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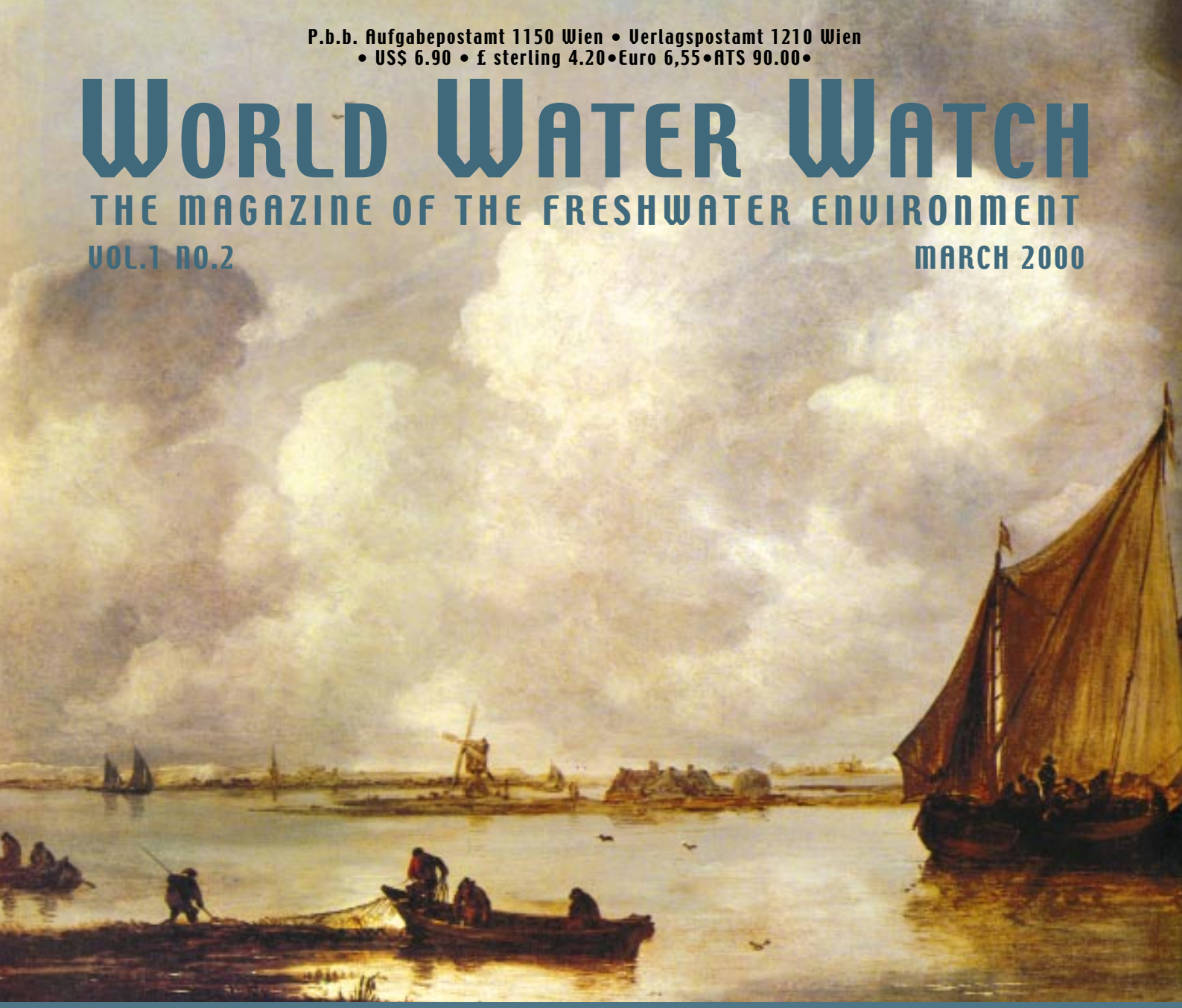
World Water Watch

THE MAGAZINE OF THE FRESHWATER ENVIRONMENT

VOL.1 NO.2 MARCH 2000



The Second World Water Forum and Ministerial Conference The Hague March 17-23

THE WORLD FRESHWATER FUND

The aim of this magazine is not only to inform you about what has affected the freshwater environment in the past but also to establish a fund that will contribute to its care in the future. In consultation with our sponsors the WWF Freshwater Campaign and the Ramsar Convention on Wetlands, *World Water Watch* aims to make a donation each year to a project that will help to solve some of the problems raised in the questions that follow. Details of each chosen project will be published in the magazine.

Water is not only a natural resource: it is also an economic and social entity. How can a balance between these last two factors be achieved ? How should water be used to eradicate poverty ? What are the rights of individuals to have access to water ? How should we value, charge for, and allocate water among all its users - including ecosystems ?

The World Charter on Water for Nature says that resources "shall be managed to achieve and maintain optimal sustainable productivity, but not in such a way as to endanger the integrity of those other ecosystems with which they co-exist". Is this principle to be applied differently in different countries and regions at varying stages of development ? Are some regions overconsuming at the expense of others ? Should managing change in our environment continue to take precedence over changing human behaviour ? Balancing supply and demand means more risk in some cases than others. Should we, for example, use and deplete fossil water or introduce genetically modified species of plants in a place where water is still being wasted ?

This issue leads naturally to the next - sovereignty over water. Should water belong to the nation within whose frontiers the rain falls ? Should upstream users be able to use whatever water they want without concern for those downstream ? There are no rules to say how water should be shared. Perhaps an evolutionary concept of water sovereignty is needed.

Whatever is most needed to safeguard the freshwater environment, everyone is invited to contribute to the **WORLD FRESHWATER FUND**.

KLAUS PAHLICH

WORLD WATER FORUM SPECIAL ISSUE
THE HAGUE, MARCH 2000

Haarlemmermeer,
by Jan van Goyen
who lived in The Hague
and died there in 1656.
Frankfurt, Städelsches Kunstinstitut

THINKING OF HOLLAND

Thinking of Holland
I see broad rivers
languidly winding
through endless fen,
lines of incredibly
tenuous poplars
like giant plumes
on the polder's rim;
and sunk in tremendous
open expanses,
the farmsteads scattered
across the plain,
coppices, hamlets,
squat towers and churches
and elms composing
a rich domain.
Low leans the sky
and slowly the sun
in mist of mother
of pearl grows blurred,
and far and wide
the voice of the water,
of endless disaster,
is feared and heard.

Hendrik Marsman

Translated by James Brockway from *A Sampling of Dutch Literature*, 1962

In 1999 the Dutch voted this poem "the poem of the 20th century".

BALANCE NOT BUSINESS

There is something surreal about a group of well-dressed people at the dawn of the 21st century taking their working papers out of expensive briefcases in a relatively luxurious building in one of the world's most prosperous cities — to make decisions about water management for the next 100 years that could decide the life-or-death fate of countless millions of people living at the edge of survival. In dramatic contrast to the ministers assembling in The Hague for the Second World Water Forum this month, many of these millions may have to walk kilometres in searing heat to fetch and carry the water on which their very existence depends. Think of THEM, ministers, as you pursue your deliberations and consume your routine meals, the like of which such people will never be able to eat even once in their lives.

Important though *Homo sapiens* is, The Hague is not just about man and his narrow needs — water to drink and to grow food, sanitation, health, prosperity — biased though we are since we are from this same species. Nor is it about making money from water, however disguised the motives are and however important it may be to price water in the right way.

What the World Water Forum is really about — if it is to make sense — is finding a sense of balance between all the natural needs on this planet in a sustainable and equitable way, because in the long term it is on this balance that man depends. It is about looking at a great forest — not just a few of the trees. It is about the health of all the world's ecosystems.

There will be no shortage in The Hague of ignorant or blinkered politicians, engineers and businessmen who see the environment as a competitor for water with other users. As long as someone will pay for it, this viewpoint runs, then (and only then) can we afford to reserve some water to protect ecosystems. They miss the point: water allocated to ecosystems is not lost but stays as a fundamentally vital reserve for present and future generations.

What hope is there of a sensible balance of interests emerging? Will the interests of big business again prevail, as it has so often in the past ?

Two drafts of the ministerial agreement to be signed at the end of the conference, made in January and February, have been seen by *World Water Watch*. The revised version is much weaker than the first.

It no longer welcomes the report of the World Commission on Water, from which the signatories have been distanced. Sustainable water resources management is no longer to be moved "to the top of the agenda". The commitment to provide the necessary financial resources is gone, as is the democratic call to enable people to decide their own local water needs while preserving freshwater and terrrestrial ecosystems. Out too are references to NGOs and man's fault in getting us into this mess. Vague calls for cooperation replace specific aims. Environmentalists are right to be sceptical of the outcome.

A century ago, European colonialists still managed their conquered territories by force to serve their own selfish needs. It took many years for the subjugated peoples to achieve something like freedom and racial equality. Ecosystems are the colonial peoples of the new century. It is high time they were given equality with man in a new spirit of enlightened self-interest. This idea is already enshrined in South African law. It is time the world followed suit.

THE EDITOR

WorldWaterWatch

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IMPRESSUM

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Grundlegende Blattlinie: ***World Water Watch*** ist ein unabhängiges Magazin in ausschließlich englischer Sprache über die Umweltaspekte von Schutz und Management des Trinkwassers der Welt. Unter dem Überbegriff Umweltschutz soll es die Bereiche Ökologie, Strategien der Versorgung mit Trinkwasser, Gesetz, Politik, Industrie, Ökonomie und soziale Faktoren abdecken.

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THE NEXT ISSUE OF *WORLD WATER WATCH*
will include a comprehensive report on the World Water Forum.

THE WORLD'S WAKE-UP CALL

BY GEOFFREY WESTON,

Editor-in-Chief, *World Water Watch* - The Magazine of the Freshwater Environment

As this issue of *World Water Watch* is being distributed, delegates from all corners of the Earth are gathering in The Netherlands for what must be the biggest concentration of minds on the subject of freshwater in history. For six days, politicians, environmental NGOs, officials, businessmen, water engineers, academics, consultants, the media, anyone who calls himself a water expert and anyone else who is interested will bend their minds to what most people involved now accept is a global crisis.

It is appropriate that the Second World Water Forum and Ministerial Conference should be held in the country that is commonly regarded as the grandfather of water management and water engineering. The organizers have achieved something near saturation point in their attempts to cover every approach to the subject within the allotted timespan. Their policy has included an invitation on the worldwide web to offer suggestions for the delegates to consider in The Hague — a democratic gesture that, however well intentioned, notably carries no voting power.

The first five days are each devoted to a different region — Europe; Africa and the Middle East; Asia; the Far East, Australia and the Pacific; and the Americas — in that order—followed by World Water Day. Interlaced with the geographical breakdown is a complex series of water/use presentations, major groups and special subjects. They cover topics that vary from "Water for Food and Rural Development", "Water–Use Management" and "Rainwater Harvesting" to "Water in Rivers", "Water and Tourism" and "Financing Water Infrastructure". Women, youth, religion, ethics, large dams, mega–cities and music are among other themes that each win a separate session.

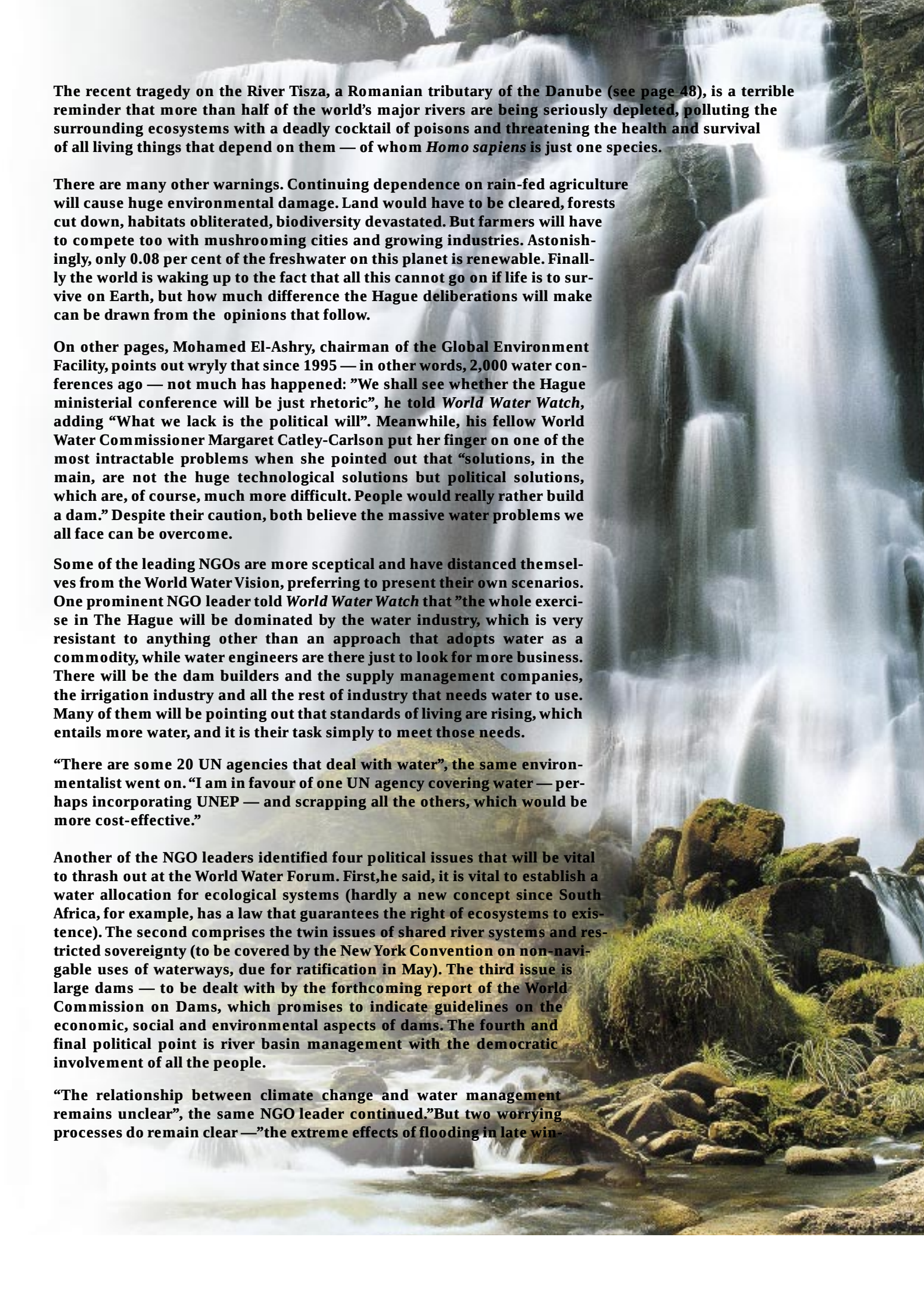
The massive documentation that has inevitably laced this mega–event comprise the usual repertoire of goals, aims and objectives, workshops, seminars, strategies and action plans, programmes and presentations, but, above all, THE VISION. The Vision is no less than an attempt at devising a global strategy for freshwater, life and the environment for the coming century. The World Water Vision has been drawn up by a worldwide network of experts from all walks of life with the help of a number of UN agencies. It will be a political appeal to all governments and all peoples to act now in order to achieve clean water and sanitation for all within a sustainable environment during this new century.

The World Water Vision has been compiled by the World Commission on Water for the 21st Century—an impressive assembly of the great, the good and (not least)the politically ambitious—under the chairmanship of Ismael Serageldin (a Vice–President of the World Bank). It will be the task of the commission to present their Vision at the World Water Forum. The last two days will be attended by the relevant ministers from around the world, and they are expected to sign a declaration on the last day, endorsing the Vision and its accompanying Framework for Action.

No one questions the facts that water is scarce and widely mismanaged. If the World Commission on Water had its way, the worldwide web would be overtaken in public consciousness by the worldwide water gap — and so it should.

The figures are simple: 20 per cent more water will be needed to feed the 3billion extra people by 2025, 1.4 billion people live without clean drinking water, 2.3billion people lack adequate sanitation, 7m die yearly from water-related diseases. Water is also very unevenly distributed. The Amazon basin holds 20 per cent of the world's annual rainfall runoff with only a tiny proportion of the global population, while two thirds of the world's population live in areas that receive only a quarter of the total rainfall.

In the last 30 years, feeding the growing population has been made possible mainly by the Green Revolution, which doubled food grain production. The increase came mostly from irrigated land, which comprises less than a fifth of cropped areas but account for 45 per cent of the world's food. These gains are now threatened, while experts point out that the main limits to agricultural production in developing countries in future will not be land shortage but water shortage. In India agriculture ominously drinks 93 per cent of all renewable water: humans, ecology and industry have to share the remaining 7 per cent between them.



The recent tragedy on the River Tisza, a Romanian tributary of the Danube (see page 48), is a terrible reminder that more than half of the world's major rivers are being seriously depleted, polluting the surrounding ecosystems with a deadly cocktail of poisons and threatening the health and survival of all living things that depend on them — of whom *Homo sapiens* is just one species.

There are many other warnings. Continuing dependence on rain-fed agriculture will cause huge environmental damage. Land would have to be cleared, forests cut down, habitats obliterated, biodiversity devastated. But farmers will have to compete too with mushrooming cities and growing industries. Astonishingly, only 0.08 per cent of the freshwater on this planet is renewable. Finally the world is waking up to the fact that all this cannot go on if life is to survive on Earth, but how much difference the Hague deliberations will make can be drawn from the opinions that follow.

On other pages, Mohamed El-Ashry, chairman of the Global Environment Facility, points out wryly that since 1995 — in other words, 2,000 water conferences ago — not much has happened: "We shall see whether the Hague ministerial conference will be just rhetoric", he told *World Water Watch*, adding "What we lack is the political will". Meanwhile, his fellow World Water Commissioner Margaret Catley-Carlson put her finger on one of the most intractable problems when she pointed out that "solutions, in the main, are not the huge technological solutions but political solutions, which are, of course, much more difficult. People would really rather build a dam." Despite their caution, both believe the massive water problems we all face can be overcome.

