Water and sustainable development

Experiences from civil society

International
Paris Conference
19,20 and
21 March 1998

International Conference on Water and Sustainable Development, March 1998

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Preface

In the context of the wide-ranging debate on sustainable development taking place throughout the planet, the French government has sought to demonstrate its concern for improving the protection and the management of freshwater resources. The objective of the Paris Conference on "Water and sustainable development" is to make a concrete contribution to the elaboration of innovative strategies in this field.

This event is part of the process of preparing for the work of the 6th session of the Commission on Sustainable Development which will be held in New York from the 20th of April to the 1st of May 1998. The French Ministries of Foreign Affairs and of the Environment wish there to be ample opportunity for the experiences and expectations of civil society to be expressed within this ministerial conference.

Civil society – scientists, professionals, or simply citizens within associations or not, all who are involved in sustainable development and its effects on their daily lives – has a joint and concrete expertise to communicate. Although water is an economic asset, for civil society, it is above all a social asset. And it is equal access to this shared asset which must be achieved and defended.

Locally elected representatives are the first to relay the body of experience acquired by civil society; they are the link between populations, governments and international concertation bodies. Although decentralised, non-government cooperation is expanding rapidly, it must be supported by a determined policy on the part of States, attracting private investment and encouraging the involvement of civil society. Governments, even with the help of development agencies, will be unable to meet people's expectations with regard to drinking water supply and sanitation without the participation of civil society.

A thorough understanding of water resources and how they are used is vital. At the same time, the data obtained must be analysed and made available at the most local level possible. Using such data rationally will be possible only if vast training and communication programmes targeting decision-makers, professionals and end-users are implemented.

Finally, institutional and legislative frameworks must be revised so that States can withdraw, whilst encouraging the involvement of civil society.

It is our hope that this document will contribute, however modestly, to a more sustainable management of our environment and to respecting the universal right to clean water.

Stéphane Hessel,
French Ambassador,
Chairman of the Water Solidarity Network.

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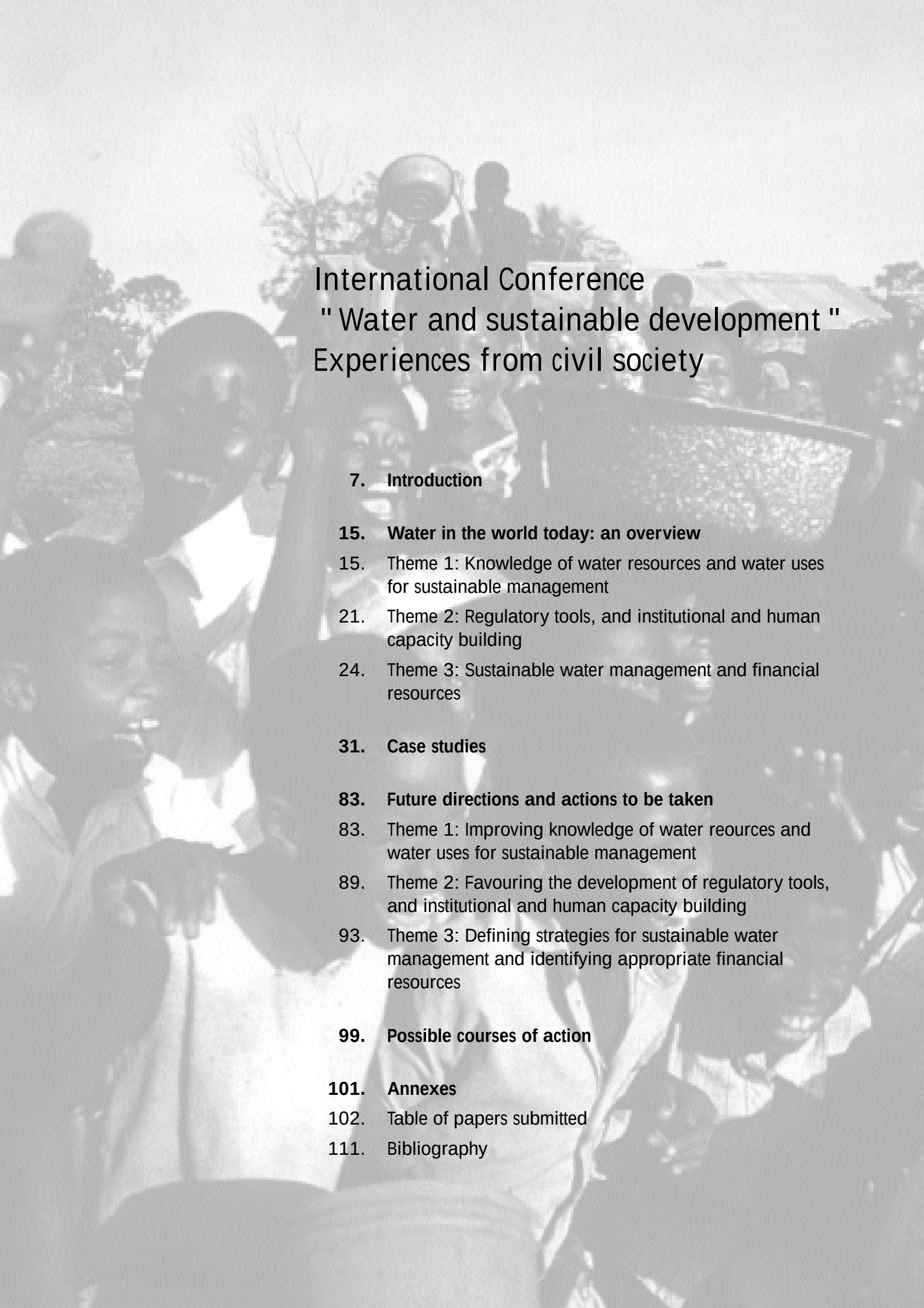


International Conference " Water and sustainable development " Experiences from civil society

Introduction

At the extraordinary session of the United Nations General Assembly in June 1997, the President of France offered to host, in France, an international conference for all public and private bodies and individuals involved in water policy. The objective of this international conference on water and sustainable development is to make a concrete contribution to the elaboration of strategies necessary to improve the protection and management of freshwater resources, in both rural and urban areas, so that drinking water supply, sanitation and irrigation are better understood and managed, by including the objectives of combating desertification in the debates. At the invitation of the Ministry of Foreign Affairs and the Ministry of the Environment, this Conference will be held in Paris from the 19th to the 21th of March.

Water policy delegates from 80 member countries of the Commission on Sustainable Development are attending. They include Ministers and senior managers of state bodies in charge of water management, representatives of civil society. Representatives of local authorities and of financial institutions, and international organisations (World Bank, World Water Council, Global Water Partnership, etc.) will also attend.

The Conference is part of the process of preparing for the work of the 6th session of the Commission on Sustainable Development (20th of April - 1st of May, New York), together with the preparatory meetings held in Cape Town (South Africa, 8th - 10th of December 1997) and Harare (Zimbabwe, 28th - 31st of January 1998). Using the fruits of these previous international meetings as their starting point, the ministerial recommendations, the proposals of specialists and the recommendations of civil society drawn up by the Paris Conference delegates will enrich the debates of the 6th Session of the Commission on Sustainable Development.

The planned working sessions focus on three areas:

– improving knowledge of water resources and water uses for sustainable management;

– favouring the development of regulatory tools, and institutional and human capacity building;

– defining strategies for sustainable water management and identifying appropriate financial resources.

The 19th and 20th of March will be mainly devoted to specialist workshops. At the Ministerial conference to be held on the 20th and 21st of March, and which is open to all the delegates, the Ministers will be present to endorse recommendations for an action plan.

Many civil society and local authorities stakeholders were willing to respond to a call inviting them to contribute accounts of their experiences, concrete examples of field experiences and reforms currently taking place, as well as proposals for applying the recommendations emanating from the previous international conferences. A selection of these representative accounts of innovative experiences from civil society has therefore been made and is presented in this document. This has served as a base for drawing up possible courses of action.

Each of the papers selected is to be the object of a presentation during the workshops detailed below:

Workshop n° 1: Improving knowledge of water resources and water uses for sustainable management

Understanding the resource and evaluating needs are a vital preliminary to global and balanced water management. This means setting up, maintaining and making full use of measurement and database networks. The objective, in liaison with international organisations (and notably World Meteorological Organisation and Unesco), is to end up with concrete projects to improve monitoring networks or planning tools. The gradual introduction of these networks, with appropriate international funding, would enable each country to better organise its water management planning in a sustainable manner.

Worshop n° 2: Favouring the development of regulatory tools, and institutional and human capacity building

Water sector investment in both rural and urban areas cannot be durable without coherent institutional systems embracing the entire water cycle being set up. This requires developing both training programmes to reach those managing the resource and the provision of vocational training on techniques appropriate to different countries, and education campaigns for consumers and the general public. Such programmes should invariably be used to complement investments. Using concrete examples, this workshop will assess the progress to be made to make concerted action on the part of the public authorities, local utility providers, public and private service companies more efficient, and will examine ways of involving water users in this progress.

Workshop n° 3: Defining strategies for sustainable water management and identifying appropriate financial resources

Investment needs in the field of water are considerable and greatly exceed the resources currently mobilised at national level and by international funders. It is therefore necessary to combine the mobilisation of local, national and international financial resources, both public and private, using innovative approaches, notably with a policy for demand management, for adapting to local circumstances, and for consumer participation. The objective of drawing up action plans – resource allocation schemes, de-pollution objectives, programmes for the development and maintenance of equipment, mobilising the appropriate funding – must be seen in the context of national and regional sustainable development strategies.

A quick sketch of the background to the main subject areas of the conference should allow the debates to be placed in their correct context.

USING THE FRUITS OF THE PREVIOUS INTERNATIONAL CONFERENCES AS A STARTING POINT

The inventory of world freshwater resources, considered in New York in June 1997 at the extraordinary session of the United Nations General Assembly, confirms that if current patterns of resource use are maintained, nearly two-thirds of the human race is in danger of suffering from moderate to serious water shortages before the year 2005. This fact needs to be seen in the light of the Rio declaration: "Human beings are at the centre of sustainable development issues: they have the right to a healthy and productive life in harmony with nature."

Water is one of the major vectors of sustainable development, the objective of which is to combat poverty, to improve social welfare, to encourage economic activities and to protect the environment. Today, given the growth in the consumption of resources and in pollution, water is in danger of becoming - as is already the case in certain arid countries - a key factor restricting economic and social development in the coming decades.

At the Rio conference, as at Nordjwik in 1996, the main recommendations related to:

– meeting, in a sustainable manner, the needs of urban and rural populations for good quality drinking water, in order to improve hygiene and health, and to prevent major epidemics;

– ensuring the food security of populations at local, regional and global levels through the sustainable development of agricultural production, and in particular through using appropriate form of irrigation;

– the harmonious development of industry, of energy production, of leisure, and in certain sectors, of tourism and of water transportation;

– increasing piscicultural production for food purposes;

– preventing pollution from all sources and of all kinds, in order to ensure optimal recycling of resources and to preserve the biodiversity of ecosystems;

– combating natural disasters and risks of erosion, flooding or drought, by taking account of water and ecosystem management.

To meet all of these challenges, there is universal agreement on the need to use an integrated, non-sectorial approach to water cycle management. This will mean involving civil society as a whole in the process of understanding and managing the water cycle.

IMPROVING OUR KNOWLEDGE OF THE RESOURCE

Although our planet has abundant supplies of water, in all its forms, most of them are made up of seawater and of ice: continental, liquid freshwater is paradoxically a globally scarce resource, most of which is to be found in groundwater. Setting aside fossil groundwater, renewable freshwater resources are part of the "water cycle"; they flow gradually back to the oceans - at a rate dictated in absolute terms by the quantity of rainwater each continent receives - or they evaporate.

These resources are very unequally distributed between continents, countries or even regions within the same country. Compared to the surface area of exposed land, their flow can range from 1 (Australia) to 15 (South America). The vast Amazon river basin alone accounts for 15% of global water courses. Clearly, situations vary widely between arid or semi-arid areas, which can in

fact be crossed by relatively large rivers, and equatorial and tropical areas, or indeed areas with an oceanic climate, characterised by a dense and complex hydrographic network.

In some island situations (the Canaries for example) or in arid countries (such as the Arab peninsula), desalinating brine or seawater is already a necessity, together with intensive recycling of purified wastewater for irrigation or to restock water tables. The watershed basins of the 215 largest international rivers cover more than 47% of exposed land.

The quantity of water available can also vary widely from one year to the next and even between the seasons of a single year. The discharge of rivers therefore varies widely from one season to another, and any annual discharge figure has therefore to be completely differently interpreted depending on how the river behaves and whether its flow is natural or controlled. A large proportion of water volume flows in the form of seasonal rises in river water levels, which cannot generally all be contained in reservoirs, if any.

This part of river flows therefore escapes any control or management and can be the cause of disastrous flooding, as well as a loss of usable water. In arid areas, however, the spread of seasonal flood waters can be a blessing for local farmers, who typically put this to good use. By contrast, in the event of several years of drought or simply of less than average rainfall, shortages can occur, and even food scarcity or famine, in certain regions which usually have plenty of water.

Additional scientific assumptions moreover regularly support the theory that climate may not be stationary, and that we may be going through a phase of climatic change, characterised by global warming together with significant effects on the water cycle. In the face of this uncertainty, it would be prudent to assume that the state of the water resources of a region or of a country will not necessarily be the same in the future as they are today.

Given the scale of the task before us, we must have a voluntarist, international and innovative policy to improve our knowledge and understanding of water resources and how they flow. To be usable over time, this knowledge must be constantly updated and be based on an analysis of user demand. Success depends largely on the latter participating in collecting and redistributing information.

