understanding of all the elements necessary for their decision-making;

(c) Strengthening of training capacities in developing countries;

(d) Appropriate training of the necessary professionals, including extension workers;

(e) Improvement of career structures;

(f) Sharing of appropriate knowledge and technology, both for the collection of data and for the implementation of planned development including non-polluting technologies and the knowledge needed to extract the best performance from the existing investment system.

(d) Capacity-building

18.21. Institutional capacity for implementing integrated water management should be reviewed and developed when there is a clear demand. Existing administrative structures will often be quite capable of achieving local water resources management, but the need may arise for new institutions based upon the perspective, for example, of river catchment areas, district development councils and local community committees. Although water is managed at various levels in the socio-political system, demand-driven management requires the development of water-related institutions at appropriate levels, taking into account the need for integration with land-use management.

18.22. In creating the enabling environment for lowest-appropriate-level management, the role of Government includes mobilization of financial and human resources, legislation, standard-setting and other regulatory functions, monitoring and assessment of the

use of water and land resources, and creating of opportunities for public participation. International agencies and donors have an important role to play in providing support to developing countries in creating the required enabling environment for integrated water resources management. This should include, as appropriate, donor support to local levels in developing countries, including community-based institutions, non-governmental organizations and women's groups.

B. Water resources assessment

Basis for action

18.23. Water resources assessment, including the identification of potential sources of freshwater supply, comprises the continuing determination of sources, extent, dependability and quality of water resources and of the human activities that affect those resources. Such assessment constitutes the practical basis for their sustainable management and a prerequisite for evaluation of the possibilities for their development. There is, however, growing concern that at a time when more precise and reliable information is needed about water resources, hydrologic services and related bodies are less able than before to provide this information, especially information on groundwater and water quality. Major impediments are the lack of financial resources for water resources assessment, the fragmented nature of hydrologic services and the insufficient numbers of qualified staff. At the same time, the advancing technology for data capture and management is increasingly difficult to access for developing countries. Establishment of national databases is, however, vital to water resources assessment and to mitigation of the effects of floods, droughts, desertification and pollution.

Objectives

18.24. Based upon the Mar del Plata Action Plan, this programme area has been extended into the 1990s and beyond with the overall objective of ensuring the assessment and forecasting of the quantity and quality of water resources, in order to estimate the total quantity of water resources available and their future supply potential, to determine their current quality status, to predict possible conflicts between supply and demand and to provide a scientific database for rational water resources utilization.18.25. Five specific objectives have been set accordingly, as follows:

(a) To make available to all countries water resources assessment technology that is appropriate to their needs, irrespective of their level of development, including methods for the impact assessment of climate change on freshwaters;

(b) To have all countries, according to their financial means, allocate to water resources assessment financial resources in line with the economic and social needs for water resources data;

(c) To ensure that the assessment information is fully utilized in the development of water management policies;

(d) To have all countries establish the institutional arrangements needed to ensure the efficient collection, processing, storage, retrieval and dissemination to users of information about the quality and quantity of available water resources at the level of catchments and groundwater aquifers in an integrated manner;

(e) To have sufficient numbers of appropriately qualified and capable staff recruited and retained by water resources assessment agencies and provided with the training and retraining they will need to carry out their responsibilities successfully.

18.26. All States, according to their capacity and available resources, and through bilateral or multilateral cooperation, including cooperation with the United Nations and other relevant organizations, as appropriate, could set the following targets:

(a) By the year 2000, to have studied in detail the feasibility of installing water resources assessment services;

(b) As a long-term target, to have fully operational services available based upon high-density hydrometric networks.

Activities

18.27. All States, according to their capacity and available resources, and through bilateral or multilateral cooperation, including the United Nations and other relevant organizations as appropriate, could undertake the following activities:

(a) Institutional framework:

(i) Establish appropriate policy frameworks and national priorities;

(ii) Establish and strengthen the institutional capabilities of countries, including legislative and regulatory arrangements, that are required to ensure the adequate assessment of their water resources and the provision of flood and drought forecasting services;

(iii) Establish and maintain effective cooperation at

the national level between the various agencies responsible for the collection, storage and analysis of hydrologic data;

(iv) Cooperate in the assessment of transboundary water resources, subject to the prior agreement of each riparian State concerned;

(b) Data systems:

(i) Review existing data-collection networks and assess their adequacy, including those that provide real-time data for flood and drought forecasting;

(ii) Improve networks to meet accepted guidelines for the provision of data on water quantity and quality for surface and groundwater, as well as relevant land-use data;

(iii) Apply standards and other means to ensure data compatibility;

(iv) Upgrade facilities and procedures used to store, process and analyse hydrologic data and make such data and the forecasts derived from them available to potential users;

(v) Establish databases on the availability of all types of hydrologic data at the national level;

(vi) Implement "data rescue" operations, for example, establishment of national archives of water resources;

(vii) Implement appropriate well-tried techniques for the processing of hydrologic data;

(viii) Derive area-related estimates from point hydrologic data;

(ix) Assimilate remotely sensed data and the use, where appropriate, of geographical information systems;

(c) Data dissemination:

(i) Identify the need for water resources data for various planning purposes;

(ii) Analyse and present data and information on water resources in the forms required for planning and management of countries' socio-economic development and for use in environmental protection strategies and in the design and operation of specific water-related projects;

(iii) Provide forecasts and warnings of flood and drought to the general public and civil defence;

(d) Research and development:

(i) Establish or strengthen research and development programmes at the national, subregional, regional and international levels in support of water resources assessment activities;

(ii) Monitor research and development activities to ensure that they make full use of local expertise and other local resources and that they are appropriate for the needs of the country or countries concerned.

Means of implementation

(a) Financing and cost evaluation

18.28. The Conference secretariat has estimated the average total annual cost (1993-2000) of implementing the activities of this programme to be about $355 million, including about $145 million from the international community on grant or concessional terms. These are indicative and order of magnitude estimates only and have not been reviewed by Governments. Actual costs and financial terms, including any that are non-concessional will depend upon, inter alia, the specific strategies and programmes Governments decide upon for implementation.

(b) Scientific and technological means

18.29. Important research needs include (a) development of global hydrologic models in support of analysis of climate change impact and of macroscale water resources assessment; (b) closing of the gap between terrestrial hydrology and ecology at different scales, including the critical water-related processes behind loss of vegetation and land degradation and its restoration; and (c) study of the key processes in water-quality genesis, closing the gap between hydrologic flows and biogeochemical processes. The research models should build upon hydrologic balance studies and also include the consumptive use of water. This approach should also, when appropriate, be applied at the catchment level.

18.30. Water resources assessment necessitates the strengthening of existing systems for technology transfer, adaptation and diffusion, and the development of new technology for use under field conditions, as well as the development of endogenous capacity. Prior to inaugurating the above activities, it is necessary to prepare catalogues of the water resources information

held by government services, the private sector, educational institutes, consultants, local water-use organizations and others.

(c) Human resource development

18.31. Water resources assessment requires the establishment and maintenance of a body of well-trained and motivated staff sufficient in number to undertake the above activities. Education and training programmes designed to ensure an adequate supply of these trained personnel should be established or strengthened at the local, national, subregional or regional level. In addition, the provision of attractive terms of employment and career paths for professional and technical staff should be encouraged. Human resource needs should be monitored periodically, including all levels of employment. Plans have to be established to meet those needs through education and training opportunities and international programmes of courses and conferences.

18.32. Because well-trained people are particularly important to water resources assessment and hydrologic forecasting, personnel matters should receive special attention in this area. The aim should be to attract and retain personnel to work on water resources assessment who are sufficient in number and adequate in their level of education to ensure the effective implementation of the activities that are planned. Education may be called for at both the national and the international level, with adequate terms of employment being a national responsibility.

18.33. Recommended actions include:

(a) Identifying education and training needs geared to the specific requirements of countries;

(b) Establishing and strengthening education and training programmes on water-related topics, within an environmental and developmental context, for all categories of staff involved in water resources assessment activities, using advanced educational technology, where appropriate, and involving both men and women;

(c) Developing sound recruitment, personnel and pay policies for staff of national and local water agencies.

(d) Capacity-building

18.34. The conduct of water resources assessment on the basis of operational national hydrometric networks requires an enabling environment at all levels. The following national support action is necessary for enhanced national capacities:

(a) Review of the legislative and regulatory basis of water resources assessment;

(b) Facilitation of close collaboration among water sector agencies, particularly between information producers and users;

(c) Implementation of water management policies based upon realistic appraisals of water resources conditions and trends;

(d) Strengthening of the managerial capabilities of water-user groups, including women, youth, indigenous people and local communities, to improve water-use efficiency at the local level.

C. Protection of water resources, water quality and aquatic ecosystems

Basis for action

18.35. Freshwater is a unitary resource. Long-term development of global freshwater requires holistic management of resources and a recognition of the interconnectedness of the elements related to freshwater and freshwater quality. There are few regions of the world that are still exempt from problems of loss of potential sources of freshwater supply, degraded water quality and pollution of surface and groundwater sources. Major problems affecting the water quality of rivers and lakes arise, in variable order of importance according to different situations, from inadequately treated domestic sewage, inadequate controls on the discharges of industrial waste waters, loss and destruction of catchment areas, ill-considered siting of industrial plants, deforestation, uncontrolled shifting cultivation and poor agricultural practices. This gives rise to the leaching of nutrients and pesticides. Aquatic ecosystems are disturbed and living freshwater resources are threatened.

Under certain circumstances, aquatic ecosystems are also affected by agricultural water resource development projects such as dams, river diversions, water installations and irrigation schemes. Erosion, sedimentation, deforestation and desertification have led to increased land degradation, and the creation of reservoirs has, in some cases, resulted in adverse effects on ecosystems. Many of these problems have arisen from a development model that is environmentally destructive and from a lack of public awareness and education about surface and groundwater resource protection. Ecological and human health effects are the measurable consequences, although the means to monitor them are inadequate or non-existent in many countries. There is a widespread lack of perception of the linkages between the development, management,

use and treatment of water resources and aquatic ecosystems. A preventive approach, where appropriate, is crucial to the avoiding of costly subsequent measures to rehabilitate, treat and develop new water supplies.

Objectives

18.36. The complex interconnectedness of freshwater systems demands that freshwater management be holistic (taking a catchment management approach) and based on a balanced consideration of the needs of people and the environment. The Mar del Plata Action Plan has already recognized the intrinsic linkage between water resource development projects and their significant physical, chemical, biological, health and socio-economic repercussions. The overall environmental health objective was set as follows: "to evaluate the consequences which the various users of water have on the environment, to support measures aimed at controlling water-related diseases, and to protect ecosystems". 1/

18.37. The extent and severity of contamination of unsaturated zones and aquifers have long been underestimated owing to the relative inaccessibility of aquifers and the lack of reliable information on aquifer systems. The protection of groundwater is therefore an essential element of water resource management.

18.38. Three objectives will have to be pursued concurrently to integrate water-quality elements into water resource management:

(a) Maintenance of ecosystem integrity, according to a management principle of preserving aquatic ecosystems, including living resources, and of effectively protecting them from any form of degradation on a drainage basin basis;

(b) Public health protection, a task requiring not only the provision of safe drinking-water but also the control of disease vectors in the aquatic environment;

(c) Human resources development, a key to capacity-building and a prerequisite for implementing water-quality management.

18.39. All States, according to their capacity and available resources, through bilateral or multilateral cooperation, including the United Nations and other relevant organizations as appropriate, could set the following targets:

(a) To identify the surface and groundwater resources that could be developed for use on a sustainable basis and other major developable water-dependent resources and, simultaneously, to initiate programmes for the protection, conservation and rational use of these resources on a sustainable basis;

(b) To identify all potential sources of water-supply and prepared outlines for their protection, conservation and rational use;

(c) To initiate effective water pollution prevention and control programmes, based on an appropriate mixture of pollution reduction-at-source strategies, environmental impact assessments and enforceable standards for major point-source discharges and high-risk non-point sources, commensurate with their socio-economic development;

(d) To participate, as far as appropriate, in international water-quality monitoring and management programmes such as the Global Water Quality Monitoring Programme (GEMS/WATER), the UNEP Environmentally Sound Management of Inland Waters (EMINWA), the FAO regional inland fishery bodies, and the Convention on Wetlands of International Importance Especially as Waterfowl Habitat (Ramsar Convention);

(e) To reduce the prevalence of water-associated diseases, starting with the eradication of dracunculiasis (guinea worm disease) and onchocerciasis (river blindness) by the year 2000;

(f) To establish, according to capacities and needs, biological, health, physical and chemical quality criteria for all water bodies (surface and groundwater), with a view to an ongoing improvement of water quality;

(g) To adopt an integrated approach to environmentally sustainable management of water resources, including the protection of aquatic ecosystems and freshwater living resources;

(h) To put in place strategies for the environmentally sound management of freshwaters and related coastal ecosystems, including consideration of fisheries, aquaculture, animal grazing, agricultural activities and biodiversity.

