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THE NETHERLANDS PARTNER IN WATER MANAGEMENT



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CORRIGENDUM

On page 27 the e-mail address of the Netherlands Water Partnership erroneously has been mentioned as nwp@ihe.nl. The correct address reads info@nwp.nl

THE NETHERLANDS

PARTNER IN

WATER MANAGEMENT

PUBLISHED FOR THE SECOND WORLD WATER FORUM TO BE
HELD IN THE NETHERLANDS IN MARCH 2000

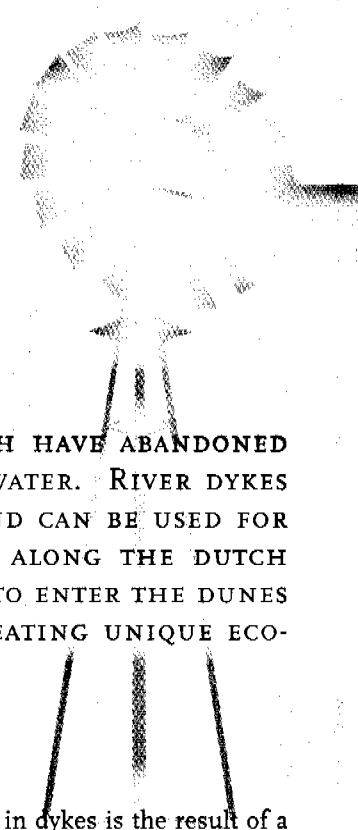
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THE NETHERLANDS PARTNER IN WATER MANAGEMENT

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INTRODUCTION



IT MIGHT SEEM AS THOUGH THE DUTCH HAVE ABANDONED THEIR CENTURIES-OLD BATTLE AGAINST WATER. RIVER DYKES ARE BEING RESTRUCTURED SO THAT LAND CAN BE USED FOR THE STORAGE OF EXCESS WATER. AND ALONG THE DUTCH COAST, THE SEA IS NOW BEING ALLOWED TO ENTER THE DUNES IN SEVERAL WELL CONTAINED AREAS, CREATING UNIQUE ECOSYSTEMS.

HAVE THE DUTCH LOST THEIR MINDS?
HAVE THEY GIVEN UP HOPE?

The answer to both questions is: no. Creating gaps in dykes is the result of a radical change of attitude towards water. It signifies a paradigm shift, in which water is no longer seen as an enemy to be fought but as a factor that exerts a major influence on ecology, the economy and social development. The change arises from a growing awareness of our dependence on water. This dependence is shown by the many functions water fulfils: as drinking water, wastewater, irrigation water, fishing water, navigable water, cooling water, process water, and so on. It is important to adopt an integrated approach by balancing these functions, preferably by involving all the stakeholders sharing the same catchment area. Integrated water management focuses on creating sustainable conditions. It places water management firmly within the context of spatial planning, and centres on the factors that link problems such as water depletion, pollution, shortages and floods, rather than viewing each in isolation.

Integrated water management does not offer ready-made solutions for every problem. It is an approach that can take on different forms depending on the circumstances. It is largely a matter of exploring possible solutions by looking at the wider context of the issue at stake. It is important to learn from one another's experience (both positive and negative) with integrated water management. Sharing regional experience can help to move towards sustainability.

The Second World Water Forum, which is to be organised in March 2000 in the Netherlands by the World Water Council, forms an excellent opportunity for exchanging views on sustainable water management. The World Water Council, a global initiative with over 160 member organisations and govern-

ment officials, will present its "Long-term Vision for Water, Life and Environment in the 21st Century", looking at water in all facets of life. The Global Water Partnership will present its Framework for Action based on the input from its regional Technical Advisory Committees. On this occasion ministers invited by the Dutch government, will give support and guidance to the implementation of the Vision and the Framework.

This booklet is intended to provide interested organisations, professionals and the public with a first general introduction to Dutch experience, approach and activities with the concept of integrated water management.

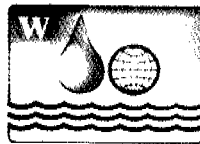
We hope that this publication will contribute to the international cooperation aimed at sustainable management of water resources.



Second

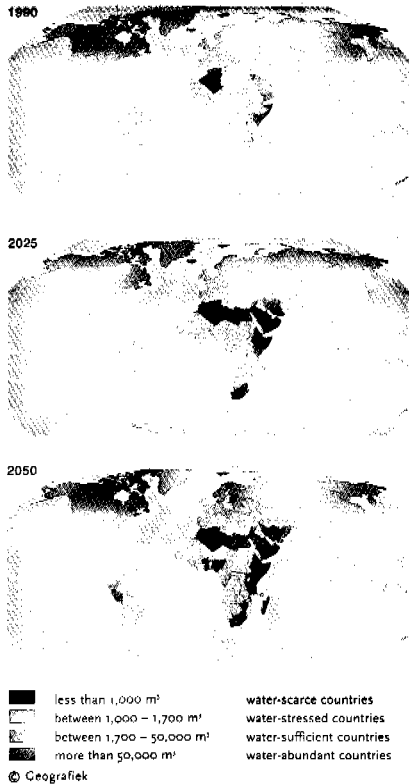
*World
water
forum*

**Global Water
Partnership**



World Water Council
Conseil mondial de l'eau
Consejo mundial del agua

I SOURCE OF LIFE UNDER THREAT



ALTHOUGH THERE IS ENOUGH FRESH WATER AVAILABLE WORLDWIDE, IT IS UNEQUALLY DISTRIBUTED - BOTH GEOGRAPHICALLY AND OVER TIME. FOR EXAMPLE, IN ALGERIA, SOMALIA AND KENYA AS WELL AS ON THE ARABIAN PENINSULA, THERE IS LESS THAN 1000 CUBIC METRES PER PERSON PER YEAR. THE OTHER EXTREME IS FOUND IN COUNTRIES SUCH AS NORWAY AND CANADA, WITH OVER 50,000 CUBIC METRES PER PERSON

Water is needed in all aspects of life. The general objective is to make certain that adequate supplies of water of good quality are maintained for the entire population of this planet, while preserving the hydrological, biological and chemical functions of ecosystems, adapting human activities within the capacity limits of nature and combating vectors of water related diseases.

Agenda 21, Chapter 18

WATER, THE SOURCE OF ALL LIFE, IS UNDER THREAT. THE NATURAL HYDROLOGICAL CYCLE PROVIDES THE EARTH WITH MORE THAN ENOUGH FRESH WATER EVERY YEAR. BUT UNEQUAL DISTRIBUTION, WASTEFUL COLLECTION METHODS AND CONSUMPTION, AND THE POLLUTION OF GROUNDWATER AND SURFACE WATER ARE LEADING TO GROWING WATER 'STRESS'. IN ADDITION TO SHORTAGES IN LARGE PARTS OF AFRICA AND THE MIDDLE EAST, UNMANAGEABLE FLOODS ARE OCCURRING IN COUNTRIES SUCH AS BANGLADESH AND CHINA.

