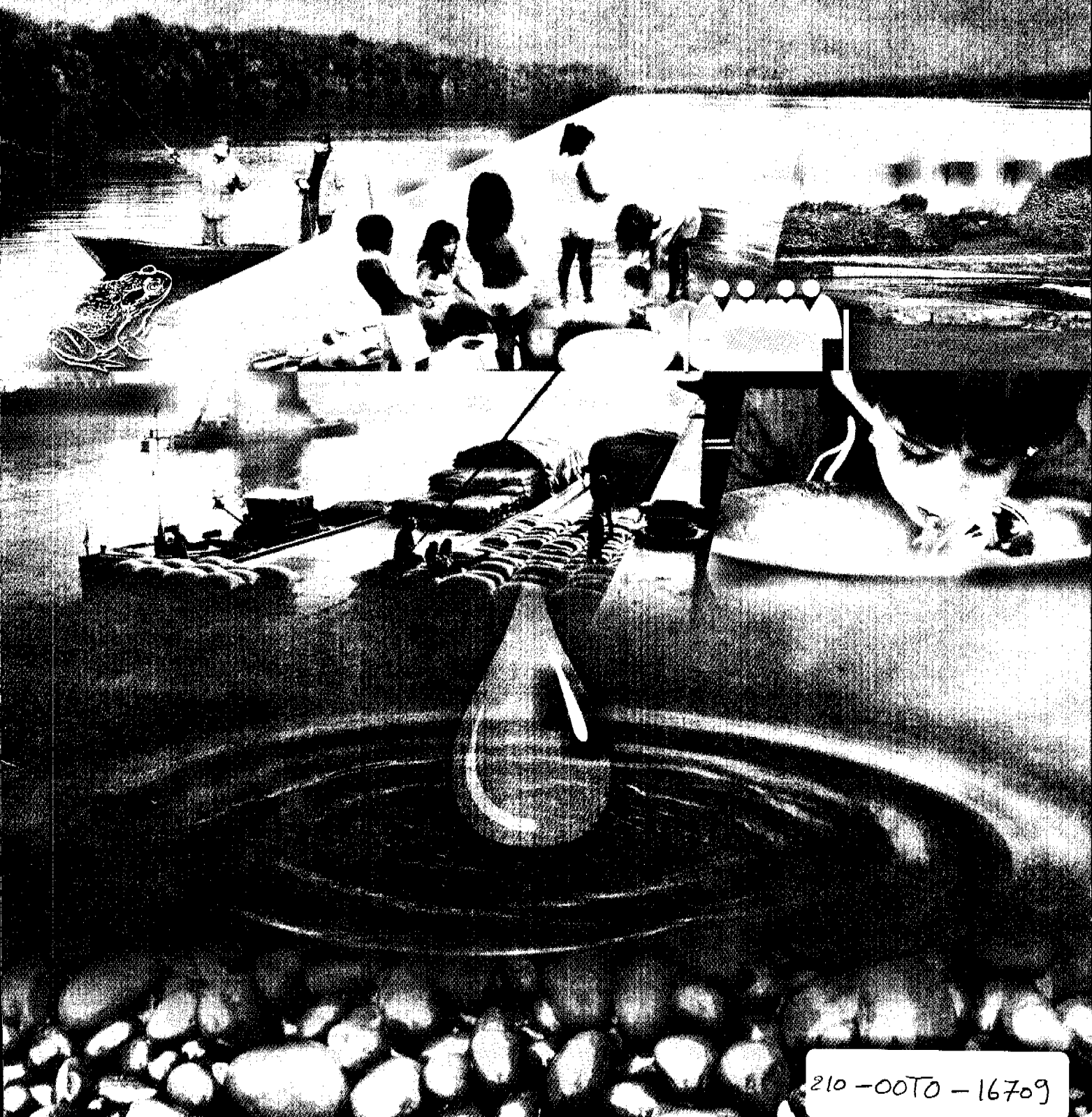


# TOWARDS SUSTAINABLE RIVER BASIN MANAGEMENT

RECOMMENDATIONS AND GUIDELINES  
ON BEST MANAGEMENT PRACTICES



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## RECOMMENDATIONS AND GUIDELINES ON BEST MANAGEMENT PRACTICES

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In preparing this document inspiration was drawn from the "Recommendations and Guidelines on Sustainable River Basin Management" arising from the international expert workshop on river basin management held in The Hague (27-29 October 1999)

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# PREFACE

River basin management will be a major challenge in this new millennium. Throughout the world some 300 river basins are shared between two or more states. River basins play an important role in sustaining ecosystems and, as the foremost source of freshwater, are also vital to mankind. They shape the world in which we live, provide the water we drink, help grow the food we eat and perform many other useful functions.