A MAJOR INTERACTIVE IMPACT OF HUMAN ACTIVITY ON THIS RESOURCE

This interaction is reflected first of in ever-increasing demand. Water consumption throughout the world has multiplied nearly 7-fold since the beginning of the century and has doubled over the last twenty years.

Nearly half of this growth can be attributed to the increase in the population, which indeed raises the problem of demographic control in areas where water resources are scarce. The other half results from the increase in per capita consumption, which is linked to industrial and agricultural development and to greater social welfare, and problems are already emerging locally on how to share resources between various forms of usage.

This rise in demand often coincides with the deterioration of the resource used.

The following are some examples of this:

– as a result of over-exploitation, some underground water tables in coastal areas have become saline. The over-exploitation of rivers has sometimes led to them drying out, at certain times of the year, with the sometimes irreversible consequences of this on aquatic fauna and on ecosystems;

– in rural areas, localised or dispersed polluting refuse, notably the poorly understood use of fertilisers and pesticides, have damaging effects on human health and in many circumstances completely or partially prevent water from being re-used, even when it is available in sufficient volumes for other usages;

– badly managed water inputs to cultivated plots, and lack of drainage, have in some areas resulted in a large proportion of the irrigated surface areas becoming saline, and therefore unusable;

– excessive clearing, over-grazing, changes in the nature of the crops grown or of the organic cover, of the structure of the cultivated area or of the agricultural techniques used, together with river installations or diversions sometimes have very serious consequences;

– a modified local climate, evaporation, erosion or changes in the watershed patterns, can lead to flooding or drought, or result in various forms of pollution.

There is also undoubtedly a close correlation between the state of water resources and land-use planning. Increasing urbanisation makes the ground become impermeable because of buildings and infrastructures, leading to significant disturbances, notably in periods of heavy rainfall. This urbanisation also leads to a spatial concentration of domestic and industrial waste, most of which is not treated and which exceeds the self-purifying capacity of the immediate environment. In order to meet energy needs, and to supply water to cities and to the countryside, large artificial reservoirs have been built. Apart from considerably modifying the local ecosystem, the resulting evaporation accounts for a very large proportion of the "consumption" of the resources available.

Our knowledge and understanding of the water cycle cannot therefore be confined to physical data alone, but must take account of the human environment as a whole. A pluri-disciplinary approach, the involvement of economic and social sciences, local accessibility to data must be key words in any future monitoring systems.

PRACTICES OF CONCERN FOR THE FUTURE

Despite a high rate of regulation of surface water resources, controlling floods, which pose a serious threat to people's safety, is still a major concern. So are seasonal droughts, or even droughts occurring several times in one year. Reservoirs are often built with insufficient measures also being taken to protect the lakes' immediate environment. As a result they rapidly fill with sediments resulting from the erosion of the upper river basins, in the absence of any adequate control of the organic ground cover. Irrigation accounts for the most consumption (practically ¾ of total consumption) and irrigated surfaces continue to increase rapidly.

In many countries, the still crude irrigation techniques being used result in very significant losses of water resources, either upstream, by evaporation from reservoir lakes or open canals, or in the irrigated area itself, by infiltration and loss in the soil (globally, it is thought that only 1 / 3 of the water used for irrigation actually helps plants to grow). The overall efficiency of irrigation systems (the ratio of the quantities of water evapo-transpired from irrigated areas to the quantities of water taken from the environment) is poorly understood and badly managed. Although infiltration restocks the water table downstream, the potential for saving water is very great and this is a major economic and environmental challenge.

There is an urgent need to redirect investment towards systems which respect the resource more and to promote systems using participatory decision-making in which consumers, locally elected representatives, researchers and entrepreneurs can express their expectations and their intentions.

USING SUITABLE FRAMEWORKS FOR CONCERTATION TO PROMOTE UNIVERSAL ACCESS TO CLEAN WATER WHILST RESPECTING THE ENVIRONMENT

Too high a proportion of the world population still has no direct access to water and lives in very difficult hygiene conditions. Water-related diseases are still the highest cause of morbidity in the world.

By the beginning of the next century, 50% of the world population will be living in cities and a growing number, approximately 10%, will be concentrated in immense "megalopolises" of more than 10 million inhabitants. Drinking water supplies and sanitation in these very large cities, particularly in their underprivileged areas, cannot be resolved by governments alone. Drinking water supply is therefore a crucial issue, but major efforts have already been made in this area. By contrast, little account has been taken of sanitation so far. These two facets of one and the same service are equally important for many medium-sized and small towns, as well as for islands. In

rural areas, despite efforts made during the water decade, many villages still have serious problems of access to clean water.

The difficulties encountered are not essentially of a technological nature, although adapting techniques more closely to local circumstances is desirable. They relate mainly to a lack of institutional and economic organisation. The absence of regulations and norms, or the failure to apply them, and the lack of suitable training for professionals and for the various users of water, merely reinforce this gap.

Public funds alone will not be able to meet the cost of the investments required. It is now imperative to involve users to a greater and greater extent in water management and funding. This means finding new forms of funding enabling the whole of civil society to be committed to managing their environ- ment.

Even with an adequate maintenance capacity, generally speaking in modernised servi-ces, recurrent operational costs are similar in scale to the amortisement of the investment. In order to reduce maintenance costs, training, informing and involving consumer associations (as well as civil society as a whole), in water resource management and in respecting the ways in which this resource is made available, constitute an important step.

At present, our knowledge and understanding of water resources, the way they are used, wastage, and how different environments behave, are still far too poor to allow a global and sustainable form of management. There is now an urgent need to mobilise the international community as a whole around ambitious, but realistic objectives. Although a world-wide understanding is necessary, nothing sustainable will be achieved without the collaboration of locally elected representatives and of the populations they represent.

Water in the world today: an overview [1]

KNOWLEDGE OF WATER RESOURCES AND WATER USES FOR SUSTAINABLE MANAGEMENT

Acquiring greater knowledge of water resources, of the pressure on them and of the ways in which they are used is clearly one of the major challenges of the coming decade. We would be deluding ourselves if we thought sustainable management of the resource could be achieved without understanding what water stocks are available, their renewal capacity, and the uses to which they are put. Such knowledge cannot be piecemeal, either in terms of time or of space. It requires introducing a monitoring network equipped in the long term with financial and human resources which far exceed regional frameworks, much less national ones.

Global progress in our knowledge of the resource and its uses requires an understanding between all the partners involved in the data collection chain, from funders through to potential users (governments, research centres, industrialists, producers, etc.). This international agreement on methods of measurement, equipment, objectives and ways of making results and syntheses available, is vital to improve our knowledge, and thereby better protection, of this resource vital to all life. As a first step on this path, international frameworks for concertation must be created to oversee the sharing of tasks and responsibilities. Negotiation between politicians, scientists and users must be the key to setting up this international measurement network in a sustainable manner. The need for a world-wide measurement network is clear from several issues.

What actually is the resource?

In terms of the quantities of water trapped on the planet, stocks are estimated at over 1,300 million km3, of which 97% is in the form of saltwater. Stocks of freshwater are therefore estimated at 35 million km^3. Depending on how they are stocked, these reserves are distributed as follows, in Table 1. Most of these freshwater stocks are therefore to be found in the form of ice. Annual average evaporation across all the oceans is estimated to be equivalent to a 1,250 mm layer of water, compared with the equivalent in estimated rainfall of 1,120 mm. As a result of atmospheric circulation, there is a continuous transfer of water vapour from the oceans towards the continents.

[1] This chapter is based on the preparatory notes written by the workshops technical counsellors.

Table 1
DISTRIBUTION OF FRESHWATER STOCKS ON THE EARTH [2]

NATURE OF STOCKS	% OF STOCKS OF FRESHWATER	DETAIL	% OF STOCKS OF FRESHWATER
Ice and snow	69,6	Antarctica	61,7
		Greenland	6,68
		The Arctic	0,24
		Other (montains, permafrost)	0,98
Underground water	30,15	Water tables	30,1
		Groundwater	0,05
Lakes and marshes	0,29		
Water in the atmosphere	0,04		
Rivers	0,006		

In a system regarded as being in equilibrium (invariable stocks), this advection of atmospheric water is entirely compensated by a flow of equal volume consisting of the sum of the discharges of all the rivers of the planet into the seas and oceans, as well as the flow of polar ice in the form of icebergs. This volume is estimated at 47,000 km^3 per annum, according to the following Table 2.

Table 2
INPUT FROM THE CONTINENTS TO FRESHWATER FLOWS [3]

AREA	ANNUAL FLOW (IN KM^3)	% OF WORLD DISCHARGE	ANNUAL FLOW (IN MM)
Asia	14 410	31	332
South America	11 760	25	661
North & Central America	8 200	17	339
Africa	4 570	10	151
Europe	3 210	7	306
Antarctica	2 230	5	160
Oceania	2 040	4	1 610
Australia	348	1	45
Total exposed land	46 770	100	314

[2] Shiklomanov, I.A. (ed.), 1996. Évaluation des ressources et des disponibilités en eau dans le monde. State Hydrological Institute. St-Petersburg. Technical document in annex to Évaluation exhaustive des eaux douces de la planète, Report of the Secretary General to the fifth session of the United Nations Commission on Sustainable Development, New York, April 1997, 64 pp.

[3] Shiklomanov, I.A., 1993. World Freshwater Ressources. In « Water in Crisis », P. Gleick ed., chapter 2, pp 1-24, Oxford University Press.

To this dimension must be added the spatial inequality of water resources. In most countries, the proximity of permanent and easily accessible water is still a major factor in land occupation and use. Such cheap, easily exploitable water is very unevenly distributed. As a result of human activities, it is more particularly subject to deterioration in its quality and in its patterns of behaviour. Its increasing scarcity means that the world will have to change from exploiting a permanent, universally accessible resource to a policy of managing a rare and expensive commodity reserved for the better-off.

To avoid this vicious circle, we therefore need precise and continuous knowledge of the state of the resource and its uses, while aiming in the future for universal access respecting the different users and their needs.

Does data collection need to be improved?

Quantifying the stocks of water available and above all water flows at relevant scales, i.e. continents, regions, countries, watershed basins, is a necessary preliminary to estimating water resources and any plan to managing them.

To meet the objectives of knowledge and management, the data collected must meet a certain number of requirements and display the following qualities:

- continuity and durability;
- relevant data collection sites;
- reliability and accessibility.

◆ *Continuity and durability*

Continuous and long-term series of measurement are needed on the same site, for the objective here is not to try to characterise a fixed stock or deposit, but to follow a flow which varies over time. In addition, the state of the water resource of one region or country will not necessarily stay the same, as a result of the existence of extreme climatic variability and the growing influence of human activities. It is therefore vital to prolong the series of existing data with new, contemporary data. This will enable the statistical risk to be specified and avoiding action to be taken.

Data collection is far from being achieved on a worldscale. In developing countries, 2 or 3 year surges correspond to the launching of measuring programmes funded by international bodies, followed by a gradual decrease over the years. Indeed, as soon as the local authorities are left on their own to meet expenses, the urgency and the priority of which are difficult to appreciate, they tend to forget about this activity.

◆ *Relevant data collection sites*

To be able to follow changes in uses and in the flow itself, the underlying structure of data collection networks must adapt to changes in demand (urbanisation, economic development, changes

in cultural practices, etc.). The vast majority of existing data still consists of rainfall figures, water table levels or depths of water in rivers, whereas the growing impact of human activities requires monitoring the chemical, physical and bacteriological quality of water.

◆ Reliability and accessibility of data

There are also long delays between data collection and primary treatment (several months, and sometimes several years), as well as a lack of long-distance access to hydro-meteorological data. Continental level evaluations ("Evaluation of water resources in Sub-Saharan Africa") have revealed a very significant deterioration in the scale and quality of the data collected since the early 80s. When the data collection was not regular and continuous, an upward adjustment then generally follows. But it is often thanks to another operator, with no continuity in the instruments or methodologies used, which clearly jeopardises progress in our knowledge of the resources.

The use of new technologies (the Internet for example), together with harmonisation of working procedures, will enable:

- improvements in the quality and the precision of the data;
- water quality parameters to be taken into account;
- the sustainability of consistent measuring systems.

Which users can and should be involved?

At present, the sustainability of systems for measuring, collecting and using data cannot be guaranteed. Opening these networks up to all information producers and users is one of the factors enabling data collection networks to become sustainable.

Data collection centres too frequently operate amongst "specialists" who deliver their information only in "digested" form without going into the nature and the scale of their work. Society as a whole, from local authorities to users, needs to be involved in collecting, enhancing and using data. Governments will only be able to give these activities high priority if the people feel involved and are directly concerned by the results. This will provide the opportunity to highlight the often questionable productivity of data collection centres. Relevant and locally accessible products enabling these centres to be recognised and funded will need to be devised.

This change should make use of experiments and programmes currently underway. The World Meteorological Organisation (WMO) has launched the World Hydrological Cycle Observing Sys-

tem (Whycos) programme which aims to improve the precision and continuity of field measurements thanks to the use of advanced technologies (such as real time satellite data collection systems) and above all by setting up regional databases on water resources. These databases will be available on the Internet both for consultation and for data to be added.

Regional Hycos programmes are underway or currently being assessed (Mediterranean, East Africa, West and Central Africa, Equatorial Africa, Caribbean, etc.).

Is evaluating the resources available currently relevant?

The way in which water resources are evaluated still lacks homogeneity and conceptual rigour. For example, attributing the total discharge of a river crossing several countries to each country, without taking into account the ways in which it might be used upstream, artificially increases the resources actually available. Conversely, although water extracted from rivers is estimated, inputs due to recycling used water (water drainage or wastewater) are not generally taken into account, which distorts estimates downwards. In tropical climates, where a large proportion of the water volume flows during seasonal floods, it is not logical to regard these volumes as "useful".