The current symptoms of stress related to fresh water form the herald of the worldwide water crisis - a crisis exacerbated by the growth in world population, economic activities and pollution. The burden on water systems is mounting. Until now, the stress factors have been tackled separately. In many cases, this merely shifts the problems and related conflicts elsewhere, or even makes them worse. To prevent this, an integrated approach is required - locally, regionally, nationally, and internationally and based on the water body as the functional entity for water management. After all, river systems and groundwater flows do not observe administrative boundaries.

I.1 STRESS FACTOR I: OVER- EXPLOITATION

Since the beginning of the century, water consumption has increased six-fold, but the limits to this growth are now in sight. Today, half a billion people (8% of the world's population) face water shortages, and it is estimated that in 10 years a quarter of the world's population will be confronted with temporary or permanent water shortages.

If present trends continue, the demand for water will grow twice as fast as the population. Since the world population will probably increase from about six billion today to eight billion in 2020, water consumption in this period will triple. In areas where water is scarce, the 'easy' sources have long since been

tapped. Each extra litre obtained therefore demands a disproportional investment. What is more, a tripling of the demand for water will inflict serious damage on the environment. Even now, water depletion is leading to ecological disasters, as in the case of the Aral Sea. There is a growing risk of conflicts about water, both between groups of users and between countries.

To produce enough food for a world population which is expected to reach 8 billion in 2020, the efficient use of irrigation water is a very important factor. At present 40% is lost during abstraction and transport. 'Green' water, i.e. the soil moisture available for plant roots, should also be used more efficiently.

CALIFORNIA

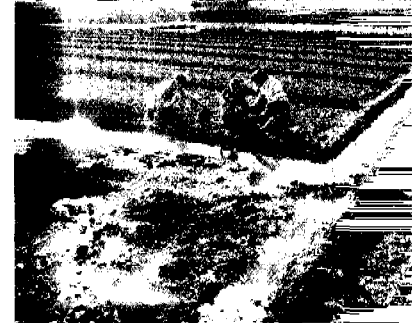
Thanks to water from the Colorado river, over 200,000 hectares of desert in the Imperial Valley in California have been turned into agricultural land. There is growing demand to use the water for cities such as Los Angeles and San Diego. Part of the irrigation water is currently sold to San Diego. So much water is now obtained from the river that for part of the year it no longer reaches the Gulf of Mexico.

WATER STRESS THREATENS FOOD PRODUCTION

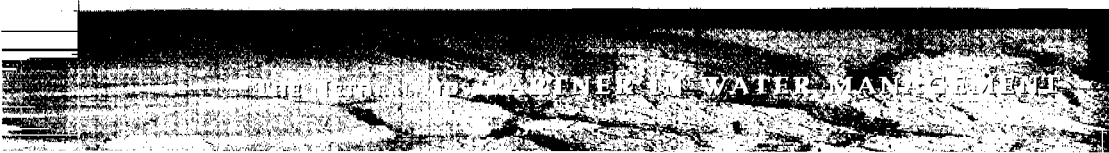
Although only 17% of the world's agricultural land is irrigated, the same area supplies nearly 40% of the food. Until 1980 the irrigated area grew faster than the population. The trend then reversed and the area of irrigated land per person is now declining. A major cause is that less water is available; the water level in the most important food producing areas, such as the Midwest in the United States and the Punjab in India, is falling.

1.2 STRESS FACTOR 2: POLLUTION

For thousands of years people have been using water to dispose of their waste. So long as there are few people and lots of water, this need not be a problem. Water contains microorganisms which are quite capable of breaking down organic waste into harmless products. However, as the amount of human waste increases, the self-purifying capacity of water will become inadequate, especially if, in addition to organic waste, more persistent compounds are discharged into it, such as heavy metals, mining waste and agricultural chemicals.



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A fifth of humanity still has no access to safe water, while half has no adequate sanitary facilities. Half the population in developing countries has to contend with illnesses which are caused either by the consumption of contaminated water or by water acting as a breeding ground for disease vectors, such as malaria and river blindness. The WHO estimates that 5 million people die every year from the effects of the lack of clean water and sanitary facilities. Aside from this human tragedy, illnesses resulting from polluted water also reduce productive capacity, which seriously impedes the socioeconomic development of a country or region.

Persistent chemicals such as DDT and PCBs accumulate in organisms at the top of the food chain. Even in fairly small concentrations, these substances can attack the immunological system of marine mammals, as well as affecting reproduction.

Polluted water threatens the health of ecosystems as well as of people. The input of nutrients (eutrophication) leads to excessive algal blooms, which seriously disrupt the coastal ecosystem. Coastal waters are nurseries, and their disruption has far-reaching consequences for ocean life.

1.3 STRESS FACTOR 3: HYDRAULIC UNBALANCE

Floods claim the lives of thousands of people every year and dislocate social and economic life. The damage seems to increase each year. It is impossible to say at present whether the floods are increasing in number and severity as a result of climate change. The increased severity of flooding is partly due to the lack of storage capacity in periods of high water. The scope for water storage is even declining, as a result, for example, of deforestation and the growth of hard surfaces such as roofs, roads and other paved areas. The impact of flooding is further exacerbated by former floodplains being used for building homes and factories.

The sea, too, claims its annual toll. Typhoons and hurricanes leave a trail of destruction across islands and coastal areas, bringing floods in their wake. They cause an increasing amount of damage, due to the greater socioeconomic

importance of coastal areas. In 2020 about four-fifths of the world population are expected to live and work in coastal zones.

FLOODS

The Netherlands is regularly hit by floods. In February 1953 nearly 2000 people lost their lives when the sea broke through the dykes in the southwest of the country. This disaster led to the unique Delta Project which aimed at protecting land by huge water works, including storm surge barriers. In addition to floods from the sea, the Netherlands regularly face the threat of floods along the Rhine and Meuse, the two major rivers that form the Dutch delta. In 1995 and 1996, there was heavy rain in the catchment areas of these two rivers. Due to the reduced storage capacity upstream, the Meuse overflowed its banks and the dykes along the Rhine threatened to give way. Unlike the floods in 1995 and 1996, the floods in the autumn of 1998 were caused mainly by the excessive rainfall in the Netherlands itself. So much rain fell in a short space of time that the drainage system was unable to cope.



Source: Rijkswaterstaat

II INTEGRATED WATER MANAGEMENT IN PRACTICE: ABANDONING RIGID THINKING

"Water is H₂O, hydrogen two parts, oxygen one, but there is also a third thing, that makes it water and nobody knows what it is." - D.H. Lawrence

UNTIL THE MIDDLE OF THIS CENTURY, THE MAIN AIM OF WATER MANAGEMENT IN THE NETHERLANDS WAS TO KEEP PEOPLE'S FEET DRY - PARTLY THROUGH FLOOD PREVENTION AND PARTLY BY TAILORING WATERLEVEL MANAGEMENT TO THE NEEDS OF AGRICULTURE. IN OTHER WORDS, IT INVOLVED QUANTITY MANAGEMENT. SINCE THE 1960'S, INCREASING ATTENTION HAS BEEN PAID TO THE QUALITY OF GROUNDWATER AND SURFACE WATER DUE TO THE GROWING PROBLEMS ENCOUNTERED IN THE PREPARATION OF DRINKING WATER. NOWADAYS THE MAIN CHALLENGE IN WATER MANAGEMENT IS BALANCING THE DIFFERENT FUNCTIONS OF WATER WITH THE INCREASING COMPLEXITY OF SUSTAINABLE LAND-USE. THE CONCEPT OF INTEGRATED WATER MANAGEMENT HAS DEVELOPED ALONG THE FOLLOWING LINES.