Yet, in many regions of the world, river basins are under severe stress. In many places demand outstrips supply more and more each year. Industrial and agricultural pollution and inadequate sanitation result in water pollution and threats to human health. Careless land-use practices cause erosion and increase flooding and flood damage.

To ensure the multi-functional use of all water resources in the present and the future, mankind has to move towards sustainable management of river basins. Authorities at all levels, river commissions, stakeholders and the general public all have their own responsibilities in the implementation of sustainable river basin management.

The hydrological, environmental, social and economic circumstances vary in different regions of the world, and every river basin will therefore need its own specific policies, plans and activities. The concept of sustainable river basin management is relatively new and there are few places in the world with experience of it.

The present document intends to contribute to the further development of sustainable river basin management, and sets out recommendations and guidelines on best management practices for river basins. The International Workshop of Experts on River Basin Management (The Hague, 27-29 October 1999) with participants from all regions of the world provided important input.

I trust that this document will be of use to all those involved in river basin management.



J.P. Pronk

Minister of Housing, Spatial Planning and the Environment  
The Netherlands

# 1 KEY MESSAGE

Water is an environmental resource and it is the basis for social and economic development. River basins are the paramount source of freshwater. To preserve and maintain this precious resource for present and future generations there is a need for sustainable river basin management. *Political leadership and commitment* are crucial. In view of regional differences, a blueprint for river basin management cannot be given. However, the following elements are essential for achieving sustainable river basin management in all basins:

**1. Basin-wide planning**

Basin-wide planning should balance all user needs for water resources, in the present and for the long term, and should incorporate spatial developments. Vital human and ecosystem needs have to be given special attention.

**2. Participation in decision-making**

Local empowerment and public and stakeholder participation in decision-making will strengthen river basin management.

**3. Demand management**

Demand management has to be part of sustainable water management.

**4. Compliance**

Compliance monitoring and assessment of commitments under river basin agreements or arrangements need to be developed.

**5. Human and financial capacities**

Long-term development of sufficient human and financial capacity is a necessity.

## 2 INTRODUCTION

River basins sustain natural ecosystems; they are the paramount source of freshwater and fulfil non-consumptive as well as consumptive uses<sup>1</sup>. The capacity of many basins to meet the growing socio-economic demands, including basic human needs (drinking water and sanitation), is decreasing rapidly. In many river basins pressures on the environment, including the marine environment, have reached levels surpassing those that may be sustainable. Vulnerability to extreme events has increased. Conflicts between different water uses and between upstream and downstream uses are increasing. Effective river basin management that meets the needs of the present without compromising the ability of future generations to meet their own needs, is a prerequisite for sustainable development, including the social, environmental and economic dimensions.

River basins comprise both freshwater and the wider environment. The interactions between parts of the 'river basin' natural unit (upstream - downstream, tributary - mainstream, land - water, groundwater - surface water, population - biotope, etc.) are so strong that the system as a whole is the logical level for environmental and water management measures. Water management policies for the local, national and international scales need to be coordinated with the policies formulated at the river basin scale. *An integrated approach<sup>2</sup> to the development of water resources and the management of river basins* is needed, in which viewpoints and interests are balanced from the start.

Since the United Nations Water Conference in Mar del Plata (1977), many initiatives have been taken and many *international policy documents* have been adopted to promote sustainable river basin management, such as the Dublin Statement on Water and Sustainable Development (1992), the Rio Declaration (1992), Agenda 21 (Chapter 18 on freshwater) (1992), the Global Programme of Action for the Protection of the Marine Environment from Land-based Activities (1995), and the work of the UN Commission on Sustainable Development. The integrated approach is a central theme in these documents.

*International legal instruments*, too, contain many elements which are relevant to river basin management, such as the Convention on Wetlands (Ramsar, Iran 1971), the Convention on Biological Diversity (Rio de Janeiro, 1992), the UN/ECE Convention on the Protection and Use of Transboundary Watercourses and International Lakes (Helsinki, 1992), the UN Convention on the Law of the Non-navigational Uses of International Watercourses (New York, 1997; not yet entered into force), and international agreements for specific rivers. The concepts, principles and rules contained in different international legal instruments require elaboration and in many basins still await implementation.

1. HUMAN USES INCLUDE DRINKING WATER, SHIPPING, AGRICULTURE (IRRIGATION), FISHING, INDUSTRY (COOLING AND PROCESSING), HYDROPOWER, RECREATION.

2. THE TERMS 'ECOSYSTEMS APPROACH' AND 'HOLISTIC APPROACH' ARE OFTEN USED AS WELL. DEPENDING ON THEIR EXACT INTERPRETATION, THEY ARE EITHER AN IMPORTANT PART OF OR EQUIVALENT TO AN INTEGRATED APPROACH.

