# MANAGEMENT OF WATER RESOURCES FOR URBAN USE



## REPORT OF AN EXPERT GROUP MEETING

**Washington DC**
**22-24 April 1991**

*United Nations Centre for Human Settlements (Habitat)*

*Nairobi, 1991*

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Contents

# 1. INTRODUCTION

## 1.1 Background to the Expert Group Meeting

The United Nations Conference on Environment and Development (UNCED), to be held in Rio de Janeiro, Brazil, on 1–12 June 1992, will have as one of its nine main issues: *Protection and Management of Freshwater Resources*. In preparation for the discussions on this issue, the World Meteorological Organization (WMO) is convening an International Conference on Water and Environment in Dublin, Ireland, from 26 to 31 January 1992. The UNDP/World Bank/UNCHS programme on Urban Management and the Environment has been asked by the Dublin Conference Steering Committee to develop one of four broad topics for the conference, with the title: *Environmental Management of Water Resources for Meeting the Needs of Urban Areas*. In response to this request, UNDP has agreed to fund a project to prepare documentation covering the issues, strategies and actions associated with this topic.

Four documents are proposed:

*Document 1*

A comprehensive Issues Paper (about 25 pages) for submission to the Dublin Conference.

*Document 2*

A book-style analytical publication (about 80 pages) containing authoritative data, graphical representation of situations and trends, and evidence from case studies to illustrate particular themes. This publication is expected to have a wide circulation among sector specialists and policy makers, and will also include photographs and other illustrative material, to broaden its appeal.

*Document 3*

An Action Programme (about 30 pages) to serve as guidance on the formulation and implementation of technical cooperation projects responsive to the issues identified.

*Document 4*

An action-oriented background document setting out options for consideration by Working Groups at the Dublin Conference dealing with this theme.

The documents are to be prepared by a Principal Author commissioned by UNCHS, guided by UNCHS and World Bank technical officers, and with the help of additional specialist consultants as required.

## 1.2 Objectives

The task of the Expert Group was to identify the major themes and subthemes to be addressed in each document (with emphasis on Documents 1 and 2), to consider the ways in which these themes can best be presented, to assist in the gathering of data and the identification of case studies, and to suggest advisors who could help to guide the Principal Author during the drafting periods. Group members will also be invited to review drafts from time to time.

## 1.3 Opening and Closure of the Meeting

The Meeting was opened on behalf of Dr A Ramashandran, Executive Director of the United Nations Centre for Human Settlements (Habitat), by Dr Gehan Sinnatamby, Human Settlements Officer. He welcomed the 17 participants (listed in Annex 1) and explained the way that the planned outputs of the UNDP/World Bank/UNCHS project linked with other inputs to the Dublin and Rio Conferences.

The four proposed documents will be the primary inputs for a Working Group in Dublin on the subject of *Water for Urban Economic Growth*. This in turn links to the third of the Dublin Conference's four themes:

I Statement of the Problem

II Meeting the Needs of the Rural Areas

III **Water for Urban and Industrial Development**

IV Challenges for the Future

The UNDP/World Bank/UNCHS Programme on Urban Management and the Environment is developing Theme III, which will be addressed by three keynote speakers covering the following topics:

I The importance of water resources for urban development

II Environmental issues: Impacts of water and waste management

III Integrated Water Resources Management

Draft briefing notes for the three keynote speakers were available to the Expert Group Meeting, as was an outline of the full Dublin programme.

**DUBLIN CONFERENCE OBJECTIVES**

**Title: Water and Environment: Development Issues for the 21st Century**

The objectives set for the Dublin Conference are:

(i) to assess the current status of the world's freshwater resources in relation to present and future water demands and to identify priority issues for the 1990s and beyond;

(ii) to develop co-ordinated intersectoral approaches towards managing these resources by strenghtneing the linkages between various water programmes;

(iii) to formulate evironmentally sustainable strategies and action programmes for the 1990s and beyond to be presented to UNCED

(iv) to bring the above issues, strategies and actions to the attention of governments as a basis for national programmes and to increase awareness of the environmental consequences and development opportunities in improving the management of water resources.

Dr Sinnatamby introduced Mr Ramesh Bhatia, Water Resources Specialist in the World Bank's Infrastructure and Urban Development Programme, who will coordinate World Bank inputs into the project, and Mr Brian Appleton, Specialist Writer, who has been commissioned as the Principal Author of the four proposed documents.

