Integrated Water Resources Management

Kunene River Basin

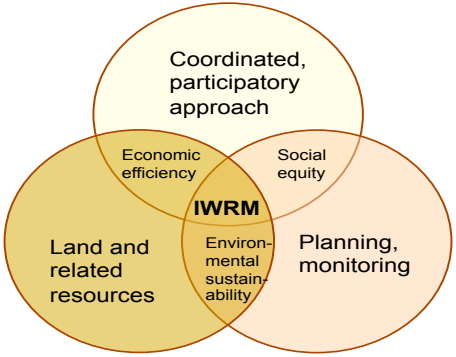
About this booklet

This booklet is intended for all water users to encourage awareness of the water sources, water use and its values, especially in a dry country as Namibia. There are no perennial rivers within the borders of Namibia and water resources are very unevenly distributed across the country. The water resources challenges in Namibia can only be addressed through efficient water resources management including development of an integrated framework and provision of infrastructure to ensure water security. In this regard, this booklet is compiled for the Ministry of Agriculture, Water and Forestry to introduce the concept of Integrated Water Resources Management (IWRM) and how it can be implemented with emphasis on stakeholder participation and decision making at the lowest appropriate level. The contents of the booklet includes:

What is IWRM and why is important?

Integrated Water Resource Management (IWRM) is defined as a process that promotes the coordinated development, management and use of water, land and related natural resources (people, vegetation, animals and eco-systems) for economic, social and environmental sustainability. The IWRM process further involves participatory approaches which include discussions, planning and negotiations between stakeholders of the basin on important issues to achieve social equity, economic efficiency and environmental sustainability.

IWRM is implemented at a basin level in Namibia, linking all aspects of the basin, so that the users can understand the interactions between resource use, economic value and conservation, as well as the impacts of their activities on eco-systems and the goods and services they provide.



The Department of Water Affairs and Forestry (DWAF) in the Ministry of Agriculture, Water and Forestry (MAWF), assisted by a Steering Committee, represnting various sectors, formulated an IWRM Plan (IWRMP) for Namibia to ensure coordinated and sustainable water use of water resources.

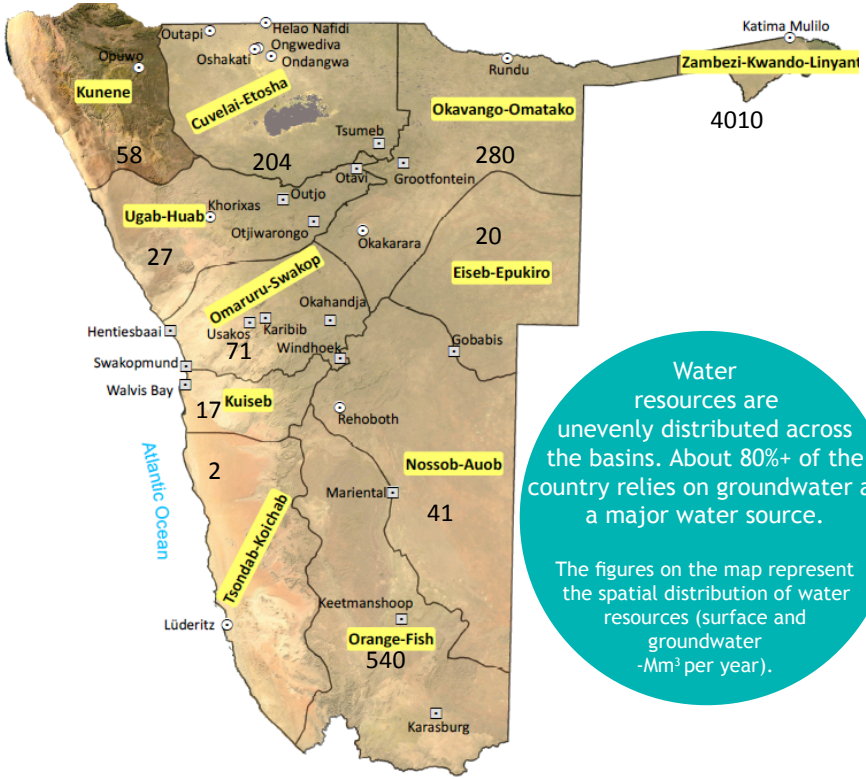
The knowledge gained from the IWRM process, enables the stakeholders to understand the threats, prescribe mitigation measures and predict changes, and then manage them accordingly.