The present document follows an integrated approach and formulates *a set of recommendations on best management practices for river basins, while respecting the different social, economic, hydrologic and environmental circumstances in different regions*. The best management practices envisage the balancing of the multi-functional use of all water resources in the present and in the long term, and incorporate spatial developments, with special attention being paid to vital human and ecosystem needs.

The present document *addresses national governments, regional and local authorities, institutions* responsible for the management of river basins or parts thereof, and where possible *stakeholders*. It also addresses *joint management or consultation bodies* of countries sharing a river basin. The contents may be of interest to the public as well.

The Recommendations and Guidelines do not pretend to any mandatory or legal status: they are intended to serve as a *guidance document* for supporting governments and other institutions in their development of effective river basin management, which of course will have to be tailored to regional characteristics and practices.

The document is composed of a key message, the present introduction, a framework with five steps showing the key elements of a management system in their mutual relations, and Recommendations and Guidelines on Best Management Practices.

## SCOPE OF THE RECOMMENDATIONS AND GUIDELINES

River basins encompass both land and water. At the same time, the multiplicity of links between the land and water components of the river basin need to be taken into account. Hence, river basin management has many links to other policy areas, such as nature protection, land use planning, air and soil pollution control, and chemicals management. The focus of these Recommendations and Guidelines is on water.

Another distinction to be considered is the transition zone between the river basin and the sea or ocean in which the river discharges its waters. The coastal zone is invariably an area of intense human activity. Unlike river basins, coastal management has long combined two facets: marine resources management and land-use planning. Because coasts are so heavily used, many conflicts arise. As in river basins, it is now widely recognised that integrated management of the coastal zone is required to lay the foundation for sustainable development. Good marine environmental management depends heavily on good river basin control. The interest of the protection of the marine environment should therefore be taken into account in river basin and coastal zone management.

Given the effects of river basin management on receiving waters (seas, deltas, coastal zones), these Recommendations and Guidelines will be profitable for these other areas as well.

### 3 FRAMEWORK FOR SUSTAINABLE RIVER BASIN MANAGEMENT

To *implement an integrated approach* to river basin management, a framework is presented here, consisting of *five sections*. In principle, these sections form a cyclic sequence, which can be applied to both national and transboundary river basins. If for a particular river basin one had to start from scratch, one could follow all these steps as a means of arriving at a satisfactory level of control. In practice, in most countries and regions at least some of the steps are already followed. In such cases, the specific management situation can be evaluated against the background of this framework and elaborated upon.

The ultimate goal, whether one starts from scratch or from a partially developed situation, is a *complete management and control system for achieving sustainable water management at river basin scale*. Of course, reaching that goal is not simply a matter of a one-off administrative sequence of actions. Experience has to be gained through a trial and error process; agreement between countries will take time to be reached, etc. Therefore, the stages of the management system will probably need to be run through several times before a satisfactory level of control is reached. At all stages, the public should be kept informed, and opportunities for *participation of the public and stakeholders in the decision-making process* should be provided.

The *first stage* consists of an *assessment of the national institutional framework and of resources and needs*. Institutions and legal provisions in the sphere of water management are needed as a basis before one can start setting up management systems for river basins. In any case, there should be a clear allocation of duties and responsibilities at national and local government levels, e.g. the establishment of competent authorities. In addition, a basis is needed for issuing emission licences, setting quality standards, and compliance and enforcement.

Assessment of resources and needs is of paramount importance for enabling river basin management to get started. Knowledge about the strategic assets of the river basin, and about the uses, the needs and the pressures exerted on it, constitutes the point of departure for objectives and plans.

The implementation of the *second stage* depends on whether the river basin to be managed is *transboundary (or inter-state in a federal state)*. Countries sharing a river basin can initiate *cooperation* on technical matters, as a first step to developing mutual understanding and trust, and political commitment for further cooperation. They should open consultations and attempt to draw up an agreement or other arrangement to cooperate in managing the river basin. Such an agreement does not need to be legally binding. It should preferably cover the whole basin, as integrated management cannot achieve its full potential if parts of the river system are excluded, or if there is no common overall objective.



In addition, the countries should try to set up a joint or coordinated body, to serve as a platform for coordination and negotiations.

The third and fourth stages form the heart of the management system. They address the development and the implementation of the management plan. The plan is a means to support and improve operational management. In the *third stage*, the competent authority, which may be an international, national or local body depending on the circumstances and the characteristics of the river basin concerned, *draws up* (or coordinates the drawing up of) *a management plan* for the next five to ten years. This planning process should be open to linkage with issues outside the field of river basin management or the basin at issue, to overcome upstream-downstream conflicts.