Some of the leading NGOs are more sceptical and have distanced themselves from the World Water Vision, preferring to present their own scenarios. One prominent NGO leader told *World Water Watch* that "the whole exercise in The Hague will be dominated by the water industry, which is very resistant to anything other than an approach that adopts water as a commodity, while water engineers are there just to look for more business. There will be the dam builders and the supply management companies, the irrigation industry and all the rest of industry that needs water to use. Many of them will be pointing out that standards of living are rising, which entails more water, and it is their task simply to meet those needs.

"There are some 20 UN agencies that deal with water", the same environmentalist went on. "I am in favour of one UN agency covering water — perhaps incorporating UNEP — and scrapping all the others, which would be more cost-effective."

Another of the NGO leaders identified four political issues that will be vital to thrash out at the World Water Forum. First,he said, it is vital to establish a water allocation for ecological systems (hardly a new concept since South Africa, for example, has a law that guarantees the right of ecosystems to existence). The second comprises the twin issues of shared river systems and restricted sovereignty (to be covered by the New York Convention on non-navigable uses of waterways, due for ratification in May). The third issue is large dams — to be dealt with by the forthcoming report of the World Commission on Dams, which promises to indicate guidelines on the economic, social and environmental aspects of dams. The fourth and final political point is river basin management with the democratic involvement of all the people.

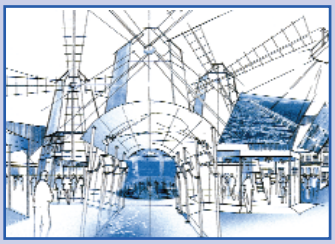
"The relationship between climate change and water management remains unclear", the same NGO leader continued."But two worrying processes do remain clear —"the extreme effects of flooding in late win-

ter in northern Europe, the United States and Russia, coupled with higher precipitation in the Caribbean, and, secondly, the drying out of the Sahel region. NGOs have their own declaration, and must make a stand on the issues they believe to be right."

The ecosystem approach is fundamental to the leading NGOs, common to the World Wide Fund for Nature, The World Conservation Union (IUCN), Birdlife, Wetland International and other organizations. "The debate in The Hague", a third leading NGO leader said, "should begin with the premiss that water is a natural resource and that interventionist moves by the construction and engineering industries should be curbed."

"It is unlikely that discussion at the top level will end in real solutions", the same spokesperson went on. "Far better to reach agreement at river basin level, since it can work, and open the process to stakeholders. The forum could be made much simpler and more effective by identifying priority problems, rather than adopting a generic approach."

FAIR PLAY



Competing for attention with the World Water Forum will be a number of related activities, notably the World Water Fair and a programme of cultural events. The fair will be spread across some 70 pavilions, dominated inevitably by Dutch enterprises. Pump makers and consultants rub shoulders with public bodies, international organizations, and a large number of NGOs —all of them, one must assume, presenting environmental ideals or credentials in one form or another.

A key link between the fair and the forum is the Global Water Partnership, which works closely with the World Water Commission and whose task will be to implement the Framework for Action that will emerge from the World Water Vision. Their stand will provide information including videos, especially concerning regional partners in parts of Asia and Africa, South America, the Mediterranean, and central and eastern Europe. A related stand will be the International Water Management Institute, based in Sri Lanka, which contributed important scientific and other data to the Vision.

Dutch-based IRC and its partners will present Streams of Knowledge - a global coalition of resource centres to help build capacities in the water and sanitation sector. Another Dutch group, ROC Oost Nederland combines the resources of two commercial companies Waterschap regge en Dinkel and Jansen Venneboer to help three NGOs - WOT and NOVIB (which cover Third World needs) and IVN, which is concerned with environmental practices.

Among a number of other exhibitors focusing on Third World needs are the World Bank's Water and Sanitation Programme, which aims to help the poor gain sustained access to water supply and sanitation through communicating knowledge, strengthening policies and improving investments for the poor. Britain's WaterAid, which has similar aims, will also be there. Twelve UN agencies, led by the United Nations Environment Programme, share their own pavilion, jazzed up with an Internet café.

Médecins sans Frontières are concentrating on a single environmental problem —that of the vanishing Aral Sea, which has lost 50 per cent of its surface area in the last 25 years, resulting in severe health problems for the population that have, the organization claims, been largely overlooked.

Two exhibitors are extolling the merits of solar power. Holland's Jeroen Verschelling proposes solar boats for sustainable tourism, as well as solar-powered weirs, pumps and telemetrics. EAWAG (a Swiss federal research and environmental agency) draws attention to solar water disinfection and solar oxidation and removal of arsenic from drinking water among its activities.

An entirely different dimension to the forum and the fair is offered by the cultural events. The stage at the World Water Fair will house a special show of music and song by women from 13 countries. It will also resound to the movements of the African Talipod Dance Group, and an international children's choir will entertain with water-inspired songs. Meanwhile, 18 actors and 140 puppets from the Thang Long Water Puppet Theatre in Vietnam are poised to perform to traditional Vietnamese music.

The International Documentary Festival of Amsterdam will present 60 specially selected films on the theme of water to enhance awareness of the water crisis. A special event is the première of the international television documentary series *Water: the Drop of Life*, filmed in more than 35 countries and featuring international celebrities such as Jimmy Carter, Mikhail Gorbachev and Kofi Annan.

In the last issue of *World Water Watch*, the chairman of the World Commission on Water for the 21st Century Ismail Serageldin reflected on the major issues to be debated at the World Water Forum. To fulfil a task as monumental as devising a water strategy for the next 100 years, the world's peoples are entitled to expect that the best possible brains have been assembled. Beginning on this page, four other members of the commission add their views to the forthcoming debates.

THE CANADIAN ADMINISTRATOR

"THIS IS A SERIES OF CRISES"

This commission member has a succinct concept of the commission's purpose, PATRICK BROGAN says in his interview with MARGARET CATLEY-CARLSON: "It's to try to shake the lapels of the world, to say 'World, sit up! There's a serious and mostly unnecessary crisis already happening in a number of countries in a number of areas that could be resolved if we managed water differently and better.'"

"People will understand eventually that free water ain't free."

Ms Catley-Carlson worked for the Canadian Ministry of External Affairs for many years and then served successively as president of the Canadian International Development Agency and the Population Council in New York. She thus sees the problems of water supply from a political angle, as an aid administrator, and as a specialist in demographic development and its economic consequences.

Just looking at water problems as an engineer isn't enough, she says. "I remember very vividly visiting a water project in northern Pakistan, and being berated by a water engineer, who took me aside and told me 'Don't you realize that because you haven't put any education component, and because there's no village organizing going on, you can do all the engineering in the world - but it isn't going to do all that much good.'"

It is above all a political problem. How can societies and governments that have no experience in conservation be persuaded to change their ways, and how then can they be helped to save themselves?

Ms Catley-Carlson admits the difficulty. "This is not politically easy. One of the reasons for the commission now is to change the global, public, common view of this. Because states', communities', people's behaviour changes long after that long-overused phrase a paradigm shift, there has to be a lot of change in opinions before it becomes suddenly the idea whose time has come. The first time it's mentioned it doesn't seem likely but eventually, like girls' education, it becomes an idea whose time has come, and it becomes anomalous not to do something rather than to do it. We're a long way from that. The reason for the voices in the wilderness is to say this idea has to come."

She is an economist and says that establishing a rational price structure for the supply of water is an essential prerequisite for sensible policy. The trouble is persuading people to pay their water bills.

She offers a few hopeful examples. "One of the examples I give is a visit to Ghana in which the water system was in perfect equilibrium: no one paid their bills, and therefore no services were provided. People could not be persuaded to pay their water bills for the simple reason that there was no service.

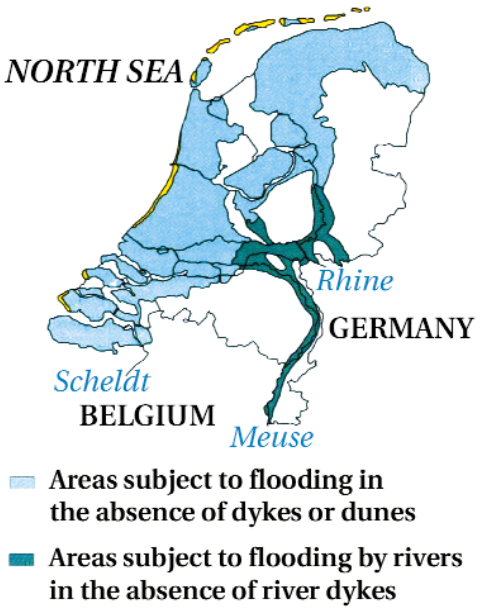
"In Ghana, eventually, it went through a lot of trial and error and came up with a solution. Finding the institutional arrangements for water is just as, or more, complicated than finding the hydrological arrangements. But there have been a lot of very innovative attempts to answer that question, and Ghana is one of the hopeful examples."

Another example is Guinea. "There was a chunk of international financing, I think World Bank, available to Guinea, and they said that the water system was working just as abominably as the one I've been talking about - they simply struck a deal with people, saying 'We will improve the water service and you will have a chance to see it working, but you're going to have to pay for it if you want the water'. They used the money to do the initial demonstration that the water was going to be delivered for those

continued on page 13

DUTCH CHANGE VIEW OF THEIR TRADITIONAL FOE

Hosts to the Second World Water Forum, the Dutch have historically made a living in the delta of three rivers: the Rhine, Meuse and Scheldt. In their long history they have fought a life-and-death struggle against the waters of the sea and of the rivers. They suffered many defeats and gained many victories as well, leaving the world with a rich legacy of experience in managing water. HENK DONKERS reports.



Without coastal dunes and river dykes two-thirds of The Netherlands would be flooded at times of high water. But for some years, especially since the nearly disastrous high river waters of '93 and '95, the Dutch have been changing their attitude to their traditional enemy. "Make way for rivers" is their new slogan.

About 5,000 years ago the first settlers came to "the low lands". There they found an extensive poorly drained flat marshy delta, a floodplain intersected by creeks, tidal inlets, and small and large rivers. To keep their goods and cattle dry, and protect themselves against high waters they raised embankments. To create conditions for agricultural activities they made small dikes to protect their fields, and flumes to drain their lands.

Life was not very comfortable at that time. The Roman writer Pliny, who visited The Netherlands in the first century, wrote: "The miserable people lead a poor existence in primitive huts on earth heights that they put up themselves. Twice a day the water inundates their residential area. You wonder if they live on the land or in the sea."

A millennium later big parts of The Netherlands were cultivated to increase the production of cereals for the growing population. In the land of peat and clay they dug drains and ditches to

lower the groundwater table and make agriculture possible. At that time the groundwater surface was 2-3 metres above sea level. Due to the drop in the groundwater table the peat and the clay layers subsided. Moreover some peat oxidized. The subsidence forced the people to deepen the drains and ditches again. This led to further subsidence of the surface. The permanent need to lower the groundwater table in order to keep the land suitable for agriculture provoked an irreversible subsidence process.

Around 1200, this process had gone on so far that large areas would be flooded during high tide. To prevent this from happening, dykes were built. Apart from protection against water from outside it was also necessary to avoid high water levels inside the embanked areas. Therefore the excess waters were discharged through outlets during low tide. In that time the water boards were born, the oldest democratic institutions in The Netherlands. The inhabitants of an embanked area were responsible for the construction and maintenance of dykes and ditches. Every landowner had the duty to maintain a section of the dyke and the ditches. Because the strength of a dyke depends on its weakest point, their condition was strictly controlled by representatives of the water boards. They are still working very well.

But through tidal creeks and inlets the sea could come far into the land. That resulted in many floods. To prevent this in the following centuries the Dutch started to connect the local embankments by dams closing the tidal creeks and inlets. There the sea couldn't come in any longer. Cities like Amsterdam, Rotterdam and Zaandam were developed around the dams in the tidal inlets of rivers like the Amstel, Rotte and Zaan.

Because of land subsidence behind the dykes, the ground level dropped below sea level. It was no longer possible to discharge excess water during low tide. Therefore the Dutch started to remove the excess water artificially. First they did this by hand and horse driven mills, but their capacity was small. Fortunately in the 14th century windmills became available. Vital for the survival of the Netherlands was the invention of turning the vanes of the mills into different wind directions.

With this new technique it also became possible to reclaim shallow lakes. In the 16th and 17th century, the Dutch Golden Age, rich merchants from Amsterdam and other cities invested their capital in enlarging agricultural areas. Thus large lakes like the Purmer, north of Amsterdam, were reclaimed. When steam-driven pumping stations became available in the 19th century, large lakes like the Haarlemmermeer (where Schiphol Airport is now), could be reclaimed.

But the struggle against high water is never won because of the ongoing man-made subsidence of the land and the rising sea level. In 1916 large areas were flooded when the dykes around the Zuyderzee burst. The Government decided to close this part of the sea by means of the 32 km Afsluitdijk. In 1953 the worst flood disaster in recent Dutch history took place. In the south-western part of the country 1,835 people lost their lives when the sea broke through the dykes in some 900 places. This disaster led to the famous multi-billion Delta Project. Most of the estuaries, into which the Scheldt, Meuse and Rhine discharge, were dammed. Only the waterways to the ports of Rotterdam and Antwerp were excluded. The first part of the Deltaplan was completed in 1958, the last part in 1997.

Now the Dutch are preparing themselves for the next phase in their never ending struggle against the subsidence of the land and the rising sea level. Sometimes it is no longer

"If you try to cage a river it will struggle to break out like a wild beast."
Dutch Crown Prince Willem Alexander

MANAGING WATER CONFLICT THE NETHERLANDS WAY

Until the 1950s the main aim of Dutch water management was to keep people's feet dry. In the 1960s and 1970s attention moved from quantity management to quality management of surface and groundwater. Water pollution has been tackled by legislation and extensive investments in waste water treatment. The problems of pollution by point sources like industries and households are largely solved. Pollution by diffuse sources like agriculture (fertilizers and pesticides) and traffic is still a problem.

In the 1980s and 1990s the concept of integrated water resource management (IWRM) was developed because water policy was too fragmented to be effective. IWRM implies that every aspect of water is considered within one integrated framework. It is a kind of comprehensive water management that takes into account quantitative aspects (consumption, drought, flooding) combined with qualitative aspects (chemical pollution, changes in water temperature, ecological effects) and different types of water (surface water and groundwater; salt, brackish and fresh water). It is also a form of conflict management. Actual and potential conflicts between various interests and users (households, industries, agriculture, nature, fisheries, recreation, shipping), and different scales can be resolved in an integrated framework.

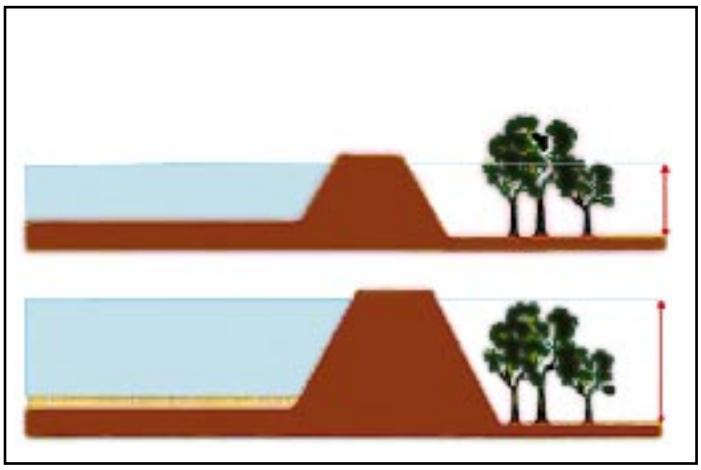
possible to open the large discharge sluices in the closure dams. When the Meuse and the Rhine bring large masses of water from their hinterlands to the delta, the water in the rivers and in the former estuaries rises to critical levels. This was the case in 1993 and 1995 after heavy rains in the catchment areas of the two rivers. In 1995 250,000 people along the branches of the Rhine were evacuated. The Dutch escaped a disaster. Their dykes were strong enough. In 1998 the rainfall in The Netherlands itself was so heavy that many of the western and northern parts of the country were flooded. The next step will be mega-pumping-stations on the big sea dykes like the Afsluitdijk.

So every five to seven generations the Dutch need to find a new answer to the combined effect of land subsidence and rising sea levels.

The near-disasters of 1993 and 1995 led to the Great Rivers Delta Project. It was set up firstly to improve the safety of the areas and cities along the main rivers. Within a few years hundreds of kilometres of dikes were made higher, wider and stronger. But the near-disasters led to a new awareness as well. Water engineers became aware that the water-holding capacity of the river systems was too severely reduced by canalization, normalization, land reclamation, the closure of overflows and economic activities in the floodplains; that the sponge function of large areas in the watershed was reduced by intensive agriculture and urbanization; that they cannot go on pumping their land downwards and making their dykes higher, because that will finally lead to a larger inundation depth and more damage, when a dyke bursts.

For many decades the Dutch felt quite safe behind their huge dykes, but the narrow escapes in 1993 and 1995 opened their eyes. "The classical approach of land use and water management had to be fundamentally changed", said the Dutch Crown Prince Willem Alexander in 1998. For some years water management has been his most important activity. He is chairman of the Commission for Integrated Water Resource Management and will be the chairman of the Second World Water Forum as well.

At the New Approaches to River Management conference Willem Alexander said: "We have learned by trial and error that the resilience of our rivers needs attention. Rivers are like living creatures. They are dynamic and need space. It is the nature of rivers that they refuse to stay straight. If you try to cage a river by building dykes too close to the main stream and by excessive normalization and canalization, it will struggle to break out like a wild beast. It will increase its pressure upon dykes, dams and artificial banks; it will look for their weak spots; and it will break through them. The usual response is of course to strengthen our dykes. But this only increases the water's pressure. It gets us into a spiral, which only makes us more vulnerable. Therefore, in The Netherlands, we opted for another approach. Nowadays we say: 'Make room for the river'. "



Raising the height of a dyke(below) eventually leeds to deeper flooding levels and therefore more damage in the event of a dyke burst. Right above: disaster hit a Dutch village during a dyke burst in 1889.

"Give way to rivers" and "More room for water" became cornerstones of Dutch water management and spatial planning. In the new (fifth) National Plan, which is expected in the summer of 2000, water will be one of the guiding principles. Some polders will be transformed back into lakes and wetlands, other low-lying areas will become water reservoirs in times of high water, while in the lowest parts it will be forbidden to build and overflows will be created along rivers and retention basins. Obstacles in the floodplains will be removed, old side-channels will be reopened, dykes will be moved away from the main river channel and so on. It has not yet been decided which polders will be transformed, where the retention basins will be located and so on. The implementation of "water as a guiding principle in spatial planning" is politically not as easy as its announcement.