Welcome to the Kunene River Basin!

Water and land resources management in Namibia is carried out at the lowest management level, known as the basin level, to broaden the management process.

Hence, Namibia is divided into 11 water management areas referred to as “water basins” according to the common drainage flows of major water sources such as rivers, groundwater systems (aquifers), water supply canals and pipelines.

The **Kunene** River Basin is located in the north-western part of Namibia occupying part of the Kunene region, featuring the Kunene River as its northern border, while having the Atlantic Ocean to the west.



Water resources are unevenly distributed across the basins. About 80%+ of the country relies on groundwater as a major water source.

The figures on the map represent the spatial distribution of water resources (surface and groundwater -Mm^3 per year).

Map provided by **Uazukuani Uazukuani,** National Planning Commission - *Central Bureau of Statistics, February, 2010*

Where does the water in the basin come from?

The water comes from groundwater, ephemeral rivers and a perenial river. The water from Kunene River, which originates from the Bie highlands in Angola, and forms the northern border of the basin, is used for water supply and power generation. Three major ephemeral rivers (only flowing after heavy rains) and their tributaries (smaller rivers which flow into larger rivers) namely the Khumib, Hoarusib and Hoanib, join the westward flow towards the Atlantic Ocean.

Most of the water supplied in the basin comes from **groundwater sources**, except for the people (especially the Himba community) who live along the rivers. They collect water directly from the river or close-by through hand-dug wells and boreholes. Small dams constructed in the ephemeral watercourses supply water for stock drinking and game. Several excavation/earth dams are found in the basin and collect seasonal surface water, which is primarily used for livestock water supply. Although a dam is expensive to build, the water is free for people and livestock to use. The major disadvantages of earth dams are that it can only recharge water in one place and it is not good for storing water because they loose most of the water through evaporation.

Rainfall is highly variable across the basin and ranges from less than 50 - 550 mm per year.

Springs are also important sources of water in the basin, especially at places such as Purros, Okandjombo, Kaoko Otavi, Otukaru and Sesfontein. Hot springs have been identified at Warmquelle.

Who supplies and manages the water in the basin?

The institutions responsible for water resources are divided into the following categories for ensuring efficient and effective management thereof:

- **Overall water resource inventory, monitoring, contol, regulation and management**: Directorate of Resources Management within the Ministry of Agriculture, Water and Forestry (MAWF).
- **Bulkwater supply:** Namibia Water Corporation (NamWater) abstracts water from primary sources (eg. rivers, aquifers or dams) and supplies to some end-users directly.
- **Self-providers:** These are commercial farmers, tour operators, mines and nature conservation parks), subject to appropriate agreements and licences, supply their own water.
- **Water supply to rural areas**: Directorate of Water Supply and Sanitation Coordination in the MAWF.
- **Water supply to urban areas**: Local Authorities and Regional Councils buy water from NamWater or supply water from own boreholes for delivery to end users.

For further information contact: Department of Water Affairs and Forestry.

Tel: 061-208 7696

The Constitution of the Republic of Namibia is the primary law for sustainable resource management and equal distribution of water to the people. Specific documents dealing with water management include the: Water and Sanitation Policy of 1993; Namibia Water Corporation (NamWater) Act of 1997; National Water Policy White Paper of 2000; Water Act 54 of 1956 and Regulations, soon to be replaced by the Water Resources Management Act (2004) [which has not yet entered into force and is currently under revision] and the Water Supply and Sanitation Sector Policy of 2008.

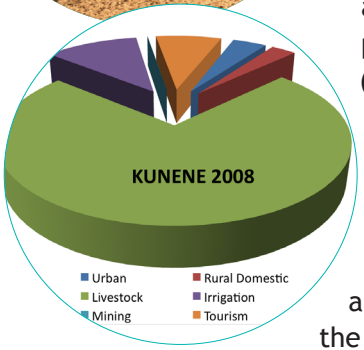
The Water Resources Management Act makes provision for the establishment of basin management committees (BMCs) to make sure that integrated management takes place at the basin level. The role of a BMC is to provide scope for addressing various issues affecting water resources in the basin, ranging from efficient water use to monitoring the health of the basin.