Activities

18.40. All States, according to their capacity and available resources, and through bilateral or multilateral cooperation, including United Nations and other relevant organizations as appropriate, could implement the following activities:

(a) Water resources protection and conservation:

(i) Establishment and strengthening of technical and institutional capacities to identify and

protect potential sources of water-supply within all sectors of society;

(ii) Identification of potential sources of water-supply and preparation of national profiles;

(iii) Preparation of national plans for water resources protection and conservation;

(iv) Rehabilitation of important, but degraded, catchment areas, particularly on small islands;

(v) Strengthening of administrative and legislative measures to prevent encroachment on existing and potentially usable catchment areas;

(b) Water pollution prevention and control:

(i) Application of the "polluter pays" principle, where appropriate, to all kinds of sources, including on-site and off-site sanitation;

(ii) Promotion of the construction of treatment facilities for domestic sewage and industrial effluents and the development of appropriate technologies, taking into account sound traditional and indigenous practices;

(iii) Establishment of standards for the discharge of effluents and for the receiving waters;

(iv) Introduction of the precautionary approach in water-quality management, where appropriate, with a focus on pollution minimization and prevention through use of new technologies, product and process change, pollution reduction at source and effluent reuse, recycling and recovery, treatment and environmentally safe disposal;

(v) Mandatory environmental impact assessment of all major water resource development projects potentially impairing water quality and aquatic ecosystems, combined with the delineation of appropriate remedial measures and a strengthened control of new industrial installations, solid waste landfills and infrastructure development projects;

(vi) Use of risk assessment and risk management in reaching decisions in this area and ensuring compliance with those decisions;

(vii) Identification and application of best environmental practices at reasonable cost to avoid diffuse pollution, namely, through a limited, rational and planned use of nitrogenous fertilizers and other agrochemicals (pesticides, herbicides) in agricultural practices;

(viii) Encouragement and promotion of the use of adequately treated and purified waste waters in agriculture, aquaculture, industry and other sectors;

(c) Development and application of clean technology:

(i) Control of industrial waste discharges, including low-waste production technologies and water recirculation, in an integrated manner and through application of precautionary measures derived from a broad-based life-cycle analysis;

(ii) Treatment of municipal waste water for safe reuse in agriculture and aquaculture;

(iii) Development of biotechnology, inter alia, for waste treatment, production of biofertilizers and other activities; (iv) Development of appropriate methods for water pollution control, taking into account sound traditional and indigenous practices;

(d) Groundwater protection:

(i) Development of agricultural practices that do not degrade groundwaters;

(ii) Application of the necessary measures to mitigate saline intrusion into aquifers of small islands and coastal plains as a consequence of sealevel rise or overexploitation of coastal aquifers;

(iii) Prevention of aquifer pollution through the regulation of toxic substances that permeate the ground and the establishment of protection zones in groundwater recharge and abstraction areas;

(iv) Design and management of landfills based upon sound hydrogeologic information and impact assessment, using the best practicable and best available technology;

(v) Promotion of measures to improve the safety and integrity of wells and well-head areas to reduce intrusion of biological pathogens and hazardous chemicals into aquifers at well sites;

(vi) Water-quality monitoring, as needed, of surface and groundwaters potentially affected by sites storing toxic and hazardous materials;

(e) Protection of aquatic ecosystems:

(i) Rehabilitation of polluted and degraded water bodies to restore aquatic habitats and ecosystems;

(ii) Rehabilitation programmes for agricultural lands and for other users, taking into account equivalent action for the protection and use of groundwater resources important for agricultural productivity and for the biodiversity of the tropics;

(iii) Conservation and protection of wetlands (owing to their ecological and habitat importance for many species), taking into account social and economic factors;

(iv) Control of noxious aquatic species that may destroy some other water species;

(f) Protection of freshwater living resources:

(i) Control and monitoring of water quality to allow for the sustainable development of inland fisheries;

(ii) Protection of ecosystems from pollution and degradation for the development of freshwater aquaculture projects;

(g) Monitoring and surveillance of water resources and waters receiving wastes:

(i) Establishment of networks for the monitoring and continuous surveillance of waters receiving wastes and of point and diffuse sources of pollution;

(ii) Promotion and extension of the application of environmental impact assessments of geographical information systems;

(iii) Surveillance of pollution sources to improve compliance with standards and regulations and to regulate the issue of discharge permits;

(iv) Monitoring of the utilization of chemicals in agriculture that may have an adverse environmental effect;

(v) Rational land use to prevent land degradation, erosion and siltation of lakes and other water bodies;

(h) Development of national and international legal instruments that may be required to protect the quality of water resources, as appropriate, particularly for:

(i) Monitoring and control of pollution and its effects in national and transboundary waters;

(ii) Control of long-range atmospheric transport of pollutants;

(iii) Control of accidental and/or deliberate spills in national and/or transboundary water bodies;

(iv) Environmental impact assessment.

Means of implementation

(a) Financing and cost evaluation

18.41. The Conference secretariat has estimated the average total annual cost (1993-2000) of implementing the activities of this programme to be about $1 billion, including about $340 million from the international community on grant or concessional terms. These are indicative and order of magnitude estimates only and have not been reviewed by Governments. Actual costs and financial terms, including any that are non-concessional, will depend upon, inter alia, the specific strategies and programmes Governments decide upon for implementation.

(b) Scientific and technological means

18.42. States should undertake cooperative research projects to develop solutions to technical problems that are appropriate for the conditions in each watershed or country. States should consider strengthening and developing national research centres linked through networks and supported by regional water research institutes. The North-South twinning of research centres and field studies by international water research institutions should be actively promoted. It is important that a minimum percentage of funds for water resource development projects is allocated to research and development, particularly in externally funded projects.

18.43. Monitoring and assessment of complex aquatic systems often require multidisciplinary studies involving several institutions and scientists in a joint programme. International water-quality programmes, such as GEMS/WATER, should be oriented towards the water-quality of developing countries. User-friendly software and Geographical Information Systems (GIS) and Global Resource Information Database (GRID) methods should be developed for the handling, analysis and interpretation of monitoring data and for the preparation of management strategies.

(c) Human resource development

18.44. Innovative approaches should be adopted for professional and managerial staff training in order to

cope with changing needs and challenges. Flexibility and adaptability regarding emerging water pollution issues should be developed. Training activities should be undertaken periodically at all levels within the organizations responsible for water-quality management and innovative teaching techniques adopted for specific aspects of water-quality monitoring and control, including development of training skills, in-service training, problem-solving workshops and refresher training courses.

18.45. Suitable approaches include the strengthening and improvement of the human resource capabilities of local Governments in managing water protection, treatment and use, particularly in urban areas, and the establishment of national and regional technical and engineering courses on the subjects of water-quality protection and control at existing schools and education/training courses on water resources protection and conservation for laboratory and field technicians, women and other water-user groups.

(d) Capacity-building

18.46. The effective protection of water resources and ecosystems from pollution requires considerable upgrading of most countries' present capacities. Water-quality management programmes require a certain minimum infrastructure and staff to identify and implement technical solutions and to enforce regulatory action. One of the key problems today and for the future is the sustained operation and maintenance of these facilities. In order not to allow resources gained from previous investments to deteriorate further, immediate action is required in a number of areas.

D. Drinking-water supply and sanitation

Basis for action

18.47. Safe water-supplies and environmental sanitation are vital for protecting the environment, improving health and alleviating poverty. Safe water is also crucial to many traditional and cultural activities. An estimated 80 per cent of all diseases and over one third of deaths in developing countries are caused by the consumption of contaminated water, and on average as much as one tenth of each person's productive time is sacrificed to water-related diseases. Concerted efforts during the 1980s brought water and sanitation services to hundreds of millions of the world's poorest people. The most outstanding of these efforts was the launching in 1981 of the International Drinking Water Supply and Sanitation Decade, which resulted from the Mar del Plata Action Plan adopted by the United Nations Water Conference in 1977. The commonly agreed premise was that "all peoples, whatever their stage of development and their social and economic conditions, have the right to have access to drinking water in quantities and of a quality equal to their basic needs". 2/ The target of the Decade was to provide safe drinking-water and sanitation to underserved urban and rural areas by 1990, but even the unprecedented progress achieved during the Decade was not enough. One in three people in the developing world still lacks these two most basic requirements for health and dignity. It is also recognized that human excreta and sewage are important causes of the deterioration of water-quality in developing countries, and the introduction of available technologies, including appropriate technologies, and the construction of sewage treatment facilities could bring significant improvement.

Objectives

18.48. The New Delhi Statement (adopted at the Global Consultation on Safe Water and Sanitation for the 1990s, which was held in New Delhi from 10 to 14 September 1990) formalized the need to provide, on a sustainable basis, access to safe water in sufficient quantities and proper sanitation for all, emphasizing the "some for all rather than more for some" approach. Four guiding principles provide for the programme objectives:

(a) Protection of the environment and safeguarding of health through the integrated management of water resources and liquid and solid wastes;

(b) Institutional reforms promoting an integrated approach and including changes in procedures, attitudes and behaviour, and the full participation of women at all levels in sector institutions; (c) Community management of services, backed by measures to strengthen local institutions in implementing and sustaining water and sanitation programmes;

(d) Sound financial practices, achieved through better management of existing assets, and widespread use of appropriate technologies.

18.49. Past experience has shown that specific targets should be set by each individual country. At the World Summit for Children, in September 1990, heads of State or Government called for both universal access to water-supply and sanitation and the eradication of guinea worm disease by 1995. Even for the more realistic target of achieving full coverage in water-supply by 2025, it is estimated that annual investments must reach double the current levels. One realistic strategy to meet present and future needs, therefore, is

to develop lower-cost but adequate services that can be implemented and sustained at the community level.

Activities

18.50. All States, according to their capacity and available resources, and through bilateral or multilateral cooperation, including the United Nations and other relevant organizations as appropriate, could implement the following activities:

(a) Environment and health:

(i) Establishment of protected areas for sources of drinking-water supply;

(ii) Sanitary disposal of excreta and sewage, using appropriate systems to treat waste waters in urban and rural areas;

(iii) Expansion of urban and rural water-supply and development and expansion of rainwater catchment systems, particularly on small islands, in addition to the reticulated water-supply system;

(iv) Building and expansion, where appropriate, of sewage treatment facilities and drainage systems;

(v) Treatment and safe reuse of domestic and industrial waste waters in urban and rural areas;

(vi) Control of water-associated diseases;

(b) People and institutions:

(i) Strengthening of the functioning of Governments in water resources management and, at the same time, giving of full recognition to the role of local authorities;

(ii) Encouragement of water development and management based on a participatory approach, involving users, planners and policy makers at all levels;

(iii) Application of the principle that decisions are to be taken at the lowest appropriate level, with public consultation and involvement of users in the planning and implementation of water projects;

(iv) Human resource development at all levels, including special programmes for women;

(v) Broad-based education programmes, with particular emphasis on hygiene, local management and risk reduction;

(vi) International support mechanisms for programme funding, implementation and follow-up;

(c) National and community management:

(i) Support and assistance to communities in managing their own systems on a sustainable basis;

(ii) Encouragement of the local population, especially women, youth, indigenous people and local communities, in water management;

(iii) Linkages between national water plans and community management of local waters;

(iv) Integration of community management of water within the context of overall planning;

(v) Promotion of primary health and environmental care at the local level, including training for local communities in appropriate water management techniques and primary health care;

(vi) Assistance to service agencies in becoming more cost-effective and responsive to consumer needs;

(vii) Providing of more attention to underserved rural and low-income periurban areas;

(viii) Rehabilitation of defective systems, reduction of wastage and safe reuse of water and waste water; (ix) Programmes for rational water use and ensured operation and maintenance;

(x) Research and development of appropriate technical solutions;

(xi) Substantially increase urban wastewater treatment capacity commensurate with increasing loads;

(d) Awareness creation and public information/ participation:

(i) Strengthening of sector monitoring and information management at subnational and national levels;

(ii) Annual processing, analysis and publication of monitoring results at national and local levels

as a sector management and advocacy/awareness creation tool;

(iii) Use of limited sector indicators at regional and global levels to promote the sector and raise funds;

(iv) Improvement of sector coordination, planning and implementation, with the assistance of improved monitoring and information management, to increase the sector's absorptive capacity, particularly in community-based self-help projects.

Means of implementation

(a) Financing and cost evaluation

18.51. The Conference secretariat has estimated the average total annual cost (1993-2000) of implementing the activities of this programme to be about $20 billion, including about $7.4 billion from the international community on grant or concessional terms. These are indicative and order of magnitude estimates only and have not been reviewed by Governments. Actual costs and financial terms, including any that are non-concessional, will depend upon, inter alia, the specific strategies and programmes Governments decide upon for implementation.

(b) Scientific and technological means

18.52. To ensure the feasibility, acceptability and sustainability of planned water-supply services, adopted technologies should be responsive to the needs and constraints imposed by the conditions of the community concerned. Thus, design criteria will involve technical, health, social, economic, provincial, institutional and environmental factors that determine the characteristics, magnitude and cost of the planned system. Relevant international support programmes should address the developing countries concerning, inter alia:

(a) Pursuit of low-cost scientific and technological means, as far as practicable;

(b) Utilization of traditional and indigenous practices, as far as practicable, to maximize and sustain local involvement;

(c) Assistance to country-level technical/scientific institutes to facilitate curricula development to support fields critical to the water and sanitation sector.