The author is a Dutch geographer, journalist and lecturer at the University of Nijmegen.

"THIS IS A SERIES OF CRISES"

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who actually paid, so it became more and more worth while, in people's view, to sign on to the system and to pay - and people began to realize that the water department was serious about only giving water to those who had paid."

Ms Catley-Carlson also made the paradoxical point that making poor people pay the market price for water services sometimes saves them money. "The poorest people on Earth pay the most for water," she said, meaning those who have no alternative but to buy drinking water from itinerant vendors. "Therefore, when you ask them to pay what may seem to others as a large amount of money for a regular, reliable supply, they may actually find it cheaper."

"So when you say 'How can people be persuaded to pay?', one of the ways of getting them to pay is to start giving them better, more regular, more predictable service. What usually happens is that you open up a dialogue and you open the ownership (or the management of the resource) a lot closer to the people involved and engage in dialogue with them about how much they are willing to pay, for what kind of service. People might be very willing to pay a little bit for only certain hours a day - if these are predictable hours."

As a true free-marketeer, Ms Catley-Carlson insists that "The price mechanism is a wonderful thing", meaning that if providing water is a sensible business proposition, and if pricing induces conservation, everyone will get the water they need.

Reminded that the same argument applies to food subsidies that have a disastrous effect on agricultural production in many parts of Africa, and that attempts to apply the price mechanism have led to revolutions in many countries, she observed "Well, eventually, people in the neighbouring country pay more for water and they have things better - and the next time there's a coup and people say we're going to restore free water, people will say that, no, we don't want free water because it doesn't work. People will understand eventually that free water ain't free.

"I think that everybody should pay for water, and I think that the subsidies should go to the individual. The full cost of water should be reflected in the water system, because that's the only way you get a reasonable water system. The other thing is that a lot of water has been over-billed or there have been inappropriate technology choices because it was the decision of the central public works department or the company or the aid donor rather than a decision really based on the likelihood of what the ongoing maintenance costs were for the community at hand.

"This is a series of crises - it isn't a single one: water is a highly regional, highly area-specific thing. It isn't like food availability where your ability to pay more for food can result in taking it away."

She mentioned the environmental aspect of water shortages: "In 1997, the Yellow River didn't reach the ocean for something like 200 days. Only 10 per cent of the Nile reaches the Mediterranean. That is doing incredible damage to delta areas and to fauna and flora every time you drain a wetland, every time you use the river upstream so that it no longer empties into the ocean.

"The Middle East is not just an environmental crisis, it's a human-needs crisis. Even where the water's still flowing by, the quality has fallen to such an extent that the ecosystem of the river has been seriously damaged.

"We have shown that by investing enough in them, rivers such as the Thames or the Seine can be brought back to health, if not to the same rivers they were before major sources of pollution developed. That kind of pollution is happening in many, many rivers around the world, simply because industrial systems in countries that are first developing are usually inefficient, and laws are either non-existent or not applied, and therefore the kind of water strictures that should apply in these countries simply do not exist."

"We have shown that by investing enough in them, rivers can be brought back to health."

Ms Catley-Carlson insists that the world is now paying more attention to water than in the past, and that's progress. "It's come full circle. People were very concerned about water 25 years ago, and then it got subsumed into the environment.

"Now, there's a realization in a number of countries that it may be more difficult to look after water as water when you subsume it into a general concern for the environment. The World Water Council is trying to emphasize the economic uses of water, trying to make people realize that the solutions, in the main, are not the huge technological solutions but political solutions, which are, of course, much more difficult. People would really rather build a dam."

THE THIRD WORLD NGO DIRECTOR

"NO UNIFORM SOLUTION"

ANIL AGARWAL is director of the New Delhi-based NGO Centre for Science and Environment and a leading environmental advocate of the Third World. He has recently been given India's distinguished civilian honour - that of Padma Bhushan - for his contributions to the cause of the environment. He gave this exclusive interview with *World Water Watch* India correspondent S.P. SAGAR.

Time is running out. A water famine is approaching.The world must wake up.It is going to be a disaster of the kind the world has never known. The disaster will multiply if precautions are not taken, said Anil Agarwal, a member of the World Water Commission.

Mr Agarwal feels the 21st century is going to face major environmental problems - the overuse of water resources and the destabilization of the atmosphere by climate change apart from the overall problem of air and water pollution. Even though it is not known to what extent the climate change would affect water resources, it is certain that either way it will create a serious situation. If the climate change releases more water, there could be more floods and if it gives less water you have droughts. Either way the climate change is going to worsen the situation.

So, the problem is grave and is becoming worse and worse. A large number of people in the world, particularly those in countries like India who do not have adequate quantities of water, are already facing a grim situation. This situation will get worse because the population is increasing and the number of cities is growing. Urbanization is intensifying, and all this will increase the demand for water. On the other hand, we continue to pollute water resources - groundwater, rivers and acquifers which we are also depleting. Where is this water going to come from?, Mr Agarwal asked.

There cannot be a uniform solution. Remedies will vary from region to region, depending on the water requirement and how the water is used. Water-stressed countries have been identified, but Mr Agarwal says the methodology identifies the water-stressed countries based on the per capita water availability and on this basis the studies were done and water-stressed areas identified. But he thinks this is not the right way. The method only indicates the problem, because whether people have enough water for their needs or have too little depends on how that society is related to water, he pointed out.

"If you want to develop the kind of water splurging that Western society has indulged in, then there is not enough water for anybody in this world. It is a question of a society's relationship with water, the way it manages its agriculture, how people dispose of their waste and how they treat and live with it. The studies that seek to identify the water-stressed areas do not take these factors into account and therefore do not present a real picture."

Mr Agarwal is deeply concerned with the state of affairs in his own country - India. So he cites the case of Delhi, which he thinks is "one of the dirtiest, filthiest and third-rate cities of the world - a rogue city in fact". It has an enormous amount of water, but it steals water from neighbouring states and then uses it and pollutes the River Yamuna on which it stands. It pollutes the river so much that nothing is left for the people downstream.

"The countries that copied the West blindly are themselves to blame."

"So if you have such rogue cities in the world, then you can do nothing about your water resources", he says, pointing out London, the cities on the Rhine and those in Japan which were also rogue cities, but they were mended, invested in remedial measures, disciplined themselves, fined the polluters and improved. We are doing nothing of the kind and so continue to be a rogue city".

Mr Agarwal attributes the main cause of India's and, for that matter, the Third World's water problem to the West's "water-splurging practices", particularly the sewage technology under which "to carry away a few hundred grams of waste materials, you waste so many hundreds of litres of clean water and then you end up polluting a whole river. In that sense the technology and the culture the West has given are simply outrageous."

But then he does not just pick holes in the Western system.The countries that copied the West blindly are themselves to blame. In India's case, he says, "you have to blame your own engineers, the water managers, the politicians. They mimicked others without taking into account their own economic and environmental implications. We should have stuck to our own excellent age-old tradition of community-based water management with which our people were very very happy. But, while the West made efforts to change, we have a long way to go and our cities continue to languish as rogue cities."

What is more disconcerting, unlike the industrialized countries, is that the developing countries have yet to grasp the gravity of the impending crisis and are yet to respond. He again reverts to the case of India and says this is because the resistance from the water establishments – the engineers, the bureaucrats and the politicians - is so strong that they think of nothing but large dams and high-cost, capital-intensive projects, ie anything that brings them fortunes, he says. But Mr Agarwal does not think it is too late. Rainwater harvesting, watershed management and a water-pricing system need to be adopted. New technologies and new approaches, particularly those that meet urban and industrial needs, must be developed. Industry has to use water carefully or should be fined. All these measures should be adopted in an organized and coordinated manner. Institutional changes too are required. Water users' institutions and community-based organizations should be formed.Technologies, institutions and policies will need to be integrated.

Water conservation, the NGO leader says, has to become everybody's concern, from the United Nations down to local bodies and village communities. Everyone has to contribute to the cause. The water crisis is nearer than many think - within the next 25 years.

Mr. Agarwal hopes the World Water Forum in The Hague will give a direction to the way the world is going to meet this challenge, how the ministers and the professionals assembling there react to the situation and how they can avert the crisis before it is too late.

THE FRENCH BUSINESSMAN

"INVESTMENT NEEDS FOURFOLD RISE"

"Water is not free. It should be paid at full cost price, and help should be provided by international financial organizations like the World Bank and by governments or cities to those who are unable to pay, so that everyone, including the poorest people of the earth, has access to potable water," JÉRÔME MONOD, member of the World Commission on Water for the 21st Century, told SUSAN BELL in Paris. As chairman and managing director of Suez Lyonnaise des Eaux, Monsieur Monod is the only representative from the commercial sector to sit on the commission. During a recent interview with *World Water Watch*, he explained his views on how the private water sector can best contribute to finding solutions to the issues under debate at the Second World Water Forum.

M. Monod admits to being extremely anxious about the quantity and quality of water resources in the first quarter of the 21st century, a time when one billion people do not have proper access to drinking water and three billion do not have acceptable sanitation provisions. "By 2025, three billion people will be living in areas that are seriously deficient in water resources and some 40-odd countries will suffer severe water supply shortages. Population growth, economic development in certain areas of the world and global warming are all going to aggravate the water shortage, and the situation will become worse if we don't change the whole water management system," he said.

Photo: Agence photo DEADLINE

"The primary source of water lies by far in the potential savings that can be made in existing networks. This is true in cities, especially in developing countries, and even more within irrigated areas. To avoid wastage and ensure the sustainability of investment, we must apply basic economic rules to water management. What better incentive than to give water a price?," said M. Monod, pointing to agriculture, where making famers pay for their water has cut down dramatically on waste as people start to perceive water as a valuable and rare resource rather than a freely available and inexhaustable commodity.

M. Monod also stressed the need for financial institutions, governments, city authorities and private companies to cooperate in multiplying four-fold current levels of investment in water management in order to meet the

water needs of the three billion people who will live on the planet by 2025 and who will require 20 per cent more water to produce enough food to feed them. "Already, a quarter of the world's population does not have convenient access to freshwater resources while more than half do not have access to sanitation services. These figures will continue to get worse if investment in this area is not increased substantially," he warned.

While the share of the private sector in the financing and operation of water resources schemes remains minor at 5-10 per cent, M. Monod believes that companies like his own can best contribute to water conservation by providing expertise and research where it is most needed. To that end, Suez Lyonnaise des Eaux has brought together 19 international water managment experts to form the Water Resources Advisory Committee. The mandate of the independent committee, which met for the first time on February 4, is to examine the social and environmental implications of the company's major projects, to identify new methods of water conservation and to find innovative solutions to problems, whether they are technical, scientific or institutional.

An example of one such solution developed by Lyonnaise des Eaux is the fuse gates installed on dams in India, South Africa and Brittany which have helped to avoid the need to build new dams. This is a low-cost device developed by Suez Lyonnaise des Eaux based on the Archimedes principle, which allows a dam to hold 25 per cent more water. It works by blocking the spillway located several metres below the top of the dam, allowing the reservoir to function at full capacity. If the reservoir floods, the fusegate opens, allowing the spillway to function.

"We have set up this committee because we realize that technical, economic and financial measures alone will not answer water resource problems. We are convinced that the latter can only find a sustainable solution if human, social, political and ethical aspects are also taken on board. Big business should have a professional code of conduct and should adopt ethical rules and an environmental charter."

M. Monod believes commercial water companies have made major strides over the last 10 years in their attitudes towards environmental and social questions. "It is very clear that big companies are now under the scrutiny of public opinion and of international financial institutions which are helping to finance them, and they can spoil their reputation by behaving badly." However, M. Monod also believes that "It is our moral duty to adopt a set of rules of good conduct towards the countries where we operate, to take care of the poorest part of the population and to propose solutions." Lyonnaise des Eaux has created an independent humanitarian organization, Aquassistance, which performs some 30 missions annually in countries from Cambodia to Bosnia that have been ravaged by natural disaster, war or water shortages.

"Water is as important today as oil was in the past. Throughout history water has been a source of conflict. As water shortages and stress continue to increase, one can indeed expect the worst. Still, I am not a pessimist. But although I do not believe there will be wars over water, I am certain, however, that in political difficulties between countries, water will continue to play a very important role. For that reason, I believe it is very important that all countries should push for the signing of the United Nations Convention Regarding International Waterways", said M Monod, castigating France and the United States for "laziness" because they have not yet signed, before adding "The interministerial conference at The Hague should encourage governments to commit themselves to resolving these problems at the regional level."

"Big business should have a professional code of conduct and should adopt ethical rules and an environmental charter."

THE UN OFFICIAL "WATER-PRICE *SHOCK* NEEDED"

MOHAMED EL-ASHRY is chairman of the Global Environment Facility, an entity set up by the World Bank, the UN Development Programme and the UN Environment Programme to help governments, non-government agencies and the private sector to get together to solve some of the world's most pressing environmental problems. Water is the chief of these, and for Mr El-Ashry it is quite clear that a long-term solution to the world's increasing water shortages must include free-market pricing. He talked to PATRICK BROGAN in Washington.

Mohamed El-Ashry hopes that The Hague conference will grasp the nettle. He said: "Over the last 5 years there have been at least 2,000 conferences on water - including Rio and Dublin - as well as corresponding reports. Not much has happened. The situation is getting worse. What we lack is the political will. We have the

Vision - a very good report, with some new messages, but now we need action.

"It addresses value, the price of water. Before, everyone danced around. We agree that unless we address price, nothing can be done. Now we shall see whether the Hague ministerial conference will be just rhetoric: will anyone address pricing?"

Mr El-Ashry says that what is needed is a water-price shock, like the oil-price shock of the 1970s. "The price of oil went up and forced everybody to behave differently - and that's what needs to be done with water. With the pricing effort, you would start not only to send a signal on the value of the water, but you also start dealing with revenues so that the Government could share in the investment for the actions needed on water sanitation.

"Governments plead poverty, just like a number of poor people in the world who have no access to this resource in the first place. So how else would you raise revenue unless you start pricing those resources at the value for which they are refunded? There's nothing difficult about it except the political will."

"Another key factor, besides price, is the institutional arrangements. Now water is being looked upon in terms of its specific use - water for agriculture, drinking, industry etc etc. These ideas are too segmented. You cannot address the challenges that exist unless you start looking in an integrated way. You must look further upstream, so to speak, to the watersheds, where the water comes from in the first place, where tremendous degradation of the ecosystems has been going on for many years.

"Look at the huge floods that came after Hurricane Mitch last year. Over 10,000 people were killed in Honduras because the whole slope of the mountains was completely devegetated. And in Venezuela, which was the worst flood disaster for some time, almost 50,000 people were killed.

"We continue to refer to these events as natural disasters, but you can see the fingerprints of human action and interference all over. And we have to start thinking of them as human-related activities and deal with them that way. You end up with not enough water in the aquifers, which moderate the flow of the stream and also help people extract from them - because now the water all stays on the surface and floods down to the seas and oceans.

Fifty per cent of the surface of the earth is covered by trans-boundary river basins. That's where there is the potential for conflict, based on water withdrawal, based on water quality. It's beginning to occur,and there will be more of it as we move forward with increased population growth, increased water use and increased pollution in industrialization as a result of development.

"We shall see whether the Hague ministerial conference will be just rhetoric."

"Look at India for example. The rivers are heavily polluted in India itself, and if they clear them it is not going to be for the best interests of the neighbouring countries, it will be first in their own best interests, and the number of children that die from water-born diseases will be reduced. At the moment, 3.4 m lives are lost every year by water-related diseases, more than half of them children. And the numbers are going up, because the level of pollution is going up and so are the numbers of people using polluted water."

Mr El-Ashry evoked American experience to illustrate the point. "So that's the issue that has been reached out West, the same issue as in any developing country because water is cheap, supplied by the Federal Government. As a result, in Colorado, they will use water to irrigate hay. Now what is the value of hay compared to the value of the water that's there? Seven states have been fighting over the Colorado River, and how it ought to be apportioned. Water goes into agriculture and causes more salinity to go into rivers in California, where people complain about the salty water and how they have to treat it. The plumbing is corroded and ultimately they realized that only through cooperation were they going to solve this problem.

Mr El-Ashry is convinced that the world's problems of water shortages can be solved.

"There are solutions - when you talk about water scarcity you also have to look at what the water is being used for in the first place. You find that it is dominated by irrigated agriculture, on average more than 70per cent but when you look at some countries, it is more than 90per cent. Very inefficient. Imagine if you improved efficiency of irrigation to 70 per cent, which is possible. You would create, or generate, enough water to support all other uses several times over. And at the same time you would increase the productivity of the land, reduce salination and waterlogging."

ARE TURKS PUTTING THE "MESS" BACK INTO MESOPOTAMIA ?

It will, says Turkey, restore civilization to its very cradle. This aim for the South Eastern Anatolian Project is no less ambitious than the enterprise itself. Better known by its Turkish acronym GAP, the scheme harnesses the water system of the northern Shatt-al-Arab basin through 22 dams and 9 hydroelectric plants. When completed, it will irrigate 1.7 m hectares of land surrounding the Tigris and Euphrates - an area about the size of Austria. The political passions the GAP arouses and the issues to which it gives rise are probably no less complex. ANDREW FINKEL in Ankara picks out some of the main ones.

Although the GAP advertises itself specifically as a sustainable development project, its very scale is precisely what some find so alarming. Cumulative scepticism, post-Aswan and post-Pergau, of large prestige projects is amplified in the Turkish instance because of the politically sensitive area in which the GAP is situated. Turkey takes freshwater management seriously, but water is one resource that it enjoys by controlling the flow downstream to Iraq and Syria. The population of Turkey's southeast is predominantly Kurdish, and the indignation of environmental critics is reinforced by a general suspicion that the project's over-riding intention is to generate electricity for the rest of Turkey at the expense of the indigenous landscape and peoples. Turkish pride in their achievement is now being undermined by a new school which sees the GAP not so much as restoring the fertile crescent to its legendary prosperity but putting the "mess" back into Mesopotamia.