The aim of such a committee is to equip basin communities to take full ownership of their own development (through developing a strategic basin management plan) with strong support from the relevant service providers. The committee is ideal for knowledge and experience sharing to realize a common vision for the basin, through IWRM principles such as stakeholder participation, transparency and information sharing. The process of establishing basin management committees is currently being implemented in phases and thus the Kunene Basin Management Committee is still pending, based on demand and priority assessments.

Who uses water and how?

The supply of water from surface and groundwater resources to competing demands is prioritised in Namibia. The first is water for domestic purposes (including livestock water for both subsistence and commercial farming) and the second is water for economic activities such as mining, industries and irrigation.

The groundwater resources in the basin mainly support the main town, Opuwo (estimated population of 6 400), settlements (estimated population of 1 100) and rural areas-estimated 32 700 people (mainly the Himba people), livestock (mainly private farms with cattle and goats as main stock), crops, vegetation and wildlife (consisting primarily of elephants, crocodiles and fish).



Water-use allocation in the Kunene Basin
Source: IWRMP Joint Venture, Theme Report 2.

The touristic attraction of the Epupa and Ruacana falls is huge and therefore the water source also supports limited safari camps along the lower Kunene River. The Ruacana weir (a barrier which forces water to move in a certain direction) controls the flow of water and diverts it towards the Ruacana hydro-electric scheme. The force of the moving water at the Ruacana Falls is used to drive turbines which generates electricity for the country.

How much water do we require (in terms of 10- litre buckets):

- One person uses on average 15 litres (one and half bucket) per day
- One goat/sheep/koedoe/zebra/oryx drinks on average 12-45 litres (about one to four buckets) per day
- One cow drinks on average 30 litres (three buckets) per day

*An average household of four people thus consumes 60 litres per day (6 buckets)

Water demand management – how to use water more efficiently

Water demand management (WDM) is a very important part of IWRM. WDM aims to improve water use efficiency by reducing water losses or changing the wasteful way people use water. WDM is an approach to achieve "water use efficiency".

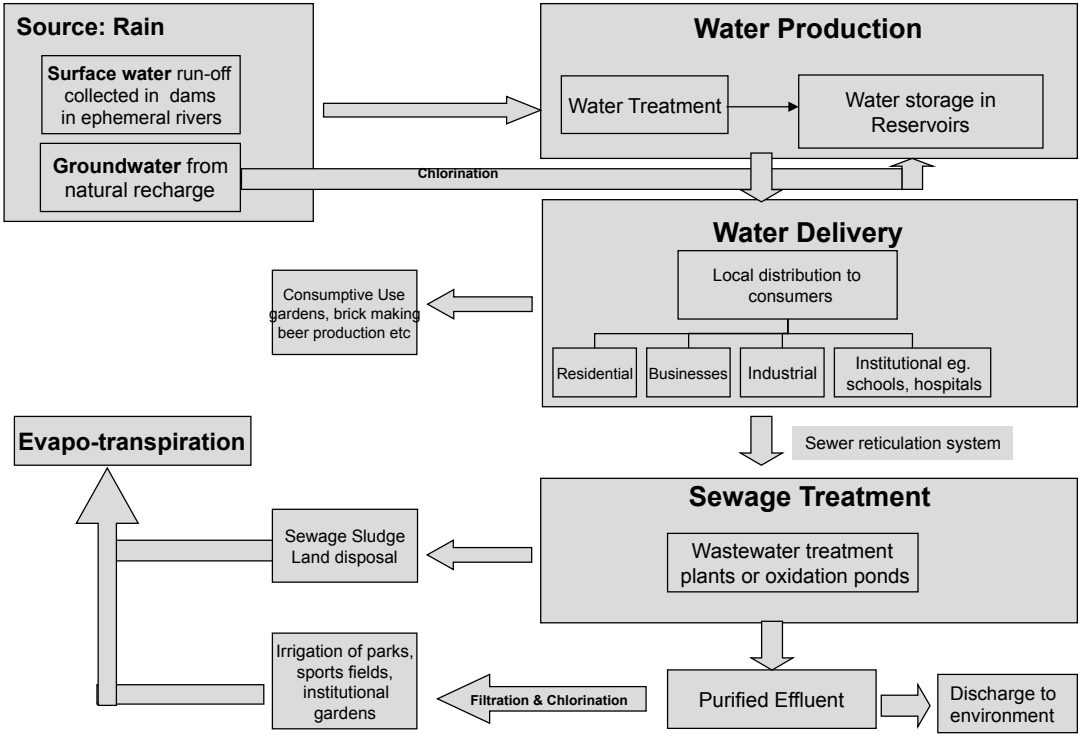
WDM is implemented through education and information; training; using economic and finanical principles; water pricing and tariff policies (eg. rising block tariffs) and technical measures.