Variability from one year to the next is also little or poorly taken into account (in the Fouta Djalon from 1970 to 1989, discharge 60% below the average established for the period 1951-1989, 30% on the median and upper courses of the Niger river, whereas the data analysed for building hydraulic structures date from before 1970).

The spatial distribution of the resources is also poorly taken into account. The widely used indicator for pressure on the resource ignores the distribution of this resource, so that semi-arid Sahel countries with small populations (Mali, Niger, etc.) crossed by a major river with a large but intermittent discharge are classified as better off than temperate, oceanic climate countries such as France or Great Britain.

The term "usable" should designate a resource meeting the following criteria:

– a resource of which the cost of exploitation and treatment, for or after use, is economically acceptable to the users;
– a resource which can be extracted and then rejected in ways which have a bearable impact on the surrounding environment.

Do other resources need to be found or should demand for water be better understood?

Renewable water resources are in absolute terms limited by the quantity of water falling as rain on the continents. At world level, water consumption has increased by a factor of nearly 7 between the beginning of the century and 1995, and it has doubled in the last twenty years. Half of this increase is due to population growth, the other to the per capita increase linked to agricultural and industrial development, together with the surge forward in social welfare for certain sections of population. However imperfectly, the ways in which the hydrological cycle functions is now understood, but the same cannot be said of those governing demand for water. Exploring

the nature of the demand for water, and rationalising it to reduce waste or at least to restrict over-consumption through negligence, still remains to be done.

The sectors involved in demand are highly fragmented, and therefore highly complex to manage. This fragmentation also provides a real opportunity to involve human communities as a whole in implementing solutions requiring major changes in behaviour.

There is little data on the efficiency of water distribution and utilisation systems, and they often confuse "water required for an operation" and "water actually consumed". Finally, some uses require only a little water, but are responsible for significant deterioration to considerable volumes of water downstream from the site of the activity.

Using data on the scale of watershed basins allows spatial correlation between data on the resource and data on its use, which geographical areas defined by legal or political boundaries do not always show.

Integrated resource and use management highlights, for each water usage, the environmental demand in objective, or at least in quantified terms.

Previsions for changes in demand are based on very crude measures combining increased demand per inhabitant and demographic growth. Experience shows that in the case of energy, for example, projections made on these bases have largely proved wrong. Previsions therefore have to be considerably adjusted and must take other factors into account if sustainable action is really to be taken on the environment.

Although demand must be our starting point, modelling it must not result in too rigid a framework for debate, but rather in a co-ordinated series of scenarios, which take into account probable changes in the economy in the coming decades. Agricultural demand, which is the highest in terms of quantity, will certainly change considerably both in quantitative and in spatial terms in the years to come. According to some observers, this demand will probably fall globally, without, however, reducing pressure on already vulnerable areas (North Africa, for example).

Information systems on agricultural uses of water will need to be better correlated with other databases; amongst the former, the FAO's Aquastat programme marks a significant initiative in so far as it is relevant on a country-wide scale and provides world-wide estimates.

As far as inter-State collaboration is concerned, Semide (the Euro-Mediterranean System for information on skills in the field of water) has been taken up with enthusiasm by ten countries bordering the Mediterranean. This programme could serve as a base for developing and validating a complete and integrated information system on aspects of "knowledge and uses of water resources".

REGULATORY TOOLS, AND INSTITUTIONAL AND HUMAN CAPACITY BUILDING

Rapidly increasing demand

United Nations studies underline the risk of serious difficulties in supplying water in the medium term, and sometimes even of lack of access to drinking water for a large proportion of the population.

Demand for household water, and indeed for industrial and irrigation water, continues to grow, leading to a policy of major hydraulic installations and equipment for irrigated areas. These increasing needs will lead to tensions between users. The fragmentation of levels of decision-making and the lack of national or international regulations will make arbitrating conflicts even more difficult.

Unequal access to water

Supplying good quality drinking water is one of the responsibilities of governments and the international community, and these must involve all sectors of civil society in concrete actions, using new forms of partnership. So that they can meet their responsibilities better, holistic approaches, centred on users' needs, must be adopted. Emphasis must also be placed on ensuring that regulations and actions undertaken complement each other. In terms of access to drinking water, in 1990 the South North gap showed an average disparity of 68 per cent, with less developed countries having in the order of 47 per cent coverage.

Although water management can be the cause of conflicts and social exclusion, it can also act as a binder, consolidating communities around water standpoints, lakes, rivers or wells. Think globally and act locally is the approach to aim for, and this includes the participatory process involving civil society.

Sanitation requires major efforts

The lack of a sanitation policy suited to their local contexts has held down the rate of water and sanitation installations in developing countries. Some drinking water consumers already find it difficult to meet the cost of their water supply. It has already been established that charging for the cost of treating wastewater, particularly in developing countries, will only be possible for better-off population groups.

In the absence of any policy being defined on installations in the medium and long term, urban or industrial sanitation - including that of agricultural and para-agricultural industries - is barely under control and lags considerably behind compared with installations for obtaining and distributing water.

We need to promote techniques which reflect local realities in this field, even more than we do for drinking water supply. Passive treatment and reusing wastewater must be popularised. This transformation of the service supply means using new forms of decision-making and distributing information more widely.

There is much to learn from the immediate environment

The water crisis is not so much an economic crisis, but rather a crisis in creativity. Looking for new partners from the private sector to provide investment means exploring and identifying suitable local solutions, developed in partnership between civil society and public authorities. Local decisions contributing to global, sustainable strategies in order to preserve the resource and ensure that it can be used in a sustainable manner have positive side effects for the world as a whole.

Promoting integrated water management

The water crisis is aggravated by the dynamic interaction of several trends occurring at local, national or global levels:

– environmental trends: climatic change, desertification, the disappearance of humid buffer zones, etc.;
– economic trends: the surge in agro-industries, the globalisation of exchanges, increasing energy needs, etc.;
– social trends: migration, urbanisation, demographic growth, epidemics, etc.;
– cultural trends: the shift from rural to urban, from traditional to modern, from subsistence farming to cash crops, etc.

There is now general agreement that to understand and manage these trends, in order to avoid that they become impoverishing, priority must be given to the integrated management of the water sector. This kind of management, however, requires a co-ordinated series of both institutional and regulatory measures, which are often still lacking. For example, the frequent lack of any regulation on extracting water from water tables means that the way they are used cannot be rationally managed. Because there is no control over how they are used, coastal freshwater tables are being increasingly contaminated by seawater.

Arbitrating between users

The water and sanitation sector involves a very large number of public and private stakeholders responsible for different – often contradictory and always interdependent – territorial or sectorial interests, which have to be reconciled. There are all too few regulatory measures to arbitrate on sharing resources between the various categories of users which put qualitative before quantitative factors.

The technical approach, which does not take sufficient account of economic and social aspects, often predominates when choices are made.

The increase in needs and the variety of uses to which water is put, the increasing complexity of societies, the progress of technologies and the impact of the economy all create new problems; to tackle these, the institutions concerned and new forms of organisation must be strengthened.

Community-based initiatives, however relevant they may be, must work alongside governments which have the regulatory and tax-raising powers needed to ensure the transition to sustainability.

Redefining the levels of decision-making

Water rights are the specific rights of all those who share water. Any attempt to regenerate the relationship of the community to water must aim to broaden the base of user action and control over water resources. We now need to reconfirm the ownership rights of communities of residents and of river bank inhabitants over sources of water, and to demand that the State and local authorities together protect and guarantee these rights.

Decentralisation, which is occurring in most countries, strengthens the prerogatives of local service providers. They are the ones who are going to be called upon to manage the way their land is used, and in particular how water resources are made available.

This responsibility goes hand in hand with the need to restructure and strengthen local skills. It is at this level of representation and decision-making that the link between national policies and local requirements must be made.

Managing water by river basin

To these considerations must be added geographical and administrative facts which complicate the possibilities of global decision-making. For example, two thirds of the world's watershed river basins are shared between several States. Each State organises water management on its own territory, often without taking its neighbours into account. In the absence of any international convention, conflicts between States run the risk of leading to serious regional tensions.

Virtually identical problems arise within each country, and above all in the large federal states. There is generally no integrated water planning system, nor any genuine global planning. Land use planing properly speaking is rarely reflected in the setting up of trans-sector decision-making bodies, but remains fragmented across a whole series of technical administrative bodies (agriculture, industry, urban development etc.), which does not make the desired integrated approach any easier.

Reconciling economic and social approaches

Social and economic approaches are too often separated, or even opposed, whereas they are clearly complementary and should be the object of a joint debate between the representatives of the users concerned. Freshwater, whether it is regarded as a common asset, a public service or a piece of merchandise, raises all the issues relating to sustainable development. Access to water is above all a political issue, in other words any individual has a right to access to drinking water and sanitation.

Taking action on training and information

Institutional capacity building requires training and informing decision-makers, technicians and users. Many projects and programmes have addressed these needs. At present, however, such programmes are too often restricted to credit lines made available by external funders. Because of the ways in which it operates, this kind of funding restricts their ability to respond to demand. Such actions are also often the object of aid and are generally regarded as less important than investments in equipment. Very often, these programme components – unjustly called "parallel actions" – occur only very late in the day and in a form which is totally divorced from the infrastructure implementation stages. Moreover, given the scale and the costs of such actions, and given that their effects are not immediately measurable, governments themselves limit their requests for assistance.

Generally speaking, users are only marginally involved in initiatives, and decision-makers very little involved; the latter feel ill-equipped to tackle the technical choices before them. The water sector is undoubtedly the first area in which we must share technology, skills and training transfers.

SUSTAINABLE MANAGEMENT AND FUNDING

Water is a common asset

The water sector is a vital and strategic one; it cannot be left to be managed solely according to market forces. The sustainable water management approach requires international and national action and a local form of management directly involving the elected representatives and the various components of civil society, NGOs, local businesses, etc. At present, as far as drinking water supply is concerned, the greatest challenge is to reconcile the market value of water and satisfying the needs of relatively insolvent users.

Water is a vital asset. The resolution adopted at the extraordinary session of the United Nations in June 1997, includes the following statement: "the water resource is essential to meet basic human needs, health and food production and the preservation of ecosystems, as well as economic and social development in general." [4]

A broad range of funding

French financial aid for 1996 in respect of public aid to development in the water sector throughout the countries eligible is summarised in the Table 3 below. At first glance, this table shows the low level of funding devoted to resource management and to improving skills, compared with the amounts devoted to capital investment. And yet, as pointed out by the Minister of Finance, French commitments to the water sector in 1996 totalled 25% of all French project aid and 1% of technical co-operation.

[4] Translated from the French, and not a direct quotation from the English version of this text.

Table 3

SUMMARY OF FRENCH FINANCIAL AID IN 1996 IN RESPECT OF PUBLIC DEVELOPMENT AID (PDA) IN THE WATER SECTOR [5]

PUBLIC DEVELOPMENT AID 96 BY SECTOR (MF)	CO-OPERATION	FOREIGN AFFAIRS	CAISSE FRANÇAISE DE DÉVELOPPEMENT	TREASURY LOANS	OTHERS
Drinking water and sanitation [6]	-	-	834	918	-
Water and agriculture [7]	21	-	340	33	5
Water resource management and capacity building [8]	32	44	15	-	1
Sub-total	53	44	1189	951	6
			Total PDA Water		2 243 MF

French water sector aid is principally directed at sub-Saharan Africa, North Africa and the Middle East.

Table 4

GEOGRAPHIC DISTRIBUTION OF THE MAIN COUNTRIES RECEIVING FRENCH AID [5]

REGIONAL DISTRIBUTION 1996 (MF)	SOUTHERN ASIA	EAST ASIA AND THE PACIFIC	LATIN AMERICA AND THE CARIBBEAN	NORTH AFRICA AND THE MIDDLE EAST	SUB-SAHARAN AFRICA	TOTAL
Bilateral aid	232	201	24	831	942	2 243
World Bank (MF at $ / 6F)	4 554	6 336	3 054	1 260	306	15 510
Regional banks (MF at $ / 6F)	2 490	2 100	8 352	300	300	13 542

[5] Source : French Ministry of the Economy, Finances and Industry.

[6] Funding principally in the form of capital investment for drinking water and sanitation.

[7] Funding for irrigation and water management in rural areas.

[8] Institutional support or technical assistance projects.

Current loans outstanding give a better picture of the geographic distribution of the World Bank:

Table 5 [9]

	SOUTHERN ASIA	EAST ASIA & THE PACIFIC	LATIN AMERICA & THE CARIBBEAN	NORTH AFRICA & THE MIDDLE EAST	SUB-SAHARAN AFRICA	TOTAL
AID outstanding (M$)	6 100	3 020	290	590	4 390	14 390
BIRD outstanding (M$)	1 758	5 550	11 500	4 590	2 690	24 330

Table 6

DISTRIBUTION OF MULTI-LATERAL FUNDING BY SECTOR [9]

MULTI-LATERAL BANKS BY SECTOR 1996 (M$)	WORLD BANK	ASIAN BANK	INTER-AMERICAN BANK	AFRICAN BANK	TOTAL
Drinking water and sanitation	683	192	1 039	10	1 924
Water and agriculture	1 505	469	85	80	2 139
Urban development / resource management	405	103	268	10	786
TOTAL	2 593	764	1 392	100	**4 849 M$**
Percentage of operations	13,6 %	13,7 %	20,7 %	12 %	

Taken as a whole, this data shows that there is little investment on the part of development banks in the poorest regions of the planet (Southern Asia and sub-Saharan Africa), although these banks are the main funders in the water sector.