Since the early 1970s, water pollution has been tackled via legislation and investments in water treatment. Although the quality of surface water improved, Demands on water management increased and in the mid-80s it was found that water policy was too fragmentary to be effective. The different functions of water - such as drinking water, wastewater, irrigation water, fishing water, navigable water, cooling water, process water, etc. - increasingly clashed. Solving one problem generated new problems elsewhere. This led to recognizing the interlinkage between the different interests involved and laid the basis for a more holistic approach of water management.

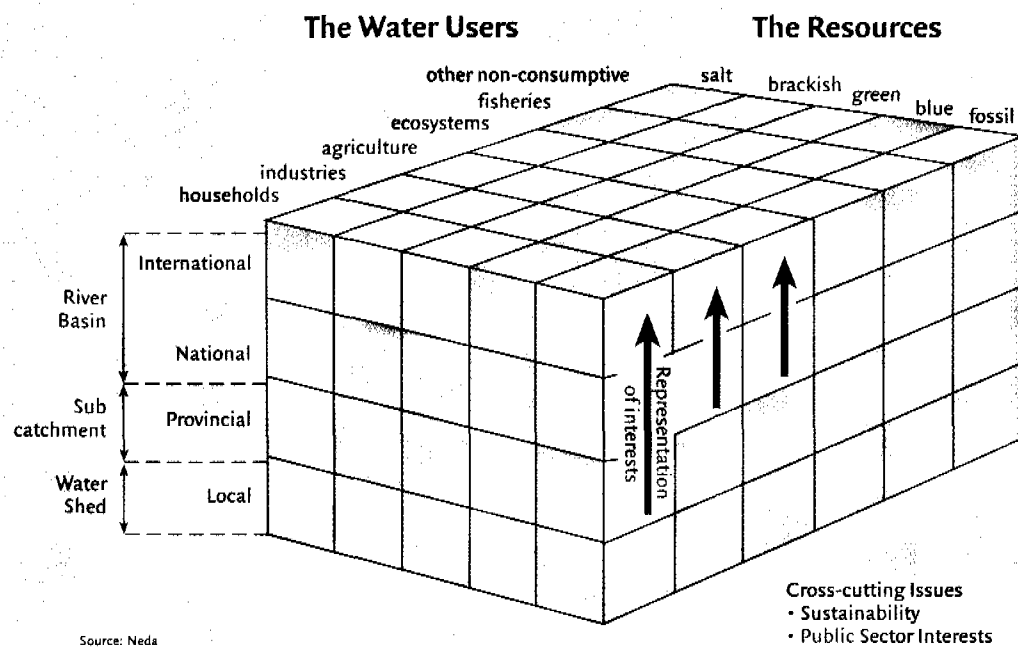
11.1 FOUR DIMENSIONS OF INTEGRATED WATER MANAGEMENT

Water management is not just a question of matching supply and demand. It also involves assessing the interests of users (including nature) in the light of availability. The main objectives of integrated water management are:

1. to maintain hydrological and ecological systems and ensure optimum integration of user functions;
2. to ensure that there is enough good-quality water for the population;
3. to avoid harmful effects caused by flooding or water scarcity.

The key aim of integrated water management is to take account of the location and quality of water sources, the functions of water, and users. Water manage-

ment is actually a form of conflict management, in which potential – and actual – conflicts are resolved by weighing up the various interests involved in an integrated fashion, and on different scales. This can be illustrated with the help of the 'water cube'.



The three axes of the cube represent the three dimensions of integrated water management: water sources, water users and the relevant scale:

Water resources

The water sources embrace all types of water, including salt and brackish water and fossil groundwater. In the cube, a distinction is drawn between blue and green water. Blue water includes surface water (rivers and lakes) and shallow groundwater. Green water is soil moisture, the capillary water in the soil which is used by plant roots. Although planners usually focus on the stocks of surface water and deep or shallow groundwater, 'green' water is responsible for over 60 per cent of agricultural output.

Water users

A broad distinction can be drawn between the use of water for consumption and non-consumption purposes. Households and companies consume many cubic metres of water. The same applies to agriculture and nature areas, fishing, shipping and recreation that make use of water without actually consuming it. It is therefore better to refer to the functions of water and the associated interests.

Level

Integrated water management takes place on different scales: locally, regionally, nationally and internationally. In addition to administrative systems, there are hydrological systems such as river basins, which play a role at national and international level, subcatchments, which are of regional importance, and watersheds, which are mainly of local importance. The boundaries of administrative and hydrological systems rarely coincide.

Time

In addition to the three dimensions of the water cube, water management also has to cater for changes over time - time being the fourth dimension. The availability of water sources varies in time, but this also applies to the use of water. The changes may be seasonal, long-term, or very abrupt, e.g. a tidal wave or a period of heavy rain. They may be of natural origin, or caused by people, as in the case of socioeconomic changes leading to changes in water demand.

II.2 PLANNING WITH WATER

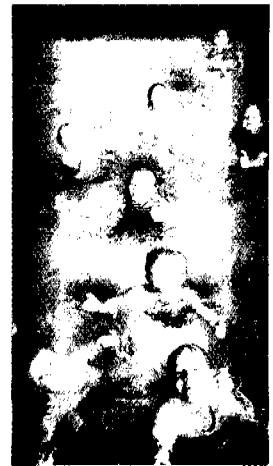
As a densely populated and highly industrialised country, the Netherlands has an extensive spatial planning system. Until recently, water management played only a limited role in spatial planning. The land was allocated and conditioned for the intended use and the water system and management were adapted to it. For instance, wet areas were drained to a great depth so that new urban areas could be created, rainwater was quickly drained via the sewers and the groundwater level was adapted to the needs of agriculture.

In recent years it has become clear that this policy cannot continue. Water depletion, land subsidence and the risk of flooding show that spatial planning needs to take greater account of water in particular areas. Nowadays water management is an important element in spatial planning. The first basic

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principle is 'water-based design', or applying hydrological principles to land use. Examples are: increasing the storage capacity of a catchment, ensuring that activities that place stringent demands on water quality (e.g. the abstraction of drinking water) are located upstream of more polluting activities, such as industry or recreation. A second basic principle is the combined use of areas. An example is the combination of new urban areas with more natural methods of wastewater treatment (lagoons) and the creation of water rich green amenities. Another example is allowing only ecological agriculture in areas intended for the supply of drinking water.