Groundwater in the basin is a scarce and precious resource which needs to be used wisely if plants and trees are to continue providing fodder for livestock and springs and boreholes are to continue supplying water.

The price of water supply services are determined by the cost to develop a water source; the distance the water has to be transported by pipeline/canal, the treatment costs, storage of treated water, pipelines to the consumer and the topography which determines the pumping cost to supply the water.

The consumer base and technology, i.e. household taps or pre-paid meters, that is affordable to various income groups, also have an effect on the cost of water.

The ability of Local Authorities to enforce credit control measures also influ-



Water supply chain, showing the process from source to the tap of a household, is the basis on which water services are charged.

Municipal costs to provide a household with water and sanitation services include charges for water collection from a source; water production (treatment of raw water to drinking water standards); water delivery to the consumer and wastewater treatment and disposal. Wastewater collection and treatment contribute to hygienic environments and form part of the water chain to prevent pollution in order to ensure that good water quality and sanitation is achieved. Therefore it is essential that water consumers PAY for water services to ensure continued quality and efficient service delivery.

In rural areas, the community based water management programme under the Directorate of Water Supply and Sanitation Coordination, established mechanisms for users to pay for water services. In addition, mechanisms for transparent and targeted subsidies for those who are unable to pay for water services are being considered. Local water point committees manage local aspects of water services, preventing issues such as illegal connections and vandalism to pipelines.

Different ways to save water in urban households:

1. Schedule garden watering for early or late in the day (before 10 am and after 4 pm).
2. Avoid the use of hosepipes for cleaning pavements, floors or cars; instead use buckets.
3. Make use of retrofits (replacement with equipment specifically designed to reduce water use) such as:

"The price for water services should be set in such a way that the price does not prevent consumers from obtaining sufficient water (quantity and quality) to meet fundamental domestic needs."

3.1 Low flush and dual flush cisterns that are being used more and more. Reducing the volume of existing toilet cisterns can be achieved by:

- Placing a 1 to 2 litre plastic bottle filled with water, or a brick wrapped in plastic, inside the cistern. This will decrease the volume of water held within it.
- Bending the swimmer arm inside the cistern downwards so that the inflow valve is shut off when the water reaches a lower level than previously.

4. Fix or report to the municipality any moisture or leak problems immediately. Most water leaks occur from toilet cisterns. A single leaking toilet cistern can lose up to 7 000 litres of water per day.

5. Explore rain water harvesting (collection and storage of rain from run-off areas such as roofs) options. Remember - the first flush of new rain should be run to waste, before collection starts

6. Keep track of water usage by regularly reading the water meters.

A Word of Caution:

It is important to seek good advice from a knowlegeable dealer as not all water-efficient fittings and devices are appropriate for every location. Also consider whether the fittings can withstand rough and frequent use.

Water quality

The quality of water is determined by its aesthetic (colour, smell, turbidity), the chemical and the bacteriological quality. There is a direct link between water quality and health and therefore it is important to be able to differentiate between safe and unsafe water sources. Water quality is determined by both natural and human-induced contaminants (pollutants) that may have found their way into the water supply. Naturally, water contains varying concentrations of dissolved oxygen and other gases, microscopic living organisms, tiny particles of dead decaying organic matter, inorganic salts and sediments. Most of the groundwater resources in the basin are of good quality, suitable for domestic, livestock and irrigation purposes. In some areas, water is reported to taste sweet, however in designated areas it is common knowledge that water is unsafe to drink, hence residents should take care.

Larger settlements quite often do not have any properly planned sewage treatment plants, nor do they have any well planned and maintained refuse dumps, which is often the major cause of groundwater pollution.

The quality guidelines for drinking water have been set out by the Department of Water Affairs and Forestry, Water Environment Division.