Civilization brings with it conflict and irreparable loss.

The project is less than half completed. Although the timetable may well slip, by 2010 Turkey expects to have invested some $ 32 billion in the schemes out of public funds. Of the $14 billion invested so far, all but $2 billion has been raised domestically. Atatürk Dam - the 10.9 billion kWh centrepiece of the project was reckoned upon its completion in 1992 to have accounted for a third of Turkey's chronic rate of inflation - then running at about 70 per cent per annum.

Latterly, the Government has sought more ingenious methods of underwriting huge construction costs. The $1.5 billion for Birecik dam currently being built on the Euphrates does not come from public money but through a self-financing (Build Operate Transfer) model. Increasing dependence on foreign participation, however, brings greater outside scrutiny.

The $1.6 billion Swiss-led investment in the hydroelectric Ilisu dam contains the comparatively modest $200 million participation by the UK-based firm Balfour Beatty. The British Government's decision in principle to

Yachts give the giant Atatürk dam an innocent air, but, as the centrepiece of the South Eastern Anatolian Project, it is helping to change the nature of the soil and even the climate, with adverse effects on the region's ecology.

grant export credit guarantees dependent on certain social and environmental preconditions has provoked fierce public debate in its own country at least. The construction of the reservoir area means the involuntary resettlement of some 2,000 families, and a similar number of households will also be affected in some way. The flooding will also submerge most of the medieval settlement of Hasankeyf and affect valuable riverine ecosystems along the Tigris. The organization Friends of the Earth describes Ilisu as "a disaster for the environment, a tragedy for the Kurdish people and a threat to peace".

"Dignified anger" probably best describes the reaction of Olcay Unver, president of the GAP administration, to this portmanteau criticism of his agency's endeavours. "All this anti-development rhetoric is fine but it doesn't deter us from developing resources for the benefit of local people," he told *World Water Watch*. In the Harran Plain where water irrigation has begun, income per capita has risen 300 per cent.

Local people are overwhelmingly in favour of the GAP, Dr Unver says - an impression not confined to his office alone. A recent US government assessment expresses genuine surprise that "the major local businessmen and human rights activists who are usually eager to criticize government programmes praised the GAP and the benefits it will bring".

The most frequent objection to the GAP inside Turkey is its cost rather than its goal of tackling the huge inequality between the prosperous west of Turkey and the impoverished east. The GAP is clearly an imperfect mechanism for distributing wealth within the region itself, but many regard it as "the only game in town".

Most of medieval Hasankeyf and valuable ecosystems along the River Tigris are due to be flooded.

to its neighbours in the next 40 years. Ankara's proposals run short of surrendering "water usage rights" but it has a clear incentive to co-operate since a proper international agreement would give it wider access to World Bank and other finance.

Far from being a cause of friction, the need to share water could become a reason for cooperation. Water is obviously not the source of conflict with Baghdad. Local chambers of commerce in Gaziantep or Diyarbakir argue that the region will remain impoverished as long as UN-imposed sanctions against Iraq remain in place.

Turkish demand for electricity clearly drives the project on and enjoys the lion's share of the funds so far committed. The demand for power is expected to increase at 8 per cent per annum, requiring some $60 billion worth of investment by the year 2010, according to official estimates. This figure could be halved, according to World Bank reports, if Turkey could increase the efficiency of its existing plants and also reduce distribution losses in the national grid. Even so, there have been power cuts in Turkish cities. With access to natural gas from the former Soviet Union still subject to uncertainty, it becomes easier to understand Turkish eagerness to increase its hydroelectric capacity.

"It is a question of luck whether important habitats will be saved."

The notion that GAP will lead to a water war is not taken with great seriousness in Turkey if only because the country enjoys clear military superiority over the other riparian states. A crisis with Syria did come to a head in October 1998 not directly over the flow of water but Damascus's support for the Kurdish PKK. Then Syria surrendered to Ankara's démarche.

Turkey, with its far more sophisticated water management, argues, again from a position of strength, that international agreement is necessary to allocate this scarce resource. Rates of evaporation in deep and cooler Turkish reservoirs are between 300 and 500 per cent less than facilities down stream. A self-interested but valid argument is that a better regulated flow of water combined with more rational usage can compensate for the dramatic reduction in the amount of water that Turkey will leave

For all that, the GAP "is not a dam or an irrigation project," Dr Unver insisted, "but an integrated socio-economic development project". He maintains that the GAP is "committed to minimizing the environmental impact according to international standards". The obligations he faces are ones that many of the great infrastructure projects in the West 30-40 years ago blissfully neglected. Foreign observers of the GAP confirm that the adminis-

The biggest danger from irrigation is salination of the soil as farmers take advantage of the demand for water-intensive cotton.

In the Harran Plain, where water irrigation has begun, income per capita has risen 300 per cent.

tration listens to advice and is eager to ascend the learning curve.

Such praise is not always showered on the GAP's main institutional partner, the State Hydraulic Works (DSI). Environmentalists in Turkey complain that the DSI's attitude is itself caught in a 1950s time-warp and simply refuses to take environmental priorities on board.

Building dams is what the DSI likes best. It has built 175 of them throughout the country. This enthusiasm for engineering , according to the Society for the Protection of Nature (DHKD), the Turkish affiliate of the World Wide Fund for Nature, is often at the cost of well documented conservation hot spots - not just in the GAP region but throughout the country.

The British DTI review of the Ilisu environmental impact report endorses the view that concern to preserve biodiversity is very much “hit and miss”. It is a question of luck whether

Plants irrigated under glass contribute to the rise in the standard of living.

important habitats will be saved, according to DHKD's bio-diversity programme director, Guven Eken. The DHKD has declined to commit its efforts to the GAP for the simple reason that it believes the major decisions have already been taken.

The threat to Bern Convention species is real both along the Tigris and further west along the Syrian border where primary steppes are being

This village is likely to be transformed as a result of the rural economic boom.

converted from dry to wet farming. Mr Eken cites the Euphrates green turtle *(Rafetus euphraticus)*, Persian gazelle *(Gazella subgutturosa)*, the lesser kestrel *(Falcon naumanni)*, pied kingfisher *(Ceryle rudis)* and the collared pratincole *(Glareola pratincola)* as being all at risk.

The economic and social benefits versus the environmental costs are much more difficult to calculate within the GAP area itself. "There is an awareness at least that the costs have to be managed properly," said Orhan Yenigun, Professor of Environmental Science at Istanbul's Bogazici University. Irrigation is, of course, the engine of the prosperity the GAP is

As a result of the GAP project fields in the Harran plain are becoming more fertile.

intended to bring, but it changes the soil, even the climate as the area is transformed from arid to semi-tropical. The greater danger is from salination of the soil as farmers cash in on demand for water intensive cotton.

The greatest need is for extension training in new farming techniques, cautioned Professor Yenigun. That and patience. "Farmers have to resist the temptation to turn on the tap and

The main canal in the Harran plain is a key element in the masssive irrigation plan

learn to wait for the rain instead," he said. Education will not be enough, others argue, and the water itself must be priced to include an environmental cost. For that to happen, Turkish politicians would have to be braver than their reputation warrants.

Turkey may well have succeeded beyond its wildest expectations in restoring civilization to its historic birthplace. Civilization, after all, brings with it conflict and some irreparable loss.

The greatest need is for extension training in new farming techniques.

A PIPE OF PEACE FOR CYPRUS

Cyprus may prove the exception to the conventional wisdom that water shortages are becoming the new source of friction between nations. The thirst for freshwater could turn out to be a vital incentive in bringing together Greek and Turkish Cypriots after 26 years of separation.

Later this year, construction is due to begin on the world's first floating pipeline, which will take water from the Turkish mainland a full 78 km to the arid island. The pipeline has an annual capacity of 75m cu metres, only a third of which is necessary for the Turkish north of the island. The project's backers hope that the excess water will tempt the Greek side to supply electricity in return.

The implementation of a contract signed 2 years ago now coincides with a new spirit of co-operation between Ankara and Athens. During his recent visit to Turkey, Greek Foreign Minister George Papandreou said that improved relations between the mother countries could well be the spur towards a settlement on Cyprus. Mutual dependence for basic public services could give an additional push.

The "peace pipeline", made of high-density polyethylene, will take water from the Dragon River near the Mediterranean town of Anamur 160 metres below the surface. The lighter density of freshwater means that it will float, anchored to the seabed with an ingenious system of weights and pulleys. In case of repairs, a remote control extends the cables, allowing the pipe to come to the surface.

The scheme is the brainchild of the Istanbul-based engineering firm Alsim-Alarko which will lead a consortium of Finnish, Dutch and Swedish companies. Alarko chairman Ishak Alaton explained that his proposal was enthusiastically received at a high-powered conflict resolution meeting between Greek and Turkish businessmen in Istanbul in December 1998. Also in attendance were Richard Holbrooke and Britain's Sir David Hanney, both of whom have been round and round the conference table in an attempt to broker a settlement. The official blessing, particularly of the United States, is seen as a key factor in securing the $300m finance.

About one tenth of the river's flow will be diverted. This could affect migratory species which travel from salt to fresh water like the European eel *(Anguilla anguilla)*, estimates marine ecologist Bayram Ozturk. However, additional impact of the project is likely to be minimal since there are already dams at both ends of the projected pipelines. These will be strengthened and extended.

The Turkish north is still dependent on agriculture. In addition to irrigating citrus groves, the water will be used to create a 7,674 hectare irrigation project on the potentially fertile Mesaoria Plain. The south chiefly requires water for domestic use and its large tourist industry. At present water is shipped from Turkey in tankers and large "Medusa" bags. The Greek Cypriots have been planning to meet their requirements with desalination plants.

The current estimate is that it could take up to four years for the water to come on tap. By that time the Republic of Cyprus could well be a member of the European Union, and Turkish candidacy much further down the line. Although the Turkish Government is the contracting party, one suggestion is that not just the pipes but the whole project could itself be floated in the further interest of peace - albeit on the stock exchanges in Athens, Istanbul, and Nicosia.

ANDREW FINKEL

SPONSORED BY THE RAMSAR CONVENTION ON WETLANDS

RAMSAR AND WATER - PREPARING THE TOOLS

Very shortly the secretariat of the Convention on Wetlands will publish its series of handbooks to assist governmental and non-governmental institutions in its 119 contracting parties, and in non-member countries, in the task of conserving wetlands and using them sustainably. The most relevant handbook related to water management issues is Ramsar Handbook No.4, entitled *Integrating Wetland Conservation and Wise Use into River Basin Management.*

The Ramsar guidelines

The handbook is based on the guidelines on this subject adopted by the 7th Meeting of the Conference of the Contracting Parties to the Convention on Wetlands (Ramsar, Iran, 1971), held in Costa Rica in May 1999. The guidelines are based on the understanding that wetlands perform a host of ecological and hydrological functions that benefit humankind.

They also recognize that river basins or river catchments, as well as coastal and marine systems influenced by catchment discharges, are important geographical units for considering the management of wetlands and water resources. Ramsar contracting parties accept that appropriate protection and allocation of water to wetlands is essential to enable these ecosystems to survive and continue to provide important goods and services to local communities.

The Ramsar guidelines were conceived because, although the need to integrate wetlands into river basin management has been recognized by many governments and global institutions, no clear guidance on how to do so has been prescribed under the Ramsar Convention on Wetlands.

The guidelines cover 12 areas, providing guidance to countries on issues such as:

- development and strengthening of policy and legislation for integrated water resources management;
- establishment of river basin management authorities and strengthening of institutional capacity;
- involvement of stakeholders, community participation and public awareness;
- assessment and enhancement of the role of wetlands for water management; and
- identification of current and future supply and demand for water.

The guidelines also cover issues related to the impacts of land use and development projects on wetlands and their biodiversity; the need to preserve natural water regimes to maintain wetlands; wetland restoration; the management of shared river basins and wetland systems; and the need for partnerships with relevant conventions, organizations, and initiatives.

The Ramsar Conference of the Parties, after recommending the guidelines, urged all contracting parties to give priority to their application, adapting them as necessary to suit national situations, and commended the guidelines for consideration by all multilateral and bilateral donors to assist and guide their planning, project assessment and decision-making in matters of integrated water resources management.

Ramsar Handbook No. 4 contains the guidelines and a number of case studies that demonstrate the application of the approach recommended in the guidelines.

Using the guidelines

The Ramsar Convention Secretariat, in cooperation with the Secretariat of the Convention on Biological Diversity (CBD) and the support of a number of partners, is presently planning to launch what may be called "The River Basin Initiative". The initiative will aim at establishing a network to link and support activities and projects in which the principles and practice of integrated management of biodiversity, wetlands, and river basins/catchments/watersheds will be demonstrated.

The overall objective of the initiative will be to promote and facilitate integrated management of wetlands, biodiversity and river basins worldwide.

Hamun Lakes in the Islamic Republic of Iran: in arid and semi-arid lands, wetlands are an especially precious resource, as they store water, provide refuge sites for many species and supply food and water for local people. *Photo: D.A.Scott*

Its expected outcome in the short term will be a number of successful initiatives in at least 20 countries to achieve this objective, as well as significant progress by contracting parties in implementing relevant provisions of the CBD and Ramsar, enhanced partnerships in the area of integrated wetland/biodiversity and river basin management, and the establishment of an information network to facilitate exchange of information and experience.

The secretariat of the initiative will be based at the Global Environment Centre in Malaysia, with the support of the Ramsar and the CBD secretariats. It is expected that the initiative will be formally launched on the occasion of the 5th Meeting of the Conference of the Parties to CBD, to be held in Nairobi, Kenya, on 15-26 May, 2000.

Wetlands and hydrology

In a related development, the Ramsar secretariat is supporting the publication by the Station Biologique de la Tour du Valat, in France, of a booklet entitled *Wetlands and Hydrology*, by Dr. Mike Acreman, within the series "Conservation of Mediterranean Wetlands".

In the preface, the Secretary General of the Convention on Wetlands, Delmar Blasco, writes: "For many years the emphasis has been placed on the biodiversity of wetlands - mostly their birds, but also their amphibians, fishes and invertebrates, and their flora - to a large extent ignoring the essential component of a wetland - the presence of and the need for water. But a change is taking place: more and more we are integrating into our concerns this essential component of wetlands, and from a double perspective.

"On the one hand, wetlands need water in adequate quantity and of the right quality in order to maintain their health and support their biodiversity; and on the other hand, wetlands in many cases perform very significant functions in the water cycle. These functions also help to maintain biodiversity, and in addition they provide significant benefits to human societies, not only to those that are settled in the vicinity of wetlands but frequently also to large numbers of people who live far away from them. An example would be the cities located at the mouth of a river which benefit from the flood-regulatory function of the wetlands located up stream."

In the publication it is recognized that wetlands in particular have suffered during past water management schemes due to a misunderstanding of their role in the hydrological cycle. They were considered merely to evaporate vast quantities of valuable water and harbour diseases.

Thus, the purpose of the publication is to explore the relationship between wetlands and the hydrological cycle. It gives details of the hydrological components of wetlands, the extent to which different wetlands can regulate floods, sustain flows during dry period, and recharge groundwater. The booklet concludes that sustainable water management is best achieved through judicious utilization of the natural functions of wetlands in conjunction with new technologies for controlling the hydrological cycle.

The Mekong River Commission covers Cambodia, China, Laos, Myanmar, Thailand and Vietnam, working together for the integrated water resource management of this major river system. ***Photo: Ramsar/H.Lethier***

For copies of the Ramsar Handbook No. 4 on *Integrating Wetland Conservation and Wise Use into River Basin Management*, in English, French or Spanish, contact the Ramsar Convention Bureau in Gland, Switzerland:
email ramsar@ramsar.org
Fax: 41-22 999 0169.

For more information on the "River Basin Initiative"(title to be confirmed), write to Faizal Parish, Global Environment Centre, in Malaysia:
email fparish@genet.po.my
Fax 60-3 757 7003;
or to Nick Davidson,
Deputy Secretary General,
Ramsar Bureau,
email davidson@ramsar.org
Fax 41-22 999 0169.

For copies of *Wetlands and Hydrology*, in English, French or Spanish, contact the Station Biologique de la Tour du Valat, in the Camargue, France:
email taris@tour-du-valat.com
Fax 33- 4 90 97 20 19.

THE FORGOTTEN V

ICTIMS OF ORISSA

Brought up in the poor village of Nanpur, in the Indian State of Orissa, PRAFULLA MOHANTI found success as an architect and planner, a painter and a writer, dividing his time between his home in London and the place of his roots in India. Last year, a violent cyclone devastated the coastal region of Orissa, which has a population of nearly 15m and an area of 1,000 sq miles (2,650sq km). Last month, the local boy who made good went back to Orissa for the first time since the tragedy. His story, which he sent exclusively to *World Water Watch*, is a devastating indictment of Orissa's authorities. It could all too easily be repeated after the more recent cyclone in Mozambique.

On October 29, the wind blew at a speed of 160 miles (424km) per hour, hovering over the land like a giant vulture, bringing with it torrential rain, destroying everything — houses, trees, cattle, crops, human beings, their hopes and lives. A 20ft (6metre) tidal seawave roared over the land from the Bay of Bengal like a white wall, moving 15 miles (26km) inland, sucking out entire villages. It paralysed the state capital, Bhubaneswar, and its neighbouring commercial town of Cuttack, which was submerged in chest-deep water. It deprived the area of electricity, telephones and drinking water. Cholera and typhoid broke out.

I was in London at that time, and the pictures of devastation and suffering I saw on my television screen horrified me. I was desperately anxious to know about the fate of my village, Nanpur, situated in the cyclone region. I felt helpless, as it was impossible to get any direct news. Orissa was cut off from the rest of the world.

After trying to telephone for several days I was suddenly connected with Jhulia, a relative from Nanpur who works as a tailor in Cuttack. He is married with three grown-up children — a son and two daughters — and lives in a small house with two rooms. Jhulia was amazed to hear my voice.

"We are lucky to be alive," he said. "I did not think we would survive. The gale was so violent that it broke the doors and water came pouring into the rooms. There was no light, it was all dark. All I was able to hear was the roaring sound of the wind and the trees breaking. I had never heard such noise before and I hope I won't again. We were terrified. The wind continued all next day. It was not possible for any of us to get out of the house and find out what had happened to our neighbours. Then the wind subsided, but the rain continued. The neighbourhood is flooded and contaminated with water from the open sewers. I am worried about cholera and typhoid and we are boiling the rainwater for drinking."