Mr Appleton introduced the draft Agenda for the Meeting (Annex 2), and the Briefing Documents prepared to facilitate discussions. The main Background Paper for the Meeting was the UNCHS publication *People, Settlements, Environment and Development*, and particularly Chapters 5-7 of that document covering water resources, sanitation and wastewater management, and solid waste management.

Mr Terence Lee from the Water Resources Unit of the Economic Commission for Latin America and the Caribbean was appointed Chairman of the Expert Group Meeting.

The Meeting lasted for three days and was formally closed by Dr Sinnatamby on 24 April 1991, after the Expert Group had approved a Summary Report which forms the basis of this Report.

# 2. DETERMINATION OF PRINCIPAL THEMES

## 2.1 Outline of major urban water resources topics

The Expert Group developed this outline for grouping the main topics to be considered in an Issues Paper and translating them into key issues, strategies and policy options:

I SUMMARY OF MAIN ISSUES/PROBLEMS

A *Importance of Urban Water Resources Management*

B *Supply Issues*

- Quantity
- Quality
- Accessibility
- Reliability

C *Demand Issues*

- Domestic
- Public
- Industrial
- Agricultural
- Power

D *Health and Environmental Aspects*

E *Economic Aspects*

II UNDERLYING CAUSES

III PRIORITIES

IV STRATEGIES/POLICY OPTIONS

## 2.2 Amplification of major topics

For each of the headings in Section I (Items A to E) above, the Group identified a series of individual issues/problems which will need to be addressed in an Issues Paper. In the listing which follows, references are to the UNCHS publication *People, Settlements, Environment and Development.*

**Supply – Quantity (see UNCHS paras 59, 60)**

- Even in so-called "water-rich" countries, growing cities experience serious water problems
- Initially, water availability was not a constraint on urban development, so planners did not have to take it into consideration; now burgeoning growth means increasing water scarcity

- It is progressively more expensive both to develop new water sources and to maintain existing ones
- Conservation and reuse strategies can defer development of more expensive sources and bring other economies
- Urbanization depletes the area of permeable land surface available for groundwater recharge

**Supply – Quality (see UNCHS paras 63, 64, 79)**

- Contamination leading to degradation of water resources means steadily rising costs
- Contamination of water leads to contamination of food
- Several distinct types of contamination are linked with urban development. They include biological, chemical (with toxic contamination as a special case), and, in some cases, nuclear contamination
- Agricultural contamination is commonly seen as primarily chemical, but use of animal wastes as fertiliser can lead to substantial organic pollution of watercourses
- Often there is a misguided assumption that groundwater is inherently "clean". In fact, it requires vigilant monitoring and protection – contamination is very hard to remedy
- Improved sanitation is a major mechanism for protecting water quality, but safeguards are needed to ensure that on-site sanitation does not threaten groundwater quality
- Low pressure in water mains is a common cause of contamination of drinking water supplies – a major problem in areas with intermittent supplies. Close proximity of sewers and water mains aggravates the risk of contamination from cross connections.
- It is not only gross pollution that matters; even comparatively low level contamination with heavy metals is serious, because of cumulative effects on human health
- Urban stormwater runoff is a prime source of stream pollution
- A distinction has to be made between point and non-point sources of pollution. Scattered non-point sources are often a major cause of water pollution. Sewerage may sometimes serve only to convert non-point sources into point sources.
- It will be important to identify national and global trends in industrial pollution, to guide future strategies. Likewise, planners need to be aware of the different sources of water pollution and their relative importance.

**Supply – Accessibility (see UNCHS paras 57, 66, 73, 74, 78)**

- There are still large numbers of the world's population lacking adequate drinking water supply and sanitation services
- Water rights and water allocations often have significant political implications, sometimes involving historic entitlement to land or water.
- Water pricing can have a major impact on the equitable distribution of available resources
- It is difficult and costly to provide and maintain services for informal settlements on the urban fringe, often on marginal land. A key issue to be addressed is: "Is there an obligation to provide services to illegal settlements?"

- The unserved frequently tap into public water supply systems illegally, with damaging consequences for water quality and quantity
- The issue of land tenure needs to be addressed alongside that of water resources. Security of tenure increases the willingness and capacity to initiate self-help activities
- User involvement in decision making helps to promote local initiatives to develop new services and look after existing ones.