The contents of a plan very much depend on the specific physical and political conditions. In general a plan consists of the following main elements: a description of the river basin (assessment of resources and needs), an outlook on probable economic, demographic and ecological developments, formulation of objectives taking account of the balancing of human uses and ecosystems, and a set of measures needed to attain each of those objectives. The level of detail with which these elements can be included in the plan will depend on the capacity available and the needs within the specific basin.

The *fourth stage* concerns the *implementation of the management plan*. The plan will be implemented by national, regional, local and sometimes river basin authorities on the one hand, and by companies, local communities and citizens on the other hand. Each player has his own responsibilities, but attaining the objectives of the management plan can only be the result of cooperation. Part of the tasks at this stage may include routine registering by the authorities of water-relevant activities (such as discharges of wastewater), checking compliance mechanisms, issuing licences, and carrying out measurements.

This stage also comprises the physical tasks such as the construction of sewage treatment plants, the installation of new technology, the construction of irrigation works and the restoration of natural environments. Evidently, unexpected events may make it necessary to change some of the planned actions: improvisation must always remain possible. Moreover, actually implementing planned actions provides new experiences that may be useful for the next cycle of planning and implementation.

The *fifth stage* concerns a specific moment of *evaluation* after a specific number of years of implementation of the plan, using the results of *compliance monitoring*. Experience teaches that making and implementing plans is a trial and error process. Compliance monitoring should ideally start at the same time as the implementation of the plan. It is important not to start evaluation too early, because it may detract attention from the tasks yet to be fulfilled. On the other hand, it is equally important to agree on a specific moment so as to be sure that the

evaluation will be carried out and can lay the foundation for the next cycle of planning, based on the framework presented here.

#### COMPLIANCE MONITORING AND PUBLIC PARTICIPATION

The recent UNEP-UN/ECE project on a draft strategy and framework for monitoring compliance with agreements on transboundary waters and draft guidelines on public participation in water management, prepared by experts, provides valuable ideas with respect to compliance review and public participation.

These documents can be used as guidance for the development of more detailed mechanisms for compliance monitoring and public participation related to water management. They have been made available to the Second World Water Forum and Ministerial Conference (The Hague, March 2000).

## 4 RECOMMENDATIONS AND GUIDELINES ON BEST MANAGEMENT PRACTICES

THIS CHAPTER SETS OUT RECOMMENDATIONS AND GUIDELINES WHICH WILL FACILITATE THE IMPLEMENTATION OF THE FIVE STAGES OF THE FRAMEWORK FOR SUSTAINABLE RIVER BASIN MANAGEMENT.

### LEADERSHIP

1. River basin management is often characterised by parochial interests and intractable problems. To achieve progress, leadership and political commitment are essential.

### LEARNING FROM EXPERIENCE

2. River basin managers can and should learn from each others' experiences, successes and failures.

### PUBLIC PARTICIPATION IN DECISION-MAKING

3. Public participation and empowerment are necessary conditions for achieving sustainable development. To ensure effective public participation, independent of the goodwill of the authorities, rights of access to information, active participation in decision-making processes, and access to justice need to be legally established. Resources should be made available for implementing the results of the public participation process.
4. Effective approaches and methods for public participation need to be devised that can be applied in different cultures and may help to overcome reluctance on the part of the authorities.
5. Since some issues in transboundary river basins can be handled best at the transboundary basin level, public participation should also be provided for at that level. This will contribute to a more integrated management of transboundary river basins.

### THE IMPORTANCE OF WATER

6. Water should be seen as a social, environmental and economic resource. The importance of a safe drinking water supply and sanitation, the role of water for subsistence farmers and fishermen, and its significance for the different ecosystems should be recognised. Moreover, water plays a key role in many economic processes. It has a high value, even if it is politically difficult to reflect this value in water transactions.

## DRINKING WATER AND SANITATION

Drinking water and sanitation are vital human needs that deserve priority among human uses of water. Groundwater is usually the best resource for the preparation of drinking water, but vulnerable to pollution and depletion. Therefore, zones where groundwater is abstracted for the production of drinking water should be protected against pollution, and groundwater resources should be compensated through replenishment in the case of abstractions that tend to exhaust the resource.

Surface waters are another resource for the preparation of drinking water, and governments and drinking water companies should make efforts - together with industry and agriculture - to prevent pollution (through rules, permits, charges, etc.). Drinking water companies could set up a monitoring network throughout river basins, to monitor the quality of the surface and ground waters to be used as a resource for the production of drinking water. Wastage of water (e.g. through pipe leakages) should be restricted to a minimum. Traditional techniques for the preparation of drinking water (e.g. slow sand filtration for surface water) are still very valuable.