"I went to Nanpur the day after the cyclone. It took me 10 hours to travel the 30 miles; the roads were blocked with fallen trees and dead animals. You won't be able to recognize the village. All the mud houses have collapsed, including your ancestral home, but your studio has survived. Over a hundred people have taken shelter there."

"The next day I went to see my sister, who works in a town 15 miles from the sea. The whole area was flooded and there were piles of dead bodies lying around, rotting. Whole villages have disappeared."

Now, three months later, I too am in Orissa. Wherever I go I see fallen trees, collapsed houses and shattered human beings with their terrifying tales of survival. People have no shelter, no food and no work. The reality is more horrifying than I had imagined.

In Nanpur, the house my father built with love and care and where I spent a happy childhood with my mother, has been ravaged by the cyclone. The old trees under which I played as a child with my friends have been uprooted. New leaves have started to grow on those fallen trees that still have a few roots attached to the soil.

As I walked around the village, I saw families living in little huts made with bamboo and straw salvaged from the cyclone. "We did not think the cyclone would be so severe", they told me. "When we saw huge branches of trees flying in the sky like little leaves, we got frightened and ran for shelter in our neighbour's concrete house. From there we watched helplessly our houses collapsing. We had no food for 2 days and drank rainwater.

"When the storm subsided we went to see our houses and possessions. The rain had washed away the mud walls, and our food and clothes had perished. We have no money or investment to rebuild our houses. All our crops have been destroyed and we have no seeds for the next season. We have lost everything. A week after the cyclone we were given a few kilos of rice, but we understand that other items like blankets, clothes and foreign goods came as outside aid, but the politicians and bureaucrats kept them. The Government has distributed 1,000 rupees (US$23) to those whose houses have been partially demolished and 2,000 rupees for those

Dead and dying trees by the polluted village pond in Nanpur

completely destroyed. But how can we build a house for 1,000 rupees? A piece of bamboo costs 100 rupees and a labourer charges 50 rupees a day. Some of us spent that money on buying food for our children.

"Now the Government has called an election. WE DON'T WANT AN ELECTION. We want shelter, food and work."

People were poor before the cyclone, and now they have lost everything. Previously the poverty was hidden behind beautifully decorated mud walls and flowering trees, but now it is exposed.

Rotting leaves and animals have polluted the river, the ponds and the wells. Several villagers are suffering from typhoid, dysentery, hepatitis, colds, coughs and fever. There is no hospital or doctor in the village and medicines, available in the local market, are expensive.

I visited villages near the coast. The roads were not even fit enough for cattle, let alone motor vehicles, and I walked across parched paddy fields lined with salt and seashells brought in by the tidal wave. The smell of death and decay still lingered, and I saw several dead bodies of men, women and children, mummified by the salt and the sun.

A few damaged coconut palms stood in the middle of the barren paddy fields spreading to the horizon to tell people they were once planted by human beings that lived there. Out of a population of 700 only a few have survived. Mendal, a fisherman, is one of them. He is 40 and lived with a family of 35. Now only four remain.

"The day before the cyclone", Mendal related, "we were asked by the Government through loudspeakers to leave our homes and go to safe areas. But we didn't take the warning seriously.

"When I woke up next morning it was very dark and I heard loud thunder at a distance. Suddenly the house was submerged in water. We all climbed up to the roof. Then, after a few seconds, a wave came and broke the roof into little fragments. I held on to a portion of the roof, which was turning round and round in the water. I looked around for my family members. The entire land had become the sea.

"I saw my elder brother holding on to a piece of bamboo. He cried out 'Help me. I'm going to die.' With great difficulty I caught hold of him by one arm but I must have become unconscious. When I came to my senses I found that my brother had slipped away from my arm. I was being carried away by the current and the force of the wind but didn't know where and in which direction. It was all dark. Suddenly I landed on a palm tree and caught hold of its trunk. Then it became light for a few seconds and I saw a temple at a distance. With the help of a piece of bamboo I walked towards the temple in chest deep water. Its doors were open and I went inside. I was cold and thought I was going to collapse. Then from the temple verandah I saw a two-storeyed building. I waded there and called for help.

"The house belonged to a Brahmin and nearly 300 people had taken shelter there. His two sons took me inside, covered me with a blanket and looked after me. The next morning my 12-year son arrived there looking like a wounded dog. His eyes were blinded by the salt water. I nursed him and thought that if we were alive then others must be living. The water had subsided so I went searching for them. I saw hundreds of dead bodies lying around and found my beautiful daughter among them. A

few feet away was my wife's lifeless body. Next to her was my 15-year-old son. Then gradually I found the rest of my family members — all dead — except my brother's 9-year- old daughter and wife."

At another village near the sea the survivors were angry. "We want shelter and food, not an election." They thought I was a party politician who had come to them to ask for their votes. How callous it was for the Central Government to call an election when the villagers are so traumatized by the cyclone. How can they be in a fit state to choose a political party or a candidate?

"Not a single politician or bureaucrat has been killed by the cyclone, only the poor have suffered" I was told by Dr Chitta Ranjan Das, a distinguished social historian. "They never imagined the cyclone would be so great and get worldwide attention and that such a large quantity of aid material, both from India and abroad, would arrive on their doorstep.

"They became greedy and misappropriated most of it. Items appeared in the press about corruption in both high and low places. One official was suspended, but no action has been taken against him. If you appoint a thief to distribute goods, he will steal them because that is his nature. The ministers and the government servants of Orissa during its long Congress rule have stolen most of the money that should have been spent on development programmes."

The welfare of the victims is being politicized. Instead of helping them to reconstruct their lives and find hope, millions of rupees will be spent by the political parties to gain power. The whole government machinery is being used for the election, and all relief work has stopped.

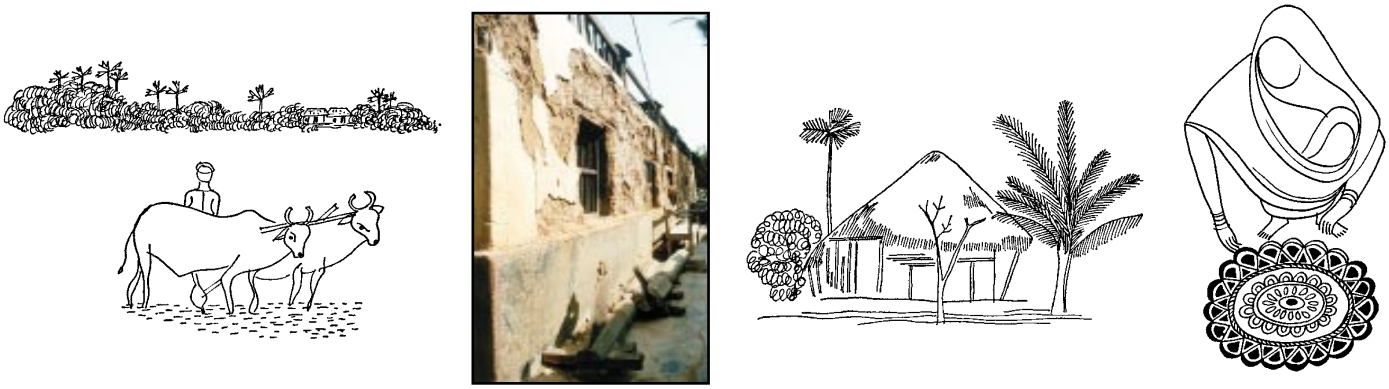
But there is a tremendous energy to live. Although vast areas of land remain barren due to salination and lack of irrigation, the farmers are growing rice where a little water is available. Some are washing their fields with fresh water, lifting it manually from the river and growing crops, without waiting for any outside help.

The Orissa Government publicizes the help it has given and charity organisations from abroad have collected large sums of money in the name of the Orissa cyclone victims. But any contribution they have made is not visible, as four months after the cyclone thousands of people have no home, no food and no safe drinking water.

As I look around I see no evidence either of assistance from the United Nations or foreign governments. Wherever I go the victims cry out for help: "Where to stay? What to eat? How to survive?" How can the world be so indifferent and let them suffer?

Yet, with vision, compassion and dedication the entire region could be transformed by planned villages with good housing, clean drinking water, proper sanitation, schools, hospitals and cyclone shelters. An efficient communication system is essential with comprehensive irrigation projects to ensure that not a single piece of land remains unnecessarily barren. There must be immediate planting of trees to replace the thousands destroyed by the cyclone. To miss this opportunity to reconstruct this traumatized region would be a crime against humanity.

The author's cyclone-battered family home with drawings from his book* My Village, My Life — Nanpur: A Portrait of an Indian Village, *written and drawn by him in happier times.



The cyclone has revealed the apathy, corruption and callousness of the politicians and bureaucrats of Orissa. Why were they not ready to face the destruction caused by the cyclone when its neighbouring state of Andhra Pradesh was well prepared and came forward to help? Its Chief Minister engaged his entire government machinery, well equipped with doctors and engineers to cope with the devastation in Orissa. They came immediately and started clearing the blocked roads, repairing electric and telephone lines, connecting the Government of Orissa to the rest of India. They also distributed truckloads of food.

In 1971 a cyclone killed 15,000 people in the same region of Orissa but the Government learned nothing from it.

SPONSORED BY THE WWF LIVING WATERS CAMPAIGN

HEEDING THE SILENT PLEA OF NATURE AT THE SECOND WORLD WATER FORUM

When world leaders gather in The Hague in March for the Second World Water Forum, freshwater ecosystems could get a new lease on life. At least this is the hope of WWF.

At the Forum, NGOs, governments, business, and just about anyone who confronts freshwater issues daily will grapple with the freshwater crisis. It is a crisis that will escalate if human population projections come to pass and if some current approaches to management of freshwater persist.

Will this world gathering amount to another week of opinions, theories and abstract recommendations or will the Forum's central theme - "vision to action" - result in steps towards a future where nature and people all benefit? The Forum boasts multimedia, interactive displays and an unprecedented world water fair; the show on which WWF will focus takes place inside the meeting rooms where ministers are expected to adopt a declaration one hopes will be a watershed for the sake of future freshwater supplies and the environment.

Despite the overwhelming evidence that environmental quality forms the basis for improving the quality of human life and that biodiversity loss hurts people, much of the world still considers environmental protection and human development as separate and even opposing objectives. Freshwater ecosystems are often portrayed as competing users of water, rather than as the ultimate provider of high-quality water used by human beings. In fact, healthy ecosystems and human development depend on each other. Industrial developments are often based on freshwater resources and provisions: any shortages or interruptions will have costs, economic and otherwise. The harm we do now to freshwater ecosystems through short-sighted development will come back to us at a much greater cost. WWF believes that conserving and protecting the natural water cycle and associated freshwater ecosystems needs to be seen as an economic imperative.

Professor Ruud Lubbers, President of WWF and former Prime Minister of The Netherlands, addressed policy-makers at the museum of Leiden this month to call for action that conserves fresh water for the future in ways that benefit nature as the source.

Photo: WWF-Canon/ WWF International

Talks at the Forum will last about five days, the same length of time in which floods in the Yangtze River last year resulted in losses totalling US$25 billion. It is critical that the World Water Forum fulfils an imperative to deliver strategies that conserve nature as the source of freshwater. The World Water Forum is an opportunity to build on progress to date. For example, one of the key elements in Agenda 21, adopted at the Earth Summit in Rio de Janeiro in 1992 is integrating wider ecological concerns and economic growth with provision of basic human needs such as drinking water. Agenda 21 also calls for "maintenance of ecosystem integrity, according to a management principle of preserving aquatic ecosystems, including living resources, and of effectively protecting them from any form of degradation on a drainage basin basis."

WWF has a long history - some 30 years - in conserving freshwater ecosystems, having recognized their crucial importance for both people and wildlife. In May 1999, WWF launched its global Living Waters Campaign to highlight the crucial role of freshwater ecosystems in water management and to accelerate actions that tackle the water crisis. Working with partners around the world, the Campaign aims to achieve the following targets:

- Demonstrating sustainable approaches to water management in at least five catchments - approaches that balance long-term human uses and biodiversity conservation; and
- Increasing, by 50 per cent, the area of the world's freshwater ecosystems that are newly designated for protection, restoration or effective management - commitments that include a total area in excess of 25 million hectares.

In "WWF's Call to World Leaders on behalf of the Future of Fresh Water", WWF urges a global response to the freshwater crisis that recognizes that:

- **Restoring and conserving the actual source of water** - the water cycle and the natural ecosystems that support it - is the basis for sustainable water management;
- **Environmental degradation is preventing us from reaching goals** of good public health, food security, and better livelihoods world-wide;
- **Improving the quality of human life** can be achieved in ways that also maintain and enhance environmental quality;

• **Reducing greenhouse gases to avoid the dangerous effects of climate** change is an integral part of protecting freshwater resources and ecosystems.

For thousands of years, humans have exploited freshwater resources and ecosystems. Ancient human societies have traditionally recognized water resources in practical as well as symbolic ways. Failure by modern societies to deal with water as a finite resource is leading to unnecessary destruction of rivers, lakes and marshes that provide us with water. This failure in turn is threatening all options for the survival and security of plants, animals, humans - in fact all life - on Earth.

Freshwater ecosystems are home to diverse species around the world such as this American alligator in the Everglades. *Photo: WWF-Canon/Y.-J. Rey-Millet*

Like a giant engine, working day and night to provide a life support system for the planet, the water cycle and the ecosystems that support it are essential to the availability of adequate freshwater. This natural occurrence, often taken for granted, allows for water to be purified, recycled and made available to people, plants and animals in areas as different as tropical rain forests, polar ice fields and moorland bogs. But the engine is misfiring and today, freshwater ecosystems are among the most degraded of all habitats.

Nature has now sent us its invoice for development at a high price. While certain schemes have improved the quality of life for many people, they have entailed approaches that threaten to wipe out the very environment that sustains it. We have built dams and weirs and have channelled rivers to control the flow of water. We have, through deforestation and drainage of lakes and wetlands, reduced the capacity of the landscape to retain rainfall and recharge underground water supplies. We continue to discharge pollutants into aquatic ecosystems both directly and over land, through the groundwater and by atmospheric deposition. And we have released great quantities of greenhouse gases into the atmosphere, thus changing the climate of the entire planet.

In spite of some progress, the majority of human beings face either insufficient amounts or poor-quality water. Water-related problems include hunger and malnutrition, inadequate water supply and sanitation, floods, effects of climate change and loss of species diversity leading to collapse of ecosystems. For some countries, recognition of a water crisis may have come too late. Neither lack of "technologies" or financial resources can explain the crisis; it is due rather to ineffective management.

Positive change is possible if we recognize that sustainable water management begins with restoring and conserving the source of water. To maintain the water cycle and its natural functions, WWF is calling on the international community — governments, trade organizations, businesses, non-governmental organizations, and individuals — to make strategic shifts in natural resource use:

• **Make rivers safe**: to improve human health through the reduction and prevention of discharges of man-made pollutants in all major rivers and lakes.

• **Shift from irrigated agriculture:** to meet increased basic food needs using rain-fed agriculture, micro-irrigation, and production of wild fisheries.

• **Manage the demand:** to meet increased water supply needs through efficiency gains in urban areas, recharging aquifers in rural areas, and improving irrigated agriculture.

• **Promote renewable energy:** to meet increased energy needs by substantially increasing demand-side management and renew-able energy sources.

• **Avoid flood damages:** to eliminate further loss of human life from floods using non-structural approaches and ecosystem restoration.

Nature has now sent us its invoice for development at a high price.

Nature is the source of freshwater and the destruction of nature is the source of freshwater-related problems. Conserving nature is therefore a logical starting point for addressing the current water shortages and poor water quality.

WWF's ultimate goal is to stop, and eventually reverse, the accelerating degradation of our planet's natural environment and to help to build a future in which humans live in harmony with nature. Gatherings such as the World Water Forum and exchanges among nations can prove useful only if we allow nature an equal voice.

For more on WWF's freshwater work, visit http://panda.org/livingwaters/

One of the siltscreens protecting the lake during clean-up work.
Left: excavating contaminated sediment. Most pollution will be locked in place with a protective layer of gel.

SWEDEN ADOPTS NEW TECHNIQUE TO COMBAT MERCURY POLLUTION

To look at, Lake Turingen appears just as a lake in rural Sweden should, with clear water and a setting of picturesque woodland, KEITH HAYWARD, editor of Water 21 - The Magazine of the International Water Association, reports. The truth though is that the lake is contaminated with mercury, so much so that the fish that live in it contain four times the amount of mercury allowable for human consumption.

"You cannot believe the lake is contaminated. The scenery is very beautiful", comments Ronald Bergman, who is responsible for a project that is under way to clean up the lake. He explains though that the people who live close to Lake Turingen know very well about the pollution: health restrictions on eating fish from the lake have been in place since the late 1960s.

The mercury pollution is a legacy of a paper mill that was operated in the nearby town of Nykvarns from 1944 to 1966. The paper-making process used lots of water and high temperatures. This led to the growth of slime in the equipment, so toxic mercury compounds were added to prevent the slime from growing. In turn the mercury ended up bound to wood fibres in the wastewater from the paper-making process.

Some precautions were taken to help to ensure the paper mill did not pollute the local environment. Two small dams were built to create ponds through which the wastewater had to pass. This allowed the wood fibres to settle out before the wastewater entered the stream that feeds Lake Turingen. But fibres were washed out despite these measures, and continued to be after the mill closed.

In all it is estimated that up to 400 kg of mercury was released in wastewater from the paper mill. Some remained behind the dams, but most escaped over the years into Lake Turingen. Not only this, some has subsequently been washed downstream from Lake Turingen into Lake Mälaren. Lake Turingen is a relatively small lake, just 3 km long. Lake Mälaren is about 100 km long, in fact Sweden's third largest lake, so the pollution has less of an impact. Nonetheless, it is the source of drinking water for the Swedish capital Stockholm.

The pollution of Lake Turingen is of wider concern as well. Upstream of Lake Turingen lies Lake Yngern. This is a pristine lake which the Swedish Environmental Protection Agency hopes to designate as a protected natural area. One reason for doing so is that the lake supports populations of the mayfly *Heptagenia sulphurea*, which is rare at this latitude. Retaining the genetic diversity in Lake Yngern would be an important part of its protected status, and pollution of Lake Turingen, as part of the same aquatic system, could threaten this.