### Supply – Reliability

- Transboundary influences can threaten the security of water resources in downstream countries
- Water resources management strategies need to assure the sustainability of water resources for future generations
- Inadequacies in operation and maintenance mean unreliable services and wasted investment
- Reliable quality is as important as dependable supplies
- Quality standards and levels of service must be appropriate and affordable. Too high a standard may be just as damaging as too low a standard.
- Water users develop ways of coping with unreliability (by providing household storage, or by excessive queuing), but the costs are high and there is a marked influence on women's productivity and incomes.
- Deforestation has a serious impact on the seasonal reliability of water supplies
- Design standards for reliability can have a major economic impact (the example was quoted of Washington DC, where designing for a 1 in 10 year drought rather than a 1 in 100 year one reduced storage needs from 16 reservoirs to one.

### Demand (see UNCHS para 61, 74, 75)

- Table 2 in th eUNCHS Background Paper may give a misleading impression of the relative importance of agriculture and industry in terms of water demand, as most of the developing countries listed are heavily dependent on irrigated agriculture.
- Japan and China offer examples to demonstrate ways of optimising water use and reuse
- Data are needed on urban demand trends, to demonstrate competition among sectors, and between urban and rural areas
- Analyses should include comparisons between potential savings from improved irrigation efficiency and the domestic/industrial needs of urban areas
- Appropriate quality criteria are needed for different water uses, as this can influence recycling and reuse
- Industry has the greatest flexibility in water use/conservation/recycling. With the right incentives, this can mean improved water use and reuse
- Choice of industries may be an important influence on urban water resources management
- Demand design standards also have an important influence on water resource planning

**Health and Environmental Aspects ( see UNCHS paras 57, 58, 62, 65, 71, 72, 77, 84, 86, 87, 92, 97-99)**

- Inadequate domestic water supply and sanitation services have serious health impacts
- Improved analytical techniques are needed to quantify and value health benefits from improved water supply and sanitation
- Contamination of surface and groundwater by domestic and industrial wastes poses increasing health threats
- Inadequate surface water drainage leaves pools of stagnant water which are breeding grounds for disease vectors
- Poor sanitation and solid waste disposal practices encourage vermin, flies and other disease vectors
- Downstream agricultural use of domestice wastewater requires appropriate safeguards; there are examples of serious human health impacts
- Health risk analysis shoul dbe part of water resource management and urban development planning
- The poor are commonly the worst hit by water-related diseases. The Peru cholera epidemic is a topical example

- In crowded urban settlements, there is widespread faecal contamination of the home environment
- Stormwater drainage improvements can bring dramatic environmental improvements
- Construction of large dams has a multiplicity of environmental impacts, many of which are well documented, but which keep recurring
- Urban wastewater discharges are damaging both rivers and coastal waters
- Water resources management is a key element of broader environmental protection/ improvement programmes, and needs to be promoted as such.
- Effective water resources management needs to be integrated with land management within watersheds and with housing policies on a city-wide basis
- The environmental impact of water resources management influences other production sectors, such as agriculture and fisheries
- Ecological effects should also be considered - eg impact on biodiversity
- Tourism can put greater pressure on water resources management, while inadequate water resources management may hit the tourist market
- Excessive withdrawal of groundwater leads to depletion and potential contamination of the resource, and also to serious subsidence problems in many cities

## Economic Aspects

- Scarcity of freshwater resources and the growing costs of developing new resources have a considerable impact on national industrial development and hence on the pace of economic growth
- Integrated water resources management provides the opportunity to match the value of water with appropriate protection and conservation programmes
- Data are needed on the value of water per cubic metre associated with different uses
- People cannot live without water and it follows that those unserved by public systems have to obtain water to survive. The costs are invariably high, which means that there will be a high willingness to pay for convenient and reliable public services
- The poor should not have to pay the capital costs of public services as a condition for their installation (the rich don't). Financing schemes and lower (subsidised) tariffs may be desirable to promote wider coverage
- Conservation and recycling have significant economic benefits, which can be developed by correct water pricing and by the adoption of appropriate design and quality standards
- The minimum cost recovery target should generally be recovery of O&M costs plus a percentage of capital costs
- Progressive tariffs are favoured, to encourage conservation and provide some subsidy
- Water services are expensive to provide and also highly valued. Wastewater disposal costs may be several times higher, and willingness to pay for such services has to be promoted through education and public awareness campaigns
- Decisions on the degree of subsidies for supplying basic needs to all are for society to take
- It is important to recognize that water is a commodity and the price rises with inflation
- Cities actually *consume* only a small proportion of the water that they *use*. Some 85% or more is returned in various degrees of contamination. This provides a strong case for multiple use and reuse
- Municipal reuse for agricultural purposes is generally cheaper than treatment of wastewater, but it requires appropriate safeguards to protect health
- Long sea outfalls are a common option for wastewater disposal in coastal cities, but can have serious environmental impacts, and need to be viewed in the light of their long-term environmental sustainability.
- The contribution of water resources to national wealth and poverty alleviation needs to be more widely promoted, as an argument for extra financial resources for the sector
- Data should be sought on public investment trends sector-by-sector, to assess the changing priorities for water resources and environmental programmes
- The 1980s saw development of many low-cost water supply and wastewater management technologies and approaches, but there remain some gaps to be filled by new applied research.