(c) Human resource development

18.53. To effectively plan and manage water-supply and sanitation at the national, provincial, district and community level, and to utilize funds most effectively, trained professional and technical staff must be developed within each country in sufficient numbers. To do this, countries must establish manpower development plans, taking into consideration present requirements and planned developments. Subsequently, the development and performance of country-level training institutions should be enhanced so that they can play a pivotal role in capacity-building. It is also important that countries provide adequate training for women in the sustainable maintenance of equipment, water resources management and environmental sanitation.

(d) Capacity-building

18.54. The implementation of water-supply and sanitation programmes is a national responsibility. To varying degrees, responsibility for the implementation of projects and the operating of systems should be delegated to all administrative levels down to the community and individual served. This also means that national authorities, together with the agencies and bodies of the United Nations system and other external support agencies providing support to national programmes, should develop mechanisms and procedures to collaborate at all levels. This is particularly important if full advantage is to be taken of community-based approaches and self-reliance as tools for sustainability. This will entail a high degree of community participation, involving women, in the conception, planning, decision-making, implementation and evaluation connected with projects for domestic water-supply and sanitation.

18.55. Overall national capacity-building at all administrative levels, involving institutional development, coordination, human resources, community participation, health and hygiene education and literacy, has to be developed according to its fundamental connection both with any efforts to improve health and socio-economic development through water-supply and sanitation and with their impact on the human environment. Capacity-building should therefore be one of the underlying keys in implementation strategies. Institutional capacity-building should be considered to have an importance equal to that of the sector supplies and equipment component so that funds can be directed to both. This can be undertaken at the planning or programme/project formulation stage, accompanied by a clear definition of objectives and targets. In this regard, technical cooperation among developing countries owing to their available wealth of information and experience and the need to avoid "reinventing the wheel", is crucial. Such a course has

proved cost-effective in many country projects already.

E. Water and sustainable urban development

Basis for action

18.56. Early in the next century, more than half of the world's population will be living in urban areas. By the year 2025, that proportion will have risen to 60 per cent, comprising some 5 billion people. Rapid urban population growth and industrialization are putting severe strains on the water resources and environmental protection capabilities of many cities. Special attention needs to be given to the growing effects of urbanization on water demands and usage and to the critical role played by local and municipal authorities in managing the supply, use and overall treatment of water, particularly in developing countries for which special support is needed. Scarcity of freshwater resources and the escalating costs of developing new resources have a considerable impact on national industrial, agricultural and human settlement development and economic growth. Better management of urban water resources, including the elimination of unsustainable consumption patterns, can make a substantial contribution to the alleviation of poverty and improvement of the health and quality of life of the urban and rural poor. A high proportion of large urban agglomerations are located around estuaries and in coastal zones. Such an arrangement leads to pollution from municipal and industrial discharges combined with overexploitation of available water resources and threatens the marine environment and the supply of freshwater resources.

Objectives

18.57. The development objective of this programme is to support local and central Governments' efforts and capacities to sustain national development and productivity through environmentally sound management of water resources for urban use. Supporting this objective is the identification and implementation of strategies and actions to ensure the continued supply of affordable water for present and future needs and to reverse current trends of resource degradation and depletion.

18.58. All States, according to their capacity and available resources, and through bilateral or multilateral cooperation, including the United Nations and other relevant organizations as appropriate, could set the following targets:

(a) By the year 2000, to have ensured that all urban residents have access to at least 40 litres per capita per day of safe water and that 75 per cent of the urban population are provided with on-site or community facilities for sanitation;

(b) By the year 2000, to have established and applied quantitative and qualitative discharge standards for municipal and industrial effluents; (c) By the year 2000, to have ensured that 75 per cent of solid waste generated in urban areas are collected and recycled or disposed of in an environmentally safe way.

Activities

18.59. All States, according to their capacity and available resources, and through bilateral or multilateral cooperation, including the United Nations and other relevant organizations as appropriate, could implement the following activities:

(a) Protection of water resources from depletion, pollution and degradation:

(i) Introduction of sanitary waste disposal facilities based on environmentally sound low-cost and upgradable technologies;

(ii) Implementation of urban storm-water run-off and drainage programmes;

(iii) Promotion of recycling and reuse of waste water and solid wastes;

(iv) Control of industrial pollution sources to protect water resources;

(v) Protection of watersheds with respect to depletion and degradation of their forest cover and from harmful upstream activities;

(vi) Promotion of research into the contribution of forests to sustainable water resources development;

(vii) Encouragement of the best management practices for the use of agrochemicals with a view to minimizing their impact on water resources;

(b) Efficient and equitable allocation of water resources:

(i) Reconciliation of city development planning with the availability and sustainability of water resources;

(ii) Satisfaction of the basic water needs of the urban population;

(iii) Introduction of water tariffs, taking into account the circumstances in each country and where affordable, that reflect the marginal

and opportunity cost of water, especially for productive activities;

(c) Institutional/legal/management reforms:

(i) Adoption of a city-wide approach to the management of water resources;

(ii) Promotion at the national and local level of the elaboration of land-use plans that give due consideration to water resources development;

(iii) Utilization of the skills and potential of non-governmental organizations, the private sector and local people, taking into account the public's and strategic interests in water resources;

(d) Promotion of public participation:

(i) Initiation of public-awareness campaigns to encourage the public's move towards rational water utilization;

(ii) Sensitization of the public to the issue of protecting water quality within the urban environment;

(iii) Promotion of public participation in the collection, recycling and elimination of wastes;

(e) Support to local capacity-building:

(i) Development of legislation and policies to promote investments in urban water and waste management, reflecting the major contribution of cities to national economic development;

(ii) Provision of seed money and technical support to the local handling of materials supply and services;

(iii) Encouragement, to the extent possible, of autonomy and financial viability of city water, solid waste and sewerage utilities;

(iv) Creation and maintenance of a cadre of professionals and semi-professionals, for water, waste-water and solid waste management;

(f) Provision of enhanced access to sanitary services:

(i) Implementation of water, sanitation and waste management programmes focused on the urban poor;

(ii) Making available of low-cost water-supply and sanitation technology choices;

(iii) Basing of choice of technology and service levels on user preferences and willingness to pay;

(iv) Mobilization and facilitation of the active involvement of women in water management teams; (v) Encouragement and equipment of local water associations and water committees to manage community water-supply systems and communal latrines, with technical back-up available when required;

(vi) Consideration of the merits and practicality of rehabilitating existing malfunctioning systems and of correcting operation and maintenance inadequacies.

Means of implementation

(a) Financing and cost evaluation

18.60. The Conference secretariat has estimated the average total annual cost (1993-2000) of implementing the activities of this programme to be about $20 billion, including about $4.5 billion from the international community on grant or concessional terms. These are indicative and order of magnitude estimates only and have not been reviewed by Governments. Actual costs and financial terms, including any that are non-concessional, will depend upon, inter alia, the specific strategies and programmes Governments decide upon for implementation.

(b) Scientific and technological means

18.61. The 1980s saw considerable progress in the development and application of low-cost water-supply and sanitation technologies. The programme envisages continuation of this work, with particular emphasis on development of appropriate sanitation and waste disposal technologies for low-income high-density urban settlements. There should also be international information exchange, to ensure a widespread recognition among sector professionals of the availability and benefits of appropriate low-cost technologies. The public-awareness campaigns will also include components to overcome user resistance to second-class services by emphasizing the benefits of reliability and sustainability.

(c) Human resource development

18.62. Implicit in virtually all elements of this programme is the need for progressive enhancement of the training and career development of personnel at all levels in sector institutions. Specific programme activities will involve the training and retention of staff with skills in community involvement, low-cost technology, financial management, and integrated planning of urban water resources management. Special provision should be made for mobilizing and facilitating the active participation of women, youth, indigenous people and local communities in water management teams and for supporting the development of water associations and water committees, with appropriate training of such personnel as treasurers, secretaries and caretakers. Special education and training programmes for women should be launched with regard to the protection of water resources and water-quality within urban areas.(d) Capacity-building

18.63. In combination with human resource development, strengthening of institutional, legislative and management structures are key elements of the programme. A prerequisite for progress in enhancing access to water and sanitation services is the establishment of an institutional framework that ensures that the real needs and potential contributions of currently unserved populations are reflected in urban development planning. The multisectoral approach, which is a vital part of urban water resources management, requires institutional linkages at the national and city levels, and the programme includes proposals for establishing intersectoral planning groups. Proposals for greater pollution control and prevention depend for their success on the right combination of economic and regulatory mechanisms, backed by adequate monitoring and surveillance and supported by enhanced capacity to address environmental issues on the part of local Governments.

18.64. Establishment of appropriate design standards, water-quality objectives and discharge consents is therefore among the proposed activities. The programme also includes support for strengthening the capability of water and sewerage agencies and for developing their autonomy and financial viability. Operation and maintenance of existing water and sanitation facilities have been recognized as entailing a serious shortcoming in many countries. Technical and financial support are needed to help countries correct present inadequacies and build up the capacity to operate and maintain rehabilitated and new systems.

F. Water for sustainable food production and rural development

Basis for action

18.65. Sustainability of food production increasingly depends on sound and efficient water use and conservation practices consisting primarily of irrigation development and management, including water management with respect to rain-fed areas, livestock water-supply, inland fisheries and agro-forestry. Achieving food security is a high priority in many countries, and agriculture must not only provide food for rising populations, but also save water for other uses. The challenge is to develop and apply water-saving technology and management methods and, through capacity-building, enable communities to introduce institutions and incentives for the rural population to adopt new approaches, for both rain-fed and irrigated agriculture. The rural population must also have better access to a potable water-supply and to sanitation services. It is an immense task but not an impossible one, provided appropriate policies and programmes are adopted at all levels - local, national and international. While significant expansion of the area under rain-fed agriculture has been achieved during the past decade, the productivity response and sustainability of irrigation systems have been constrained by problems of waterlogging and salinization. Financial and market constraints are also a common problem. Soil erosion, mismanagement and overexploitation of natural resources and acute competition for water have all influenced the extent of poverty, hunger and famine in the developing countries. Soil erosion caused by overgrazing of livestock is also often responsible for the siltation of lakes. Most often, the development of irrigation schemes is supported neither by environmental impact assessments identifying hydrologic consequences within watersheds of interbasin transfers, nor by the assessment of social impacts on peoples in river valleys.

18.66. The non-availability of water-supplies of suitable quality is a significant limiting factor to livestock production in many countries, and improper disposal of animal wastes can in certain circumstances result in pollution of water-supplies for both humans and animals. The drinking-water requirements of livestock vary according to species and the environment in which they are kept. It is estimated that the current global livestock drinking-water requirement is about 60 billion litres per day and based on livestock population growth estimates, this daily requirement is predicted to increase by 0.4 billion litres per annum in the foreseeable future.

18.67. Freshwater fisheries in lakes and streams are an important source of food and protein. Fisheries of inland waters should be so managed as to maximize the yield of aquatic food organisms in an

environmentally sound manner. This requires the conservation of water-quality and quantity, as well as of the functional morphology of the aquatic environment. On the other hand, fishing and aquaculture may themselves damage the aquatic ecosystem; hence their development should conform to guidelines for impact limitation. Present levels of production from inland fisheries, from both fresh and brackish water, are about 7 million tons per year and could increase to 16 million tons per year by the year 2000; however, any increase in environmental stress could jeopardize this rise.

Objectives

18.68. The key strategic principles for holistic and integrated environmentally sound management of water resources in the rural context may be set forth as follows:

(a) Water should be regarded as a finite resource having an economic value with significant social and economic implications reflecting the importance of meeting basic needs;

(b) Local communities must participate in all phases of water management, ensuring the full involvement of women in view of their crucial role in the practical day-to-day supply, management and use of water;

(c) Water resource management must be developed within a comprehensive set of policies for (i) human health; (ii) food production, preservation and distribution; (iii) disaster mitigation plans; (iv) environmental protection and conservation of the natural resource base;

(d) It is necessary to recognize and actively support the role of rural populations, with particular emphasis on women.

18.69. An International Action Programme on Water and Sustainable Agricultural Development (IAP-WASAD) has been initiated by FAO in cooperation with other international organizations. The main objective of the Action Programme is to assist developing countries in planning, developing and managing water resources on an integrated basis to meet present and future needs for agricultural production, taking into account environmental considerations.

18.70. The Action Programme has developed a framework for sustainable water use in the agricultural sector and identified priority areas for action at national, regional and global levels. Quantitative targets for new irrigation development, improvement of existing irrigation schemes and reclamation of waterlogged and salinized lands through drainage for 130 developing countries are estimated on the basis of food requirements, agro-climatic zones and availability of water and land.

18.71. FAO global projections for irrigation, drainage and small-scale water programmes by the year 2000 for 130 developing countries are as follows: (a) 15.2 million hectares of new irrigation development; (b) 12 million hectares of improvement/modernization of existing schemes; (c) 7 million hectares installed with drainage and water control facilities; and (d) 10 million hectares of small-scale water programmes and conservation.

18.72. The development of new irrigation areas at the above-mentioned level may give rise to environmental concerns in so far as it implies the destruction of wetlands, water pollution, increased sedimentation and a reduction in biodiversity. Therefore, new irrigation schemes should be accompanied by an environmental impact assessment, depending upon the scale of the scheme, in case significant negative environmental impacts are expected. When considering proposals for new irrigation schemes, consideration should also be given to a more rational exploitation, and an increase in the efficiency or productivity, of any existing schemes capable of serving the same localities. Technologies for new irrigation schemes should be thoroughly evaluated, including their potential conflicts with other land uses. The active involvement of water-users groups is a supporting objective.