The Lake Turingen Remedial Project was launched in response to this problem. This is being supported by the European Union's LIFE fund and by the Swedish Environmental Protection Agency, as well as receiving funds from local municipalities.

It was clear what to do about the pollution remaining in the ponds behind the dams. Bypass channels were constructed around them to ensure no more sediment could be washed out. It was less clear what to do about the pollution in Lake Turingen. One possible solution would be to dredge out the polluted sediments and to treat them in some way, but even if a technique were available this would be prohibitively expensive. Similarly, the dredged sediment could be placed in a surface disposal facility such as a landfill. Again this would be expensive and difficult because of the need to

remove water from the sediment, and in a sense this approach only transfers the mercury problem elsewhere.

Instead of these options it was decided to keep the contaminated sediment in the area but to isolate it so that it no longer presented a risk. Two approaches were identified- one conventional, the other a world first.

The first phase of the remedial project got under way early last year and used conventional methods to isolate the pollution. Most of the contamination in Lake Turingen, about 100 kg, had accumulated around where the stream enters the lake. The section of the lake bottom closest to the mouth of the stream was dredged using mechanical excavators. The contaminated sediment was then placed in one half of a narrow bay adjacent to the mouth. The bay had become overgrown with reeds, so the other half was excavated as well and the excavated material placed with the contaminated sediment.

In a process known as capping, a fabric-like material known as geotextile and layers of clean sand and gravel were then placed on top of the excavated material to form new land. The bed of the lake around the stream mouth was also capped. So was another small bay near by, where a lot of sediment had also accumulated, although it was capped using geotextile and a thicker layer of clean material.

One problem with dredging is that it mixes sediment with the water above, entailing the risk that pollution is spread throughout the lake. Special precautions were therefore taken during the remedial work. Fine mesh screens of geotextile were suspended from floats to create a barrier. Two of these silt screens were used, an inner one close to the work and an outer one at the limit of the mouth area. Tests have shown that these successfully prevented sediment from reaching the rest of the lake.

Most of the first phase has been completed. Work had to stop for the winter but is due to be completed early this year. The lake will then be monitored for the rest of the year to check on progress and the impact of the first phase work. A second phase of work will then follow in 2001. This will use a new technique which has been undergoing development for several years through involvement of the company which provides it, Vattenresurs, with the remedial project. While final tests still need to be carried out on the method, a trial run in the lake was carried out successfully last year.

The plan is that in the second phase of the remedial project a layer of gel will be created over the bottom of 80per cent of the lake's total area of about 100 ha. This will keep the contaminated sediment in place but will also allow the lake bottom to be recolonized over subsequent years.

The techniques use a chemical that is routinely used in drinking water treatment - polyaluminium chloride. A barge will be used to introduce the chemical to the lake bed, where it will precipitate to form a gel of aluminium hydroxide. A very pale yellow in colour, this soft gel will be 3-10 cm deep, the exact figure to be finalized by ongoing tests. It will also be necessary to add sodium hydroxide at the same time, to make shure that the pH of the lake is not changed.

Although the work is still to be carried out, latest estimates are that this approach will cost just 15 per cent of the cost of dredging the lake and removing water from the sediment, and only one third of the cost of capping the whole lake.

It will still probably be a matter of years before mercury levels in the lake's fish return to normal, but it will be far quicker than if the lake were left as it is. And the work will begin another process - restoring the confidence of the local people. "I believe the work is very important for them", commented the project manager Ronald Bergman, while pointing out that the restrictions on eating fish from the lake have also created worries about whether it is safe to swim in the lake.

NEW DEFENCE AGAINST DRY-CLEANING SOLVENTS

One of the most insidious forms of pollution of the aquatic environment comes from chlorinated solvents seeping into the soil and groundwater from activities such as dry cleaning. A new approach that has been developed to tackle such pollution works by promoting bioremediation. Bioremediation is the term given to the degradation of pollutants by microorganisms, where specific microorganisms able to degrade particular pollutants are added or where microorganisms already in the environment are encouraged to degrade the pollutants.

This new approach falls into the latter category, and involves adding a chemical - a polylactate ester - to the contaminated soil or groundwater. Contact with water causes the release of hydrogen, whose availability supports the degradation activity.

The new technique, known as hydrogen release compound(HRC), is being offered by consulting engineering company Montgomery Watson and US technology company Regenesis of San Clemente, California. Pollution from chlorinated solvents tends to spread and HRC is intended as a means of stopping the spread of such pollution plumes and reducing the levels of pollutant in the environment.

Early trials of HRC have already been carried out in the United States, one at a dry cleaning company in Wisconsin, the other at a manufacturing plant in Iowa. In the first of these the HRC was injected into the polluted area while in the second canisters filled with solid HRC were placed in barrier wells.Both trials gave positive results.

Other possible applications of HRC include tackling pollution at military installations.

KEITH HAYWARD

THREAT TO MADAGASCAR LAKE FROM CEMENT PLANT

HABITAT FOR 63 BIRD SPECIES IN DANGER

Tsarasaotra Park, right in the centre of Madagascar's capital, is home to a rich collection of 63 bird species and has been proposed by Madagascar as the first Ramsar private wetland site in the world. But for the last two years the lake and its surroundings have been polluted by a nearby cement mixer plant. With the support of the local people, the owners of the park are demanding relocation of the plant, but they have come up against the Government's determination to achieve its electoral promise to build up to 35,000 housing units, VOAHANGY RAKOTOARIVELO reports.

Left top: a simple wall separates the Macoma cement mixer plant from the Tsarasaotra park in the west of Antananarivo, Madagascar's capital.

Left and below left: views of the park, which is home to 63 birdspecies. A small selection is shown on this page and the next three.

Tsarasaotra Park lies in the western part of Antananarivo, the capital of Madagascar. White birds perched high up in the trees and ducks swimming in the lake seem to be the only occupants of this magical place. Man's presence is more discreet. Hidden by the trees and the green vegetation, a stony path leads, after a few hundred yards, to the homes of the Ranarivelo family. For many years, Tsarasaotra, as it has been known by several generations in this country, has been the property of the Ranarivelos, a long-standing name in business circles. But the park has its own history, too. Queen Ranavalona used to go there to enjoy the luxuriance of nature and erstwhilt Prime Minister Rainilaiarivony, its original owner, had had two pavilions built under the supervision of the French architect René Savaron. Though uninhabited, these pavilions are still well-preserved. Tsarasaotra Park was later sold by the Prime Minister's heirs to Emile Ranarivelo, the grandfather of the current owner.

Apart from its historical background, the lake is environmentally interesting today because it shelters the unique nesting place of the heron and a total of 63 bird species, of which 27 are endemic.

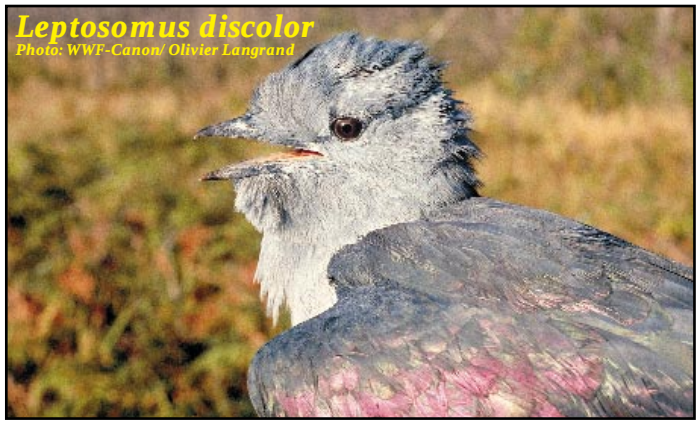
Stretching out over 27 hectares, this private park welcomes visitors, including students who undertake rese-

arch work on birds specific to Madagascar, children from the neighbouring schools in need of a picnic place, nature lovers who delight in the sight of the trees and the majestic flight of the white birds over Tsarasaotra Lake and, from time to time, anglers who appreciate the quietness of the place.

For two years, the peace of this natural sanctuary in the heart of the capital has been disturbed by the ear-splitting crunch of spark-emitting gravels unloaded by lorries belonging to the Macoma cement mixer plant located close to Tsarasaotra Lake. "We can see from our living room the dust blown up by the gravel that is dumped", complained Sonya Ranarivelo, a member of the family. Other residents , who mostly live in three nearby districts, have joined the Ranarivelos in voicing their grievances. They denounce not only the noise and the dust, which compel them to live day and night behind closed windows but also the pollution of their rice fields partly irrigated by the Andriantany Canal which is being used by the cement mixer plant for sewage disposal. Lots of these rice-growing people think that their field yield has been reduced the last two years because of this pollution. Some of them who are used to fishing in the lake complain about the fact that their catch is no longer as big as before.

Observations and investigations carried out on the site by the National Office of Environment, the authority in charge of environmental matters and decisions in Madagascar, reveal that the proximity of the plant seriously jeopardizes the environmental quality of the area. The birds living in the park are frequently upset by the intermittent stress-inducing noise, which can affect their hearing, contribute to a loss of their vitality, cause a modification in their behaviour during the period of reproduction and, eventually, lead to a decrease in the number of their species.

"The population of some species of heron such as the *Ardeola idae* and the *Egretta dimorpha* has already declined in upsetting proportions", said Tiana Razafimahatratra from the World Wide Fund for Nature. But the dust coming from the gravel unloaded by the lorries also represents another danger: It covers the surface of the floating flora as well as that of the leaves and branches of the trees used by some birds like the *Bulbucus ibis* and the *Egretta dimorpha* for their nests. Moreover, the cement dust which is used for making concrete and settles over the waters of the lake can gradually destroy the aquatic fauna and flora. Once dissolved, it may be a cause of disease for the ducks, whose feet, beaks and feathers may be polluted, and whose vitality may decrease, thus endangering the survival of the species. But pollution is also a threat to the growth of the trees and may even bring about their deaths. If the growth of the eucalyptus, one of the main



species in the park, is affected, the birds will be deprived of the necessary materials for their nest building.

In the face of this dramatic situation, a series of questions arises: why has the concrete mixer plant been authorized to set up its premises so close to Tsarasaotra Park (there is just a wall between them) ? Such a decision is all the more difficult to understand as, during the May 1999 Costa Rica wetlands conference, it was proposed by Madagascar's Minister of Waters and Forests as the first private site in the world to be classified among the Ramsar wetlands sites. Why has the plant been opened without any environmental impact assessment when the first Malagasy law requiring environmental impact assessments for any industrial project was passed in 1992 ?

"Our concrete mixer plant is a mobile one, its power does not exceed 50 KWh and it does not operate like any ordinary factory. It is very different from a cement works where the process of combustion reaches more than 1400°C and where pollution is real. A concrete mixer plant simply mixes up cement, sand, gravel and water", said the general manager Gaston Albrecht. He added that the concrete mixer in this factory was very similar to any concrete mixer used by most of the building contractors on their sites.

Even if the vagueness of the laws that rule the framework

Dryolianas cuvieri aldabranus

Photo: WWF/V.-J.Rey-Millet

Ixobrychus minutus

Photo: WWF/Fred Hazelhoff

Ardea cinerea

Photo: WWF-Canon/Jaques Trotignon

Scobus umbretta

Photo: WWF/Mauri Rautkari

Tachybaptus ruficollis

Photo: WWF/J.Trotignon

Ardea purpurea

Photo: WWF/J.Trotignon

of the environment could sometimes lead to some misunderstanding and uncertainty, the National Office for Environment is not prepared to leave the ambiguous status of the concrete mixer plant as it is. It has confirmed that its activities should comply with the MECIE law, (Mise en Compatibilité des Investissements et de l'Environnement), an environmental text issued in May 1995 which obliges all investors to include environmental impact assessments in their industrial projects. This study, which must be carried out by each investor, is one of the conditions that must be fulfilled to obtain a building permit and an operating licence.

Set up in October 1998, this concrete mixer plant did not present its environmental impact assessments until July 1999. Nevertheless, such a move has been considered by the National Office for Environment as a positive effort towards complying with the law. The same office has taken into consideration the contradictory opinions expressed by some members of the technical evaluating committee in charge of evaluating the environmental assessment of factories. It numbers representatives from the ministries of industry, environment, waters and forests, who see in the activities and the location of the plant a helpful element in the achievement of national housing targets.

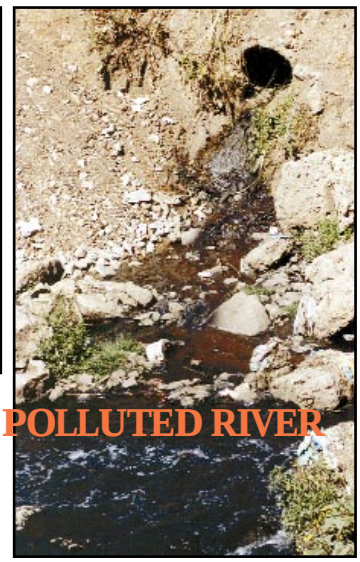
It is also aware of the Government's concern for its credibility in its effort to attract investors. For all these reasons, and to lessen the harmful effects of the activities of the concrete mixer factory on the lake, the National Office for Environment has devised terms of reference, which the plant has to respect. "We also have to allow for the services needed by the contractors whose building sites are in the city centre", explained a spokesman, who added: "In view of the call for investors, launched by the Government to develop industry in the country, we also have to help build up its credibility".

Of course, the decision to set up specific terms of reference for this factory triggered off different reactions. The local residents living in the three areas surrounding the park think that economic development should not imperil ecology on the Tsarasaotra site, which is also a symbol of their past and a link to their roots. They just refuse to share the same air as an entirely automated plant, which has supplied very few jobs to the unemployed. In collaboration with the owners of the park and backed up by some non-governmental organizations working for the protection of the environment, they have urged relocation of the plant. "We have acted as a strong lobby to protect Tsarasaotra Lake", said Tiana Razafimahatratra of WWF.

After evaluating the application of the terms of reference on February 8, some environmental authorities have recognized that actions have been taken to reduce the noise, reduce the spread of dust and clean the polluted waters poured into Andriantany Canal. But has the factory completely fulfilled the terms of reference? Are the actions sufficient to protect the birds living in the park from pollution? Will the plant be invited to move or will it receive the necessary environmental permit needed to continue its activities? How long will it be allowed to continue?

The National Office for Environment should answer these queries in a few weeks. But, apart from these questions, there is another one which concerns the newly-elected city council of Antananarivo: has it provided for the relocation of such plants into safer places in its planning provisions? On a larger scale, the authorities appear to be divided between their environmental responsibilities and the demands of economic development - between the devil and the deep blue sea.

Egretta dimorpha
Photo: WWF/V.-J.Rey-Millet



IGNORANCE ADDS TO PROBLEMS OF ETHIOPIA'S MOST POLLUTED RIVER

The River Akaki and Akaki town are located 25 km south of Addis Ababa, the capital of Ethiopia. Addis Ababa - at 2,400-3,000 metres, with its population of 2.4 m people and many factories - is higher than Akaki . Eleven streams criss-cross the big metropolis, eventually joining the River Akaki farther downstream. Sewage from the capital and dry waste effluent go into the streams and then into the Akaki.

The people of Akaki town and the peasants who live from horticulture use water for drinking, bathing, cooking and for their livestock. They do not know that it is hazardous. The people of Addis Ababa and the towns of Debrezeit and Nazareth do not know that the vegetables they consume are grown with the aid of the highly polluted water of Akaki either. Upstream the people of Addis pollute the water and the downstream people sell them back unhealthy vegetables. What symbiotic irony!

A study paper on the Awash River basin described the pollution upstream as follows: "Once the stream entered Addis Ababa oxygen within the stream was virtually totally depleted, resulting in septicity and anaerobic decay, further compounded by extensive use of the stream as a public lavatory for tens of thousands of people... Visual inspection of several of the streams reveal gross pollution, the growth of sewage fungus and deposits of fecal and other obnoxious materials."

The River Akaki is not only polluted by human waste. Out of the 35 factories of Addis Ababa and Akaki town, 96per cent of them dump their waste in the river without treatment, according to a research document from the Ethiopian Environmental Protection Authority (EPA). Experts who studied the pollution impact of industrial waste in Akaki categorize the 35 industries into tanneries, textiles, beverages, food, metal, sugar, chemicals, pharmaceuticals and paper and pulp industries. The worst polluters among them were found to be the Akaki textiles factory (the old Indo-Ethiopian) and ELICO Tannery. Both factories dump tons of untreated biological and chemical waste into the river. Environmentalists believe that the waste can be treated if some restrictions are imposed on the industries.

A sociologist, Tigist Kefetew, who studied the impact of the pollution on the people, observed:"The livelihood of 5,000-6,000 people from six urban dwellers' associations and seven peasant associations in Akaki depends on the river. They use the river for horticultural irrigation, livestock, washing, bathing, cooking, even drinking."

These people are poor factory workers, pensioners and peasants. The majority of the town dwellers do not have tap water so they consume the polluted water. Only 25per cent of the Ethiopian population have access to potable water according to UNICEF's *The State of the World's Children*, 1999.

Health officers observed: "The people of Akaki suffer from intestinal cancer, malaria and other water-born diseases. Studies on vegetables and soil reveal high concentrations of chrome and other chemicals. Dr. Fiseha Itana, who studied the health and environmental problems of the area said: "Chemical pollution causes cancer and miscarriages. It pollutes the underground water and decreases soil fertility." The pollution from Addis does not stop at Akaki. The River Akaki joins the River Awash, important for irrigating much of eastern Ethiopia. Downstream rural dwellers, aquatic life and the soil are all heavily affected by pollution.

Tekuame Tesfa Mariam of the EPA said: "As a matter of urgency, the EPA and UNIDO are working on projects to treat and manage industrial waste." Meanwhile, a workshop on pollution revealed that factory managers were not aware of the damage they were doing and the people who use the Akaki for irrigation believed the polluted water gave them a better yield. Most of the population is illiterate, Tigist Kefetew said and recommends increasing public awareness of pollution problems.