Groundwater monitoring is considered very important, not only to understand and identify water quality trends and related indicators, but also to determine the availability of acceptable quality water sources. The Geohydrology division in the MAWF is responsible for groundwater investigation and monitoring.

Many people in the basin are exposed to “dirty” unsafe water from open wells and watercourses.

Dirty water can have a colour (yellow, brown or black), but it can also be clear and contain invisible bacteria or chemicals that are harmful to humans and animals. Therefore it is advisable to “clean/cook” water before drinking it.

The following ways are used to clean water:

- **Step 1**: Remove dirt that you can see, through filtering by using a sieve wire or a dense cloth of material
- **Step 2**: Boil water or keep water in a clean container in the sun for two days
- **Step 3**: Store clean water in a clean container with a cover

Water sanitation and hygiene

Communities have the right to determine which water and sanitation solutions are acceptable and affordable to them

Sanitation is vital for human health, generates economic benefits, contributes to dignity and social development, and protects the environment. Sanitation promotion focuses on stimulating demand for ownership and use of a physical good. Access to basic sanitation refers to access to facilities that hygienically separate human excreta from human, animal, and insect contact. Hygiene promotion focuses on changing personal behavior related to safe management of excreta, such as washing hands and disposing safely of household wastewater. Both are essential to maximize health benefits. Lack of sanitation facilities and poor hygiene cause water-borne diseases such as diarhoea, cholera, typhoid and several parasitic infections. Provision has been made for both urban and sanitation management objectives and principles in the Water and Sanitation Sector Policy of 2008, to contribute towards improved health and quality of life.

Considering that Namibia is a water-scarce country, in most (rural and urban) instances, the most affordable individual household or community sanitation option are ecological or dry sanitation facilties, however where possible it should be left to the individuals to decide on the most appropriate technological and payment options as well as maintenance responsibility allocation. The institutions responsible for water sanitation and hygiene are divided into the following categories:

- Public health issues and awareness: Ministry of Health and Social Services; Directorate of Water Supply and Sanitation Coordination within the MAWF; Regional Councils and Local Authorities
- Health policies and legislation: Ministry of Health and Social Services
- Advice and research on alternative sanitation options and development: Habitat Research and Development Centre

Washing hands with soap at key times such as after going to the toilet can reduce the occurance of diarrhoea

Challenges of IWRM in the basin

The biggest threat to the water resources is the increasing number of people, both local and tourists, domestic stock and wildlife. In particular, the basin is highly prone to the following challenges:

- Land degradation and deforestation: The topsoil of land contains valuable nutrients for vegetation to grow. When vegetation cover or trees are destroyed (either through high population growth or overgrazing due to high livestock concentrations in an area) the land becomes vulnerable and results in topsoil being easily blown away by wind; increased run-off (rainwater not infiltrating in the soil) and therefore causes loss of agricultural productivity (soil fertility).
- Bush encroachment: Invader bushes is the highest single consumer of groundwater in the upper basin area, with detrimental long-term consequences on the sustainability of groundwater resources and fodder availability.

Due to the arid and highly variable climate in Namibia, water resource managers and users have to focus on improving efficiency of water resource use through improvement of water demand management practices.

Future of water in the basin

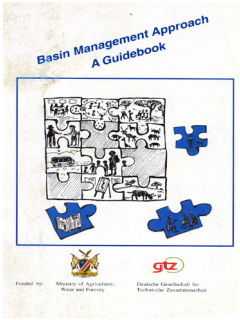
Plans to develop a dam at the Baynes dam site to supplement hydro-electric power in Namibia is under investigation, taking into consideration environmental and social impacts. Potential agricultural, mining and tourism opportunities are identified on the Hoanib River, while irrigation schemes and a large dam are being investigated in the Hoarusib River area, close to Purros.

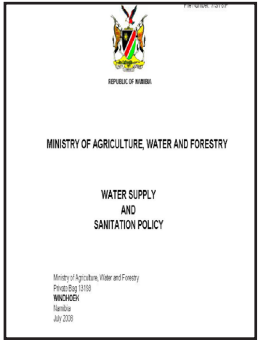
There is a growing economic and social importance of the desert-dwelling elephants in the basin, which requires improved elephant management (especially with regard to limiting movement near garden and water systems) for emerging and established conservancies in the basin. In addition, a potential Ramsar site (in accordance with the Ramsar Convention of Wetlands of International Importance) is identified at the Kunene River mounth, but is not yet designated.