18.73. It should be ensured that rural communities of all countries, according to their capacities and available resources and taking advantage of international cooperation as appropriate, will have access to safe water in sufficient quantities and adequate sanitation to meet their health needs and maintain the essential qualities of their local environments.

18.74. The objectives with regard to water management for inland fisheries and aquaculture include conservation of water-quality and water-quantity requirements for optimum production and prevention of water pollution by aquacultural activities. The Action Programme seeks to assist member countries in managing the fisheries of inland waters through the promotion of sustainable management of capture fisheries as well as the development of environmentally sound approaches to intensification of aquaculture.

18.75. The objectives with regard to water management for livestock supply are twofold: provision of adequate amounts of drinking-water and safeguarding of drinking-water quality in accordance with the specific needs of different animal species. This entails maximum salinity tolerance levels and the

absence of pathogenic organisms. No global targets can be set owing to large regional and intra-country variations.

Activities

18.76. All States, according to their capacity and available resources, and through bilateral or multilateral cooperation, including the United Nations and other relevant organizations as appropriate, could implement the following activities:
(a) Water-supply and sanitation for the unserved rural poor:

(i) Establish national policies and budget priorities with regard to increasing service coverage;

(ii) Promote appropriate technologies;

(iii) Introduce suitable cost-recovery mechanisms, taking into account efficiency and equity through demand management mechanisms;

(iv) Promote community ownership and rights to water-supply and sanitation facilities;

(v) Establish monitoring and evaluation systems;

(vi) Strengthen the rural water-supply and sanitation sector with emphasis on institutional development, efficient management and an appropriate framework for financing of services;

(vii) Increase hygiene education and eliminate disease transmission foci;

(viii) Adopt appropriate technologies for water treatment;

(ix) Adopt wide-scale environmental management measures to control disease vectors;

(b) Water-use efficiency:

(i) Increase of efficiency and productivity in agricultural water use for better utilization of limited water resources;

(ii) Strengthen water and soil management research under irrigation and rain-fed conditions;

(iii) Monitor and evaluate irrigation project performance to ensure, inter alia, the optimal utilization and proper maintenance of the project;

(iv) Support water-users groups with a view to improving management performance at the local level;

(v) Support the appropriate use of relatively brackish water for irrigation;

(c) Waterlogging, salinity control and drainage:

(i) Introduce surface drainage in rain-fed agriculture to prevent temporary waterlogging and flooding of lowlands;

(ii) Introduce artificial drainage in irrigated and rain-fed agriculture;

(iii) Encourage conjunctive use of surface and groundwaters, including monitoring and water-balance studies;

(iv) Practise drainage in irrigated areas of arid and semi-arid regions;

(d) Water-quality management:

(i) Establish and operate cost-effective water-quality monitoring systems for agricultural water uses;

(ii) Prevent adverse effects of agricultural activities on water-quality for other social and economic activities and on wetlands, inter alia, through optimal use of on-farm input and the minimization of the use of external input in agricultural activities;

(iii) Establish biological, physical and chemical water-quality criteria for agricultural water-users and for marine and riverine ecosystems;

(iv) Minimize soil run-off and sedimentation;

(v) Dispose properly of sewage from human settlements and of manure produced by intensive livestock breeding;

(vi) Minimize adverse effects from agricultural chemicals by use of integrated pest management;

(vii) Educate communities about the pollution-related impacts of the use of fertilizers and chemicals on water-quality, food safety and human health;

(e) Water resources development programmes:

(i) Develop small-scale irrigation and water-supply for humans and livestock and for water and soil conservation;

(ii) Formulate large-scale and long-term irrigation development programmes, taking into account their effects on the local level, the economy and the environment;

(iii) Promote local initiatives for the integrated development and management of water resources;

(iv) Provide adequate technical advice and support and enhancement of institutional collaboration at the local community level;

(v) Promote a farming approach for land and water management that takes account of the level of education, the capacity to mobilize local communities and the ecosystem requirements of arid and semi-arid regions;

(vi) Plan and develop multi-purpose hydroelectric power schemes, making sure that environmental concerns are duly taken into account;

(f) Scarce water resources management:

(i) Develop long-term strategies and practical implementation programmes for agricultural water use under scarcity conditions with competing demands for water;

(ii) Recognize water as a social, economic and strategic good in irrigation planning and management;

(iii) Formulate specialized programmes focused on drought preparedness, with emphasis on food scarcity and environmental safeguards;

(iv) Promote and enhance waste-water reuse in agriculture;

(g) Water-supply for livestock:

(i) Improve quality of water available to livestock, taking into account their tolerance limits;

(ii) Increase the quantity of water sources available to livestock, in particular those in extensive grazing systems, in order to both reduce the distance needed to travel for water and to prevent overgrazing around water sources;

(iii) Prevent contamination of water sources with animal excrement in order to prevent the spread of diseases, in particular zoonosis;

(iv) Encourage multiple use of water-supplies through promotion of integrated agro-livestock-fishery systems;

(v) Encourage water spreading schemes for increasing water retention of extensive grasslands to stimulate forage production and prevent run-off;

(h) Inland fisheries:

(i) Develop the sustainable management of fisheries as part of national water resources planning;

(ii) Study specific aspects of the hydrobiology and environmental requirements of key inland fish species in relation to varying water regimes;

(iii) Prevent or mitigate modification of aquatic environments by other users or rehabilitate environments subjected to such modification on behalf of the sustainable use and conservation of biological diversity of living aquatic resources;

(iv) Develop and disseminate environmentally sound water resources development and management methodologies for the intensification of fish yield from inland waters;

(v) Establish and maintain adequate systems for the collection and interpretation of data on water quality and quantity and channel morphology related to the state and management of living aquatic resources, including fisheries;

(i) Aquaculture development:

(i) Develop environmentally sound aquaculture technologies that are compatible with local, regional and national water resources management plans and take into consideration social factors;

(ii) Introduce appropriate aquaculture techniques and related water development and management practices in countries not yet experienced in aquaculture;

(iii) Assess environmental impacts of aquaculture with specific reference to commercialized

culture units and potential water pollution from processing centres;

(iv) Evaluate economic feasibility of aquaculture in relation to alternative use of water, taking into consideration the use of marginal-quality water and investment and operational requirements.

Means of implementation

(a) Financing and cost evaluation

18.77. The Conference secretariat has estimated the average total annual cost (1993-2000) of implementing the activities of this programme to be about $13.2 billion, including about $4.5 billion from the international community on grant or concessional terms. These are indicative and order of magnitude estimates only and have not been reviewed by Governments. Actual costs and financial terms, including any that are non-concessional, will depend upon, inter alia, the specific strategies and programmes Governments decide upon for implementation.

(b) Scientific and technological means

18.78. There is an urgent need for countries to monitor water resources and water-quality, water and land use and crop production; compile inventories of type and extent of agricultural water development and of present and future contributions to sustainable agricultural development; evaluate the potential for fisheries and aquaculture development; and improve the availability and dissemination of data to planners, technicians, farmers and fishermen. Priority requirements for research are as follows:

(a) Identification of critical areas for water-related adaptive research;

(b) Strengthening of the adaptive research capacities of institutions in developing countries;

(c) Enhancement of translation of water-related farming and fishing systems research results into practical and accessible technologies and provision of the support needed for their rapid adoption at the field level.

18.79. Transfer of technology, both horizontal and vertical, needs to be strengthened. Mechanisms to provide credit, input supplies, markets, appropriate pricing and transportation must be developed jointly by countries and external support agencies. Integrated rural water-supply infrastructure, including facilities for water-related education and training and support services for agriculture, should be expanded for multiple uses and should assist in developing the rural economy.

(c) Human resource development

18.80. Education and training of human resources should be actively pursued at the national level through: (a) assessment of current and long-term human resources management and training needs; (b) establishment of a national policy for human resources development; and (c) initiation and implementation of training programmes for staff at all levels as well as for farmers. The necessary actions are as follows:

(a) Assess training needs for agricultural water management;

(b) Increase formal and informal training activities;

(c) Develop practical training courses for improving the ability of extension services to disseminate technologies and strengthen farmers' capabilities, with special reference to small-scale producers;

(d) Train staff at all levels, including farmers, fishermen and members of local communities, with particular reference to women;
(e) Increase the opportunities for career development to enhance the capabilities of administrators and officers at all levels involved in land- and water-management programmes.

(d) Capacity-building

18.81. The importance of a functional and coherent institutional framework at the national level to promote water and sustainable agricultural development has generally been fully recognized at present. In addition, an adequate legal framework of rules and regulations should be in place to facilitate actions on agricultural water-use, drainage, water-quality management, small-scale water programmes and the functioning of water-users' and fishermen's associations. Legislation specific to the needs of theagricultural water sector should be consistent with, and stem from, general legislation for the management of water resources. Actions should be pursued in the following areas:

(a) Improvement of water-use policies related to agriculture, fisheries and rural development and of legal frameworks for implementing such policies;

(b) Review, strengthening and restructuring, if required, of existing institutions in order to enhance their capacities in water-related activities, while recognizing the need to manage water resources at the lowest appropriate level;

(c) Review and strengthening, where necessary, of organizational structure, functional relationships and linkages among ministries and departments within a given ministry;

(d) Provision of specific measures that require support for institutional strengthening, inter alia, through long-term programme budgeting, staff training, incentives, mobility, equipment and coordination mechanisms;

(e) Enhancement of involvement of the private sector, where appropriate, in human resource development and provision of infrastructure;

(f) Transfer of existing and new water-use technologies by creating mechanisms for cooperation and information exchange among national and regional institutions.

G. Impacts of climate change on water resources

Basis for action

18.82. There is uncertainty with respect to the prediction of climate change at the global level. Although the uncertainties increase greatly at the regional, national and local levels, it is at the national level that the most important decisions would need to be made. Higher temperatures and decreased precipitation would lead to decreased water-supplies and increased water demands; they might cause deterioration in the quality of freshwater bodies, putting strains on the already fragile balance between supply and demand in many countries. Even where precipitation might increase, there is no guarantee that it would occur at the time of year when it could be used; in addition, there might be a likelihood of increased flooding. Any rise in sealevel will often cause the intrusion of salt water into estuaries, small islands and coastal aquifers and the flooding of low-lying coastal areas; this puts low-lying countries at great risk.

18.83. The Ministerial Declaration of the Second World Climate Conference states that "the potential impact of such climate change could pose an environmental threat of an up to now unknown magnitude ... and could even threaten survival in some small island States and in low-lying coastal, arid and semi-arid areas" (A/45/696/Add.1, annex III, preamble, para. 2). The Conference recognized that among the most important impacts of climate change were its effects on the hydrologic cycle and on water management systems and, through these, on socio-economic systems. Increase in incidence of extremes, such as floods and droughts, would cause increased frequency and severity of disasters. The Conference therefore called for a strengthening of the necessary research and monitoring programmes and the exchange of relevant data and information, these actions to be undertaken at the national, regional and international levels.

Objectives

18.84. The very nature of this topic calls first and foremost for more information about and greater understanding of the threat being faced. This topic may be translated into the following objectives, consistent with the United Nations Framework Convention on Climate Change:

(a) To understand and quantify the threat of the impact of climate change on freshwater resources;

(b) To facilitate the implementation of effective national countermeasures, as and when the threatening impact is seen as sufficiently confirmed to justify such action;

(c) To study the potential impacts of climate change on areas prone to droughts and floods.

Activities

18.85. All States, according to their capacity and available resources, and through bilateral or multilateral cooperation, including the United Nations and other relevant organizations as appropriate, could implement the following activities:

(a) Monitor the hydrologic regime, including soil moisture, groundwater balance, penetration and transpiration of water-quality, and related climate factors, especially in the regions and countries most likely to suffer from the adverse effects of climate change and where the localities vulnerable to these effects should therefore be defined;

(b) Develop and apply techniques and methodologies for assessing the potential adverse effects of climate change, through changes in temperature, precipitation and sealevel rise, on freshwater resources and the flood risk;

(c) Initiate case-studies to establish whether there are linkages between climate changes and the current occurrences of droughts and floods in certain regions;

(d) Assess the resulting social, economic and environmental impacts;

(e) Develop and initiate response strategies to counter the adverse effects that are identified, including changing groundwater levels and to mitigate saline intrusion into aquifers;

(f) Develop agricultural activities based on brackish-water use;

(g) Contribute to the research activities under way within the framework of current international programmes.

Means of implementation

(a) Financing and cost evaluation

18.86. The Conference secretariat has estimated the average total annual cost (1993-2000) of implementing the activities of this programme to be about $100 million, including about $40 million from the international community on grant or concessional terms. These are indicative and order of magnitude estimates only and have not been reviewed by Governments. Actual costs and financial terms, including any that are non-concessional, will depend upon, inter alia, the specific strategies and programmes Governments decide upon for implementation.