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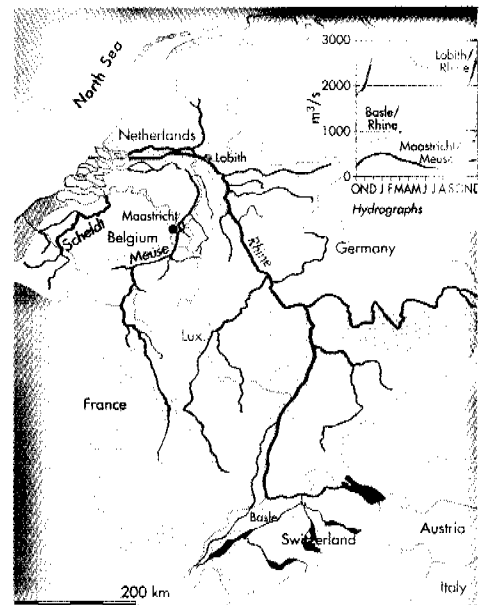
TACKLING THE POLLUTION OF THE RHINE CATCHMENT

The Rhine catchment spans nine countries. The main stream of this European artery passes through four countries: Switzerland, France, Germany and the Netherlands. The river is the main supplier of fresh water to one of the most densely populated and highly industrialised regions in the world. Although Rhine water is also used for preparing drinking water, many companies used to discharge wastewater into the river. Major polluters were the French potash mines, with their discharges of sodium salts. In 1970 the salt concentration in the Rhine exceeded 300 mg/litre, which meant that the water in Rotterdam and the surrounding area was barely fit to be used as drinking water. In 1950 the Rhine riparian states had set up the International Commission for the Protection of the Rhine against Pollution, and this became the forum for negotiations on the salt discharges. After many delays and arguments, it was eventually decided that the French mines would store the waste underground.

In addition to concern for the quality of Rhine water, the Commission also concerns itself with quantity management. Following the floods in 1995 and 1996, a High-Water Action Plan was launched to increase the storage capacity in the upper reaches of the Rhine.

CATCHMENT AREAS

CATCHMENT AREAS OF THE RIVERS RHINE, MEUSE AND SCHELT.



	Scheldt 23,260 km ²		Water divide
	Meuse 33,000 km ²		River
	Rhine 180,000 km ²		Border

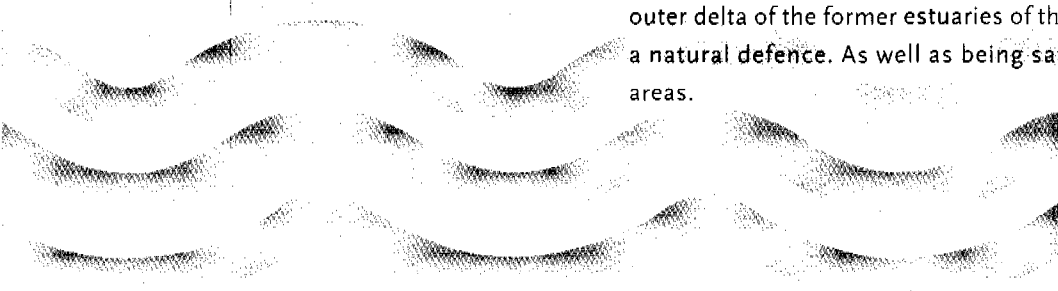
Source: Rijkswaterstaat



RESILIENT COASTS

Until ten years ago, Dutch policy was aimed at 'hard' coast protection. The shifting dunes were fixed with beach grass and where there were no dunes, sturdy flood-defence structures were built to protect the land behind them. In 1990 the Dutch government adopted a new and more dynamic policy – a flexible form of coast protection in which use is made of natural processes in the foredunes. Tide, waves and wind will again be given free play. If sections of the coast threaten to crumble away, sand replenishment will take the place of concrete and basalt.

By giving natural processes free rein, the coast will become more resilient. Sometimes these processes will be helped a little by allowing the development of tidal creeks, i.e. open connections with the sea. Salt marshes and shoals, such as the recently formed Prodelta i.e. the outer delta of the former estuaries of the Rhine, Meuse and Scheldt, form a natural defence. As well as being safer, it is also creating new nature areas.





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III PRIORITIES FOR COOPERATION

"Tu as donc soif aussi?" lui demandai-je. Mais il ne répondit pas à ma question. Il me dit simplement: 'L'eau peut aussi être bonne pour le coeur.' - Saint-Exupéry, 1943

THE NETHERLANDS HAS GAINED EXPERIENCE IN COOPERATION WITH NEIGHBOURING COUNTRIES IN THE RHINE AND MEUSE CATCHMENTS, AND THROUGH TREATIES AND PARTNERSHIPS WITH COUNTRIES AND THROUGH ORGANISATIONS IN OTHER PARTS OF THE WORLD. THANKS TO INTERNATIONAL COOPERATION, THE NETHERLANDS POSSESSES A GREAT DEAL OF KNOWLEDGE ON HOW PEOPLE ELSEWHERE DEAL WITH WATER.

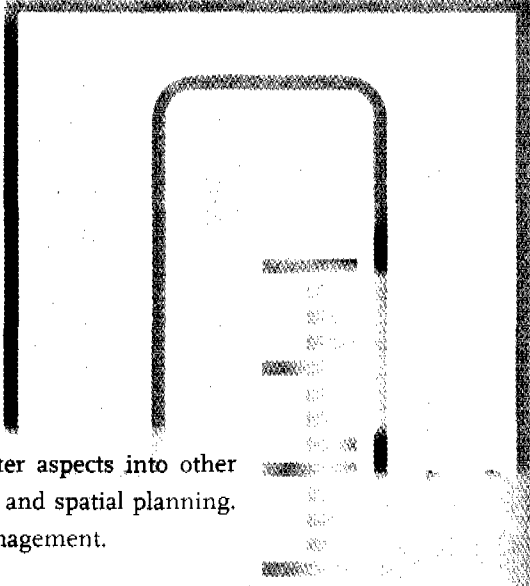
The Netherlands is interested in contributing to strengthening the capacity for integrated water management internationally, in order to make progress towards sustainability worldwide. When developing activities in other countries, special emphasis will be given to cooperation in the field of sustainable development in delta areas - where three quarters of the world's population will soon live.

III.1 STRENGTHENING CAPACITY

In addition to sharing and selling technical know-how, the Netherlands has always attached great importance to capacity building in the fields of planning, design and execution of major hydraulic-engineering works. Examples are its long-standing programmes in Indonesia, its intensive cooperation with countries in Central and Eastern Europe and its relations with Bangladesh and Egypt. Although there is no blueprint for integrated water management, it is possible to sketch a number of requirements such as policy formulation and legislation, institutional framework, skills, research and development and public participation.