[9] Source : French Ministry of the Economy, Finances and Industry.

Demand exceeds supply

In developing countries, the proportion of GNP allocated to water and sanitation has risen from 0.25% to nearly 0.4% between 1980 and 1990. Capital investments have mainly been externally funded, at nearly 80% for Africa, compared with a world average of 55%. Operator contribution to funding, particularly in Africa and in Asia, has fallen from 20% to 10%. The increased investment from external sources is limited, while demand is constantly growing.

How much does water cost?

At the last United Nations Conference for Environment and Development (UNCED) in Rio de Janeiro, water was defined as "a social and economic asset playing a vital role in meeting basic human needs, food security, reducing poverty and protecting ecosystems". At the same time, it was stated that: "The economic exploitation of water must be seen in the context of these social and economic implications, by reflecting the importance of meeting basic needs".[9] This definition opposes two distinct views: one seeking to allow market forces to dictate the price of water, and the other emphasising the public and limited nature of this resource vital to life.

As far as irrigation is concerned, the lack of resources to make relevant measurements to estimate water consumption and poor recognition of water users' rights limit the possibilities of regulation through market forces. To define the cost of water in this context, we therefore need to start by rehabilitating users' rights and – through arbitration – locally setting rates which reflect the impact of using water on the common asset. With regard to drinking water supply, recovering total costs is the subject of much debate.

A consensus seems to be emerging in the direction of the need to take all costs, including environmental costs, into account when calculating the rates applicable. However, such rates should be introduced gradually, in the light of the users' ability to pay. Cross-subsidy systems should ensure equality of access to drinking water. Water supply is a public service, and in the same way as for roads or the police, the concept of the user-payer does not have to be applied to everyone, everywhere.

It is commonly stated that, in certain urban areas, the poorest pay very high prices for their water. This consideration has to be compared with the quantities consumed. Improving the access of these population groups to water will increase their consumption only slightly and in the medium term, since household budgets, and therefore the proportion of these spent on water, are particularly low. The rates applied must be set in the light of people's ability to pay, rather than according to average estimated consumption. We must not repeat the mistake of the water decade objective of "40 litres per inhabitant per day in rural areas", which led to over-sized installations, impossible to make sustainable.

[9] Translated from the French, and not a direct quotation from the English version of this text.

Encouraging a rational use of water

Demand management requires the organisation responsible for water supply to encourage the consumer to moderate his consumption and to avoid wastage. Water leakage during distribution has certainly sometimes been wrongly included in this notion of demand management, whereas this aspect rather requires improvements in maintenance. It is still true, however, that it can be partly avoided by good management.

Two mechanisms for encouraging consumers in this respect have been suggested, notably by the world water council: financial inducements and physical inducements. The former, if they are based on penalising the consumer, will have the disadvantage of making him dissatisfied and mistrustful of the distribution body. Differential rates, with for example, lower charges for the first cubic metres; is more suitable and should be more widely used. The other approach focuses more on grants towards installing water-saving devices (double flush reservoirs, push-button taps, etc.) or devices enabling wastewater to be recycled for certain purposes.

Irrigation is the area in which the most substantial water savings could be made. There are many techniques which use less water than spraying or gravity irrigation. Unfortunately, they are still too expensive compared to the current low cost per cubic metre saved. If the actual cost of the water used (including environmental costs) is not passed on to large agricultural businesses, and if they are not offered any financial inducements (such as tax exemptions, subsidies per hectare, etc.) they have no incentive to change the ways in which they farm.

For small-scale farmers, as for the poorer users of drinking water supply (DWS) services, there are suitable systems to encourage them to save water. These include campaigns on respecting water and its value in the cities, and improving and rehabilitating traditional systems in the countryside.

Taking demand as a starting point, adapting the supply of services

If services are to become sustainable, we must first analyse demand, how it is expressed and how to help local consultation and decision-making bodies to be set up.

In Cameroon, for example, in the city of Bamenda, if the demand had not been analysed and if the population had not been helped to find ways of expressing themselves, and places to do so, priority would probably have been given to DWS. Following analysis of the demand and thanks to the genuine collaboration of the local authorities, the focus is now on rainwater harvesting and sanitation.

The population, including the local economic operators, are now taking part in improving the infrastructures, as they have been consulted. Choosing between the types of service available

must be discussed with the users. Initial investments should therefore be devoted to improving the skills not only of local decision-makers and technical operators, but also of all users, so that they can play a real part in the debate.

Introducing environmental taxes

The environmental considerations of water management, such as protecting rivers, lakes, wetlands, hydrographic basins, water tables, etc., have been too long neglected. The idea of including all the costs to the environment is a recent one. Until now, service costs were often estimated in relation to system maintenance, without even taking capital depreciation costs into account. Environmental costs and the sustainability of the resource exploitation must come first.

Introducing environmental taxes was widely discussed in Zimbabwe in January 1998 at the specialist seminar held in Harare. This financial mechanism has been used in several developed countries, although with differing methods of application. In developing countries, introducing such taxes is seen as a constraint imposed from outside, rather than a requirement to improve respect for the local environment. If such a tax were introduced, it could not be decided at international level. Each country must be free to judge if such a tax is relevant to their situation.

One possibility which should, however, be more widely used is international agreements on trans-boundary river basins. There have been many initiatives on such agreements, and if these were compared, they could enable international strategies for mobilising funds to be devised.

Devising instruments to assist private investment

There is an urgent need to trust private investors to finance water supply and sanitation. Redirecting funds towards guarantee systems enabling private bodies to invest whilst limiting their risks would greatly increase their possibilities of intervention. Turning to private investors has enabled certain governments to meet their responsibilities better, or has even relieved them of some of their responsibilities.

There are many variations in contractual agreements with private bodies in the water industry, covering operation, funding and construction.

In the United Kingdom, water companies have only a 25-year, renegotiable contract, but they own the installations. In France, the system has evolved from rental to concession agreements, with the public authority retaining its powers and staying in close contact with the consumer, and infrastructure remaining in the public domain. In many countries (Argentina, Côte d'Ivoire, Guinea, etc.), the private sector uses lease or concession arrangements.

In the case studies presented below, private companies undeniably make a major contribution. Such companies have enabled cities such as Gdansk or Aguascalientes to overcome difficult situations.

The water service has become efficient, through providing an input in terms of mastering new methodological and technical tools and institution building. However, once the market of large metropolises has been covered, there is no guarantee that smaller towns will attract investors.

Franchise experiments by local companies taking on water in addition to their traditional activities are being tried, in Guinea Bissau for example. There is an urgent need for such initiatives to spread, in order to equip secondary towns with infrastructures likely to encourage their population to stay and to prevent it from migrating to the capital cities.

Water supply affects economic development. It is therefore likely that local operators, the solvent users of the service, will then settle elsewhere than in the capital cities.

Making it easier to obtain credit

There are many obstacles in the path of a more harmonious form of land use.

Firstly, municipalities, apart from a few large metropolises, do not have access to any international aid, although they are now often entirely responsible for water distribution and sanitation. They draw on municipal development funds made available by their States. These are generally in the form of loans at much higher rates (over 10%) than those allocated to States by development banks. The overall poverty of the consumers in these towns and cities, and the problems they have in retaining their trained staff, do not make the municipalities' task any easier.

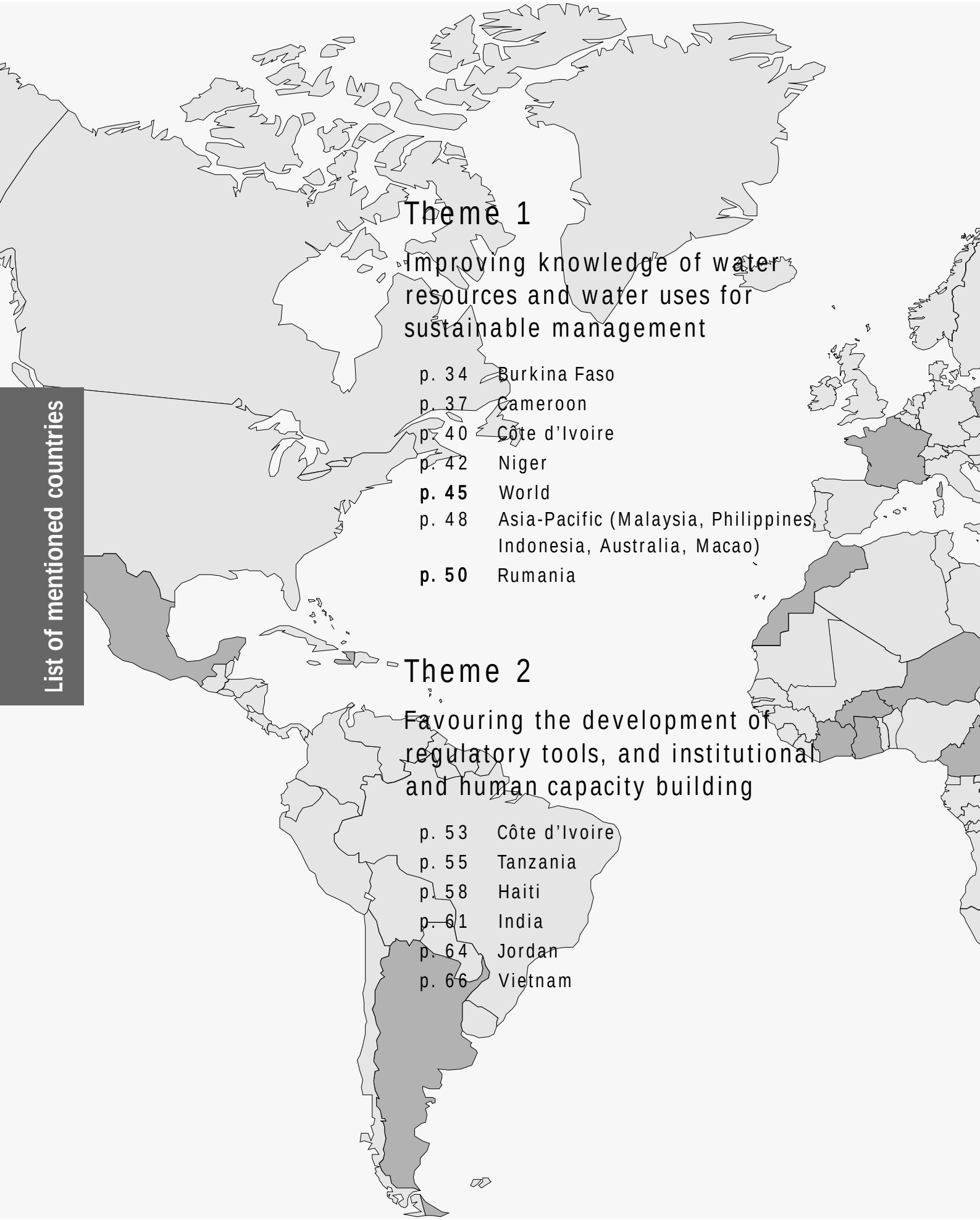
Conditions attached to loans or aid sometimes prevent choices likely to lead to the development of partnerships with the private sector from being made. In addition, local entrepreneurs, who could play a part in the great increase in services, cannot respond to calls for tender either, as the scale of the contracts and the guarantees required are beyond their means.

Innovative mechanisms to support these initiatives do exist; programmes such as the European Union's Echo have enabled urban areas of Haiti for example to take over from the State distribution company Camep in respect of management in their neighbourhood. In general, the need to have local development funds, working on sectors broader than water alone, has emerged clearly.

In Bobo Dioulasso, Burkina Faso, the population and private entrepreneurs are going to play a financial and material part in introducing sanitation and in improving their DWS thanks to incentive funding from the World Bank. Still in Burkina Faso, in the capital's underprivileged urban areas, integrated water access and sanitation operations are taken on by the local population with Caisse française de développement (CFD) aid.

We need to analyse these experiments, to learn from them and to make local development desks widely available to help both municipalities and civil society in their efforts to improve their environment.

Case studies



List of mentioned countries

Theme 1

Improving knowledge of water resources and water uses for sustainable management

Theme 2

Favouring the development of regulatory tools, and institutional and human capacity building

Theme 3

Defining strategies for sustainable water management and identifying appropriate financial resources

Karfiguela waterfalls, upper basin of the Comoe river

Fam

1

Programme for the improved use of water resources in the South-West of Burkina Faso (RESO)

Context and stakes

The programme covers 1/5 of the surface area of the country, i.e. 60,000 km², in the south-west. This is the part of this Sahel country which receives the highest rainfall, and notably it contains the country's two permanent rivers. Because of the great potential of its water and its soil, and following the eradication of onchocerciasis, the region is currently attracting significant movements of population. There is therefore great potential for using the region's water resources for agricultural purposes, but current practices making poor use of water and soil resources are already resulting in local water shortages and conflicts in the way these resources are used.

Objectives of the action

The aim of the programme is to help to exploit the hydric potential of Burkina Faso's south western provinces, in accordance with the objectives of the global environment and water strategy drawn up by the Government of Burkina Faso. Through the watershed management environmental approach which the programme is currently testing, the south-west serves as a pilot region for the new national water policy.

The objectives of the programme are:
– to improve the drinking water supply (DWS) of rural and semi-rural inhabitants in a manner which ensures that installations and equipment are sustainable;
– to improve the use of installations and equipment thanks amongst others to assisting community based initiatives;
– to strengthen the decentralised planning capacity at regional level, particularly by training staff with a view to ultimately achieving independent "post-programme" monitoring.

Description of the action

Each sub-project is presented below, giving its specific objectives and the innovations expected of it.

The "Water resources" sub-project

The specific objective is to significantly improve knowledge and understanding of water resources, their productive potential and the constraints relating to these.