(b) Scientific and technological means

18.87. Monitoring of climate change and its impact on freshwater bodies must be closely integrated with national and international programmes for monitoring the environment, in particular those concerned with the atmosphere, as discussed under other sections of Agenda 21, and the hydrosphere, as discussed under programme area B above. The analysis of data for indication of climate change as a basis for developing remedial measures is a complex task. Extensive research is necessary in this area and due account has to be taken of the work of the Intergovernmental Panel on Climate Change (IPCC), the World Climate Programme, the International Geosphere-Biosphere Programme (IGBP) and other relevant international programmes.

18.88. The development and implementation of response strategies requires innovative use of technological means and engineering solutions, including the installation of flood and drought warning systems and the construction of new water resource development projects such as dams, aqueducts, well fields, waste-water treatment plants, desalination works, levees, banks and drainage channels. There is also a need for coordinated research networks such as the International Geosphere-Biosphere Programme/Global Change System for Analysis, Research and Training (IGBP/START) network.

(c) Human resource development

18.89. The developmental work and innovation depend for their success on good academic training and staff motivation. International projects can help by enumerating alternatives, but each country needs to establish and implement the necessary policies and to develop its own expertise in the scientific and engineering challenges to be faced, as well as a body of dedicated individuals who are able to interpret the complex issues concerned for those required to make policy decisions. Such specialized personnel need to be trained, hired and retained in service, so that they may serve their countries in these tasks.

(d) Capacity-building

18.90. There is a need, however, to build a capacity at the national level to develop, review and implement response strategies. Construction of major engineering works and installation of forecasting systems will require significant strengthening of the agencies responsible, whether in the public or the private sector. Most critical is the requirement for a socio-economic mechanism that can review predictions of the impact of climate change and possible response strategies and make the necessary judgements and decisions.

Notes

1/ Report of the United Nations Water Conference, Mar del Plata, 14-25 March 1977 (United Nations publication, Sales No. E.77.II.A.12), part one, chap. I, sect. C, para. 35.
2/ Ibid., part one, chap. I, resolution II.

Appendix B: UNEP Decision-Makers Guide to Agenda 21

In June 1992 the Earth Summit of world leaders approved the Rio Declaration on Environment and Development and adopted Agenda 21, a pioneering plan on national and international action needed for moving toward development that is economically, socially and environmentally sustainable. Agenda 21 highlights 38 key environment and development issues containing 132 priority programme areas and over 2,500 recommendations for action.

The *Decision-Makers Guide to Agenda 21* is intended to assist key decision-makers in government and the private sector whose commitment and cooperation is needed to accelerate progress toward sustainable development. In the *Guide* the official text of Agenda 21 is reduced by over 70% by summarizing the main intent of each recommendation in a short substantive statement. Each entry is followed by a reference to the exact paragraph in the official text.

The summary recommendations are presented in numbered checklists which can be quickly scanned. The checklists can be used for reviewing and strengthening existing policies, for preparing new national plans and strategies for sustainable development and for assessing progress made and needed.

Agenda 21 Recommendations on Water Resources

The following excerpt from the Guide summarizes the over 300 recommendations on water resources under the seven main priority programme areas in Chapter 18 (Part 1) and other relevant chapters of Agenda 21 (Part 2). The official text of Chapter 18 is nearly 40 pages long. The following summary of Chapter 18 is only 6 pages.

The table below shows the *average total annual cost during 1993-2000* estimated by the UNCED secretariat for implementing the recommendations in Chapter 18. All figures are US$ millions annually. The three columns represent:

Aid External grants or concessional financing needed to assist developing countries.
Internal Costs of implementation to be met by developing countries themselves.
Total Total costs of implementation.

18. Protect the Supply and Quality of Water Resources	**Aid**	**Internal**	**Total**
A. Ensure the integrated management and development of water resources	115	-	115
B. Assess water quality, supply and demand	145	210	355
C. Protect water resource quality and aquatic ecosystems	340	660	1,000
D. Improve drinking water supply and sanitation	7,400	12,600	20,000
E. Ensure sustainable water supply and use for cities	4,500	15,500	20,000
F. Manage water resources for sustainable food production & development	4,500	8,700	13,200
G. Assess the impact of climate change on water resources	40	60	10
Total (US$ millions annually)	**17,040**	**37,730**	**54,770**

SUMMARY OF CHAPTER 18
Protect the Supply and Quality of Water Resources

A. Ensure the integrated management and development of water resources

Strengthen management

1. Prepare national plans and investment programs for integrated water management 18.12 a
2. Integrate freshwater supply measures with conservation and development programs 18.12 b
3. Develop analytical models and assessment methods for water management and planning 18.12 c
4. Optimize water resource allocations under physical and socio-economic constraints 18.12 d
5. Implement allocation decisions through demand management, pricing and regulatory measures 18.12 e
6. Undertake flood and drought management, including risk analysis and impact assessments 18.12 f
7. Encourage rational water use through public information and economic instruments 18.12 g
8. Develop water resources, especially in arid and semi-arid areas 18.12 h
9. Expand international research cooperation on freshwater resources 18.12 i
10. Develop new and alternative sources of water supply 18.12 j
11. Integrate the management of water quality and quantity 18.12 k
12. Improve water conservation through more efficient use and waste minimization measures 18.12 l
13. Support local water users groups to optimize water resources management 18.12 m
14. Expand public participation in water resources planning and management 18.12 n
15. Decentralize water management to local authorities, industries and communities 18.12 o i
16. Integrate water resources management in national development plans 18.12 o ii
17. Establish independent monitoring and regulatory bodies for freshwater resources 18.12 o ii
18. Harmonize national water management strategies at the regional level 18.12 o iii
19. Improve coordination of international agencies and programs on water management 18.12 o iv
20. Provide public information, education and operational guidelines for water users 18.12 p
21. Declare a World Water Day 18.12 p

Assess costs and financing

22. Provide $115 million annually on grant or concessional terms 18.13

Strengthen science and technology

23. Apply new GIS and other techniques to collect and assess multisectoral information 18.14
24. Transfer new low-cost and other water technologies to developing countries 18.14
25. Assess and test economic instruments and options for charging water users 18.15
26. Conduct willingness to pay surveys in rural and urban areas 18.15
27. Consider the full costs of water and ability to pay when setting water charges 18.16
28. Ensure optimal operation and utilization in existing water projects 18.18
29. Increase use of new or alternative clean technologies 18.18
30. Consider environmentally and socially benign hydropower in water investment strategies 18.18

Expand education and training

31. Increase public information and participation in water resource planning and management 18.20 a
32. Train water managers and decision-makers at all levels 18.20 b
33. Strengthen the training capacity in developing countries 18.20 c
34. Provide train to water resource professionals and extension workers 18.20 d
35. Improve career structures in water resources management 18.20 e
36. Share water resources management knowledge and technologies 18.20 f

Strengthen capacity

37. Improve the institutional capacity for water management at all levels 18.21
38. Increase public participation in integrated water resources planning and management 18.22
39. Support participation of community based institutions, NGO's and women's groups 18.22

B. Assess water quality, supply and demand

Strengthen institutions

1. Establish national water resource priorities and policies 18.27 a i
2. Strengthen capabilities for water resource assessments and flood and drought forecasting 18.27 a ii
3. Improve cooperation among agencies which collect and analyse hydrologic data 18.27 a iii
4. Increase cooperation of riparian countries for assessing transboundary water resources 18.27 a iv

Improve data and information

5. Assess the adequacy of water resource data collection networks 18.27 b i
6. Strengthen information networks on water quantity and quality and related land-use data 18.27 b ii
7. Apply standards and other measures to ensure data compatibility 18.27 b iii
8. Improve facilities for collecting, analysing and disseminating hydrologic data 18.27 b iv
9. Establish national databases for all types of hydrologic data 18.27 b v
10. Provide data rescue operations and establish a national archives on water resources 18.27 b vi
11. Apply proven techniques for processing hydrologic data 18.27 b vii
12. Use hydrologic data to derive water resource estimates for specific areas 18.27 b viii
13. Assimilate data from remote sensing and GIS sources 18.27 b ix
14. Identify water resource data requirements for planning 18.27 c i
15. Assess and improve data for environmental and development planning and management 18.27 c ii
16. Issue public forecasts and warnings on floods and droughts 18.27 c iii

Strengthen research

17. Strengthen research and water resources assessment programs 18.27 d i
18. Ensure water research and development programs use local expertise and resources 18.27 d ii

Assess costs and financing

19. Provide $355 million annually, including $145 million on grant or concessional terms 18.28

Strengthen science and technology

20. Develop global models to help assess water quantity and climate change impacts 18.29 a
21. Close the gap between terrestrial hydrology and ecology at different scales 18.29 b
22. Study water quality and close gap between hydrologic flows and biogeochemical processes 18.29 c
23. Build on hydrologic balance studies and include consumptive water use in research models 18.29
24. Accelerate the development and transfer of water resource technologies 18.30
25. Prepare comprehensive catalogues of water resources information at different sources 18.30

Expand education and training

26. Identify national education and training needs for water resources management 18.33 a
27. Strengthen education and training programs for all water resource staff 18.33 b
28. Develop sound recruitment, personnel and pay policies for water resource agencies 18.33 c

Strengthen capacity

29. Review the legislative and regulatory basis for water resource assessments 18.34 a
30. Increase cooperation among agencies in the water sector 18.34 b
31. Implement water resource policies based on realistic assessments of conditions and trends 18.34 c
32. Strengthen the managerial capabilities of local water user groups 18.34 d

C. Protect water r esources quality and aquatic ecosystems

Strengthen water resources conservation

1. Improve capabilities to identify and protect potential water supply sources 18.40 a i
2. Identify potential water supply sources and prepare national profiles 18.40 a ii
3. Prepare national plans for water resources protection and conservation 18.40 a iii
4. Rehabilitate important but degraded catchment areas, especially on small islands 18.40 a iv
5. Strengthen administrative and legal measures to protect potentially usable catchment areas 18.40 a v

Strengthen water pollution prevention and control

6. Apply the Polluter-Pays-Principle 18.40 b i

7. Use appropriate technologies and expand sewage and industrial effluents treatment facilities 18.40 b ii
8. Set ambient and emission standards for water quality 18.40 b iii
9. Use the precautionary approach to minimize and prevent water pollution 18.40 b iv
10. Require environmental assessments of development projects likely to affect water quality 18.40 b v
11. Use risk assessment and management techniques for decision-making 18.40 b vi
12. Apply best environmental practices at reasonable costs to avoid diffuse pollution 18.40 b vii
13. Use adequately treated and purified waste water in agriculture and other sectors 18.40 b viii

Develop and use clean technologies

14. Control industrial effluents with precautionary measures based on life-cycle analysis 18.40 c i
15. Treat municipal waste water for safe reuse in agriculture and aquaculture 18.40 c ii
16. Develop biotechnology for waste treatment, production of fertilizers and other activities 18.40 c iii
17. Use appropriate methods for water pollution control, including traditional practices 18.40 c iv

Protect groundwater

18. Use agricultural practices that do not degrade groundwater 18.40 d i
19. Mitigate salt water intrusion into aquifers on small islands and coastal plains 18.40 d ii
20. Prevent pollution of aquifers by toxic substances 18.40 d iii
21. Establish protected areas in groundwater recharge and abstraction areas 18.40 d iii
22. Use the best practicable technology for managing landfills 18.40 d iv
23. Improve safety of wells and reduce intrusion of biological pathogens and hazardous chemicals 18.40 d v
24. Monitor water quality threatened by toxic and hazardous materials storage sites 18.40 d vi

Protect aquatic ecosystems

25. Improve degraded water bodies to restore aquatic habitats and ecosystems 18.40 c i
26. Rehabilitate agricultural lands and protect groundwater for agricultural productivity 18.40 c ii
27. Protect and conserve wetlands as habitats for many species 18.40 c iii
28. Control noxious aquatic species which may destroy other species 18.40 c iv

Protect freshwater living resources

29. Control and monitor water quality for the sustainable development of inland fisheries 18.40 f i
30. Protect ecosystems from degradation to allow development of aquaculture projects 18.40 f ii

Monitor water resources

31. Establish water monitoring networks and point and diffuse sources of pollution 18.40 g i
32. Expand use of environmental impact assessments and GIS 18.40 g ii
33. Monitor pollution sources and compliance with standards, regulations and discharge permits 18.40 g iii
34. Monitor use of agrochemical that may have adverse environmental effects 18.40 g iv
35. Improve land use practices to prevent erosion and siltation of water bodies 18.40 g v

Improve national and international water law

36. Strengthen laws on pollution monitoring and control in national and transboundary waters 18.40 h i
37. Improve laws to control the long range atmospheric transport of pollutants 18.40 h ii
38. Expand laws to control accidental or deliberate spills in national or transboundary waters 18.40 h iii
39. Strengthen legal requirements for environmental impact assessments 18.40 h iv

Assess costs and financing

40. Provide $1 billion annually, including $340 million on grant or concessional terms 18.41

Strengthen science and technology

41. Increase cooperative research projects on water quality and aquatic ecosystems 18.42
42. Strengthen national water research networks and linkages to regional centres 18.42
43. Expand the North-South twinning of water research centres and projects 18.42
44. Ensure part of the funds for water resources development are

allocated to research 18.42
45. Use GIS and GRID methods to collect and assess information for water management 18.43