POLICY FORMULATION AND LEGISLATION

To make integrated water management possible, various steps need to be taken at national level. As a basic requirement laws and licences must make clear who may use water and under what conditions. This applies not only to the actual use of drinking water and industrial water, but also to the use of water for discharges, fishing, shipping or recreation. In addition, the protection of ecosystems must be addressed by legislation, and it is very important that legislation be



enforced. Another major issue is the integration of water aspects into other policy areas, such as agriculture, fisheries, environment and spatial planning. Taxation and subsidies often have a bearing on water management.

INSTITUTIONAL FRAMEWORK

Integrated water management requires formal organisations, but also the involvement of local networks within communities. For integrated water management it is important to take existing water management activities in communities fully into account. Also in this context 'subsidiarity', i.e. assigning responsibility to the lowest possible level is of great importance.

JOINT BODIES FOR RIVER BASIN MANAGEMENT

There is no blue-print for allocating responsibilities to different levels of government. Management of a river basin or internationally shared water body asks for some form of coordination in order to deal with the multitude of interests. For an international or transboundary waterway a joint body can be created for this purpose. Establishing such an international joint body does not necessarily mean a devolution of power and responsibilities by the parties involved. The joint body could primarily synchronise the necessary actions for shared management, such as setting up monitoring schemes, preparing the river basin planning and designing and operating early warning systems. Within the European Union joint bodies will be established for all river basins, based on lessons learned with rivers such as the Rhine and the Danube. Exchanging regional experiences gained in a wide variety of transnational contexts all over the world is expected to add an interesting dimension to the international cooperation aimed at sustainable management of water resources.

SKILLS, RESEARCH AND DEVELOPMENT

The change from sectoral to integrated water management demands a different type of professional: people who can think along interdisciplinary lines and attach importance to communicating with the public. In addition to technical knowledge, they must have a feel for policy and for the way decisions are taken. So far, research into water has mainly been focused on the supply of drinking water, and water for industrial and irrigation purposes. Integrated water management requires a different approach: more attention to the demand side and to ecological, social and economical aspects of sharing water resources in a sustainable and equitable way.

PUBLIC PARTICIPATION

Integrated water management demands a new way of thinking about the familiar topic of water. The development of the new approach requires information, education and training at local, national and international level. Internationally, the World Water Council is already contributing to this approach by developing a long-term perspective on water, life and environment. At national level, the development of national water strategies, with full participation of interested parties, is a good way of changing attitude towards water. Locally, attitudes towards water can be changed by activities in such fields as water conservation and nature conservation. Water pricing is also important as an incentive for sustainable use of the scarce water resources.

GAZA WATER RESOURCES

Water is scarce in the Gaza Strip and is becoming more and more scarce due to the growing population. The problem is compounded by the fact that the infrastructure and social institutions have suffered from many years of neglect. Since its inception, the Palestinian Water Authority has taken important steps to tackle water scarcity and pollution.

With assistance of the Netherlands, a survey of water resources was carried out in the region and an estimate was made of the amount of fresh water available. Next, the use of water for domestic, agricultural and industrial purposes was charted systematically (via the water cycle), including losses during the cycle and groundwater pollution in order to design an optimum mix of critical water and soil dependent crops. The integrated approach made it possible to identify areas for improvement, and a strategy has now been developed for agriculture development, protecting groundwater and tackling pollution.



SHARING SCARCE RESOURCES IN THE ZAMBEZI CATCHMENT

The catchment of the Zambezi in Zambia and Zimbabwe is a savanna. However, periods of severe drought combined with the large population have led to the disappearance of much of the original 'miombo' forest land. Government authorities and the public are becoming increasingly concerned about the region's future.

The universities in the region are carrying out research, but their limited resources pale into insignificance beside the magnitude of the problems. Too little research is focused on sustainable land use in the region.



Source: Palestinian authority

Knowledge institutes from the region and from the Netherlands have now joined forces and set up a joint research programme to study the natural resources in the region, their current use and how to make it more sustainable. Another aim is to strengthen research capacity in the region. In relation to land use and deforestation, research is carried out into water management at different levels. Specific information is gathered for the sustainable management of the Zambezi catchment.

WATERNET

Water problems in Southern Africa are transboundary by nature. International cooperation is necessary to tackle the growing water scarcity, the recurring floods and droughts. The need for international cooperation in the region as became clear at the conference on the Management of Shared River Basins, held in Maseru, Lesotho, in 1997. One of the conference's recommendations was to ensure that the knowledge and institutions of the participating countries will be brought to the same level. To achieve this, WaterNet was set up with Dutch assistance. WaterNet is a regional network for research, education and training in the field of integrated water management. Participants include universities and training institutes in the region, as well as stakeholders such as government authorities and companies concerned with water. WaterNet aims to set up a modular MSc course in integrated water management. Students can complete the modules at different places. A WaterNet Research Fund has also been set up to study regional water issues.

III.2 OBJECTS OF COOPERATION

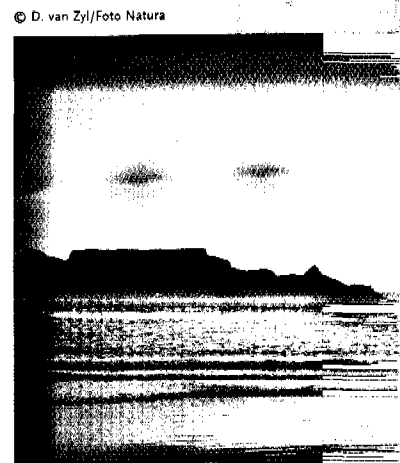
Integrated water management provides the framework within which the different functions of water are developed in a well-balanced way. International cooperation can assist in finding ways of reconciling different user functions by adjusting experiences to a new context. Basic functions, like drinking water and sanitation must be safeguarded, and stress factors have to be coped with.

DRINKING WATER AND SANITATION

Drinking water projects do not always live up to expectations, in particular when the population is not sufficiently involved. An approach is required which places the main emphasis not only on the construction of physical infrastructure but also on creating local institutions for the planning, management



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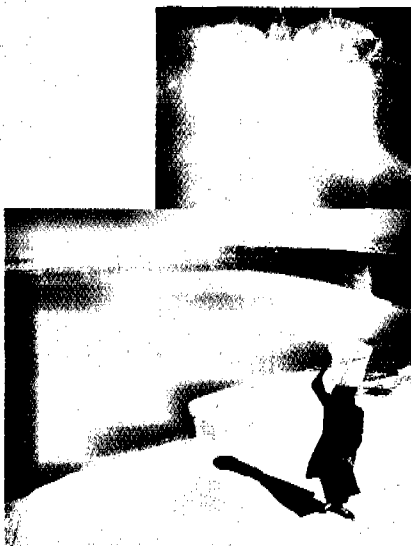


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and maintenance of drinking water and sanitation systems, including a sound financial basis for continuity. The problems are manifold, e.g. a choice has to be made between private or public ownership, according to the specific context.

PUBLIC WATER COMPANIES

In many parts of the world, the supply of water is increasingly left to private companies. This form of water supply is often limited to areas with a high density of connections. Poorer districts, often rural areas, need special attention with regard to a continued supply of sound water. In rural areas, contracting out the supply of water is barely an option. The distances between households are often too large to make drinking water and sanitary facilities profitable.