Adequate sanitation is needed as a safeguard for human health. Wastewater from households and industries should be treated before discharge, to prevent diseases and to protect surface and ground waters. Attention should be given to leakages in sewage pipes, to protect the environment and to safeguard waters used as a source of drinking water.

### 4.1 ASSESSMENT OF THE NATIONAL INSTITUTIONAL FRAMEWORK AND RESOURCES AND NEEDS

National institutions and legal provisions form a necessary basis for river basin management. Such institutions and legal regimes should reflect local conditions, and be flexible and responsive to current and future needs. Furthermore, institutions and legal regimes should provide a framework for conflict avoidance management.

#### CRITERIA

7. The institutional structure for river basin management should facilitate the necessary coordination within the water management sector and between the water management sector and other sectors such as land use and environment in order to achieve sustainable water use and maintain the balance of the river system.
8. The institutional structure should also be a means of empowerment. All stakeholders should be able to play an active role in river basin management, including economic interest groups, local communities, environmental NGOs and women.
9. Policy formulation, and mediatory, regulatory and other management tasks should be well defined, clearly allocated and transparent.

#### GENERAL GOVERNMENT AND RIVER BASIN COMMISSIONS FOR STRATEGIC TASKS

10. Strategic tasks with many interfaces between sectors should be the primary responsibility of general (national, regional and local) government, and not of a specific functional institution.
11. River basin authorities with autonomous decision-making powers may be a good option for operational tasks with a narrow scope.
12. River basin commissions should be established for river basins crossing administrative boundaries in order to provide the necessary intergovernmental coordination and offer a platform for negotiation.

#### DECENTRALISATION ADVISABLE AND USUALLY FEASIBLE

13. Decentralisation should be pursued as much as possible in order to bring river basin management as close as possible to the individual citizens and facilitate local variation in response to differing local conditions and preferences.
14. Decentralisation is also possible in the case of tasks with supra-local scope if the decentralised authorities concerned cooperate (e.g. in a river basin commission) or if they are supervised by a higher-level government body.
15. The decentralisation process should be transparent, phased and planned.

#### CAPACITY BUILDING

16. The capacity of all institutions needs to be maintained and/or developed by means of short-term and long-term programmes (including postgraduate education and curricula development).

#### LOCAL INSTITUTIONS

17. Traditional regimes and institutions should be recognised and integrated in river basin management.

#### PRIVATE SECTOR PARTICIPATION AND CORPORATE MANAGEMENT

18. There may be a distinct role for private entities (publicly or privately owned) in the provision of water services and water management. Private ownership of water infrastructure is a controversial issue that needs to be carefully explored.

#### WATER RIGHTS

19. Water rights should be flexible and responsive to changing circumstances at both national and international level.

#### THE NEED FOR DATA AND INFORMATION

20. Effective river basin management requires sound data, information and knowledge, including both data on surface and groundwater (quantity and quality) and social and economic data. Collection and processing of relevant data, easy accessibility and broad dissemination are prominent tasks of river basin management.
21. To increase policy relevance, data should be aggregated into meaningful information, for example in the form of indicators and systems for bench-marking.

## PARAMETERS FOR ECOSYSTEM AND WATER QUALITY

Surface waters and groundwater as well as their associated ecosystems are characterised by an almost infinite number of biological, ecological, geological, hydrological, morphological and chemical parameters. In water management practice, it is necessary to limit the number of parameters to be used for descriptions, objectives, monitoring, etc., because time and money for monitoring and assessment are limited. The topics that should be covered and the level of detail of a checklist depend on the issues in the specific basin and on the capacity available.

Fortunately, experience shows that working with a limited number of parameters is sufficient for most of the ends of practical water management. The UN/ECE Guidelines on the Ecosystem Approach in Water Management provide valuable guidance on this matter.

### HARMONISATION OF MONITORING AND ANALYSIS METHODS

22. Monitoring and analysis methods should be harmonised nationally and, in the case of transboundary basins, at the transboundary level.

### EXCHANGE AND DISSEMINATION OF DATA AND KNOWLEDGE

23. The unrestricted exchange of data and knowledge is a prerequisite of efficient management and cooperation in both national and transboundary river basins. Monitoring data collected with public funds should be publicly available and easily accessible, nationally and internationally.

### A COMPREHENSIVE ANALYTICAL MODEL

24. To support river basin management, a new analytical model should be developed that can aggregate socio-economic, political, institutional and technological potentials and hydrological constraints. This model should also be capable of evaluating the actual management capacity.