Expand education and training

46. Adopt innovative approaches for training water resource experts and managers 18.44
47. Provide training to water agency staff at all levels 18.44
48. Strengthen capabilities in local authorities on water protection, treatment and use 18.45
49. Expand technical and engineering education on water quality protection and control 18.45

Strengthen capacity

50. Improve national capabilities for the protection of water quality and aquatic ecosystems 18.46

D. Improve drinking water supply and sanitation

Protect the environment and health

1. Establish protected areas for sources of drinking water 18.50 a i
2. Ensure sanitary treatment and disposal of excreta and sewage 18.50 a ii
3. Expand water supply and rainwater catchment systems, especially on small islands 18.50 a iii
4. Build and expand sewage treatment facilities and drainage systems 18.50 a iv
5. Treat domestic and industrial waste water for safe reuse 18.50 a v
6. Control water-borne diseases 18.50 a vi

Improve institutions and human resources

7. Strengthen national and local water management agencies 18.50 b i
8. Use a participatory approach to water management and development 18.50 b ii
9. Decentralize decisions to the lowest appropriate level and involve water users 18.50 b iii
10. Develop human resources at all levels with special training programs for women 18.50 b iv
11. Conduct public education programs emphasizing hygiene, local management and risk reduction 18.50 b v
12. Provide international support for program funding, implementation and follow-up 18.50 b vi

Strengthen national and community management

13. Assist communities to manage water resources on a sustainable basis 18.50 c i
14. Involve local communities and indigenous people in water management 18.50 c ii
15. Link national planning and local community water resources management 18.50 c iii
16. Integrate community water resources management with overall development planning 18.50 c iv
17. Improve local primary health and environmental care programs and training 18.50 c v
18. Assist water agencies to become more cost-effective and responsive to consumers 18.50 c vi
19. Expand water services for rural and low-income peri-urban areas 18.50 c vii
20. Rehabilitate defective water systems, reduce waste and make safe reuse of water 18.50 c viii
21. Increase programs for rational water use and systems maintenance 18.50 c ix
22. Expand research and development of appropriate technical solutions 18.50 c x
23. Increase urban treatment capacities to handle growing loads 18.50 c xi

Expand public information and participation

24. Strengthen water and sanitation monitoring and information management at all levels 18.50 d i
25. Assess and publish national and local monitoring results annually 18.50 d ii
26. Develop and use sector indicators at regional and global levels 18.50 d iii
27. Improve coordination, planning & implementation, especially of community self-help projects 18.50 d iv

Assess costs and financing

28. Provide $20 billion annually, including $7.4 billion on grant or concessional terms 18.51

Strengthen science and technology

29. Develop low-cost scientific and technological approaches 18.52 a
30. Use indigenous methods to maximize local involvement 18.52 b
31. Assist national institutes to expand curricula in fields related to water and sanitation 18.52 c

Expand education and training

32. Increase number and training of water and sanitation professional and technical staff 18.53

33. Establish staff development plans to meet present and future requirements 18.53
34. Strengthen national water and sanitation training institutions 18.53
35. Train women in water management, sanitation and equipment maintenance 18.53

Strengthen capacity

36. Increase delegation of responsibilities to and cooperation with local communities 18.54
37. Expand public participation and involvement of women in water and sanitation projects 18.54
38. Strengthen national and local capacities for improving water supply and sanitation 18.55
39. Expand technical cooperation among developing countries on water and sanitation 18.55

E. Ensure sustainable water supply and use for cities

Protect water resources from depletion and pollution

1. Use environmentally sound, low-cost and upgradable waste disposal technologies 18.59 a i
2. Implement urban storm run-off and drainage programs 18.59 a ii
3. Recycle and reuse waste water and solid wastes 18.59 a iii
4. Control industrial sources of water pollution 18.59 a iv
5. Reduce deforestation and other harmful upstream activities in watersheds 18.59 a v
6. Expand research on contribution of forests to sustainable water resources management 18.59 a vi
7. Improve management practices to minimize impact of agrochemicals on water resources 18.59 a vii

Make efficient and equitable allocation of water resources

8. Reconcile urban planning with availability and sustainability of water resources 18.59 b i
9. Meet the basic water needs of urban populations 18.59 b ii
10. Apply water tariffs reflecting the marginal and opportunity costs of water 18.59 b iii

Strengthen institutions and laws

11. Use a city-wide approach to water resources management 18.59 c i
12. Incorporate water resources development in local and nation land-use plans 18.59 c ii
13. Increase use on skills of NGO's, private sector and local community 18.59 c iii

Expand public participation

14. Provide public information on improving rational use of water resources 18.59 d i
15. Inform the public on the importance of protecting urban water quality 18.59 d ii
16. Increase public involvement in the collection, recycling and elimination of wastes 18.59 d iii

Strengthen local capacities

17. Improve policies and laws to promote investments in urban water and waste management 18.59 e i
18. Provide seed money and technical support for local materials supply and services 18.59 e ii
19. Increase autonomy and financial viability of urban water, solid waste and sewage utilities 18.59 e iii
20. Expand professional and technical staff for water and solid waste management 18.59 e iv

Increase access to sanitary services

21. Implement water, sanitation and waste management programs for the urban poor 18.59 f i
22. Increase availability and options for low-cost water supply and sanitation technologies 18.59 f ii
23. Choose technologies and service levels on basis of user preferences and willingness to pay 18.59 f iii
24. Involve women in water management 18.59 f iv
25. Assist local water associations to manage community water supply and latrines 18.59 f v
26. Rehabilitate existing systems and correct operation and maintenance problems 18.59 f vi

Assess costs and financing

27. Provide $20 billion annually, including $4.5 billion on grant or concessional terms 18.60

Strengthen science and technology

28. Develop sanitation and waste disposal technologies for low-income urban settlements 18.61
29. Increase information exchanges on low cost sanitation and waste disposal technologies 18.61

Expand education and training

30. Improve water and sanitation

training and career development programs at all levels 18.62

Strengthen capacity

31. Increase capacity to meet water and sanitation needs of unserved urban populations 18.63
32. Establish intersectoral planning groups and improve national and local institutional links 18.63
33. Improve monitoring programs and economic and regulatory instruments 18.63
34. Strengthen design, water quality and discharge standards 18.63

F. Manage water resources for sustainable food production and rural development

Extend water supply and sanitation to rural poor

1. Establish national policies and priorities to expand water supply and sanitation services 18.76 a i
2. Use appropriate technologies 18.76 a ii
3. Implement efficient and equitable cost-recovery programs 18.76 a iii
4. Increase community ownership and rights to water supply and sanitation services 18.76 a iv
5. Establish monitoring and evaluation systems 18.76 a v
6. Improve the management and financing of rural water supply and sanitation services 18.76 a vi
7. Expand public education on hygiene and eliminate disease transmission sources 18.76 a vii
8. Adopt appropriate water treatment technologies 18.76 a viii
9. Undertake environmental management measures to control disease vectors 18.76 a ix

Improve water use efficiency

10. Increase efficiency and productivity of agricultural water use 18.76 b i
11. Expand water and soil management research for irrigated and rainfed areas 18.76 b ii
12. Monitor and assess irrigation projects, especially on optimal utilization and maintenance 18.76 b iii
13. Assist water users groups to improve local management and performance 18.76 b iv
14. Make appropriate use of relatively brackish water for irrigation 18.76 b v

Control waterlogging and salinity and improve drainage

15. Use surface drainage in rainfed agriculture to avoid lowland flooding and waterlogging 18.76 c i
16. Expand artificial drainage in irrigated and rainfed agriculture 18.76 c ii
17. Increase combined use, monitoring and water balance studies of surface and groundwater 18.76 c iii
18. Use drainage for irrigated lands in arid and semi-arid regions 18.76 c iv

Improve water quality management

19. Install cost-effective water quality monitoring systems for agricultural water uses 18.76 d i
20. Prevent adverse impacts of agricultural activities on water quality and wetlands 18.76 d ii
21. Set water quality criteria for agricultural water use and marine and freshwater ecosystems 18.76 d iii
22. Minimize soil erosion and sedimentation 18.76 d iv
23. Ensure proper disposal of urban sewage and manure from intensive livestock operations 18.76 d v
24. Use integrated pest management to minimize adverse impacts of agrochemicals 18.76 d vi
25. Inform public on adverse impacts of chemicals on water quality, food and health 18.76 d vii

Improve water resources development programs

26. Develop small scale irrigation and water supply systems to conserve water and soil 18.76 e i
27. Formulate large scale, long-term and sustainable irrigation development programs 18.76 e ii
28. Support local initiatives for integrated water resources management 18.76 e iii
29. Provide technical advice and support for institutional cooperation in local communities 18.76 e iv
30. Improve land and water management by farmers in arid and semi-arid regions 18.76 e v
31. Implement environmentally sound and multi-purpose hydropower schemes 18.76 e vi

Strengthen management of scarce water resources

32. Develop long-term strategies for agricultural use of scarce water resources 18.76 f i
33. Recognize water as a social, economic and strategic resource in irrigation programs 18.76 f ii

34. Create drought preparedness programs stressing food security and environmental safeguards 18.76 f iii
35. Increase reuse of waste water in agriculture 18.76 f iv

Improve water supply for livestock

36. Improve quality of water for livestock 18.76 g i
37. Increase water sources for livestock to prevent overgrazing around existing sources 18.76 g ii
38. Prevent contamination of water sources by animal excrement 18.76 g iii
39. Make multiple use of water through integrated agro-livestock-fishery programs 18.76 g iv
40. Use water distribution schemes to prevent run-off and improve forage growth in grasslands 18.76 g v

Improve inland fisheries

41. Include sustainable management of fisheries in national water resources planning 18.76 h i
42. Assess different hydrobiology and environmental requirements of key inland fish species 18.76 h ii
43. Prevent or mitigate adverse impacts on aquatic living resources and ecosystems 18.76 h iii
44. Rehabilitate degraded aquatic environments 18.76 h iii
45. Improve fish yields in inland waters using environmentally sound management methods 18.76 h iv
46. Collect and assess data on water quality, quantity, morphology and living aquatic resources 18.76 h v

Expand aquaculture

47. Develop environmentally sound aquaculture technologies 18.76 i i
48. Extend aquaculture techniques and related water management practices to other countries 18.76 i ii
49. Assess the environmental impacts of aquaculture, especially commercial operations 18.76 i iii
50. Evaluate economic feasibility of aquaculture compared to other uses of water resources 18.76 i iv

Assess costs and financing

51. Provide $13.2 billion annually, including $4.5 billion on grant or concessional terms 18.77

Strengthen science and technology

52. Identify critical areas for water resources research 18.78 a
53. Strengthen water resources research capabilities in developing countries 18.78 b
54. Accelerate use of appropriate water related farming and fishing technologies 18.78 c
55. Facilitate transfer of water related farming and fishing technologies 18.79
56. Increase water resources education, training and support services for agriculture 18.79
57. Expand integrated, multiple use rural water supply infrastructure 18.79

Expand education and training

58. Assess training needs for agricultural water management 18.80 a
59. Increase formal and informal programs for water management training 18.80 b
60. Train extension staff on water resource technologies, especially for small scale farmers 18.80 c
61. Provide water management training at all levels, including local communities and users 18.80 d
62. Improve career development programs for land and water management staff 18.80 e

Strengthen capacity

63. Improve water policies and laws concerning agriculture, fisheries and rural development 18.81 a
64. Strengthen water management capabilities and decentralize responsibilities 18.81 b
65. Increase cooperation and coordination within and among water management agencies 18.81 c
66. Undertake long-term capacity building measures for improved water management 18.81 d
67. Involve the private sector in developing human resources and infrastructure 18.81 e
68. Improve international exchange of information on water management technologies 18.81 f

G. Assess the impact of climate change on water resources

Improve monitoring and research

1. Monitor hydrologic regime and related climate factors, especially in vulnerable areas 18.85 a
2. Assess the likely effects of climate change on freshwater resources and flood control 18.85 b

3. Make case studies on possible links between climate change and current droughts and floods 18.85 c
4. Assess the likely social, economic and environmental impacts of climate change 18.85 d
5. Prepare and implement response strategies to counter adverse impacts of climate change 18.85 e
6. Develop agricultural activities based on brackish water use 18.85 f
7. Increase participation in international research programs on climate change 18.85 g

Assess costs and financing

8. Provide $100 million annually, including $40 million on grant or concessional terms 18.86

Strengthen science and technology

9. Integrate water/climate change monitoring with environmental monitoring programs 18.87
10. Strengthen research on and analysis of climate change data and indicators 18.87
11. Expand research and development of technological and engineering response measures 18.88
12. Strengthen international research networks such as the IGBP/START network 18.88

Expand education and training

13. Strengthen national expertise and response capabilities regarding climate change 18.89

Strengthen capacity

14. Build national capacity to prepare and implement climate change response strategies 18.90
15. Establish national mechanism for assessing climate change risks, impacts and responses 18.90

Part 2

Summary of Other Agenda 21 Recommendations on Water r esources management *(in addition to Chapter 18)*

3. Combat Poverty

A. Enable the poor to ac hieve sustainable livelihoods

Strengthen efforts by all countries to:

21. Ensure the poor have access to adequate water and sanitation 3.8 p

6. Protect Human Health

B. Control communicable diseases

Control environment factors influencing spread of communicable diseases

23. Use prevention and control measures for water, wastes and other environmental factors 6.13 d

E. Reduce health risks from environmental pollution and hazards

Reduce water pollution

5. Develop water pollution control technologies based on health risk assessments 6.41 c (i)
6. Improve water pollution control capacities in large cities 6.41 c (ii)

12. Combat Desertification and Dr ought

B. Incr ease soil conservation, afforestation and refor estation pr ograms

Strengthen management

3. Improve the management of soil and water resources in vulnerable drylands 12.18 a (iii)
20. Integrate research programs on land and water conservation and land use management 12.23 b

E. Develop drought contingency and relief pr ograms for environmental r efugees

Strengthen management

4. Prepare contingency plans for providing food, fodder and water in drought risk areas 12.48 d

Improve data and information

8. Expand research on water loss, absorption and harvesting in drought prone areas 12.49 b

13. Managing Mountain Ecosystems

B. Ensure integrated watershed development and provide alternative liv elihoods

Strengthen management

2. Establish watershed task forces or committees to integrate local services and initiatives 13.16 b

Strengthen international cooperation

11. Improve international research and training programs on watershed development 13.18 a
12. Strengthen international exchanges and cooperation in shared mountain areas and watersheds 13.18 b
13. Expand partnerships with NGO's involved in watershed development 13.18 c

Strengthen science and technology

17. Use participatory approaches for technologies for specific watershed and farm conditions 13.21 b

Strengthen capacity

22. Strengthen national centres for comprehensive watershed management and development 13.23

14. Ensure Sustainable Agriculture and Rural Development

D. Strengthen agricultural land resources planning and education

Strengthen science and technology

11. Integrate watershed and land use planning to reduce erosion and water pollution 14.41 c

F. Manage water resources for sustainable food production and rural development

This program area is included in Chapter 18, programme area F.