◆ Expected innovations:

– integrating a team of scientists within highly operational teams;

– running a multi-disciplinary scientific team: a geologist, hydro-geologists, hydrologists, a pedologist, an ecologist, etc.;
– collecting, sorting and analysing physical and socio-economic data, notably by using scientific tools for hydraulic modelling;
– "discovering" new exploitable resources;
– drawing up a plan of action to protect the resource.

The "Exploiting water resources" sub-project

The specific objective is to strengthen at regional level the capacities of water sector stakeholders to take productive and consistent initiatives and action by:
– supporting and promoting community-based initiatives;
– assisting better water and infrastructure management with a view to covering costs and saving water resources;
– introducing permanent mechanisms and frameworks for structured dialogue between stakeholders on the ways in which water is used.

◆ Expected innovations:

– creating a environment favourable to community-based initiatives and assisting these;
– improving their self-funding capacity and their access to sources of funding;
– broadening the regional market for goods and services in the water sector;
– introducing contractual frameworks for hydraulic infrastructure and water management.

The "Semi-rural hydraulics" sub-project

The specific objective is to introduce a sustainable drinking water service for these consumers.

◆ Expected innovations:

To introduce new habits in order to:
– raise the market value of water and thus provide funding for simplified drinking water supply (SDWS) projects which cost more than classic village hydraulic systems;
– set up projects: identifying and training contractors, financial participation in the investment, and subsequently in maintenance and repair, contractual management, etc.

The "Rural hydraulics" sub-project

The specific objective is to introduce a sustainable drinking water service in rural areas.

◆ Expected innovations:

– handing responsibility for maintenance over to the villagers;
– a firm legal and financial foundation for the water collection point committees;
– a new approach to maintenance, as a service activity in its own right;
– funding the investment and the sustainability of the installations.

The Master plan and planning division

The specific objective is to draw up a concerted water resource management programme in the south-west (the master plan for the improvement and management of water resources in the south west, SDAGRESO). Expected innovations are the watershed management environmental approach and the concerted, strategic planning method.

Localisation
Burkina Faso's South-West Provinces surrounding Bobo Dioulasso: Bougouriba, Comoé, Houet, Kénédougou, Poni, Tuy, Léraba, Ioba and Noumbiel

Domain of intervention
drinking water distribution, irrigation, environment, integrated resource management

Area of intervention
urban areas, secondary towns, rural areas

Contracting authority
Ministry of Environment and Water

Implementing agency
Head Office of the Hydraulics Department

Donor
European Union (7th EDF)

Total budget
15 million ECU's

Duration : from mid 1993 to the end of 1999

STRONG POINTS OF THE EXPERIENCE AND PERSPECTIVES

The RESO programme owes its strength and solidity to its original concept: several concrete field action sub-projects, providing the opportunity for life-size testing of innovations in managing and exploiting water resources, and a determination to learn from these innovations within a strategic planning framework, a determination which took concrete form in the installation of the horizontal planning division in March 1997. Today, the teams have gained field experience and an understanding of how to learn from experiences which clearly come together within the planning process.
The aim of concertation is to gradually increase the awareness of stakeholders who are not used to dialoguing with each other, and who sometimes mistrust each other. Concertation is a tool which can tip the balance between mistrust and trust. The different circles of partners gradually involved in the dialogue include:
– the internal teams of the RESO programme;
– the institutional or organised partners of the Regional Hydraulic Department;
– the inhabitants of the RESO region, with whom dialogue has already started – albeit gingerly – in a number of ways (departmental meetings, information and training sessions for water collection point committees, and the Comoé and Kou river basin committees, etc.).

A major side-effect of the institutional study was the involvement of the Department and of the teams in the SDAGRESO process. The main objective of the SDAGRESO concertation, during the setting-up stage, is to involve the RESO programme partners in the planning process.
The current empowerment of social sub-contractors within all the sub-projects is essentially aimed at the involving the inhabitants.
Launched in 1993, and significantly re-worked in 1996, the RESO programme, two years from its completion date, has now seen:
– a shift in the teams' results and in their impact, notably towards capitalisation and the planning process;
– a shift in the visibility of the key issues of the programme;
– and a shift in the internalisation of the SDAGRESO process.
The move towards internalising skills and knowledge within Burkina Faso is currently occurring, on at least three levels for the time being:
– first, the planning process is being internalised by the programme management;
– next, the Water resources sub-project teams are internalising the environmental monitoring of water resources and the scientific tools to assist the use and sustainable management of water;
– and finally, internalisation is just beginning to occur amongst the "social sub-contractor" teams in the specific area of maintenance. This would then open the door wide to involving the inhabitants in a trend to change their habits vis à vis water resources, in an atmosphere of trust between them and their future water sector service providers.
Thus, the hand-over of skills and knowledge generated by the RESO programme goes beyond the strict framework of the permanent programme teams (the civil servants of the regional hydraulic team). The notion of handing-over skills and knowledge is interpreted far more broadly than the skills and knowledge of the teams directly involved in the programme. It concerns a much larger and rather more durable audience, i.e. that of the programme partners and the people targeted by the programme, by aiming to transfer new habits rather than set and rapidly obsolete skills and knowledge.

PROBLEMS

Problems relate to the highly innovative and highly internalised nature of the programme. There are in fact very few references or guidelines to steer this kind of exercise of concerted strategic planning for water resources in the context of a developing country in the Sahel region.
The first major problem was a practical one: the programme had great difficulties in finding professional researchers and consultants capable of grasping the objectives of the programme as a whole and of playing the innovation card. This problem was reflected in relationships characterised by relative conflict with a certain number of the programme service-providers. This was, however, tempered by great understanding on the part of the funding agency, which was very keen on the nature of the programme in this respect, i.e. on its major focus on internalisation by local stakeholders.
The second major problem was a conceptual one: the recent experience of the French SDAGE programmes might have been useful. These however, have proved to be planning mechanisms tailor-made for a French-style water Agency, i.e. a planning tool for the financial and regulatory management of regional water policy on the scale of a very large area, in a highly regulated country, with high rainfall and dominated by pollution concerns.
The methodology they use is of lesser relevance to a country where water regulation is still vague and inefficient, where the challenges are first the exploitation of water resources, since cases of pollution are still highly localised, and where structured concertation and negotiating ways of using water are still in their infancy.

Possible courses of action 3, 4, 6 and 7

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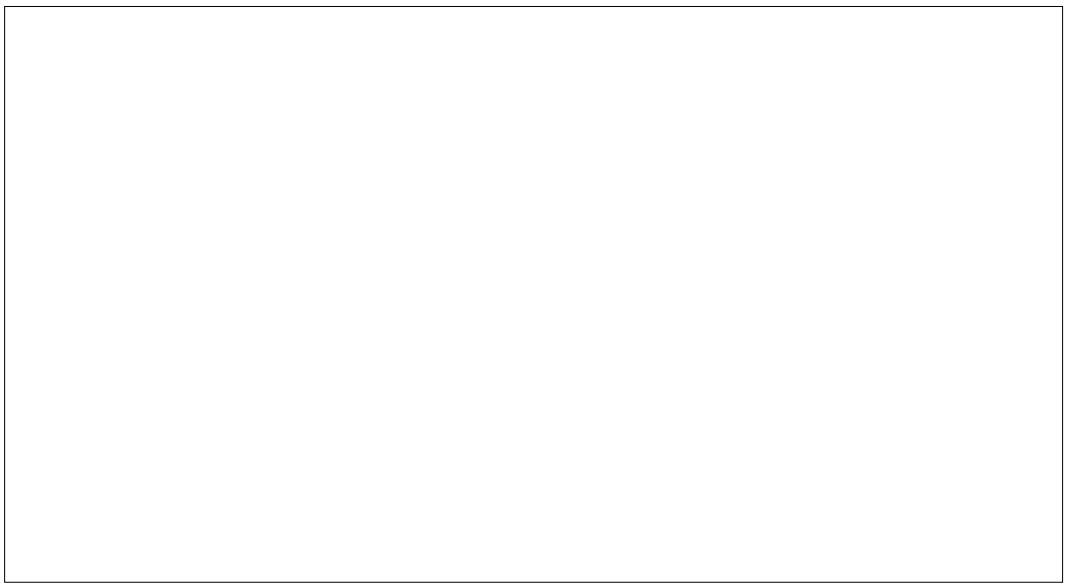


Nui-Essong neighbourhood: « Nsole » spring before improvement (July 1997)

Form 2

Upgrading public standposts in a large city

Context and stakes

The population of Yaoundé, the capital of Cameroon, stands today at nearly 1 million. Its water supply is characterised by the co-existence of a public service franchised to a national company, SNEC, and a large number of traditional water collection points (springs, wells and wet season streams) drawing on the city's abundant underground resources.

In June 1997, SNEC conceded that there was only one water connection for every 25 inhabitants in Yaoundé.

Moreover, the free distribution of water from public standposts has gradually been stopping since 1993, because the communes are in debt to the SNEC.

Because the national water policy failed to anticipate such shortfalls in the piped water network, there have been no systematic measures to improve the traditional water collection points which are in fact being used. These collection points, rarely protected against various forms of pollution and left entirely to the care of the end-users, are a major public health risk.

Should they continue to be ignored, eliminated or upgraded? The AFVP, fully aware of the difficulties involved, has for some years been exploring the option of upgrading them.

Objectives of the action

The action attempts to test the advantages and the feasibility of upgrading traditional water collection points in urban perimeter areas through 6 objectives:

– assessing the quality of the water and of the service provided by the traditional water collection points: this consists in both testing the bacteriological quality of the water from the various water collection points being used, and gaining a better understanding of the ways in which the different water resources are used and why; carrying out test improvements involving the local inhabitants;

– assessing the post-improvement quality of the water;

– considering ways of funding such improvements locally and their on-going costs; this means considering the price / quality ratio of the various forms of improvement, the local inhabitants' investment capabilities and their need to seek external assistance; the project also intends to look for possible ways of covering on-going costs;

– studying the feasibility of collective chlorination systems, and particularly ways of covering costs and of quality control;

– including these building works in urban plans

and promoting a pragmatic attitude to the inhabitants living on the margin of the piped water supply network.

DESCRIPTION OF THE ACTION

A study carried out in 1993 by AFVP in the Nkoldongo neighbourhood of Yaoundé IV showed that, despite the existence of a public piped water network, a quarter of the population used only river, well and spring water. A pilot action was therefore implemented in the following stages (as at 31/12/97):
– May 96: the pilot action is commissioned from AFVP by the French Ministry of Cooperation;
– December 96: diagnostic survey of the drinking water supply in 15 urban perimeter neighbourhoods of Yaoundé IV;
– February 97: 1st Consultative Committee on traditional water collection points in Yaoundé IV;
– March 97: setting up of the first Neighbourhood Committees and launch of neighbourhood studies;
– May 97: the Canadian High Commission agrees to fund the upgrading of 4 water springs (Canadian Local Initiative Fund - FCIL);
– June 97: the Water Solidarity Programme (WSP) agrees to continue the activity after validation of the AFVP's interim report;
– November 97: work starts using FCIL funds;
– December 97: the French Co-operation and Cultural Action Mission (MCAC) agrees to fund the upgrading of 4 drinking water springs (Devolved Credit Intervention - CDI);
– January 98: preparation for a bacteriological analysis exercise involving 100 water collection points in Yaoundé IV;
– May 98: completion and reporting back to the WSP.

◆ Responsibilities of each actor at each stage:

There is a major gap between the underlying approach of the action and the national water policy currently in force (i.e. to provide all the inhabitants of urban areas with a piped water supply). Although they are often most interested in the approach the AFVP is attempting to promote, institutions have no choice but to limit their involvement in the pilot-action to mere consultation:
– the Ministry of Mines, Water and Energy (MINMEE): responsible for the investments required by the national water policy;
– the Cameroon National Water Company (SNEC): sole operator of urban hydraulic installations under the MINMEE, the Company reports on the condition of its network and its extension plans;
– the Urban Community of Yaoundé (CUY): responsible for applying the urbanisation plan, its powers often overlap with those of the Communes of the Arrondissements;
– Arrondissement of Yaoundé IV Urban Commune (municipal corporation of Yaoundé IV): this body has very limited powers of action, but is following the progress of the pilot action;
– Yaoundé sub-préfecture district: gives its backing to the improved use of nationally-owned land (seasonal water catchment areas and marshes);
– the inhabitants: provide the human and financial resources required, make technical choices, contract a craftsman, check the work, and then become the owner of the built structure and assume responsibility for managing and protecting it.

RESULTS

A better understanding of the location of traditional water collection points and the ways in which they are used. Following the survey of 267 water points, the detailed study of 8 selected water springs showed not only high rates of usage (400 to 1000 users per spring) and but also that the various resources available were used in a large variety of combinations (e.g. spring water for drinking and well water for clothes washing).
The Social and Sanitary Action Centre (CASS) helped to provide a structure for the groups of users by considering a suitable statute for them. An agreement with the group setting a time limit for collecting the funds (10 to 15% of the total costs of the works) is a key factor in assessing its ability to manage the built structure seriously. 4 sites are currently underway (with Canadian funding) and work will begin on 4 others (with French funding) from February 98 onwards.
The first results of the work carried out were presented to the main institutional partners on 27/02/97 at a meeting of this committee. The committee's second meeting is due to be held in February 98.

Strong points of the experience

◆ Underlying approach:
– promoting alternative drinking water supply systems amongst the institutions;
– applying rural hydraulic techniques in an urban context.
◆ Method:
A partnership with Cameroon civil society (the university and NGOs).