# 3. PRIORITY ISSUES

Grouping of the individual issues, and consideration of the priority needs in urban water and wastewater management led to the establishment of five key issues, each with a number of subthemes. These will be the priority issues to be developed in the Issues Paper (Document 1) and amplified in the book (Document 2).

## 3.1. Insufficient access to water, sanitation and waste disposal services

- Inadequate water and sanitation services, particularly for the poor
- Affordability gap between increasing costs and users' ability/willingness to pay
- Lack of sustainability of services and unreliability of supplies
- Health impact of inadequate services

## 3.2. Diminution and degradation of water resources

- Contamination of surface water and groundwater, with resulting health threats
- Environmental impacts of urban water resources management
- Inadequate surface water drainage, including links with the spread of vector-borne diseases

## 3.3. Inefficient/inequitable allocation of water resources

- Lack of demand management
- Inadequate pricing of services
- Special problems of industrial water use

## 3.4. Institutional/legal/management inadequacies

- Lack of integrated management within the urban water sector and between that sector and other related sectors
- Ineffective monitoring, surveillance and enforcement of standards
- Legal/administrative/social constraints on water use

## 3.5. Resource mobilization inadequacies

- Need to mobilize financial resources
- Lack of appropriately qualified management/human resources
- Insufficient involvement of users and the private sector

# 4. STRATEGIES/POLICY OPTIONS

For each of the priority issues identified in Section 3, the Expert Group developed a list of potential strategies and policy options which should be considerd by agencies seeking to develop coherent urban water resources management policies. This list, together with actions related to the specific problems identified in Section 2 will form the basis of the presentation of strategies/policy options in the four proposed documents. Headings suggested for grouping the recommendations are:

- **How to Manage the Sector**
- **How to Finance the Sector**
- **How to Manage the Resource**

## 4.1 Access to water, sanitation and waste disposal services

Under this heading, the recommended strategies/policy options are:

- Give priority to meeting basic needs
- Promote more efficient use of existing services, including reduction of losses, recycling and reuse
- Recognize that those lacking public services generally pay a high price for water, and that this represents an untapped source of finance for extending public services
- Base choice of technology and service level on user willingness to pay
- Make low-cost water and sanitation options available
- Employ cost recovery policies to assure adequate operation and maintenance
- Optimize involvement of users and private sector in upkeep of water and sanitation facilities
- Apply realistic design norms to prevent intermittent supplies
- Enhance hygiene education programmes, focused on women and children

## 4.2 Diminution and degradation of water resources

Under this heading, the recommended strategies/policy options are:

- Accompany investments in water supply with appropriate investment in removal and safe disposal of wastes
- Implement national programmes to introduce sanitary waste disposal facilities, based on low-cost upgradable technologies
- Adopt safeguards and legislative controls on the transport and disposal of hazardous and toxic wastes
- Recognize the severe polluting effects of urban stormwater runoff and implement commensurate drainage programmes.

- Take advantage of recycling opportunities as part of city-wide plans for collection and disposal of garbage, to remove breeding grounds for vermin and other disease vectors, and to prevent pollution of groundwater and surface water by leachates.
- Promote widespread reuse of wastewater by industry and agriculture, through education, water pricing, effluent charges, and adoption of appropriate water quality objectives/ criteria.
- Develop and use planning tools based on environmentally sustainable water and waste management, including risk assessment and impact evaluation based on environmental accounting
- Develop policy instruments to control transboundary transport of pollutants.
- Apply pollution protection laws equally to municipal and industrial discharges, and include incentives for relocation of polluters where possible
- Avoid the creation of stagnant pools, through improved surface water drainage and public education/awareness raising