16. Manage Biotechnology on an Environmentally Sound Basis

B. Improve human health

Strengthen management

4. Introduce appropriate measures to assess and improve drinking water quality 16.13 d

17. Protect Oceans and Marine Resources

A. Ensure integrated management and sustainable use of coastal and marine areas

Strengthen management

1. Prepare and implement land and water use and siting policies 17.6 a

B. Protect the marine environment from land and sea-based pollution

Tackle coastal sewage priorities

12. Ensure primary treatment of municipal sewage discharged to rivers and seas 17.27 e
26. Improve watershed management to prevent degradation of the marine environment 17.29

21. Strengthen Management of Solid Wastes and Sewage

B. Maximize environmentally sound waste reuse and recycling

Expand education and training

31. Incorporate waste reuse and recycling in water supply and sanitation training programs 21.25 b

C. Ensure environmentally sound waste treatment and disposal

Strengthen science and technology

20. Increase investment and scale of urban water supply, waste collection and treatment facilities 21.35 f

D. Expand waste collection and disposal services

Strengthen science and technology

15. Integrate waste management with other basic services such as water supply 21.45 c

35. Strengthen Science for Sustainable Development

B. Expand research on ecosystems, ecological processes and development impacts

Improve monitoring and research

15. Expand monitoring of freshwater quality and quantity, especially in developing countries 35.12 g

Appendix C: Plan of Implementation of the World Summit on Sustainable Development (Excerpts)[12]

I. Introduction

1. The United Nations Conference on Environment and Development, held in Rio de Janeiro in 1992, provided the fundamental principles and the programme of action for achieving sustainable development. We strongly reaffirm our commitment to the Rio principles, the full implementation of Agenda 21 and the Programme for the Further Implementation of Agenda 21. We also commit ourselves to achieving the internationally agreed development goals, including those contained in the United Nations Millennium Declaration4 and in the outcomes of the major United Nations conferences and international agreements since 1992.

2. The present plan of implementation will further build on the achievements made since the United Nations Conference on Environment and Development and expedite the realization of the remaining goals. To this end, we commit ourselves to undertaking concrete actions and measures at all levels and to enhancing international cooperation, taking into account the Rio principles, including, inter alia, the principle of common but differentiated responsibilities as set out in principle 7 of the Rio Declaration on Environment and Development. These efforts will also promote the integration of the three components of sustainable development — economic development, social development and environmental protection — as interdependent and mutually reinforcing pillars. Poverty eradication, changing unsustainable patterns of production and consumption and protecting and managing the natural resource base of economic and social development are overarching objectives of, and essential requirements for, sustainable development.

3. We recognize that the implementation of the outcomes of the Summit should benefit all, particularly women, youth, children and vulnerable groups. Furthermore, the implementation should involve all relevant actors through partnerships, especially between Governments of the North and South, on the one hand, and between Governments and major groups, on the other, to achieve the widely shared goals of sustainable development. As reflected in the Monterrey Consensus, such partnerships are key to pursuing sustainable development in a globalizing world.

4. Good governance within each country and at the international level is essential for sustainable development. At the domestic level, sound environmental, social and economic policies, democratic institutions responsive to the needs of the people, the rule of law, anti-corruption measures, gender equality and an enabling environment for investment are the basis for sustainable development. As a result of globalization, external factors have become critical in determining the success or failure of developing countries in their national efforts. The gap between developed and developing countries points to the continued need for a dynamic and enabling international economic environment supportive of international cooperation, particularly in the areas of finance, technology transfer, debt and trade and full and effective participation of developing countries in global decision-making, if the momentum for global progress towards sustainable development is to be maintained and increased.

5. Peace, security, stability and respect for human rights and fundamental freedoms, including the right to development, as well as respect for cultural diversity, are essential for achieving sustainable development and ensuring that sustainable development benefits all.

6. We acknowledge the importance of ethics for sustainable development and, therefore, emphasize the need to consider ethics in the implementation of Agenda 21.

II. Poverty Eradication

7. Eradicating poverty is the greatest global challenge facing the world today and an indispensable requirement for sustainable development, particularly for developing countries. Although each country has the primary responsibility for its own sustainable development and poverty eradication and the role of national policies and development strategies cannot be overemphasized, concerted and concrete measures are required at all levels to enable developing countries to achieve their sustainable development goals as related to the internationally agreed poverty-related targets and goals, including those contained in Agenda 21, the relevant outcomes of other United Nations conferences and the United Nations Millennium Declaration. This would include actions at all levels to:

   a. Halve, by the year 2015, the proportion of the world's people whose income is less than 1

dollar a day and the proportion of people who suffer from hunger and, by the same date, to halve the proportion of people without access to safe drinking water;

b. Establish a world solidarity fund to eradicate poverty and to promote social and human development in the developing countries pursuant to modalities to be determined by the General Assembly, while stressing the voluntary nature of the contributions and the need to avoid duplication of existing United Nations funds, and encouraging the role of the private sector and individual citizens relative to Governments in funding the endeavours;

c. Develop national programmes for sustainable development and local and community development, where appropriate within country-owned poverty reduction strategies, to promote the empowerment of people living in poverty and their organizations. These programmes should reflect their priorities and enable them to increase access to productive resources, public services and institutions, in particular land, water, employment opportunities, credit, education and health;

d. Promote women's equal access to and full participation in, on the basis of equality with men, decision-making at all levels, mainstreaming gender perspectives in all policies and strategies, eliminating all forms of violence and discrimination against women and improving the status, health and economic welfare of women and girls through full and equal access to economic opportunity, land, credit, education and health-care services;

e. Develop policies and ways and means to improve access by indigenous people and their communities to economic activities and increase their employment through, where appropriate, measures such as training, technical assistance and credit facilities. Recognize that traditional and direct dependence on renewable resources and ecosystems, including sustainable harvesting, continues to be essential to the cultural, economic and physical well-being of indigenous people and their communities;

f. Deliver basic health services for all and reduce environmental health threats, taking into account the special needs of children and the linkages between poverty, health and environment, with provision of financial resources, technical assistance and knowledge transfer to developing countries and countries with economies in transition;

g. Ensure that children everywhere, boys and girls alike, will be able to complete a full course of primary schooling and will have equal access to all levels of education;

h. Provide access to agricultural resources for people living in poverty, especially women and indigenous communities, and promote, as appropriate, land tenure arrangements that recognize and protect indigenous and common property resource management systems;

i. Build basic rural infrastructure, diversify the economy and improve transportation and access to markets, market information and credit for the rural poor to support sustainable agriculture and rural development;

j. Transfer basic sustainable agricultural techniques and knowledge, including natural resource management, to small and medium-scale farmers, fishers and the rural poor, especially in developing countries, including through multistakeholder approaches and public-private partnerships aimed at increasing agriculture production and food security;

k. Increase food availability and affordability, including through harvest and food technology and management, as well as equitable and efficient distribution systems, by promoting, for example, community-based partnerships linking urban and rural people and enterprises;

l. Combat desertification and mitigate the effects of drought and floods through measures such as improved use of climate and weather information and forecasts, early warning systems, land and natural resource management, agricultural practices and ecosystem conservation in order to reverse current trends and minimize degradation of land and water resources, including through the provision of adequate and predictable financial resources to implement the United Nations Convention to Combat Desertification in Those Countries Experiencing Serious Drought and/or Desertification, particularly in Africa,7 as one of the tools for poverty eradication;

m. Increase access to sanitation to improve human health and reduce infant and child mortality, prioritizing water and sanitation in national

sustainable development strategies and poverty reduction strategies where they exist.

8. The provision of clean drinking water and adequate sanitation is necessary to protect human health and the environment. In this respect, we agree to halve, by the year 2015, the proportion of people who are unable to reach or to afford safe drinking water (as outlined in the Millennium Declaration) and the proportion of people who do not have access to basic sanitation, which would include actions at all levels to:

   a. Develop and implement efficient household sanitation systems;

   b. Improve sanitation in public institutions, especially schools;

   c. Promote safe hygiene practices;

   d. Promote education and outreach focused on children, as agents of behavioural change;

   e. Promote affordable and socially and culturally acceptable technologies and practices;

   f. Develop innovative financing and partnership mechanisms;

   g. Integrate sanitation into water resources management strategies.

IV. Protecting and managing the natural r esource base of economic and social development

9. Human activities are having an increasing impact on the integrity of ecosystems that provide essential resources and services for human well-being and economic activities. Managing the natural resources base in a sustainable and integrated manner is essential for sustainable development. In this regard, to reverse the current trend in natural resource degradation as soon as possible, it is necessary to implement strategies which should include targets adopted at the national and, where appropriate, regional levels to protect ecosystems and to achieve integrated management of land, water and living resources, while strengthening regional, national and local capacities. This would include actions at all levels as set out below.

10. Launch a programme of actions, with financial and technical assistance, to achieve the Millennium development goal on safe drinking water. In this respect, we agree to halve, by the year 2015, the proportion of people who are unable to reach or to afford safe drinking water, as outlined in the Millennium Declaration, and the proportion of people without access to basic sanitation, which would include actions at all levels to:

    a. Mobilize international and domestic financial resources at all levels, transfer technology, promote best practice and support capacity-building for water and sanitation infrastructure and services development, ensuring that such infrastructure and services meet the needs of the poor and are gender-sensitive;

    b. Facilitate access to public information and participation, including by women, at all levels in support of policy and decision-making related to water resources management and project implementation;

    c. Promote priority action by Governments, with the support of all stakeholders, in water management and capacity-building at the national level and, where appropriate, at the regional level, and promote and provide new and additional financial resources and innovative technologies to implement chapter 18 of Agenda 21;

    d. Intensify water pollution prevention to reduce health hazards and protect ecosystems by introducing technologies for affordable sanitation and industrial and domestic wastewater treatment, by mitigating the effects of groundwater contamination and by establishing, at the national level, monitoring systems and effective legal frameworks;

    e. Adopt prevention and protection measures to promote sustainable water use and to address water shortages.

11. Develop integrated water resources management and water efficiency plans by 2005, with support to developing countries, through actions at all levels to:

    a. Develop and implement national/regional strategies, plans and programmes with regard to integrated river basin, watershed and groundwater management and introduce measures to improve the efficiency of water infrastructure to reduce losses and increase recycling of water;

    b. Employ the full range of policy instruments, including regulation, monitoring, voluntary measures, market and information-based tools, land-use management and cost recovery of

water services, without cost recovery objectives becoming a barrier to access to safe water by poor people, and adopt an integrated water basin approach;

c. Improve the efficient use of water resources and promote their allocation among competing uses in a way that gives priority to the satisfaction of basic human needs and balances the requirement of preserving or restoring ecosystems and their functions, in particular in fragile environments, with human domestic, industrial and agriculture needs, including safeguarding drinking water quality;

d. Develop programmes for mitigating the effects of extreme water-related events;

e. Support the diffusion of technology and capacity-building for nonconventional water resources and conservation technologies, to developing countries and regions facing water scarcity conditions or subject to drought and desertification, through technical and financial support and capacity-building;

f. Support, where appropriate, efforts and programmes for energy-efficient, sustainable and cost-effective desalination of seawater, water recycling and water harvesting from coastal fogs in developing countries, through such measures as technological, technical and financial assistance and other modalities;

g. Facilitate the establishment of public-private partnerships and other forms of partnership that give priority to the needs of the poor, within stable and transparent national regulatory frameworks provided by Governments, while respecting local conditions, involving all concerned stakeholders, and monitoring the performance and improving accountability of public institutions and private companies.