◆ Innovatory nature of the results obtained:
– diagnostic survey of the drinking water supply in Yaoundé IV: 267 springs and wells surveyed in 15 urban perimeter neighbourhoods of Yaoundé IV;
– a detailed understanding of the people's habits with regard to drinking water in urban peri-meter areas by monitoring the way collection points are used and conducting household surveys;
– bacteriological analyses of the water from traditional collection points in a large African city: monitoring the upgraded collection points and "snapshot" of 100 water points.

Problems / lessons learned

◆ The fact that any genuine commitment on the part of institutions is not possible:
As suggested before, the significant gap between the underlying approach of the action and the water policy in force in Cameroon leaves the institutions with no choice but to leave the AFVP as the sole genuine actor in the project.

◆ Poor availability of municipal decision-makers:
The electoral background (legislative elections in May 97 and Presidential elections in October 97) has prevented locally elected representatives from being genuinely available. In addition, the Arrondissements Communes have no real means of taking action (financial difficulties and overlapping responsibilities with the Urban Community of Yaoundé).

◆ Carrying out a field study:
Statistical or cartographic data are not always available or are difficult to obtain because they are little used.

Localisation
4th district of Yaoundé (Cameroon)

Domain of intervention
drinking water distribution

Area of intervention
underprivileged urban areas

Contracting authority
the Water Solidarity Programme

Implementing agency
the AFVP's regional delegation in Cameroon

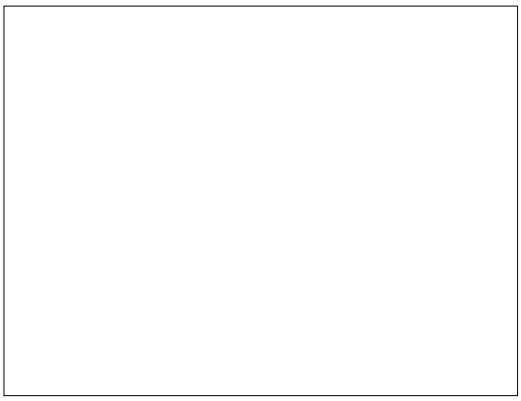
Donors
the State Cooperation Secretariat, the Canadian High Commission at Yaoundé, the Cooperation and Cultural Action Mission of Yaoundé

Total budget
371,000 FF (study component : 268,000 FF; implementation component : 103,000 FF)

Duration
from May 96 to May 98

PERSPECTIVES AND IMPACTS

The next stages of the action will be defined shortly:
– at a seminar to report jointly on the work of the AFVP and the ENSP (Yaoundé, May 98);
– at the closing seminar of the "Drinking water and sanitation in Africa's urban perimeter areas and small towns" programme which will be attended by the programme's 16 teams (June 1998);
– within the AFVP, as part of its efforts to strengthen the ability of communes to manage building projects.
It is intended to produce certain documents to aid decision-making, addressing such key questions as: How to carry out an objective diagnostic survey a given area? What criteria to apply when selecting the wells and springs to be upgraded given the technical, socio-economic and political constraints? What form of implementation should be adopted to avoid the built structures being abandoned or allowed to deteriorate?
The technical, social and political lessons learnt should have an impact on:
– other NGOs' operations in the field of urban hydraulics;
– the social measures to be introduced at the same time as the future privatisation of SNEC;
– redefining water policy on the initiative of the MINMEE.



Ntui-Essong neighbourhood: « Nsole » spring during improvement (January 1998).

Possible courses of action 1, 6, 7 and 10

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The Man reservoir. It allows the city to be supplied during the dry season.

Fam
3

Water, source of life and of development (Côte d'Ivoire)

Context and stakes

The national context consists of decentralisation and strong urban demographic growth. The local context corresponds to the following characteristics: increased decentralisation against a difficult resource and management background, strong urban growth (rural depopulation, immigration, influx of Liberian refugees), uncontrolled urban environment (waste, wastewater), major effect of water-related illnesses. The challenge is to improve, in a sustainable manner, the various components making up the urban environment, of which the principle one is drinking water, by raising awareness amongst community development actors and involving them. The needs of the inhabitants of underprivileged urban areas are considered to be the most urgent.

Objectives of the action

To understand where inhabitants obtain their supplies of water and its quality; map water collection points, and identify shortcomings. To raise awareness amongst elected representatives, municipal departments, population groups, and train them in the importance of the urban environment and in the benefits of managing it in a consistent and sustainable manner. To build installations improving access to drinking water for the most underprivileged populations and reducing the impact of water-related diseases.

Description of the action

The elected representatives of the French and Côte d'Ivoire communes which have now been cooperating for ten years consider urban environment problems to be the most urgent. A dossier was prepared and submitted to the European Commission (EC) and in due course project funding was agreed. Following a 2-months training period for the project leader in 1996, the definition of the institutional set-up, and financial inputs from the Côte d'Ivoire communes, the project started up in 1997. Water resources were surveyed neighbourhood by neighbourhood, with the help of the Côte d'Ivoire municipal service and the AFVP. The quality of the water was analysed by the Besançon hospital centre, which also prepared a mechanism for evaluating the effect of quality on diarrhoeic diseases. Neighbourhoods for project implementation were chosen with the help of each municipality in November 1997. Work would take place in 40 neighbourhoods or villages with sixteen communes. An agreement was reached at the same time with the Côte d'Ivoire Water Distribution Company (Sodeci) to subcontract network extensions, and with village hydraulics for rural area boreholes. The type of action to be undertaken is being chosen by the inhabitants with the help of the AFVP until April 1998. Each action is validated by the municipality. Following calls for tender, building starts,

with AFVP providing assistance with the management of the collective structures. CREPA-CI are carrying out a training and awareness-raising programme for municipalities in parallel.
At the end of the project, the results will be evaluated, and a document summarising the lessons learnt prepared and handed to the EC.

◆ Responsibilities of each actor:

– Commissioning body: Regional Association for the Development of Decentralised Cooperation (Ardecod).
– Associate commissioning body: mountainous region of Western Côte d'Ivoire Towns and Communes Association (Avicom-CI).
– Delegated commissioning body: each Côte d'Ivoire commune (16 communes in all).
– Contractor: Ardecod / City of Besançon. The City of Besançon plays the role of Project Leader, through a technical services engineer based at Besançon. Ardecod has taken on a project steering manager, based at MAN (Côte d'Ivoire).
– Delegated contractor in social engineering: French Association of Volunteers for Progress (AFVP).
– Health component responsibility: Besançon University Hospital Centre.

Localisation
16 Communes in the mountainous region of western Côte d'Ivoire

Domain of intervention
drinking water distribution, environment

Area of intervention
underprivileged urban areas, secondary towns, rural areas

Contracting authority
Ardecod

Implementing agency
Ardecod, City of Besançon

Donors
EC, Franche-Comté and Côte d'Ivoire communes, French Cooperation, with the mobilisation and organisation of other programmes

Total budget
2,229,691 ECU's

Duration
from October 96 to June 99

Results

◆ Strong points of the experience:

– involving the commune development actors (municipalities and the inhabitants) and providing them with explanatory tools and information documents;
– the stress placed on the inhabitants themselves choosing and managing the structures to be built, thus acting as guarantors of their sustainable use;
– the stress placed on health aspects (impact on water-related diseases, water analyses) which enables the results of the project to be evaluated and provides valuable data on the built structures likely to provide drinking water;
– the possibility of replication by communes or by another operator using the methodology and the documents provided by the project.

◆ Problems / lessons learned:

– the planned duration of the project (2 years) is proving too short, even inadequate;
– a stated objective is to reduce the impact of water-related diseases. Even if the project does provide drinking water, it is not certain to achieve this objective, which is highly dependent on hygiene practices. In the short term, this objective is very difficult to achieve;
– the project is active in underprivileged areas. The inhabitants will have to pay if they want drinking water. Some building works (extending the network and individual connections) guarantee a sustainable supply of drinking water. They cost too much, however, for many of the inhabitants of the area. Other installations (wells, springs, pumps) provide a lower cost supply, but will probably not provide drinking water in the long term. The project has to decide on a case by case basis how to proceed. The main solution rests in improving the populations living conditions. The project will test another solution: setting up "People's Mutual Societies for access to drinking water";
– the project addresses sanitation very little (only individual systems exist). This problem is becoming more and more acute.

Perspectives and impacts

The project touches directly on 40 neighbourhoods or villages from 16 communes of the mountainous region of western Côte d'Ivoire. Ultimately, approximately 500,000 inhabitants of this region will be reached directly or indirectly. The involvement of the population makes sustainable results more hopeful. The number and the range of partners involved in this decentralised project, in both France and in Côte d'Ivoire, is also of significant impact. The involvement of the various partners, notably of the Côte d'Ivoire communes, and the publication of a document drawing the main methodological lessons, suggest that the experience may be used by the communes themselves and by other operators. Finally, this is Ardecod's first "big project". Its success will encourage the association and its members to conduct others of a similar scale.

Possible courses of action 1, 3, 6 and 7

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Fam
4

Regional management of lakes in the Sahel using remote sensing

Context and stakes

In the West African Sahel, increased agricultural production depends partly on resource mobilisation. The background of drought demands that all water resources capable of being mobilised be urgently researched and quantified. And yet there are a certain number of natural, semi-permanent lakes in these Sahel regions of West Africa which could be better exploited for agricultural purposes. Existing methods of surveying and evaluating lakes using field measurements are too slow and too costly. Developing rapid diagnostic methods in order to be able to survey them better, to define their potential for agricultural upgrading and to be able to monitor them better is therefore of great interest. To develop rapid diagnostic methods for these lakes, remote sensing, combined with exogenous data, can provide a viable alternative, easily adaptable throughout the region.

Objectives of the action

Remote sensing images have already been used to make complete inventories of the lakes. Here, we are concerned with a model defining the input of satellite imaging on more precise points:

– developing a method using satellite images to recreate a model defining the geometry of the lakes. This model (height-surface-volume curve) is the basic tool already being used by hydrologists in the Sahel for lake management, management simulation and thus upgrading decision-making. It is usually obtained using field measurements;

– testing a method for monitoring the annual inputs to complement data from the observation network (using a dry season image);

– mobilising earlier image type data to consolidate the hydrological data bank using a method to reconstruct past patterns on sites not being monitored with instruments. The object here is to achieve a better understanding of surface waters in the Sahel area.

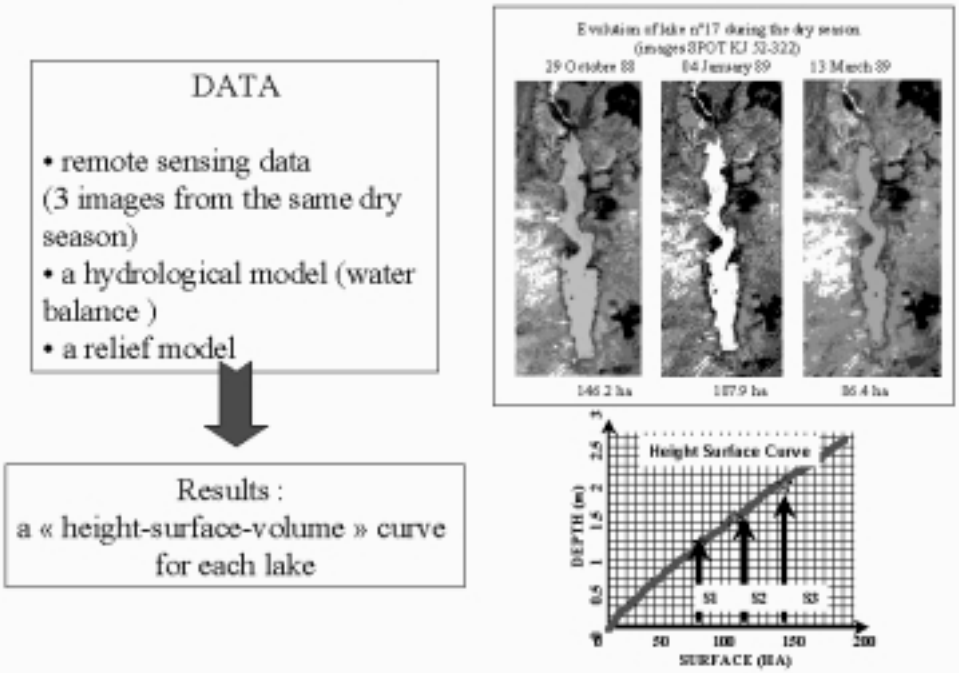
Description of the action

The first action is intended to replace field data with satellite imagery to construct the "height-surface-volume" model.

The method is based on the following outline:

1/ determining water surfaces on three images of the same dry season;

Figure 1 : Using SPOT images to calculate the volume of lakes
Sahelian ponds near Tillabery (Niger)



2/ introducing values in a modelling process combining hydrological assessment in the dry season and formalisation of the relief (typical shape of the height surface curves in the Sahel region).

The second action uses the model (height-surface-volume curve) emerging from the preceding stage or defined beforehand, during hydrological monitoring of these lakes and to recreate past patterns in annual input volumes. To achieve this, any remote sensing image (whether old or recent, satellite image or aerial photography) calculates surface values which are translated into volume and into level of fill at the beginning of the dry season.

All these activities are occurring at regional level, with remote sensing data providing comprehensive data. The degree of precision, although lower than in situ figures, is adequate.

◆ Responsibilities of each actor:

– LCT: design (satellite imaging, hydrology, field surveys), steering and training;

– DRE, Ministry of Hydrology and the Environment, Water Resources Department, Niamey (Niger): defining key issues, logistical support, then involvement through a course in France.