In the Netherlands, drinking water is being supplied by public companies whose shares are held by local and regional governments. They operate satisfactorily and recently Parliament decided that drinking water supply to households and small industries must remain with public companies. To ensure that these public monopolies will continue to operate efficiently, a system of obligatory benchmarking will be introduced between the companies.

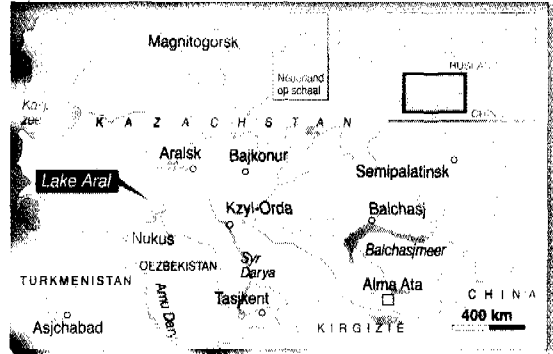
Public water companies are not unique to the Netherlands. In the United States, Germany, Japan and many other countries there is as well a dominance of the public sector.

POLLUTION ABATEMENT

The risks presented by water are not confined to floods and tidal waves. The pollution of groundwater and surface water threatens the health of both people and the environment. In the Netherlands a lot of experience has been gained with preventing and abating point source discharges. The more complicated issue of diffuse discharges, e.g. by agriculture, shipping and leaching from building materials, has the full attention of society, both from governments and the various sectors giving rise to this form of pollution.

IRRIGATION AND DRAINAGE

By far the greatest quantity of water humans consume is used for producing food. Less and less water is becoming available for agriculture. This is partly because the sources of 'blue' water are being exhausted, and partly because other users are demanding their share. As a result, the area of irrigated



agricultural land is stabilising. To produce sufficient food for a growing world population, farmers will have to use the available water more efficiently. Water pricing, crop selection and technical infra structure are basic aspects of improving water efficiency.

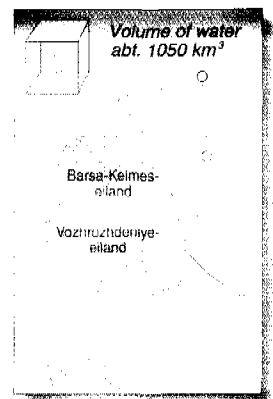
Most of the food for the coming generations will have to come from non-irrigated fields. To raise production, sustainable techniques need to be developed for storing rainwater and improving soil moisture management. These are not necessarily costly but their introduction and application requires a great deal of knowledge, not only of the techniques themselves but also of local conditions. Given its geographical location, the Netherlands has centuries of experience in drainage methods. The Netherlands also possesses knowledge about drainage and irrigation as a result of extensive cooperation with developing countries over the last decades.

IMPROVING WATER MANAGEMENT IN THE LAKE ARAL BASIN

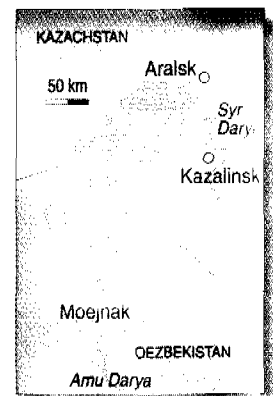
One of the most notable water related environmental disasters of recent years was the gradual disappearance of Lake Aral in Central Asia. Overuse of the water from the Amu Darya and Syr Darya rivers has caused the lake to shrivel to less than half its former size. The irrigation of the cotton fields in the catchment of the two rivers has caused yet another problem. The soil has become so saline that crop yields have fallen by a third since the late 80s. Salinisation is partly caused by the failure of irrigation water to drain away fast enough. In addition, 'fossil' salts from the subsoil are flushed to the surface. The only way to avoid further shrinkage of Lake Aral and further salinisation is to reduce water consumption.

The Netherlands has contributed in preparing the programme for Lake Aral. An environmental impact assessment (the first in Central Asia) has been carried out for a drainage project. A plan has also been drawn up to ensure better coordination between irrigation and drainage, not only at the collective farm level but also at district and regional level and even at the level of the entire catchment.

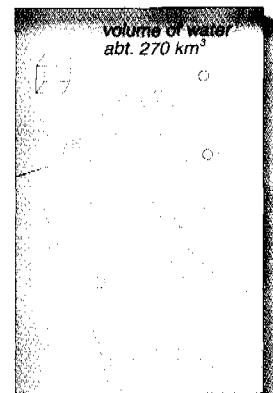
The five states that form the catchment of the Amu Darya and Syr Darya have now joined forces to reduce the use of water for irrigation by 15 per cent in the coming years.



1960



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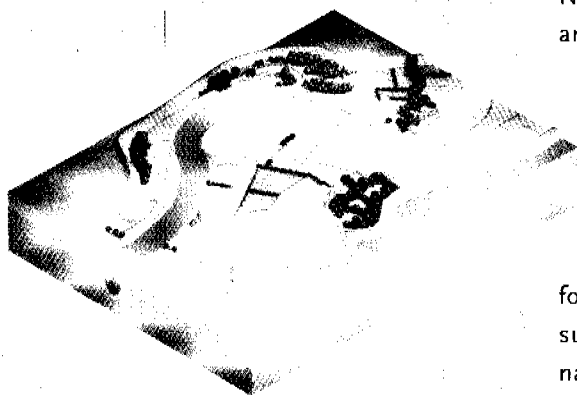
Agriculture is not the only source of water related food production. Fish is an important source of protein in many countries, but overfishing is decimating fish stocks in many parts of the world. Fish farming is an alternative, though the methods used often have a disastrous impact on the ecology of lakes and coastal waters. The development and application of methods for more sustainable fishing and fish farming are important challenges in integrated water management.

FLOODING

Many regions of the world are regularly exposed to the destructive power of water. The building of dykes and barriers is not always the best solution from the standpoint of integrated water management. For instance, floods deposit silt, which maintains the fertility of the soil. Even if building dykes along rivers and constructing storm-surge barriers are financially feasible, this may be undesirable for water management reasons. There are alternative methods for limiting the effects of floods, such as the construction of 'refuge mounds', where people and animals can find safety. Such an approach is only possible if there is an adequate early warning system. For such a system to operate efficiently, there need to be techniques for predicting floods with a reasonable degree of accuracy, a system for warning people promptly and facilities for the temporary reception of people and animals.