### REQUIREMENTS FOR ANALYTICAL METHODS

25. To support strategic planning, methods for analytical support should be developed that:
  - a. cover the whole basin and all significant impacts;
  - b. specifically consider the socio-economic processes that affect the basin;
  - c. predict the socio-economic effects of alternative strategies; and
  - d. present the issues in a way that people can understand.
26. Methods for analytical support should reflect the fact that policy analysis can never rely on quantitative information only. Moreover, these methods should be transparent and flexible, promote policy learning by all actors, and facilitate negotiation processes. Appropriate methods may include argumentative policy analysis and role playing supported by a computer model of the natural system and the socio-economic effects.

#### DECENTRALISED INFORMATION SYSTEMS

27. There is a large role for appropriate decentralised information systems and networks that can promote interaction among sectors, provide a basis for consistent technical studies, facilitate communication with the public, and stimulate participation.

#### 4.2 TRANSBOUNDARY (OR INTER-STATE IN A FEDERAL STATE) COOPERATION

Where river basins are transboundary, cooperation between two or more countries is needed to achieve sustainable river basin management. Cooperation on technical matters could be a first step for confidence building. Thereafter, states should try to draw up an international agreement or other arrangement for cooperation in river basin management, preferably covering the whole basin, and establish a joint or coordinated body for organising and supervising such cooperation.

#### TRANSBOUNDARY COOPERATION: CONTENT AND DEVELOPMENT

28. Mutual understanding and trust and shared information are the basis for transboundary cooperation.
29. Technical cooperation involving the collection and dissemination of information promotes the acceptance of this information by all basin states and stimulates mutual understanding and trust. In times of international conflicts, at least technical cooperation should be maintained.
30. Several mechanisms could be used to overcome conflicting (upstream-downstream) interests. Contentious international issues could be linked with other issues ("issue linkage"). Moreover, countries may accept less favourable agreements in the expectation that other countries will do the same in the future ("diffuse reciprocity"). In some cases payment of financial compensation by the benefiting country to the country having to incur costs could be justified, provided the polluter-pays principle is respected.
31. River basin treaties and other forms of international cooperation should reflect the relevant principles of international law, primarily the principles of equitable and reasonable use, the obligation not to cause significant harm, and the duty to notify and exchange information.

#### INTERNATIONAL RIVER BASIN COMMISSIONS USUALLY ADVISABLE

32. International river basin commissions can perform many useful functions in the management of transboundary basins, such as coordination of research and monitoring, coordination of river basin management between the participating basin states, planning, compliance monitoring and conflict resolution. International river basin commissions are almost indispensable for transboundary basins located in more than two states, and advisable for many basins located in two states. States sharing several transboundary waters may also establish joint boundary water commissions.

#### INTERNATIONAL RIVER BASIN AUTHORITIES CAN BE PRACTICAL

33. International river basin authorities with decision-making and enforcement powers may be a good option for specific operational tasks, such as the restoration of water quality, shipping and the joint operation and management of infrastructure.

#### WATERCOURSES CONVENTION

34. Ratification of the 1997 UN Watercourses Convention should be considered as an instrument to facilitate river basin management. The principles of this Convention may be supplemented by principles with respect to limiting transboundary impacts (1992 UNECE Helsinki Transboundary Watercourses Convention), encouraging public participation (1998 Aarhus Convention), and water and health (1999 Protocol on Water and Health).

#### INTERDISCIPLINARY FORUM TO DEVELOP PRINCIPLES AND STANDARDS

35. A global multilateral interdisciplinary forum should be established to develop general principles and minimum standards for the sustainable management of transboundary river basins. All relevant actors, including states, international organisations and non-state actors, such as NGOs and other interest groups, should be enabled to participate in the discussions. The aim of the forum should be to exchange and share experiences and ideas on the management of transboundary river basins.

#### INTERNATIONAL DONORS AND BANKS CAN PLAY A POSITIVE ROLE

36. The lending operations and programmes of international donors and banks should reflect the principles and considerations expressed in these Recommendations and Guidelines. Donors and recipient countries should coordinate funding programmes in order to ensure a coherent approach and long-term solutions.

#### COOPERATION AND TWINNING IMPORTANT FOR STRENGTHENING RIVER BASIN MANAGEMENT

37. Cooperation and mutual support between river basin organisations are important means of strengthening river basin management. Twinning of river basin organisations is an important form of such cooperation. It should aim at mutual learning and capacity building with respect to operational management, planning, institutions, mediation and analytical support.
38. Such cooperation is most effective if the partners are both national or both international organisations. Moreover, the partners should be comparable with respect to some, but not all of the following groups of parameters:
  - the tasks and competencies of the river basin organisations and their internal structure;
  - the size and hydrology of the basins and the level of environmental pressure;
  - the socio-economic and cultural context.