Localisation
West African Sahel, application in the Tillabery Region, Niger

Domain of intervention
irrigation, integrated resource management

Area of intervention
rural areas

Contracting authority
the Niger Water Resources Department (DRE)

Implementing agency
the Cemagref-Engref Joint Remote Sensing Laboratory

Donor
the Niger Water Resources Department (DRE)

Total budget
150,000 FF

Duration
from 1990 to 1994

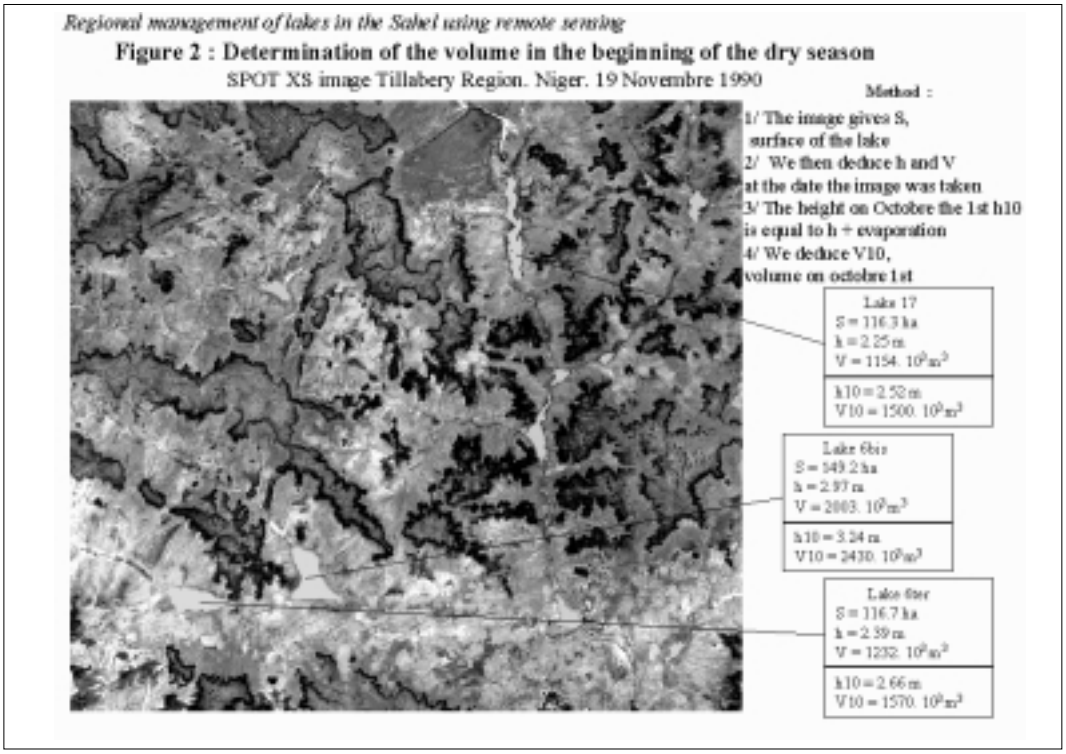
RESULTS

Development of alternative methodologies to measure and monitor the lakes of the Sahel. The model has shown the potential for obtaining height-volume-surface curves. Measurement precision has been mastered. For example, on a SPOT XS image (20m resolution), surfaces are estimated with a margin of error of less than 5% for any lake of more than 10 hectares. The model has also proved useful for the annual monitoring and recreation of past hydrological patterns using former images.

Integration into the DRE team, through a project training course (A. Ousmane DESS, 1994). This work was then the subject of a paper by the Niger DRE (A. Ousmane), presented to the FAO-LCT ORSTOM International Workshop on "Remote sensing and water resource management", Montpellier, December 1995.

◆ Strong points of the experience:

Technical: the surface-like form of the data contained within the images creates a very rich "memory bank" of events, which should be fully ex-



ploited and which can be of particular value in the context of the Sahel where there is little cartographic and hydrological data.

Innovative aspect: remote sensing is useful for complementing traditional data obtained on the ground. The teams responsible for ground measuring were directly involved in the project. The methods were therefore transferred virtually implicitly.

◆ Problems / lessons learned:

To be able to make rapid use of the method, the lack of computer equipment suitable for effective appropriation of the method was apparent. With regard to hydrological monitoring of the lakes, year by year, the cost of the images is a stumbling block. This cost could fall if they were used jointly by the various ministerial teams.

PERSPECTIVES AND IMPACTS

The advantage of these methods rests in their potential for regional-wide use.

The "measurement of the height surface curve" part provides a method applicable throughout the Sahel, enabling a rapid understanding of the resource. The cost of the operation is relatively low, given the great rapidity of the measurement process, in contrast to classic ground measurements (using a bathometer), which are long and tedious.

The most innovative aspect is undoubtedly that the information obtained is now comprehensive, compared to local measurements which can, at best, cover only one or two lakes per year.

As far as monitoring and past patterns of fill are concerned, the method for learning about inputs in the Sahel area gives data complementary to traditional hydrological observations. At a time when ground surveys are becoming more and more difficult, image patterns enable a certain "memory bank" of events to be preserved and updated.

Possible courses of action 2, 3, 5 and 6

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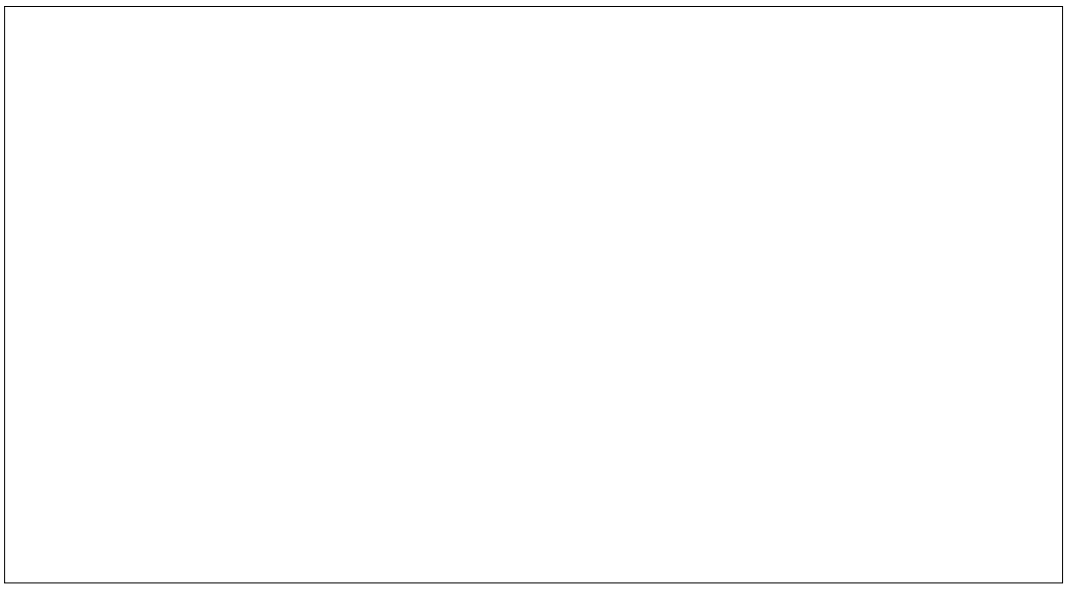
Disinfected water reservoir (120 000 m^3) before the irrigation of 3 000 ha of greenhouses in Almeria (Spain). C. Caudron / Anjou Recherche.



Form 5

Wastewater reuse: a valuable link in sustainable water resources development

CONTEXT AND STAKES

For the last quarter century, a repeated thesis has been that advanced treatment of municipal and industrial wastewater provides a treated effluent of such high quality that it should not be wasted but put to beneficial use. This conviction in responsible engineering, coupled with the vexing problem of increasing water shortage and environmental pollution, provides a realistic framework for considering reclaimed municipal wastewater as a sustainable water resource in many parts of the world.

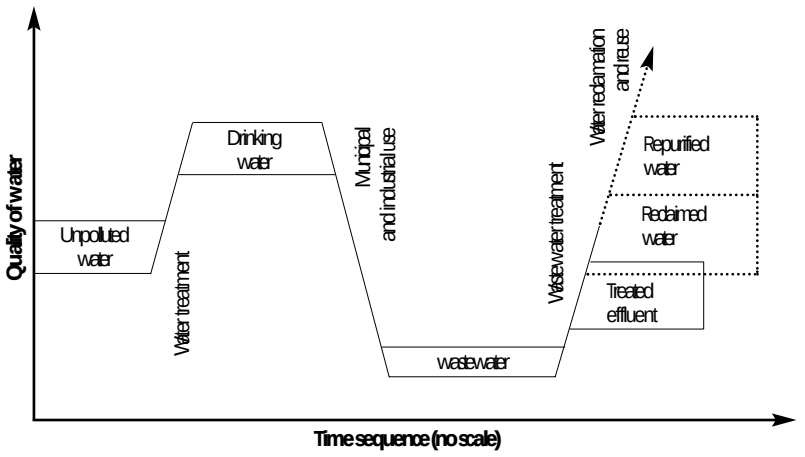
Wastewater reclamation and reuse is one element of water resources development and management which provides a sustainable option for agriculture, municipalities, and industries. The water pollution control efforts in many countries have made treated effluent from municipal wastewater available that may be an economical augmentation to the existing water supply when compared to the increasingly expensive and environmentally destructive new water resources development.

However, wastewater reuse is only one alternative in planning to meet future water resources needs. Water conservation, water recycling, efficient management and use of existing water supplies, and new water resources development are examples of other alternatives.

Wastewater reclamation and reuse involves considerations of public health and also requires close examinations of infrastructure and facilities planning, wastewater treatment plant siting, treatment reliability, economic and financial analyses, and water utility management involving effective integration of water and reclaimed wastewater. Whether wastewater reuse will be appropriate depends upon careful economic considerations, potential uses for the reclaimed water, stringency of waste discharge requirements, and public policy wherein the desire to conserve rather than develop available water resources may override economic and public health considerations.

Through integrated water resources planning, the use of reclaimed wastewater may provide sufficient flexibility to allow a water agency to respond to short-term needs as well as increase sustainable, long-term water supply reliability without constructing additional storage or conveyance facilities at substantial economic and environmental expenditures. Thus, wastewater reuse has a rightful place and an important role in optimal planning and more efficient management and use of water resources in many countries.

Figure 1 : Quality changes during municipal use of water and the concept of wastewater reclamation and reuse



OBJECTIVES OF THE ACTION

Wastewater reclamation is the treatment or processing of wastewater to make it reusable, and water reuse is the use of treated wastewater for a beneficial use such as agricultural irrigation and industrial cooling. In addition, direct wastewater reuse requires existence of pipes or other conveyance facilities for delivering reclaimed water. Indirect reuse, through discharge of an effluent to a receiving water for assimilation and withdrawals downstream, is recognized to be important but does not constitute planned direct water reuse. In contrast to direct water reuse, water recycling normally involves only one use or user and the effluent from the user is captured and redirected back into that use scheme. In this context, water recycling is predominantly practiced in industry such as in pulp and paper industry.

Figure 1 shows, conceptually, the quality changes during municipal use of water in a time sequence. Through the process of water treatment, a drinking water is produced which has an elevated water quality meeting applicable standards for drinking water. The municipal and industrial uses degrade water quality, and the quality changes necessary to upgrade the wastewater then become a matter of concern of wastewater treatment.

In the actual case, the treatment is carried out to the point required by regulatory agencies for protection of other beneficial uses. The dashed line in Figure 1 represents an increase in treated wastewater quality as necessitated by wastewater reuse. Ultimately as the quality of treated wastewater approaches that of unpolluted natural water, the concept of wastewater reclamation and reuse is generated. Further advanced wastewater reclamation technologies, such as carbon adsorption, advanced oxidation, and reverse osmosis, will generate much higher quality water than conventional drinking water, and it is termed repurified water. Today, technically proven wastewater reclamation or purification processes exist to provide water of almost any quality desired.

DESCRIPTION OF THE ACTION

In the planning and implementation of wastewater reclamation and reuse, the intended wastewater reuse applications govern the degree of wastewater treatment required and the reliability of wastewater treatment processing and operation. In principle, wastewater or any marginal quality waters can be used for any purpose provided that they meet the water quality requirements for the intended use. Seven categories of reuse of municipal wastewater are identified in Table 1, along with the potential constraints. Large quantities of reclaimed municipal wastewater have been used in four reuse categories: agricultural irrigation, landscape irrigation, industrial recycling and reuse, and groundwater rechar-ge. The trends and motivating factors in wastewater reclamation and reuse are characterized as follows:

– water pollution abatement in receiving waters;
– availability of highly treated effluents for various beneficial uses due to stringent water pollution control requirements;
– providing long-term reliable water supply in nearby communities;
– water demand and drought management in overall water resources planning;
– public policy encouraging water conservation and wastewater reuse.