SPACE FOR RIVERS

Since the 17th century, the meandering rivers that have created the Netherlands have been subject to increasing restrictions. Summer dykes and dams forced the river into a particular bed and the many side-channels disappeared. The fertile forelands are now used for agriculture. However, the restrictions imposed on the river give rise to problems with flood discharge. The silting up of the forelands reduces the capacity of the winter bed. To prevent flooding, the level of the dykes has to be steadily raised - an unsustainable and costly solution. In the early 90s, the concept of returning the forelands to the river took shape. As a result of the disappearance of the summer dykes and removal of the silt, side-channels will reappear, and nature will be able to develop in the original forelands. In addition to the 'freeing' of the forelands, overflows have to be created. If the water level



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is extremely high, polders will be allowed to fill up to prevent flooding elsewhere. Following the threats of floods in 1995 and 1996 and the extreme rainfall in 1998, these concepts are gradually being implemented.

ECOSYSTEMS

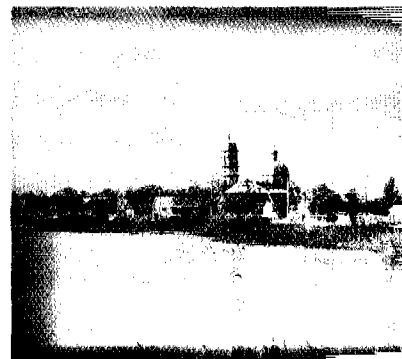
The use of water for drinking, irrigation or other purposes will always have repercussions on water in its essential function i.e. for maintaining sound ecosystems. Wetlands for example are often under great pressure as a result of the growing population and the growth of economic activities, such as agriculture and fish farming. Merely protecting these areas is generally not feasible, because the above mentioned pressures are too great. It is a real challenge finding ways to reconcile these pressures with maintaining and developing sound ecosystems e.g. by creating well guided opportunities for eco-tourism.

REHABILITATION OF DANUBE DELTA

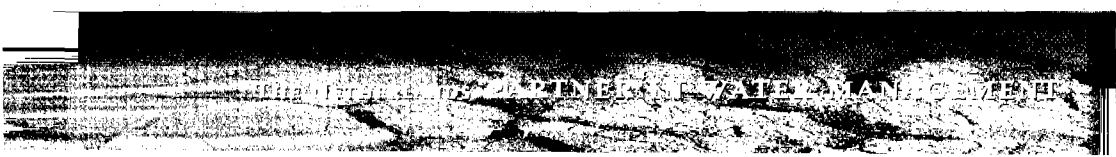
In the 17th century, according to the monk Niccolo Barsi, two thousand sturgeons a day were caught near the mouth of the Danube river.

The Danube delta, where the Danube splits into many branches before reaching the Black Sea, now is a wetland of global importance. However, its vitality has been seriously undermined by the effects of land reclamation, irrigation and other attempts at water-level control. The area was not being 'flushed' properly, which led to increased pollution. This not only harmed the wildlife but also undermined the local economy.

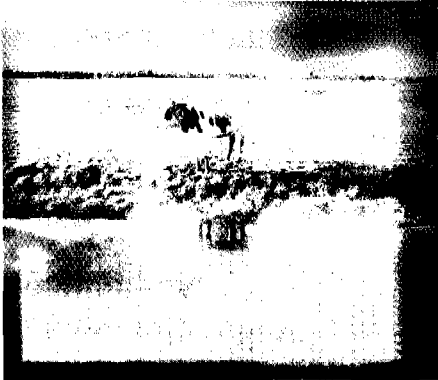
About 20% of the Danube delta lies in Ukraine. In the Ukraine people are highly motivated to make the Danube delta healthy again. For this region, the World Wide Fund for Nature has set up a remediation programme. To initiate the sustainable development of the region, the WWF in the Netherlands has donated 1.5 million dollars to the project and Dutch technical expertise is contributing to the rehabilitation of the important ecosystem in Danube delta. The aim is not only to restore the wetland to good health but also to secure the sustainable economic and social development of the area. Companies, fishermen and farmers who will benefit from the rehabilitation of the area are therefore being intensively involved in this program.



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IV NETWORKS FOR INTEGRATED WATER MANAGEMENT



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"That water-land of Dutchmen and of ditches." - Lord Byron

THE NETHERLANDS HAS AN EXTENSIVE, INTERNATIONALLY ORIENTED WATER MANAGEMENT NETWORK, COMPRISING OF KNOWLEDGE INSTITUTIONS, AUTHORITIES, COMPANIES AND NON GOVERNMENTAL ORGANISATIONS.

Dutch knowhow is available at government institutes, universities, consultancy-firms, drinking water companies and water boards where basic and policy oriented research is being conducted, including legal, economic, cultural and social aspects of water.

GOVERNMENT AUTHORITIES

The Dutch government is active in many international fora relating to water management. Multilateral cooperation takes place both at global level (UNEP, WHO, UNDP, FAO, CSD, GEF) and at regional level (EU, UN/ECE, Rhine Commission). Agreements on longer-term bilateral cooperation have been made with several countries (Hungary, Poland, Yemen, Benin, Bhutan, Costa Rica and others). Water-related projects are carried out in many countries in the context of Dutch development cooperation. Local authorities, too, are active internationally. Municipalities, for example, set up partnerships with towns and cities. Water boards, together with drinking water companies, have developed programs aimed at sharing experience by providing experts, offering training courses and exchanging trainees for in-company learning.

COMPANIES

The Netherlands has a strong and innovative private water and environment sector. Civil and hydraulic engineering contractors have an annual turnover of about 15 billion guilders, nearly a third of which is earned abroad. Dutch contractors, when operating abroad, involve local businesses to the maximum. Partly due to the government's strict domestic environmental policy, a large sector has developed for the production of equipment and the supply of equipment and techniques for preventing and abating water pollution. Dutch consultants carry out These projects range from feasibility studies to turn-key projects, with management and maintenance included. Each stage in the project demands a sound financial basis. Financial engineering is aimed at paving the way for large investments in the water infrastructure.

In the next decade investments in the water sector will be in the order of several hundred billions of dollars. The Netherlands banks are major global players in the financial world, i.e. they are in the top range of International Project Finance in the Infrastructure and Food & Agribusiness sectors. They have a long track record in delivering financial services for water related infrastructure, among others in flood defence and coastal zone development. Also, the expertise is strong in public private financing, local community (co-operative) financing and co-operation with multilaterals and other partners.

NGOs

Dutch NGOs do not limit themselves to identifying problems, but also contribute to the development of innovative water management concepts and have an extensive network with similar organisations throughout the world. They are very active in making the public aware of the importance of water for all sectors of society.



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NETHERLANDS WATER PARTNERSHIP

THE NETHERLANDS WATER PARTNERSHIP (NWP) IS A NEW INDEPENDENT BODY SET UP JOINTLY BY THE DUTCH PRIVATE AND PUBLIC SECTOR TO ACT AS A NATIONAL COORDINATION AND INFORMATION POINT IN RELATION TO WATER ACTIVITIES OVERSEAS. THE MAIN AIMS OF THE NWP ARE TO HARMONIZE THE ACTIVITIES AND INITIATIVES OF THE DUTCH WATER SECTOR OVERSEAS AND TO UNDERTAKE WORLDWIDE PROMOTION OF DUTCH EXPERTISE RELATED TO WATER. THE ORGANIZATION IS A FOCAL POINT FOR THE EXCHANGE OF INFORMATION RELATED TO ACTIVITIES AND SERVICES OF GOVERNMENT BODIES, KNOWLEDGE AND RESEARCH INSTITUTES AND BUSINESSES INVOLVED IN THE WATER SECTOR.