## 4.3 Inefficient/inequitable allocation of water resources

- Investments in urban water and waste management should reflect the major contribution of cities to national economic development
- Ensure that city development planning reflects availability and sustainability of water resources
- Move rapidly towards tariffs which reflect the marginal (including opportunity) cost of water
- Evaluate the scope for water-saving devices
- Initiate public awareness campaigns to promote conservation and reuse
- Give preference to rehabilitation and better management of existing systems ahead of investment in new ones

## 4.4 Institutional/legal/management inadequacies

- Adopt an integrated and comprehensive approach to the management of water resources, taking account of all sectors of the economy, and establish an appropriate institutional framework and support mechanisms at local and national levels
- Create the enabling environment for users to influence decisions and participate in the upkeep of community services
- Promote community-based approaches to micro-level drainage basin management
- Take advantage of the skills of non-governmental organizations in mobilizing community action
- Seek to remove legislative/institutional restrictions on water use

- Develop and enforce appropriate water and effluent quality standards, based on a realistic appraisal of health risks and use financial instruments, including the "polluter pays" principle, to prevent water quality degradation
- Institute regular surveillance to arrest contamination of both groundwater and surface water, based on quality objectives to ensure sustainability. Monitoring should include chemical and biological parameters (and nuclear where appropriate).

## 4.5 Resource mobilization

- Encourage autonomy and financial viability of city water and sewerage utilities, with powers to generate and manage increased revenue
- Support HRD programmes to create and retain a cadre of professionals and semi-professionals with skills in water and waste management, pollution control, municipal finance, integrated water resources planning, and operation and maintenance of water and sewerage/sanitation services.
- Provide seed money and technical support to encourage local involvement in the supply of materials, components and services

# 5. MEETING FOLLOW-UP

Many participants provided documents containing data which will assist in the preparation of the Issues Paper and the book. Others quoted possible additional sources of information and/or case studies. The Principal Author will follow up these references, and requested that participants review the topics listed in this report, with a view to identifying additional sources of data. In addition, the UNDP/World Bank/UNCHS Programme will commission data gathering and analysis to provide new information to strengthen the messages in the Issues Paper and the book. The first draft of the Issues Paper is scheduled for the end of May 1991, and will be sent to all participants for review. It is anticipated that a further meeting may be called in October, to discuss drafts of Document 2 (the book) and the contents of Documents 3 and 4.

# ANNEX 1

# LIST OF PARTICIPANTS

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# ANNEX 2

# MEETING AGENDA

| Date and Time | Discussion topic | Reference documents |
|---|---|---|
| Monday, 22 April 10.00 to 10.30 | Meet and greet. Administrative matters. | |
| 10.30 to 11.00 | Explanation of UNDP/World Bank/UNCHS project. UNCED and Dublin Conference background. Description of planned outputs (Four documents) Role of Expert Group and purpose of meeting. | Briefing Document No. 1 |
| 11.00 to 12.15 | Group discussion of project aims, identification of key issues for discussion later. Preliminary discussion on the four documents. | UNCHS Document: People, Settlements, Environment and Development – Chapters V, VI and VII Briefing Document No. 2 |
| 12.15 to 12.30 | Review of meeting agenda | |
| 12.30 to 14.00 | Lunch | |
| 14.00 to 17.30 | Discussion of first two identified issues (e.g. Economic significance of water resources; Water availability/scarcity). Identification of main themes and subthemes, sources of national and global information, potential case studies, experts to advise Principal Author. | Briefing Document No. 2 Briefing Document No. 3 UNCHS Document |
| Tuesday, 23 April 09.30 to 16.00 | Discussion of remaining identified issues (e.g. Water and sewerage demands; Environmental aspects of water and wastewater management; Water quality criteria; Problems of industry; Institutional and legislative issues; Future strategies) | Briefing Document No. 2 Briefing Document No. 3 UNCHS Document |
| 16.00 to 17.30 | Review of the scope and content of the four planned documents. Discussion of the review process and production timetable. Suggestions for Advisory Panel | Briefing Document No. 1 |
| Wed, 24 April 09.30 to 12.00 | Round-up of meeting conclusions, suggestions of further data sources, illustrations, etc. Review of proposed Dublin Papers briefing notes. | Briefing Document No. 4 |
| 12.00 to 3.30 | Break for preparation of Meeting Conclusions | |
| 3.30 to 4.30 | Adoption of Meeting Conclusions | |