12. Support developing countries and countries with economies in transition in their efforts to monitor and assess the quantity and quality of water resources, including through the establishment and/or further development of national monitoring networks and water resources databases and the development of relevant national indicators.

13. Improve water resource management and scientific understanding of the water cycle through cooperation in joint observation and research, and for this purpose encourage and promote knowledge-sharing and provide capacity-building and the transfer of technology, as mutually agreed, including remote-sensing and satellite technologies, particularly to developing countries and countries with economies in transition.

14. Promote effective coordination among the various international and intergovernmental bodies and processes working on water-related issues, both within the United Nations system and between the United Nations and international financial institutions, drawing on the contributions of other international institutions and civil society to inform intergovernmental decision-making; closer coordination should also be promoted to elaborate and support proposals and undertake activities related to the International Year of Freshwater, 2003 and beyond.

15. Agriculture plays a crucial role in addressing the needs of a growing global population and is inextricably linked to poverty eradication, especially in developing countries. Enhancing the role of women at all levels and in all aspects of rural development, agriculture, nutrition and food security is imperative. Sustainable agriculture and rural development are essential to the implementation of an integrated approach to increasing food production and enhancing food security and food safety in an environmentally sustainable way. This would include actions at all levels to:

a. Achieve the Millennium Declaration target to halve by the year 2015 the proportion of the world's people who suffer from hunger and realize the right to a standard of living adequate for the health and well-being of themselves and their families, including food, including by promoting food security and fighting hunger in combination with measures which address poverty, consistent with the outcome of the World Food Summit and, for States Parties, with their obligations under article 11 of the International Covenant on Economic, Social and Cultural Rights;

b. Develop and implement integrated land management and water-use plans that are based on sustainable use of renewable resources and on integrated assessments of socio-economic and environmental potentials and strengthen the capacity of Governments, local authorities and communities to monitor and manage the quantity and quality of land and water resources;

c. Increase understanding of the sustainable use,

protection and management of water resources to advance long-term sustainability of freshwater, coastal and marine environments;

d. Promote programmes to enhance in a sustainable manner the productivity of land and the efficient use of water resources in agriculture, forestry, wetlands, artisanal fisheries and aquaculture, especially through indigenous and local community-based approaches;

e. Support the efforts of developing countries to protect oases from silt, land degradation and increasing salinity by providing appropriate technical and financial assistance;

f. Enhance the participation of women in all aspects and at all levels relating to sustainable agriculture and food security;

g. Integrate existing information systems on land-use practices by strengthening national research and extension services and farmer organizations to trigger farmer-to-farmer exchange on good practices, such as those related to environmentally sound, low-cost technologies, with the assistance of relevant international organizations;

h. Enact, as appropriate, measures that protect indigenous resource management systems and support the contribution of all appropriate stakeholders, men and women alike, in rural planning and development;

i. Adopt policies and implement laws that guarantee well defined and enforceable land and water use rights and promote legal security of tenure, recognizing the existence of different national laws and/or systems of land access and tenure, and provide technical and financial assistance to developing countries as well as countries with economies in transition that are undertaking land tenure reform in order to enhance sustainable livelihoods;

j. Reverse the declining trend in public sector finance for sustainable agriculture, provide appropriate technical and financial assistance, and promote private sector investment and support efforts in developing countries and countries with economies in transition to strengthen agricultural research and natural resource management capacity and dissemination of research results to the farming communities;

k. Employ market-based incentives for agricultural enterprises and farmers to monitor and manage water use and quality, inter alia, by applying such methods as small-scale irrigation and wastewater recycling and reuse;

l. Enhance access to existing markets and develop new markets for valueadded agricultural products;

m. Increase brown-field redevelopment in developed countries and countries with economies in transition, with appropriate technical assistance where contamination is a serious problem;

n. Enhance international cooperation to combat the illicit cultivation of narcotic plants, taking into account their negative social, economic and environmental impacts;

o. Promote programmes for the environmentally sound, effective and efficient use of soil fertility improvement practices and agricultural pest control;

p. Strengthen and improve coordination of existing initiatives to enhance sustainable agricultural production and food security;

q. Invite countries that have not done so to ratify the International Treaty on Plant Genetic Resources for Food and Agriculture;

r. Promote the conservation, and sustainable use and management of traditional and indigenous agricultural systems and strengthen indigenous models of agricultural production. * * *

16. Strengthen the implementation of the United Nations Convention to Combat Desertification in Those Countries Experiencing Serious Drought and/or Desertification, particularly in Africa, to address causes of desertification and land degradation in order to maintain and restore land, and to address poverty resulting from land degradation. This would include actions at all levels to:

    a. Mobilize adequate and predictable financial resources, transfer of technologies and capacity-building at all levels;

    b. Formulate national action programmes to ensure timely and effective implementation of the Convention and its related projects, with the support of the international community,

including through decentralized projects at the local level;

c. Encourage the United Nations Framework Convention on Climate Change, the Convention on Biological Diversity and the Convention to Combat Desertification to continue exploring and enhancing synergies, with due regard to their respective mandates, in the elaboration and implementation of plans and strategies under the respective Conventions;

d. Integrate measures to prevent and combat desertification as well as to mitigate the effects of drought through relevant policies and programmes, such as land, water and forest management, agriculture, rural development, early warning systems, environment, energy, natural resources, health and education, and poverty eradication and sustainable development strategies;

e. Provide affordable local access to information to improve monitoring and early warning related to desertification and drought;

f. Call on the Second Assembly of the Global Environment Facility (GEF) to take action on the recommendations of the GEF Council concerning the designation of land degradation (desertification and deforestation) as a focal area of GEF as a means of GEF support for the successful implementation of the Convention to Combat Desertification; and consequently, consider making GEF a financial mechanism of the Convention, taking into account the prerogatives and decisions of the Conference of the Parties to the Convention, while recognizing the complementary roles of GEF and the Global Mechanism of the Convention in providing and mobilizing resources for the elaboration and implementation of action programmes;

g. Improve the sustainability of grassland resources through strengthening management and law enforcement and providing financial and technical support by the international community to developing countries. * * *

17. Mountain ecosystems support particular livelihoods and include significant watershed resources, biological diversity and unique flora and fauna. Many are particularly fragile and vulnerable to the adverse effects of climate change and need specific protection. Actions at all levels are required to:

a. Develop and promote programmes, policies and approaches that integrate environmental, economic and social components of sustainable mountain development and strengthen international cooperation for its positive impacts on poverty eradication programmes, especially in developing countries;

b. Implement programmes to address, where appropriate, deforestation, erosion, land degradation, loss of biodiversity, disruption of water flows and retreat of glaciers;

18. Forests and trees cover nearly one third of the Earth's surface. Sustainable forest management of both natural and planted forests and for timber and nontimber products is essential to achieving sustainable development as well as a critical means to eradicate poverty, significantly reduce deforestation, halt the loss of forest biodiversity and land and resource degradation and improve food security and access to safe drinking water and affordable energy; in addition, it highlights the multiple benefits of both natural and planted forests and trees and contributes to the well-being of the planet and humanity. The achievement of sustainable forest management, nationally and globally, including through partnerships among interested Governments and stakeholders, including the private sector, indigenous and local communities and non-governmental organizations, is an essential goal of sustainable development.

VIII. Sustainable Development for Africa

19. Provide financial and technical support for Africa's efforts to implement the Convention to Combat Desertification at the national level and integrate indigenous knowledge systems into land and natural resources management practices, as appropriate, and improve extension services to rural communities and promote better land and watershed management practices, including through improved agricultural practices that address land degradation, in order to develop capacity for the implementation of national programmes.

20. Mobilize financial and other support to develop and strengthen health systems that aim to:

a. Promote equitable access to health-care services;

b. Make available necessary drugs and technology in a sustainable and affordable manner to fight and control communicable diseases, including

HIV/AIDS, malaria and tuberculosis, and trypanosomiasis, as well as noncommunicable diseases, including those caused by poverty;

c. Build capacity of medical and paramedical personnel;

d. Promote indigenous medical knowledge, as appropriate, including traditional medicine;

e. Research and control Ebola disease.

21. Deal effectively with natural disasters and conflicts, including their humanitarian and environmental impacts, recognizing that conflicts in Africa have hindered, and in many cases obliterated, both the gains and efforts aimed at sustainable development, with the most vulnerable members of society, particularly women and children, being the most impacted victims, through efforts and initiatives, at all levels, to:

a. Provide financial and technical assistance to strengthen the capacities of African countries, including institutional and human capacity, including at the local level, for effective disaster management, including observation and early warning systems, assessments, prevention, preparedness, response and recovery;

b. Provide support to African countries to enable them to better deal with the displacement of people as a result of natural disasters and conflicts and put in place rapid response mechanisms;

c. Support Africa's efforts for the prevention and resolution, management and mitigation of conflicts and its early response to emerging conflict situations to avert tragic humanitarian consequences;

d. Provide support to refugee host countries in rehabilitating infrastructure and environment, including ecosystems and habitats, that were damaged in the process of receiving and settling refugees.

22. Promote integrated water resources development and optimize the upstream and downstream benefits therefrom, the development and effective management of water resources across all uses and the protection of water quality and aquatic ecosystems, including through initiatives at all levels, to:

a. Provide access to potable domestic water, hygiene education and improved sanitation and waste management at the household level through initiatives to encourage public and private investment in water supply and sanitation that give priority to the needs of the poor within stable and transparent national regulatory frameworks provided by Governments, while respecting local conditions involving all concerned stakeholders and monitoring the performance and improving the accountability of public institutions and private companies; and develop critical water supply, reticulation and treatment infrastructure, and build capacity to maintain and manage systems to deliver water and sanitation services in both rural and urban areas;

b. Develop and implement integrated river basin and watershed management strategies and plans for all major water bodies, consistent with paragraph 25 above;

c. Strengthen regional, subregional and national capacities for data collection and processing and for planning, research, monitoring, assessment and enforcement, as well as arrangements for water resource management;

d. Protect water resources, including groundwater and wetland ecosystems, against pollution, and, in cases of the most acute water scarcity, support efforts for developing non-conventional water resources, including the energy-efficient, costeffective and sustainable desalination of seawater, rainwater harvesting and recycling of water.

IX. Other regional initiativ es

23. Important initiatives have been developed within other United Nations regions and regional, subregional and transregional forums to promote sustainable development. The international community welcomes these efforts and the results already achieved, calls for actions at all levels for their further development, while encouraging interregional, intraregional and international cooperation in this respect, and expresses its support for their further development and implementation by the countries of the regions.

A. Sustainable development in Latin America and the Caribbean

24. The Initiative of Latin America and the Caribbean on Sustainable Development is an undertaking by the leaders of that region that, building on the

Platform for Action on the Road to Johannesburg, 2002,36 which was approved in Rio de Janeiro in October 2001, recognizes the importance of regional actions towards sustainable development and takes into account the region's singularities, shared visions and cultural diversity. It is targeted towards the adoption of concrete actions in different areas of sustainable development, such as biodiversity, water resources, vulnerabilities and sustainable cities, social aspects, including health and poverty, economic aspects, including energy, and institutional arrangements, including capacity-building, indicators and participation of civil society, taking into account ethics for sustainable development.

25. The Initiative envisages the development of actions among countries in the region that may foster South-South cooperation and may count with the support of groups of countries, as well as multilateral and regional organizations, including financial institutions. As a framework for cooperation, the Initiative is open to partnerships with governments and all major groups.

B. Sustainable development in Asia and the Pacific

26. Bearing in mind the target of halving the number of people who live in poverty by the year 2015, as provided in the Millennium Declaration, the Phnom Penh Regional Platform on Sustainable Development for Asia and the Pacific recognized that the region contains over half of the world's population and the largest number of the world's people living in poverty. Hence, sustainable development in the region is critical to achieving sustainable development at the global level.

27. The Regional Platform identified seven initiatives for follow-up action: capacity-building for sustainable development; poverty reduction for sustainable development; cleaner production and sustainable energy; land management and biodiversity conservation; protection and management of and access to freshwater resources; oceans, coastal and marine resources and sustainable development of small is land developing States; and action on atmosphere and climate change. Follow-up actions of these initiatives will be taken through national strategies and relevant regional and subregional initiatives, such as the Regional Action Programme for Environmentally Sound and Sustainable Development and the Kitakyushu Initiative for a Clean Environment, adopted at the Fourth Ministerial Conference on Environment and Development in Asia and the Pacific organized by the Economic and Social Commission for Asia and the Pacific.

C. Sustainable development in the West Asia region

28. The West Asia region is known for its scarce water and limited fertile land resources. The region has made progress to a more knowledge-based production of higher value-added commodities.
29. The regional preparatory meeting endorsed the following priorities: poverty alleviation, relief of debt burden; and sustainable management of natural resources, including, inter alia, integrated water resources management, implementation of programmes to combat desertification, integrated coastal zone management and land and water pollution control.

www.unep.org

United Nations Environment Programme
P.O. Box 30552, Nairobi, Kenya
Tel: 254 20 621234
Fax: 254 20 623927
Email: cpiinfo@unep.org
web:www.unep.org

UNEP

Division of Policy Development and Law
P.O. Box 30552 Nairobi, Kenya
Tel: 254 20 623365
Fax: 254 20 624324
Email: dpdl@unep.org
Web: www.unep.org/dpdl/law