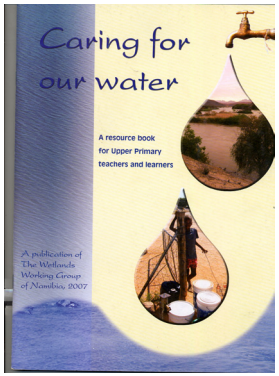
Maintenance of rural water supply and livestock drinking points remains a challenge in the basin, due to sparse distribution of people.

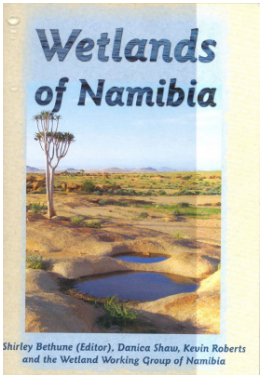
Development will affect the many wetlands that supply water and food to nomadic pastoralists and wildlife in the basin.

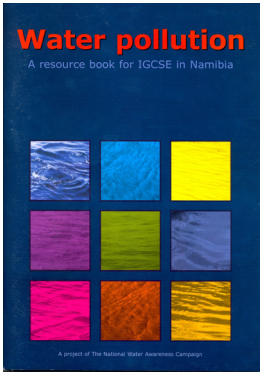
Basin management Related information:

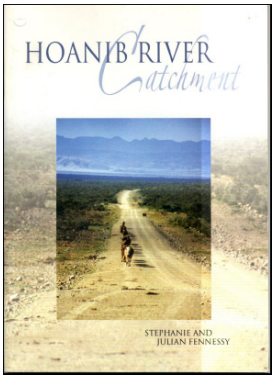


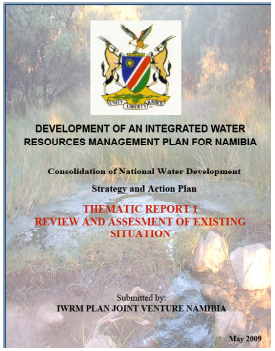


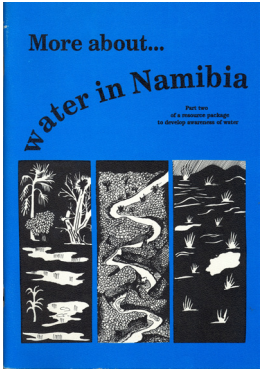


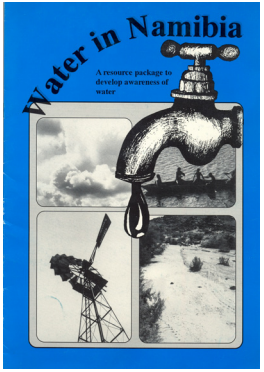


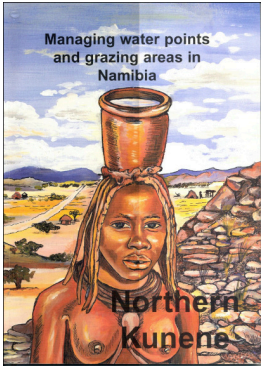












Note: some information used in this booklet is extracted from the above-mentioned material.

Everybody who
uses water is responsible
for looking after the supply
and maintenance of the
water source.

Tani Forbes Irving and Viv Ward, 1999,
Managing water points and grazing
areas in Namibia. Nothern Kunene

Acknowledgements

The booklet is compiled by the IWRM Joint Venture Consultants (Namibia) as part of the development of an **Integrated Water Resources Management Plan** for Namibia, on behalf of the Ministry of Agriculture, Water and Forestry.

This booklet was reviewed by the multi-sectoral Steering Committee of the IWRM plan.

The booklet is funded by **African Water Facility administered by the African Development Bank.**

Photo credit: Desert Research Foundation of Namibia

Dublin Principles adopted for IWRM in Namibia

I. Fresh water is a finite and vulnerable resource, essential to sustain life, development and the environment

II. Water development and management should be based on a participatory approach, involving users, planners and policymakers at all levels.

III. Women play a central part in the provision, management and safeguarding of water.

IV. Water has an economic **V**alue in all its competing uses and should be recognized as an economic good.

Source: International Conference on Water and the Environment in Dublin, 1992.