LAEKE MARIAM, in Addis Ababa

ITALY'S DESERT THREAT

The Italian Government is to adopt emergency anti-drought measures to prevent almost a third of the nation's territory becoming a desert. The areas under threat are southern and western Sicily, southern Sardinia and the mainland regions of Calabria, Puglia and Basilicata facing on to the Gulf of Taranto between the toe and the heel of the Italian peninsula. Altogether some 90,000 square kilometres are at risk.

At a specially convened conference held in Rome on February 17, Valerio Calzolaio, under-secretary at the Italian Ministry of the Environment, said that a major cause was the greenhouse effect resulting from excessive emissions of carbon dioxide leading to global warming. He also cited bad management of soil and water resources, the lack of proper land husbandry, forest fires and wasteful use of water as other causes of the crisis.

"All these factors have come together to make barren land that was once fertile," Mr. Calzolaio said and issued a warning that Italy faced a problem similar to that in northern Africa.

Willer Bordon, under-secretary at the Ministry of Public Works, said that better water conservation measures were the key solution to the problem. "We are investing considerable resources to deal with the water emergency in southern Italy."

The Italian section of the World Wide Fund for Nature, however, was none too impressed."While the Government talks of its fight against desertification and declares itself committed at the national and international level, it does not respect its undertakings to reduce carbon dioxide emissions, which are the biggest cause of the greenhouse effect", it commented.

"The European Commission itself has pointed out that in 1999 emissions of this gas in Italy were up by 5 per cent compared with 1990. So, instead of cutting down on carbon dioxide, we are allowing it to increase."

Meanwhile, the Government is to prepare an updated detailed map of the areas concerned and a new plan to deal with the situation has been scheduled for May this year.

PETER MUCCINI

THE SHAPE OF THINGS TO COME

WATER FAIRS AND EXHIBITIONS

ACCADUEO

International exhibition of technologies for the treatment and distribution of drinking water and waste water treatment

27.05.2000 - 30.05.2000

Products: Installations, Technologies, Application Specific, Water, Services

Ferrara/Italy
Organizer: Ferrara Fiere

ENTSORGA

International Trade Fair for Recycling and Waste Disposal

26.06.2000 - 29.06.2000 every 3 years

Products: Waste Water Processing, Water Supply, Water Processing Pumps, Publishing Companies, Waste Removal, Laboratory Technique, Measuring Technique etc.

Köln Messe exhibition centre
Cologne/Germany

ENCUENTRO

International Exhibition of Cochabamba

07.04.2000 - 16.04.2000 annual

Products: Water

Recinto Ferial de la Laguna Alalay
Cochabamba/Bolivia
Organizer: Fundacion para la Feria International de Cochabamba FEICO-BOL

WATER

International conference with related specialized exhibition

29.03.2000 - 31.03.2000

Products: Drinking Water, Water Treatment, Waste Water Management, Management of Water Resources, Project Financing

MCC Messe Wien Congress Center
Vienna/Austria
Organizer: Wiener Messen & Congress GmbH

HYDROTOP

International Trade fair For The Water Economy With Congress

21.04.2000 - 23.04.2000 every 2 years

Products: Water Processing, Water Treatment, Water Economy

Parc Chanot
Marseilles/France
Organizer: Hydrotop-Asiem

SEASONAL WETLANDS TOO EASILY OVERLOOKED

KENYA POSES TEST CASE

From Kenya to California, seasonal wetlands are being lost, and we are losing their stores of biodiversity, their water-regulating functions and the beauty they add to the landscape, FLEUR N'GWENO reports from Nairobi. Flooded grassland, seasonal marshes, lakes and springs, temporary pools in grassland, woodland and bush, and ephemeral rock pools and seeps are all aspects of seasonal wetlands. They are crucial in arid and semi-arid lands, where rains falls only occasionally but with great force. Near urban areas, seasonal wetlands play a vital role as refuges, breeding and feeding grounds for amphibians and other animals under threat.

In the dry season, the wind blows over a barren expanse of dry grass, bare rocks and dust on a hillside in Nairobi. Right: rain then brings the land to life, and white rock violets **(Craterostigma hirsutum)** ***bloom in the waterlogged soil around the rock slabs.***

All photos: Bettina Ng'weno

The wind blows across a barren, sun-baked expanse of dry grass, rock outcrops and dust on a hillside in Nairobi. It is a wetland, but for many months it does not look like one. Instead it looks like a dry, barren, rocky hillside - until it rains.

Rain brings the land to life. Overnight, algal spores on the dusty surface swell with water and form clumps of green jelly. As rain reaches into the soil, bulbs sprout and seeds germinate. The sound of thunder awakens toads sheltering underground. Brilliant pink flowers of *Ammocharis tinneana* burst into bouquets within a week of the first heavy rain.

Rainwater fills the spaces between the rocks and soaks the shallow soil.Tiny springtails (types of wingless insect) jump about on the surface film. A succession of flowers begins to appear in the waterlogged soil, where most grasses will not grow. Rare and endangered plants occur here, among them *Euphorbia brevitorta*, like spiny cushions scattered on the rock slabs, and a species of Brachystelma not yet described by botanists, best located by the cowdung smell of its flowers.

As the pools fill with rainwater, dragonflies and other insects fly in to lay their eggs.

Plants of *Euphorbia brevitorta* are relatively slow-growing", says Professor L.E. Newton of Kenyatta University, Nairobi, "and the

large plants at this locality are probably very old, though at the moment there is no means of determining their age."

Drought or fire, followed by steady rain, brings out the best wildflower display around the rock slabs. Areas of dark shallow soil become green meadows of Eragrostis grass *(Eragrostis hispida)*, spangled with yellow Hypoxis and Eriospermum, white Anthericum *(Anthericum corymbosum)* and purple rock violet *(Craterostigma plantagineum)*. Dense mats of white rock violets *(C. hirsutum)* ring the rock pools. A few weeks later the flooded rocks are decorated with the orange flowers of *Commelina lugardii* and the massed blue flowers of *Murdannia clarkeana*. To see them together, you must visit at noon; Commelina fades by midday on sunny days, while Murdannia blossoms open from 11 o'clock.

The 'four-leaf clover' leaves of* Marsilea macrocarpa*, a floating fern, make patterns on seasonal pools and other temporary waters.

On the hillside, the rainy season is a race for life, for the rains may end before plants or animals have gone through their life cycle. Heavy rain fills hollows and depressions, turning them into pools. The hillside is dotted with hollows, each only a few metres across. Some are natural depression, others old quarry pits for murram - a local gravel from the days when it was railway land or even ditches dug by motorcycle wheels spinning in the mud when it was the site for motocross.

Toads and frogs gather from afar, filling the night air with their calls, mating and laying eggs in strings and rafts of jelly. Toads take their chances with shallow pools and ditches; the eggs hatch quickly into small black tadpoles, and within a few weeks the tadpoles turn into tiny toads hopping on the rocky ground. Most frogs choose the larger pools, where their transparent tadpoles gather into large shoals for months.

Red, green and blue dragonflies fly in to lay their eggs in the pools, and soon the water is filled with insects: dragonfly larvae, diving beetles, backswimmers, water boatmen.

On the floor of the pools, other eggs lay in wait; soaked by water, they hatch into young. Copepods, fairy shrimp, seed shrimp and clam shrimp hatch and grow, sometimes so numerous that the water is cloudy with microscopic life. Crustaceans lack wings and cannot escape their habitat. They live out their lives in one rainy season and lay eggs that fall to the bottom. The eggs withstand the blazing days and chilly nights of drought to hatch again in the rain-filled pool.

Birds, snakes and mud terrapins feast on the teeming life of seasonal pools. Rainy seasons in Nairobi coincide with the transcontinental migrations of birds - the birds may

A week after the first heavy rain, bouquets of* Ammocharis tinneana *burst out of the ground. They live out the dry season unseen, as bulbs

Birds and reptiles such as green grass snakes come to the pools to feed. The water may be cloudy with copepods and other crustaceans.

ride the same winds as the rains - and seasonal wetlands are crucial feeding grounds. Tadpoles, insects and crustaceans are processed into layers of fat to fuel the birds over deserts and seas. Mud terrapins live out the dry season buried in the ground, and dig themselves out to lay eggs near the pools where their young will feed.

Plants too grow from the bottom to spread their leaves on the surface of pools. *Marsilea macrocarpa*, a floating fern with fronds like four-leaf clovers, and *Aponogeton abyssinicus* with lance-shaped leaves and purple flower spikes, appear within days, and a succession of plants grow up through the water or along the edges as the pool matures.

No two pools on the hillside are exactly alike. The pool floor may be rock, bare earth or filled with plants. Large ferns grow in just one pool, and different sedges favour different pools. Decorative *Chara sp.*, with red spores on spiky green foliage, may fill rock pools where standing water has become alkaline.

When sedges and other plants around the pools are tall enough, yellow-crowned bishops fly in to build their nests. The little black and yellow birds, like giant bumblebees, patrol their pools with buzzing display flights. Warthogs come to wallow in the mud, and reedbuck hide among the bulrushes.

A series of springs and seeps continue to flow as the rains end. The rock here is volcanic tuff, hard, light and somewhat porous, nature's own breeze block. Rain falling on the top of the hill percolates through the rock and flows out pure and clear in springs and seeps. On another face of the hill, across the road, large numbers of people collect free water from the spring. Here the springs are small, feeding the pools and swampy ground for several months. The drying waterlogged soil around springs and seeps is the habitat for another series of flowers, most of them tiny annuals such as the minute, pale pink bladderwort, *Utricularia arenaria*.

The rock slabs, first to fill with rainwater, are the first to dry out as the rains end. Lichens serve as clues that there was water there: they grow only on the highest parts of the rocks. The meadows of Eragrostis turn from green to orange-pink. Ammocharis has long since shed its fat seeds; they will sprout with the next rains and slowly build their bulbs each rainy season, to blossom decades hence.

The pools shrink and become dry hollows, the bottom sometimes white with the shells of seed shrimp. Springs and seeps stop flowing, but their surroundings remain green, as the hillside turns brown. In a very dry year, even the tough Typha *(Typha domingensis)* reeds wither.

The dry season is essential to the life of these wetlands. With continuing rain, the plants of the rock slabs simply grow more leaves: they no longer bloom. Rain every month allows Typha reeds and other marsh vegetation to grow and grow, filling each hollow and depression with organic matter. Heavy rain, when it comes, simply sinks into the soil; it no longer forms pools.

Drought, fire, trampling and grazing drive back the encroaching Typha and sedges and create space in the pools. In their dry, resting stage, bulbs, seeds, animals

Fairy shrimp are only found in temporary waters, as they cannot withstand predation by fish. They live for one rainy season; the eggs fall to the bottom, to survive the hot days and cold nights of drought, and hatch with the next rains.

and their eggs prepare to explode into life with the coming of the rains. Just as seasonal wetlands need alternating dry and wet to survive, they regulate the flow of water in both drought and flood — collecting, storing, purifying and releasing rainwater through the seasons.

This hillside in Nairobi is private land, zoned for development. An informal coalition of government institutions including Kenya Wildlife Service, the National Environment Secretariat and the National Museums of Kenya and non-government organizations — among them the World Wide Fund for Nature, the World Conservation Union (IUCN), Nature Kenya, the East African Wild Life Society and others — has come together to propose and support conservation status for the site. Close to the city, the hillside has vast potential for education, research and recreation.

However, land values are high in Nairobi, and the issue has not been settled. This year new initiatives have begun under the auspices of Nature Kenya and with initial funding from the Whitley Award Scheme for International Nature Conservation, to negotiate the future status of the site. Options to be discussed include leasing the land for a nature centre; donation of the site for conservation by the owners (an outside possibility , as there are no tax benefits under Kenyan law); exchange of the site for another piece of land, and outright purchase for conservation (difficult because of the high land values in Nairobi).

Intrinsic to the misconception over the fight, apparently ripe for development, is that its wetlands are invisible for most of the year. In surveys and aerial photographs, taken during the dry season, it looks a suitable building site. Discovery of the mistake usually happens only after the nature of seasonal wetlands becomes apparent, when structures are built and plagued with water damage, and wetland functions are altered, leading to destructive flooding.

In a world short of fresh water, a priority in environmental management and environmental impact assessments is to find, recognize, survey and set aside seasonal wetlands. The beneficiaries will be ourselves.

The author is a naturalist, writer and editor in Kenya. For nearly 30 years she has led weekly Wednesday morning bird walks from the National Museum in Nairobi.

The flowers of the delicate* Eriospermum triphyllum *open only in the afternoon in the wet meadows among the rocks.

FACT SHEET

Site
Hillside of about 25 ha., with seasonal springs, pools, and rock outcrops, 7 km from Nairobi city centre, between Nairobi National Park and Carnivore restaurant

Biodiversity
- Over 350 species of plants recorded, four listed as rare in Upland Kenya Wild Flowers
- Over 250 different kinds of birds observed
- Over 30 species of aquatic insects, six orders of crustaceans, including two fairy shrimp
- Mammals, reptiles, amphibians

Importance
- Globally rare plants and invertebrates
- Diverse and complex hydrology
- Unique and rapidly disappearing habitats
- Easy access, near other recreational facilities, ideal for education, recreation and research

Conservation challenge
40 acres (16.8 ha) are private land. The challenge is to find a solution that benefits both conservation interests and the land owners.

For more information contact
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Phone (+254-2) 749957 or 746090,
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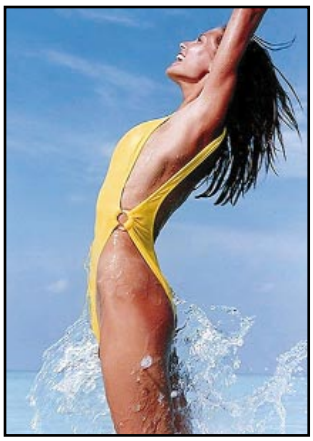


HOW TO STOP BEING A HUMAN SPONGE

At least half the human body consists of water — but not excessively, it would seem, in the case of model Heidi Klum. ***Photo: Sports Illustrated***

Any book that begins "To be able to sit on the loo and urinate away up to 20lbs [9kg] of excess body weight in a few days probably sounds like something out of you wildest dreams" is bound to be compulsive reading for anyone desperate to lose weight but unable to. The author of ***The Waterfall Diet*** (Piatkus, London, £8.99) Linda Lazarides (a dietician) explains quickly that many doctors fail to detect that some of their patients cannot lose excess weight because they are trying to shed fat when they should be adopting measures to shed water.

One woman who said she existed on little more than fresh meat or fish without fat and a few dry biscuits but could not lose any weight found she was simply retaining water in her body. In her case it was caused by a food allergy. Once on the Waterfall Diet, she cut out her allergens and lost a total of 22lb (almost 10kg). The first eight chapters help to teach you how to work out why you may be retaining water in your body, and then chapter nine plunges you into the diet itself - explaining how to stop becoming a human sponge.

At least half the human body consists of water - from cells and blood to glands, bone and muscle. If the proportion rises to 65 per cent, then you start to have a problem, but it can be difficult to detect. This does not mean you should drink less. The best thing to drink is - yes - plain water, which is needed by your kidneys to flush daily waste products out of your bloodstream. The worst things are tea, coffee and alcohol, which can eventually cause water retention, so that drinking plenty of water before going to bed after drinking alcohol, for example, can help to restore the right balance.

But water can come from any of the foods you eat. Fruit, salads and vegetable are up to 95 per cent water. Too much protein, too little protein, too much fat, too little fat all can add to your weight, not forgetting that medicines can damage your health too. The author picks her way carefully through this medical minefield, explaining your personal plumbing as she goes.

Finally we get to the diet, which is not about cutting calories but about choosing the right foods to release fluid. But don't forget, at the end of the day you should still drink plenty of water.

EUROPE'S INFORMATION GAP

A recurring theme in the environmental assessment reports published by the European Environment Agency is the lack of information when monitoring the state of Europe's rivers, lakes, reservoirs, coastal waters and ecosystems. The lack of adequately comparable data renders comprehensive assessments impossible, they concede, with central and eastern Europe posing the biggest problems. How valuable these studies are then to specialist readers remains an open question.

The first study - ***Sustainable Water Use in Europe*** (Part I: Sectoral Use of Water) - was the result of work by two institutions in Britain and one each from Spain and France. One of the first problems in making these studies is that "The use of water across Europe is as varied as are the constituent countries, because of different climates, cultures, habits, economies and natural conditions." Government temptations to take the easy option are soon exposed: groundwater needs less treatment than surface water, and so over-abstraction of groundwater has followed as surely as night follows day.

There are, however, some positive trends. In western and northern Europe, extraction rates have more or less stabilized, while there appear to be downward trends in Denmark, Finland, Sweden and Britain, as droughts have made the public more acutely aware of the finite nature of water supplies.

The latest assessment report received is ***Nutrients in European Ecosystems***, compiled by French, British, Danish and Spanish teams of experts, who issue a warning in their preface that "Comparisons of results from different sampling stations may lead to potentially wrong conclusions." Should fertizers be heavily taxed or be subject to quotas ? The authors are unsure.

One thing that is certain is that the problems of overexploitation of water resources are immensely complex in Europe, as elsewhere in the world. Arriving at solutions that are environmentally sound in the long term is one of the major headaches of the World Water Forum. An awful lot more homework will clearly have to be done before sound decisions can be reached.

GEOFFREY WESTON

PATAGONIAN GLACIER SET TO 'EXPLODE'

In the wake of reports of a supervolcano in Yellowstone National Park in the United States which, if it suddenly erupted, could have catastrophic effects on the planet, comes another spectacular though less threatening phenomenon.

Perito Moreno, a glacier in Argentina's southern region of Patagonia which moves at a smart 1.7 metres a day, has in the past "exploded" by colliding with a land mass in its path with ensuing catastrophic floods.

The glacier is part of the third-largest ice cap on Earth after Antarctica and Greenland and shows no signs of yielding to global warming despite being at the same latitude in the Southern Hemisphere as London in the Northern Hemisphere. Known as the Hielo Patagonico, the ice mass is part of the spectacularly beautiful Parque Nacional de los Glacieros on Argentina's border with Chile. The Hielo extends over the border into Chile where another glacier, the San Rafael, is situated at 45 deg. latitude making it the coastal glacier closest to the Equator.