### 4.3 MANAGEMENT PLAN

A river basin management plan should preferably cover the whole basin. In developing the plan, particular attention needs to be paid to the specific problems and cultures of the basin at issue. It should be ensured that the plan is in proportion to the resources available for its implementation. The plan may be an outline that is supplemented by detailed plans for subbasins. The plan should be drawn up by an authority designated by the national government or, in the case of a transboundary river basin, by the governments involved, preferably through a joint or coordinated body. It should be drawn up with the involvement of the public and relevant stakeholders in the river basin.

#### FUNCTION, SCOPE AND LIMITATIONS OF PLANNING

39. Planning (the formulation of plans and policies) is an important and often indispensable means of supporting and improving operational management. Planning has four related functions:
- a. to assess the current situation (including the identification of conflicts and priorities), formulate visions, set goals and targets, and thus orient operational management;
  - b. to provide a framework for organising policy-relevant research and public participation;
  - c. to increase the legitimacy, public acceptance of, or even support for, operational management;
  - d. to facilitate the interaction and discussion among managers and stakeholders, offer a common point of reference (the plan or policy), and thus provide coordination.
40. Planning should involve, in a systems framework, all phenomena, institutions and issues that affect the allocation and protection of inland waters. It should not result in negative effects on other natural resources and should consider linkages to plans for biodiversity management, coastal protection, ocean health, and human health and wellbeing.

#### BALANCING HUMAN USES AND ECOSYSTEMS

To strike a balance between social, economic and ecological developments, priorities need to be set, giving special attention to vital human needs and sustainable water management. The principle of sustainability means developing balanced objectives, avoiding dominance of a single use and respecting the ecosystem, which is the basic resource for economic and social development. Future generations will then not be confronted with irreversible changes precluding the restoration of ecosystem conditions or the exploitation of the river system for other uses. When priorities have been set, specific human uses of water can be stimulated, stabilised, reduced or abolished.

Reconciling the various human uses of surface and ground waters and ecosystems is not a process which comes naturally in the management of water. There are many

examples of one-sided projects concerning the use of water or the related infrastructure. The negative effects on other uses or on the ecosystem may become apparent after the projects' completion. Integrated management is needed to ensure that the initiation of new projects is well-balanced and takes account of other interests.

A good rule of thumb for integrated management is to adhere closely to original, natural ecosystem conditions. Extreme deviations from the natural state have often led to unexpected and unwanted side-effects. Not only is the original system destroyed, but economic interests are affected too. For example, in many river basins agriculture is such an economic interest that will be directly affected, and consequently food supply. Fisheries may be impaired by the building of dams, e.g. by impeding the movements of migratory species. Regulating river flow and river morphology for shipping may lead to flooding problems because of the smaller water storage capacity in the vicinity of the river and the faster discharges of water to downstream reaches of the basin. Therefore, the dynamics of the hydrological system should be maintained as much as possible.

41. Planning should be focused and coherent and be in proportion to the resources available for implementation. Planning should be rooted in the real problems to be solved and be realistic.
42. Planning systems should be evaluated to check whether they serve their purpose; planning systems should not be taken for granted.
43. Given the differences in problem situations and cultures, planning systems should reflect the local situation.

#### SECTORAL AND INTERSECTORAL STRATEGIC PLANS

44. For transboundary river basins and national basins located in several jurisdictions, strategic water management plans should be prepared that preferably cover the complete basin. The main function should be to coordinate water management between the different jurisdictions and offer a framework for negotiation. The planning process should be open to linkage with issues outside the water sector, since this may result in win-win solutions for upstream-downstream conflicts, which otherwise would have a win-lose character.
45. For river basins falling within one jurisdiction, strategic river basin management plans should be prepared that are intersectoral in character. In such basins intersectoral planning offers good opportunities for intersectoral coordination.
46. Strategic (water management or intersectoral) plans should typically include or reflect, inter alia:
  - a. institutional arrangements;
  - b. capacity building policy;
  - c. public participation;
  - d. transparency of decision-making;
  - e. legitimacy;
  - f. structural and non-structural measures;
  - g. economic aspects and efficiency;
  - h. compliance.

#### OPERATIONAL PLANS

47. The operational manager should be committed to and hence involved in (or even better, responsible for) operational planning. Depending on the institutional structure, the geographical scope of operational plans could or could not coincide with river basins or subbasins.
48. Operational plans should be realistic and consider the management capacity (finances, personnel, legal resources, etc.) that is or can be made available for the planning period. If necessary, the proposed measures should be adjusted accordingly, and shortcomings in the management capacity should be indicated.

#### PLANNING PROCESSES

49. To improve the quality and practicability of the planning exercise, planning processes should be participatory and involve all interested parties, preferably directly.