**Netherlands
Water Partnership**

The NWP is a single contact point for people in other countries seeking information on or access to study, consultancy, service or investment opportunities in the Netherlands;

- supplies information on the Dutch water sector generally to foreign parties;
- coordinates the interests of the Dutch private and public sectors in relation to international matters in the water field;
- supports the collective interests of the Netherlands within the international water community;
- creates new opportunities for Dutch knowledge and research institutes and private sector organizations;
- promotes Dutch expertise and experience in the field of capacity building and human resources development, institutional strengthening, consultancy, design, contracting, supply of goods and financing worldwide.

INTERNATIONAL PARTNER

The purpose of this joint initiative is to strive for full exploitation of existing Dutch capacity in the water sector. The NWP will provide a single means of access to the entire range of products and services offered by the Dutch water sector. The NWP will tie in with the World Water Council (WWC) and the Global Water Partnership (GWP). It will also contribute to the development of the Vision for Water, Life and the Environment in the 21st Century, due to be presented during the Second World Water Forum, to be held in The Hague, The Netherlands, on 17-22 March 2000.

INDEPENDENT NON-PROFIT ORGANIZATION

The NWP is an independent non-profit organization. Its board includes representatives of the public sector (central, provincial and municipal governments; knowledge and research institutes; water boards and non-governmental organizations); and the private sector, including water supply companies, consultancy firms, contractors, manufacturing industry and the banking sector.

For further information please contact:

NWP secretariat

Mr Jeroen van der Sommen

Managing Director

Westvest 7

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ANNEXE: INTERESTING WEBSITES

ACRONYME	FULL NAME	URL	LANGUAGES
<i>Knowledge institutions</i>			
NWP	Netherlands Water Partnership	www.nwp.nl	English / Dutch
FION	Federation of Institutes for International Education in the Netherlands	www.fion.nl	English
IHE	International Institute for Structural, Hydraulic and Environmental Engineering	www.ihe.nl	English
IAC	International Agricultural Centre	www.fion.members/iac.html	English
ILRI	International Institute for Land Reclamation and Improvement	www.ilri.nl	English
DutchWL/ Delft Hydraulics	WL/Delft Hydraulics	www.wldelft.nl	English / Dutch
TNO	Netherlands Organization for Applied Research TNO	www.tno.nl	English / Dutch
NITG	Netherlands Institute for Geosciences TNO - Netherlands Geological Survey	www.nitg.tno.nl	English / Dutch

ACRONYME	FULL NAME	URL	LANGUAGES
IRC	International Water and Sanitation Centre	www.irc.nl	English
WSSCC	Gateway to Water and Sanitation Information	www.wsscc.org	English
ITC	International Insitute for Aerospace Survey and Earth Sciences	www.itc.nl	English
<i>Government Institutes</i>			
RIZA	National Institute for Inland Water Management and Wastewater Treatment	www.riza.nl	English / Dutch
RIKZ	National Institute for Coastal Management	www.waterland.nl	English / Dutch
CZMC	Coastal Zone Management Centre	www.minvenw.nl/projects/netcoast/	English / Dutch
IBN-DLO	Institute for Forestry and Nature Research	www.ibn.dlo	Site under construction
SC-DLO		www.sc.dlo.nl	English / Dutch
RIVM	National Institute for Public Health and the Environment	www.rivm.nl	English / Dutch
KNMI	Royal Netherlands Meteorological Institute	www.knmi.nl	English / Dutch

ACRONYME	FULL NAME	URL	LANGUAGES
<i>Basic Research and Development</i>			
NWO	National Research Council	www.nwo.nl	English / Dutch
KNAW	Royal Academy of Arts and Sciences	www.knaw.nl	English / Dutch
NIOZ	Netherlands Institute of Sea Research	www.nioz.nl	English / Dutch
NIOO	Netherlands Institute of Ecology	www.nioo.knaw.nl	English / Dutch
VUA	Faculty Hydrology of the University of Amsterdam	www.geo.vu.nl/users/hydro/index.html	English
LUW	Faculty Soil, water and atmosphere of the University of Wageningen	www.wau.nl/vwo/tbodem.html	
TU-Delft	Department of Water Mangement, Environmental and Sanitary Engineering	www.ct.tudelft.nl/wmg/enivron.htm	
<i>Ministries</i>			
BuZa	Ministry of Foreign Affairs	www.minbuza.nl	English / Dutch
BuZa/OS	Ministry of Foreign Affairs/ Netherlands Development Assistance	www.minbuza.nl	English / Dutch

ACRONYME	FULL NAME	URL	LANGUAGES
VROM	Ministry of Housing, Spatial Planning and the Environment	www.minvrom.nl	English / Dutch
LNV	Ministry of Agriculture, Nature Managment and Fisheries	www.minlnv.nl	English / Dutch
V&W	Ministry of Transport, Public Works and Water Management	www.minvenw.nl	English / Dutch
OCenW	Ministry of Education, Culture and Sciences	www.minocw.nl	English / Dutch
<i>Local authorities</i>			
IPO	Provinces	www.provincies.nl	Dutch
VNG	Association of Netherlands Municipalities	www.gemnet.nl	Dutch
<i>Drinking water supply</i>			
VEWIN	Association of drinking water supply companies	www.waterleiding.nl	Dutch
KVWN	Royal Association for Water Supply in the Netherlands	www.vwn.nl	Dutch
Aqua Nederland	Netherlands Water Conditioning Association	www.aquanederland.com	English

ACRONYME	FULL NAME	URL	LANGUAGES
KIWA	Kiwa Consultancy and Research	www.kiwa.nl	English / Dutch
<i>Consultants</i>			
Nethconsult		www.nethconsult.org	English
KIVI	Royal Institute of Engineering	www.kivi.nl	Dutch
<i>NGO's</i>			
WNF	WWF Netherlands	www.wwf.nl/wnf.nl	
Dutch Wetlands	Wetlands International	www.wetlands.agro.nl	English / Dutch
<i>Miscellaneous</i>			
Waterland	various (n.)g.o.s	www.waterland.net	English / Dutch
ENN	Environmental News from the Netherlands	www.minvrom.nl/enn	English
Interwad	Interwad	www.waddenzee.nl	English / Dutch

Colophon

This brochure has been published in the context of the Second World Water Forum to be held in The Hague, the Netherlands, in March 2000.

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An altered version of the text is available on the World Wide Web:

www.minvrom.nl/water

Further copies (order number 22636/210) can be ordered free of charge from the Distribution Centre of the Ministry of Housing, Spatial Planning and the Environment, P.O. Box 2700, 3430 GC Nieuwegein, the Netherlands, fax (from abroad) +31 70 339 1568, fax (from within the Netherlands) 0900 201 8052 (not free of charge).