The Hielo Patagonico is fed by moisture-laden winds blowing eastwards from the Pacific. Annual precipitation is fantastically high at around 7,000 mm most of which falls as snow that becomes compacted into glaciers. Perito Moreno rises in the Andes and extends eastwards for 30 km spanning 4km at its advancing edge. Its walls are the height of a 20-storey building and its surface is dotted with ice peaks rising to more than 70 metres. At the end of its course it fans out to span 4km.

Every year thousands of tourists pay top prices to see this mammoth meringue from a boat or a nearby observation platform. The glacier breaks the surrounding silence with continual creaks and groans as it moves mixed with sudden roars as huge chunks of ice break away to reveal an intensely blue interior where the ice is at its densest.

Usually the balance between ice and melting snow is enough to keep the glacier from doing any damage. However, if this balance is disturbed and the compactness of the ice increases, the glacier becomes a solid mass which explodes as it crashes into the hill beyond which lies the glacial Lake Argentino. The debris produced causes the lake's level to rise by 20 metres and since it lies at 185 metres above sea level, the underlying terrain is engulfed by the flood.

The last such explosion took place on February 17, 1988 and lasted 24 hours. International TV crews were there to cover the event and a video of what happened is still a best seller in the nearest tourist resort of El Calafate. Geologists now believe another collision is due.

PETER MUCCINI

BOLIVIA'S WATER WAR

A formerly lush green valley in Bolivia is drying out and the water table is falling. The area around Cochabamba, the country's third largest city set on the flat floor of a valley in the Andes, has traditionally produced much of Bolivia's foodgrain, poultry, fruit and vegetables. All this is changing as a result of an exploding population and a climate that is becoming progressively drier, causing farmers to switch to crops that need less water and severe water rationing in the urban areas.

President Hugo Banzer's Government, backed by the local mayor Manfred Reyes, hopes to solve the problem through a $450m scheme to pipe water from several rivers high in the surrounding mountains. The project, which has progressed intermittently since 1998, entails boring a

19km tunnel through the mountains. It is financed partly by the World Bank and international donors, but a major row has erupted because part of the remaining funding is intended to come from higher charges levied by Aguas del Tunari. This recently privatized water company has raised the city's water charges by an average of 35 per cent, in some cases double that amount.

Local people are angry because they are being asked to pay for supplies and services that will not begin for another two years. Last month enraged crowds clashed with police for two days. Some 130 people needed hospital treatment, 30 of them police. The Government claimed that the unrest was caused by leftwing extremists and farmers, while local leaders blamed the police for excessive force.

Despite the support of Mr Reyes's small party in the government coalition, President Banzer has removed it from power because of ongoing disputes over water and other issues. Back in his home city, the mayor has been attacked for being less than open about the agreement with the water company to raise tariffs. The Catholic Archbishop of Cochabamba has entered the fray as a mediator, and Mr Reyes has backed down. Water charges have been frozen at last October's levels pending negotiations, and there have been public celebrations as protesters sense victory, but the battle is not yet over.

A SPECIAL CORRESPONDENT

Cows coming in to be milked along a newly built bark track.

All photos: Ann Sansom

During a study tour in the American states of North Carolina and Iowa, ANN SANSOM learnt how a voluntary cost/share scheme for farmers is reducing pollution from nutrients and improving water quality. Not the least attractive aspect of the scheme was the discovery that environmental care can be good for business.

HOW AMERICAN FARMERS LEARNT TO LOVE REGULATION

The farmer's response to my question "What do you think of regulation?" was surprising. "We like it", he said with enthusiasm. We were leaning on a brand new gate watching the cows amble towards us along a new bark track. It was a beautiful sunny spring day in Orange County, North Carolina.

Last spring this same scene had not been such a pretty sight. The dairy cows had had access to the small valley we were now admiring, but instead of a sea of green, the whole area was a sea of mud. In the valley bottom the stream which now runs crystal clear, had carried silt and nutrients down to the River Neuse.

Carson Lloyd and his brother Clayton are more than happy with the improvements to their farm. The fenced bark tracks connect the dairy and the paddocks, the stream has been fenced off, a ford and a small bridge provide access to the fields, and gravity-fed drinking troughs have been installed. This work has improved the access for the herdsman and his cows, the cows are cleaner when they enter the milking parlour, and mastitis and foot problems have declined.

The scheme cost $25,000 which was split 25/75 between the farmer and the cost-share programme. The farmer can contribute his 25 per cent in cash, materials and/or labour and, through the same programme, he also has

access to loans at only 3 per cent interest.

Brent Bogue, the district conservationist, explained that the cost-share programme aims to reduce diffuse pollution and improve water quality. The River Neuse drains a large chunk of North Carolina, and much of the catchment is farmed intensively. In recent years there have been serious algal blooms in the estuary causing periodic fish kills, which have seriously affected tourism and the fishing industry. For now the state has chosen the voluntary approach to reducing diffuse pollution, but the target is ambitious: to reduce the amount of nitrate in the main river by 30 per cent by 2003.

Strategically placed permanent grass swales help to trap silt and protect soil as surface water runs off arable land.

As Brent said, "Farmers have realized that if this voluntary initiative fails, regulation will become tougher and less flexible. Once farmers understand that environmental protection and good farming practice make good business sense, the job of selling the cost-share programme will be easy. Given the time and resources we can get up to 75 per cent of farmers actively involved."

In the United States, the philosophy that it is the responsibility of the nation as well as the landowner to conserve natural resources can be traced back to the days of the dust bowl in the early 1930s. In the Great Plains millions of acres of topsoil blew away, leaving an expensive legacy of environmental, economic and social damage. Such was the scale of this disaster that the legislation, organizational structure and financial support that were developed in its aftermath still play a major role today. America has learnt her lesson.

In 1935 President Roosevelt signed the Soil Conservation Act, which created the Soil Conservation Service (now the Natural Resource Conservation Service) the same year. This service provided and still provides a technical and monitoring role. Although a few demonstration projects had already been set up, a programme was needed to get farmers as interested and involved as possible and the idea of a conservation district was conceived.

A conservation district is a governmental subdivision of the state, with elected officers, organized and run by local people to meet local needs. The first conservation district was set up in 1937, and today there are nearly 3,000 districts across the United States employing district conservationists like Brent Bogue. Creating a non-regulatory, farmer-friendly, free advisory service has been a key element in the success of soil and water conservation in America.

My arrival in north-east Iowa in mid-May coincided with tornado warnings and the worst storm for 25 years: 20cm of rain fell in 10 hours. I could not have chosen a better week to look at techniques to conserve soil.

Ninety per cent of Iowa is farmland with 75 per cent under maize and soybeans. By mid-May only about half the land had been sown, and the plants were barely showing. Most of the arable land was thus unprotected when the storm hit. To try to minimize the effects of such storms, cost-share programmes are used to fund techniques such as creating terraces and introducing contour cropping, sowing permanent grass swales in vulnerable low-lying areas, encouraging cultivation by minimum-tillage and, in particularly vulnerable areas, taking land out of production altogether.

About 50 per cent of the arable land is cultivated by minimum-tillage techniques and, as I travelled through the storm-ravaged area, it was clear that this land had eroded less than the land that had been ploughed. Minimum-tillage techniques leave the remains of the previous crop on the soil surface and these help to break the impact of raindrops. Minimum-tillage also creates an open, permeable soil structure which remains undisturbed, encouraging maximum infiltration and minimizing run-off and soil erosion.

Of the few dairy or beef farms in the state the permanent pasture had suffered virtually no run-off and no erosion. As little as 200 years ago, Iowa was part of the great prairie which supported 700m buffalo; as far as the eye could

It is recognized that farmers learn from other farmers first, so farm walks are always led by the farmer.

see its dark silty-loam soils were covered with tall, thick, waving grasses. Run-off, even during heavy storms would have been virtually nil. There were no surface streams and all the water percolated through the soil into the limestone below, emerging as clear springs lower down. In contrast, as the silt-laden floodwater subsided after this storm, surface streams were developing in areas where they would not have occurred under natural conditions.

District conservationist John Rodecap took me to see the Big Spring Basin Demonstration Project. Big Spring, the largest spring in Iowa, produces 15,000 gallons of groundwater every minute from 100 square miles of agricultural catchment. Following the storm the flow was turbid, and the largest trout at the local fish farm were struggling to breathe. In the past, nitrogen has been the main problem. During the 1960s and 1970s the use of nitrogen fertilizer increased almost three-fold. The amount of nitrate flowing annually from the spring was equivalent to one third of the nitrogen fertilizer applied by farmers.

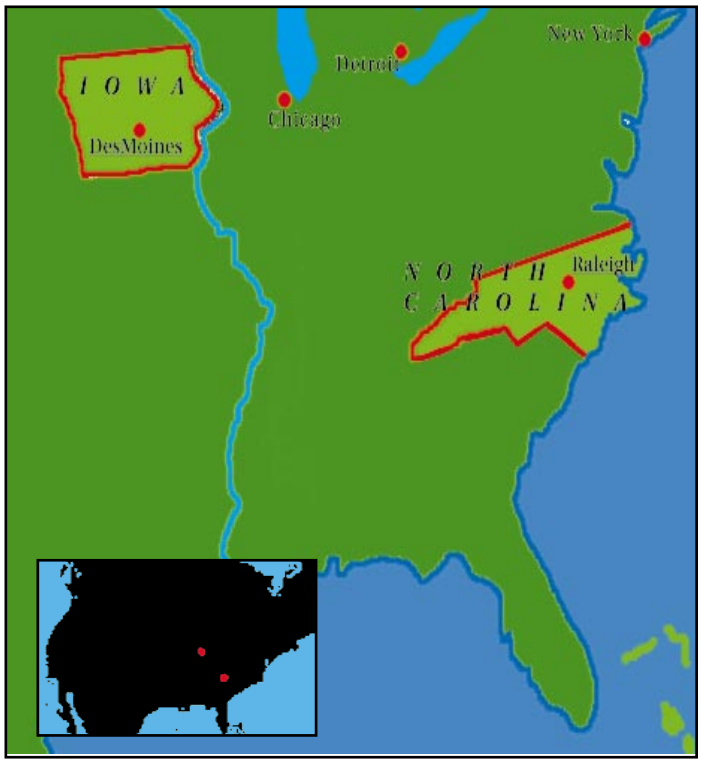
The Big Spring Basin Demonstration Project used existing farms and farmers to show others how, by reducing the amount of fertilizer applied, profit margins could be improved without decreasing yields. Between 1981 and 1993, as the farmers became more confident, nitrogen input decreased from 79 to 52 kilos per acre, a reduction of 34 per cent, saving farmers about $360,000 a year.

As John Rodecap pointed out "It is important to tie in the economics and water quality from the farmer's viewpoint. Can he save money? Is the water in his borehole safe for his family to drink? But perhaps most of all, it is important to recognize that farmers learn from other farmers first." The last point was illustrated on a farm walk organized by the conservation district but led by the farmer, with staff from government organizations taking a definite, though supportive, back-seat role.

The Iowa Groundwater Act, passed in 1987, provided a non-regulatory approach to reduce the use of agro-chemicals. Money was raised by a levy of only 6 cents per tonne of fertilizers and pesticides which raised $3m a year. This money funds education programmes, technical assistance and research, and during the first 10 years the use of inorganic fertilizers has decreased by 15 per cent. The farming community fully supported this initiative which has been widely praised throughout the United States.

Meanwhile, in other parts of the world, regulatory organizations are only just beginning to recognize that diffuse pollution is causing serious problems and farmers are feeling increasingly threatened by regulation, including proposed taxes on pesticides and fertilizers. When it comes to solving diffuse pollution, the United States has a wealth of experience, expertise and results from which the rest of us would do well to learn. We can all make a start by changing attitudes and behaviours and creating common ground. A powerful message could be given to governments and communities, and untold benefits could be achieved, if farmers and regulators worked together to seek the support and funding required to reduce diffuse pollution through a voluntary approach.

The author works as a rural land use officer for Britain's Environment Agency. In 1999 she spent eight weeks in the United States on a Nuffield Farming Scholarship. A copy of her 35-page report Farmer/regulator relationships and how to improve them *can be found on the web site: www.nuffieldscholar.org.uk*



LETTERS TO THE EDITOR-IN-CHIEF

CHERNOBYL AND WORLD WATER WATCH

From the Deputy Head of the Chemical Department in Water Chemistry and Liquid Radioactive Waste Management
Chernobyl Nuclear Power Plant

I was very pleased to receive your perfect new magazine and read it from cover to cover. I showed it to all my friends in the Slavutich Democratic Organization of the Youth of Chernobyl. They were impressed. It is just what we need.

I have been aware of many problems concerning the life of young people, environmental protection and nuclear safety, and in 1993 (10 years after I started working at the Chernobyl Nuclear Power Plant) I jointly founded the SDOYC with the aim of making life easier, safer and more dignified for all of us, especially for the children and teenagers of Slavutich, Chernobyl and other areas in the region. Now we are a real force in Ukraine's youth movement and have good relationships with similar organizations in the CIS countries. Last year we celebrated the twelfth anniversary of our annual water festival.

Slavutich is Ukraine's youngest city and was begun in 1987 after the Chernobyl disaster. Many of the present population of 27,000 work at Chernobyl Nuclear Power Plant, on which the city depends.

Many of Chernobyl's ecological problems are likely to be resolved through decommissioning, but there are major challenges still to be met. The drinking water treatment plant in Slavutich must be reconstructed, a solution found for the heavy pollution of Chernobyl's cooling lake and new measures found to prevent radioactive releases into the environment. We believe that Chernobyl's ecological and social problems are not those of Chernobyl alone.

VALERI SULIMOV

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WORLD WATER WATCH

From the Director-General
The Ramsar Convention on Wetlands

The first issue of the magazine looks excellent. I very much hope that it is getting the good reception it deserves.

DELMAR BLASCO

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From the Professor Emeritus of Geography at the University of Colorado

Congratulations to you and the publisher Klaus Pahlich upon the inaugural issue of *World Water Watch*!

It has a thoughtful and diverse selection of significant articles, and ought to have strong appeal to anyone interested in water.

I also applaud your strong statement on environment and war, and look forward to the material that you will present for the Hague conference.

GILBERT F. WHITE
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From Jan Reche

Many thanks for the first issue of *World Water Watch*. It is outstanding, with a very good spectrum of reports. Please continue like this.

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From Alexander Zinke

Congratulations on your new magazine - a really attractive new product!

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GREEN PENS TO MEET IN FIJI

Prizes to encourage Asian and Pacific journalists and photojournalists specializing in environmental journalism will be presented this year at the Millennium International Media Conference on the Environment in conjunction with the 12th Asia Pacific and 3rd Commonwealth Congress of Environmental Journalists in Suva, Fiji, June 5-9. More than 100 delegates from nearly 50 countries are expected to attend the debates.

The APFEJ International Green Pen Awards are presented each year for leadership in environmental journalism. This year's awards will be announced on April 22.

Tougher rules for mining are probably one consequence of the worst ecological disaster in Europe since the Chernobyl nuclear power plant blew up in April 1986. But no measures can alter the sad news: a river has died. By ERWIN WEIERMANN.

DEATH OF A RIVER

New and tougher legislation on mining is due to be passed after some of the consequences of the cyanide-spill in a Romanian gold mine became known, the worst ecological disaster in Europe after the explosion in the Chernobyl nuclear power plant, in Ukraine, in April 1986. Representatives of Euromine, an umbrella-organization for miners in Europe, and environmental experts from DG XI, the department in charge of environmental affairs in the European Commission, have begun talks in Brussels to avoid future disasters in mines. The European Commission intends to toughen the rules , while the mining industry pushes for voluntary agreements. The talks, which are still under way, began under the shadow of what has happened in Romania.

During the late night of January 30, cyanide had overflowed from a waste pool at a gold mine owned by Aural SA - a joint venture between the Australian company Esmeralda Exploration, based in Perth, and the Romanian state-owned Remin. An estimated 100,000 cubic metres of cyanide burst through a dyke into the Lepus River in north-western Romania. This river flows into the Somes, which ends up in the river Tisza, which in turn flows into the Danube. Mud – heavily polluted with cyanide and heavy-metals like silver, lead, copper and zinc – spilled into the water pulling a stream of poison through south-eastern Europe. Cyanide is poisonous and blocks breathing: 50 milligrams is lethal for man. Cyanide is diluted in water within days, unlike heavy metals, which do not dilute.

A few days after the incident at the gold mine, the first effects could be observed. Hundreds of tons of fish died in the River Tisza and had to be burned. The poisonous stream went on through the country. In mid-February it became clear that 300km of the Tisza was dead. Even plankton - the source of nourishment for river fish - were killed. Worse still, even mammals died. The World Wide Fund for Nature (WWF) reported the deaths of 40 otters, while other victims included a donkey, deer and wild boar. Some 120,000 people in Hungary were advised not to drink water from their wells.

Esmeralda's spokesman claimed that there was no evidence of linkage between the cyanide spill and the mass-death of river fish. But Romanian, Slovak, Hungarian, Yugoslav and Bulgarian authorities have reported high concentrations of cyanide in the water that is within the same catchment. The EU and the United Nations Environment Programme (UNEP) have set up task forces to check what has happened and when. Esmeralda has also sent a group of experts to its gold mine, which has been closed since January 31.

During a visit to the scene European Environment Commissioner Margot Wallström asked for a detailed inventory of all mines in Europe – in member states as well as accessory countries. The inventory was originally initiated by WWF in a letter to Wallström's predecessor Ritt Bjerregaard. "An accident like this may happen again", said Phil Weller, head of WWF's Danube-Carpathian Programme. "First of all we need an inventory. And then we need tougher rules and better inspection of the safety measures taken in the mines. That's the only way to avoid future accidents."

The incident has also shown the limits of the early-warning-system that has been in place for some time in the Danube basin, even though Romania reported the incident instantly to Hungary. Yugoslavia and Bulgaria praise the efficiency of the system, but there was nothing that could be done to counteract the poison once it had entered the rivers.

"It's a tragedy for the river; and it's a tragedy for us", said Istvan Vegsö, a resident of Tsizafüred, a small town on the Tisza. "The river and the fish form the base of our lives here. They are destroyed", he told *World Water Watch* with tears in his eyes, standing by the river, which flowed on as if nothing had happened.

The author is an environmental journalist in Passau, Germany.