### 4.4 IMPLEMENTATION OF THE MANAGEMENT PLAN

National, regional, local and river basin authorities and members of society are accountable for the implementation of a river basin management plan. Each player has his own responsibilities, but to attain the objectives of the management plan cooperation is essential. For successful implementation of the river basin management plan, the commitment to long-term capacity building of all actors in river basin management is needed.

#### KEY ROLE OF OPERATIONAL MANAGEMENT

50. The only form of river basin management that directly affects the river basin and its users is operational management (the application of regulatory, economic and communicative policy instruments and concrete activities such as infrastructure management). Consequently, it should play a pivotal role in any river basin management strategy. Planning, policies, analytical tools and institutional systems play an essential role as deciders and facilitators. They can improve operational management, promote a basin-wide, intersectoral long-term approach, and in this way further the sustained multi-functional use of the basins concerned.

#### EFFECTIVE AND ACCOUNTABLE OPERATIONAL MANAGEMENT

51. National and international agencies responsible for executing operational decisions should be accountable to all stakeholders (including the public) through appropriate governance. They should work on the basis of a plan and be equipped with the necessary financial and legislative resources.

#### FLOOD AND DROUGHT MANAGEMENT

52. Floods not only cause suffering but also support life. Flood management should not be based solely on building dykes and dams. It needs to be based on strategies that use both structural and non-structural methods. The strategy should balance all interests involved and be based on an integrated

assessment of the environmental, economic and human costs and benefits of these alternatives, including their potential contribution to drought mitigation and the possibilities that they offer for nature.

## WATER MANAGEMENT AND SPATIAL PLANNING

Water management and spatial planning are closely related. Water use, hydrological regimes, water quality and vulnerability to extreme events are all profoundly influenced by land use patterns in the river basin. Hydrological principles should therefore be incorporated in spatial planning. The various human uses and activities should be balanced with the hydrological potential of the river basin concerned. They should be ordered in such a way that negative interference among uses is minimised. For example drinking water abstraction should take place upstream of major industrial centres.

Spatial planning can play an important role in mitigating floods and droughts. Flooding is a natural phenomenon, but the risk of and vulnerability to flooding has increased through hydraulic engineering interventions, intensive building activities and intensive land-use in flood-prone areas. In addition, climate change may result in increasing peak river discharges and in sea level rise. Responses to flood risks should include - in addition to infrastructural measures - spatial planning measures such as restoration of rivers to the natural situation and enlargement of floodplains (where they exist) in order to decrease flow velocity, increase water retention and raise water storage capacity. This will reduce peaks in discharges and in water levels. Rather than simply curing the symptoms, a proactive approach should be taken that integrates hydrological and spatial measures.

## POLLUTION CONTROL

53. The ultimate goal of pollution control is to close substance cycles and thereby prevent pollution. A mix of regulation and compliance instruments can be used to move in this direction and solve urgent pollution problems: waste control, process and emission standards, and a water quality approach. The exact mix should reflect inter alia the local management capacity and the availability of water quality data and other data.

## COMMUNICATIVE INSTRUMENTS COMPLEMENT REGULATION

54. Communicative instruments for operational management, such as voluntary agreements, can help to improve the implementation of river basin plans and policies, but they only work in relation to (pending) regulation and compliance mechanisms.

#### WATER MARKETS UNDER CERTAIN CONDITIONS

55. Tradable water rights can be an important tool for river basin management, but they are only effective if a number of conditions are met:
- a. the basic water demands of citizens and ecosystems are safeguarded;
  - b. the rights should be defined and agreed upon;
  - c. utilisation of the rights should be physically possible;
  - d. monopolies can be prevented;
  - e. for transboundary river basins: an international agreement has been concluded.
56. Tradable emission rights are often not feasible because of the large number of different pollutants – many of which will only be emitted by one or a few polluters in a subbasin – and in case of diffuse pollution.

#### CHARGES

57. Charges are an effective and efficient means of financing river basin management (cost recovery) and reducing water use and pollution if the basic water needs of the poor are safeguarded, e.g. by means of block tariffs.

#### 4.5 COMPLIANCE MONITORING AND EVALUATION

Evaluation is needed to gain insight into the progress made in the implementation of a river basin plan and the results achieved. Monitoring provides the necessary data for such an evaluation. On the basis of the evaluation, the plan could be revised. A periodic evaluation could be useful. The first occasion may be the moment when intermediate targets should have been reached. This can help in adapting elements of the plan shown to be unsuccessful.

#### COMPLIANCE MONITORING

58. Compliance monitoring (reporting, reviewing and evaluating) is very important for promoting the implementation of plans.

#### TRANSBOUNDARY IMPACT ASSESSMENT

59. Within transboundary river basins the social, economic, regulatory and environmental consequences of planned developments for other countries should be evaluated.