PERSPECTIVES AND IMPACTS

Significant progress has been made with respect to developing sound technical approaches to producing a quality and reliable

Table 1 : Categories of municipal wastewater reuse and potential constraints *

Wastewater reuse categories	Potential constraints
• Agricultural irrigation: crop irrigation, commercial nurseries.	• Effect of water quality, particularly salts on soils and crops
• Landscape irrigation: park, school yard, freeway median, golf course, cemetery, greenbelt residential	• Public health concerns related to pathogens (bacteria, viruses and parasites). Surface and groundwater pollution if not properly managed. Marketability of crops and public acceptance
• Industrial reuse: cooling, boiler feed, process water, heavy construction	• Reclaimed wastewater constituents related to scaling, corrosion, biological growth and fouling. Public health concerns, particularly aerosol transmission of organics and pathogens in cooling water and pathogens in various process waters
• Groundwater recharge: groundwater replenishment, salt water intrusion, subsidence control	• Trace organics and their toxicological effects. Total dissolved solids, metals and pathogens in reclaimed wastewater
• Recreational and environmental uses: lakes and ponds, marsh enhancement, streamflow augmentation, fisheries, snowmaking	• Health concerns of bacteria and viruses. Eutrophication due to nutrients. Esthetics including odor
• Nonpotable urban uses: fire protection, air conditioning, toilet flushing	• Public health concerns about pathogen transmission by aerosols. Effects of water quality on scaling, corrosion, biological growth, and fouling. Potential cross-connections with potable water systems
• Potable reuse (repurified water): blending in water supply, pipe to pipe water supply	• Trace organics in reclaimed wastewater and their long-term toxicological effects. Public acceptance. Public health concerns on pathogen transmission including viruses

* Arranged in descending order of volume of use.

water source from reclaimed wastewater. Continued research and demonstration efforts will result in additional progress in the development of water reuse applications. Some key topics include:

– assessment of health risks associated with trace contaminants in reclaimed water;
– improved monitoring approaches to evaluate microbiological quality;
– optimization of treatment trains;
– improved removal of wastewater particles to increase disinfection effectiveness;
– the application of membrane processes in production of reclaimed water;
– the effect of reclaimed water storage systems on water quality;
– evaluation of the fate of microbiological, chemical and organic contaminants in reclaimed water;
– and the long-term sustainability of soil-aquifer treatment systems.

A key to improving the implementation of water reuse is the continued development of cost-effective treatment systems.

To date the major emphasis on wastewater reclamation and reuse has been for nonpotable applications such as agricultural and landscape irrigation, industrial cooling, and in-building applications such as toilet flushing. While direct potable reuse of reclaimed municipal wastewater is, at present, limited to extreme situations, it has been argued that there should be a single water quality standard for potable water. If reclaimed water can meet this standard, it should be acceptable regardless of the source of water. While indirect potable reuse by groundwater recharge or surface water augmentation has gained support, some concerns still remain regarding trace organics, treatment and reuse reliability, and particularly, public acceptance.

Domain of intervention
drinking water supply, sanitation, irrigation, environment, integrated resource management

Area of intervention
urban areas, underprivileged urban areas, secondary towns, rural areas

Possible courses of 3, 6, 10 and 12

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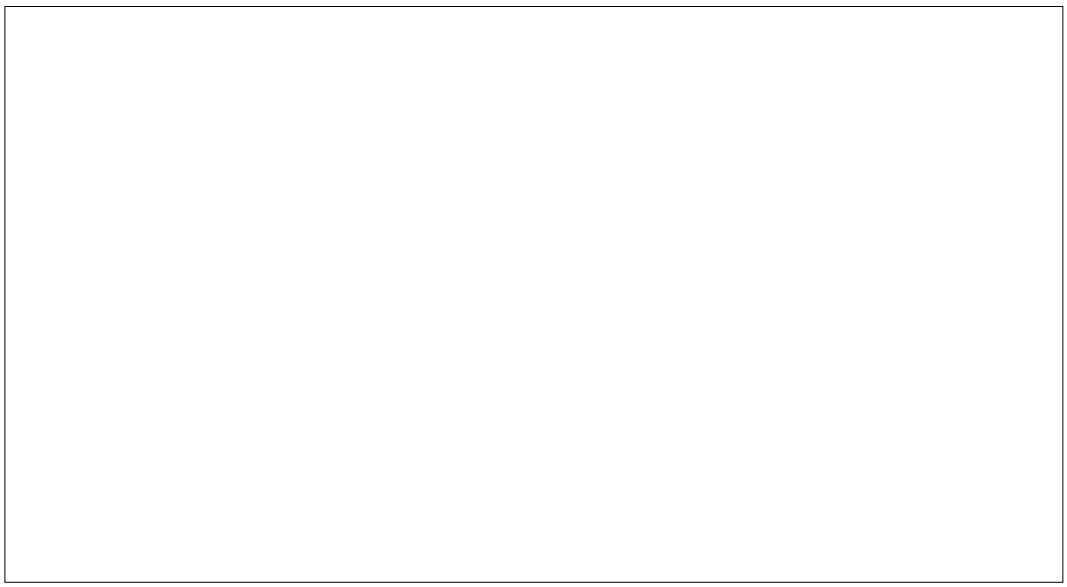

Water carrier in Jakarta

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6

Astran: the Asian research networks

Context and stakes

The Asian Pacific area is experiencing very strong demographic and economic growth. Water distribution and sanitation infrastructures, and problems with the quantity and quality of water resources, are a major development challenge for the area.
These particular circumstances demand a specific research effort, to coincide with and assist the increase in delegated management.

Objectives of the action

To run applied research programmes matching local particularities and using a network of skills enabling water and sanitation operations of the Asian Pacific area to receive high level technical assistance.
To encourage the use of local skills and to adapt the skills and knowledge of Lyonnaise des Eaux to the special constraints of this geographic sector.
To encourage the dissemination of technologies, skills and knowledge within Lyonnaise des Eaux.

Description of the action

The key points of the programme, which was agreed in 1997 and implemented with effect from 1998, are as follows:
- European researchers (mainly French and English) are installed in Asia;
- research areas are subject to contractual agreements with local teams;
- integration into the world-wide Lyonnaise des Eaux network (Intranet);
- local networking, with specialisation on each of the sites:
  - Kuala Lumpur and Manila: resource management, eutrophication of the large water catchment areas in tropical areas;
  - Jakarta: management of the wide distribution networks of Asia's megalopolises, recognition of the issues raised by the absence of urban plans;
  - Macao: drinking water treatment;
  - Sydney: wastewater treatment and use.

Results

Networking, using local skills and technology transfers, "Knowledge management", training.

Perspectives and impacts

Ultimately, developing new partnerships with China and Thailand. Improving the quality of the water distributed to the populations of this geographical area.

Localisation
Asia-Pacific, Kuala Lumpur, Macao, Manila, Sydney, Jakarta

Domain of intervention
drinking water distribution, sanitation, irrigation, environment, integrated resource management

Area of intervention
urban areas

Contracting authority
Lyonnaise des eaux

Implementing agencies
Lyonnaise des eaux in partnership with the Universities and Laboratories of the region

Donor
Lyonnaise des eaux

Total budget
40,000,000 FF

Possible courses of action 2, 3, 5 and 6

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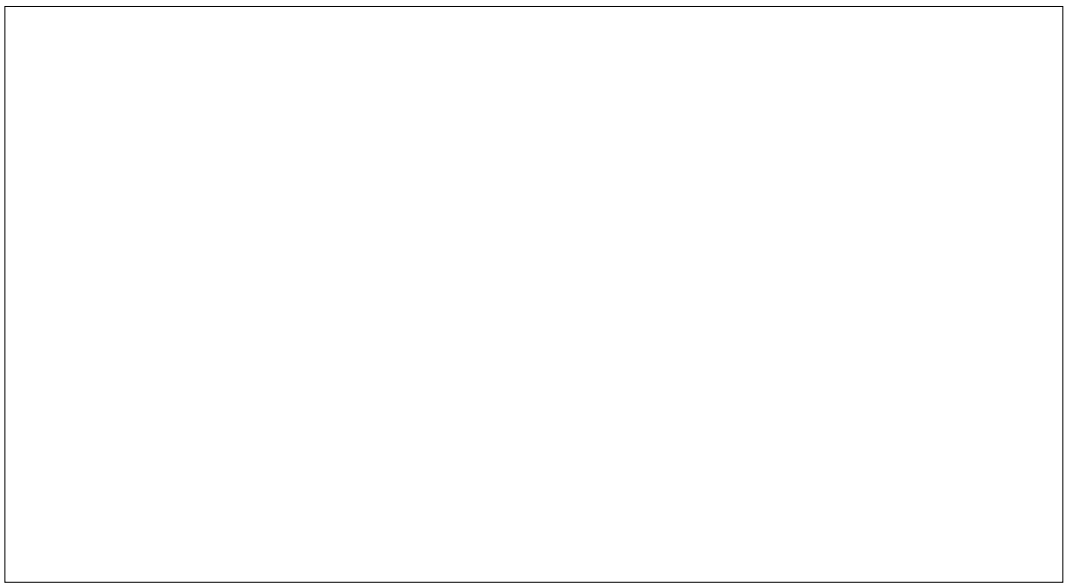

A museum in Constantza

Fam

7

Partnership with the independent water authority of the Constantza region in Rumania

CONTEXT AND STAKES

The cities of Central and Eastern Europe generally have water distribution infrastructures. However, although water resources, when adequate, are heavily used, the population does not always have continuous access to water.

The two main reasons for this are: insufficient infrastructure maintenance, leading to much leakage on the one hand, and lack of awareness on the part of the end-users, leading to individual wastage, on the other.

Leakage and wastage have immediate economic consequences – high operating costs (pumping, treatment, etc.), high maintenance costs (premature wear and tear, ground movements, etc.), and high investment – and social – costs – user dissatisfaction, increased hygiene risks.

In the longer term, they could ultimately result in the resources being exhausted.

The feasibility study for the upgrading and development of the drinking water distribution and sanitation systems of Constantza (Rumania) are part of a programme for improving water management, for reducing the health risks of the inhabitants and for improving the quality of service to the population.

OBJECTIVES OF THE ACTION

The objective of the feasibility and pre-investment study conducted by the conurbation of Constantza (Rumania), in partnership with various overseas structures, was to define priorities for action, in a sustainable context, in order to improve the water situation from an environmental and health point of view.

The study carried out was intended to identify the weak spots in the water cycle in the conurbation, but not solely by addressing the problem from the point of view of new investments aimed at satisfying ever-growing demand. This consisted in assessing the part that each of the stakeholders in the system, managers and consumers, could play in improving the efficiency of the system for all, rather than designing infrastructure projects with heavy investment and operating costs which would ultimately result in increasing the volume of leakage.

The activities to be undertaken were to be costed. Priorities were to be worked out in the light of their efficiency / cost ratio.

DESCRIPTION OF THE ACTION

The study examines first the drinking water distribution system and then the sanitation system.

◆ Diagnostic survey of the drinking water distribution system:
– operational analysis, quantitative aspects;
– overview of needs versus resources, detailed study of the water piping system, study of the distribution network in one service area;
– qualitative aspects;
– analysis of the operation of the drinking water treatment station, analysis of the quality of the water distributed, organisational approach.
◆ Diagnostic survey of the sanitation system :
– analysis of the purification stations ;
– study of the treated water receptor areas ;
– summary of the diagnostic survey and actions to be taken.

The study, which began in Spring 1995, initially consisted in collecting data enabling the built structures to be identified, in selecting representative sectors and in carrying out measuring exercises on them. This reliable data is required to:
– model the way in which the system works;
– optimise its operation by taking account of the existing installations (by changing the management of tools available, organising the services, reducing the consumption of drinking water, etc.);
– define the investments to be made (in terms of upgrading, replacing or extending installations), in order to ensure that all the inhabitants have sufficient good quality water, and to protect aquatic environments given the ways in which they are used.

◆ Responsibilities of each actor:

The feasibility and pre-investment study was designed by the World Health Organisation (WHO) Nancy Projects Office, which drew up the terms of reference.
As a pilot project, it received French bilateral funding and a contribution in kind from the Independent Water and Sanitation Authority of the Constantza region.
The SCE consultants and the Independent Water Authority of the Constantza region, assisted by the WHO Projects Office of Nancy, carried out the study.
The Rumanian authorities are using the results of the study to decide which investments they should make using European Bank for Reconstruction and Development funding.

Localisation
Constanta, Rumania

Domain of intervention
drinking water supply, sanitation, environment, integrated resource management

Area of intervention
urban areas

Implementing agency
France, Rumania and the WHO Projects Office of Nancy

Donors
France and Rumania

Total budget
2,000,000 FF

Duration
from the beginning of 1995 to Summer 1996

RESULTS

The results of the diagnostic survey of the drinking water distribution and sanitation systems led to the following proposals to optimise infrastructure and the way in which they are used:
– priority actions to resolve major malfunctions;
– medium and long term actions to improve and optimise the systems and the way in which they are used.
A summary technical-economic estimates of the priority investments was carried out. A timetable for the medium and long-term actions was put forward.
Recommendations fall under three headings: technical, organisational and awareness-raising.
Priority technical recommendations were made on metering, discharge pipes, pumping stations, treatment of surface waters, valves. Medium and long term actions include the use of boreholes, continuing metering, the treatment plant pipeline, strengthening and extending the network.
With regard to the organisation and the operation of the services, the following were agreed: staff training, improving maintenance policies and practices, computer resources and the introduction of procedures.
For awareness-raising, more use will be made of consumer information and media communication.

◆ Strong points of the experience:

Measuring discharge rates in different sectors of the drinking water network of the city and of the conurbation of Constantza highlighted a public network output of less than 50%. Measurements made in housing blocks also revealed permanent water losses. Average domestic consumption was evaluated at 435 inhabitants per day. To meet this demand, the water service draws nearly 3 times as much from the natural environment and as a result has had to draw dubious quality water from the Danube - Black Sea canal, underground water resources being insufficient.
The priorities defined were as follows:
– changing metering and charging policy to make all those involved aware of the cost of water;
– introducing a programme to repair housing sanitation installations;
– upgrading the worst deteriorated sections of the drinking water distribution network.

◆ Problems / lessons learned:

Water and sanitation infrastructures are very heavy investments. The way in which they are managed should notably take account of economic realities, but should also see the end-user as actor, since the combined individual consumption of each end-user represents very significant volumes of the resource, which is not after all inexhaustible. All these aspects have to be taken into account in order to achieve a sustainable development policy on investment, funding and maintaining the built structures (Rio 1992).

This approach should be adopted by water company managers, whose natural tendency is, a priori, to increase the capacity of their infrastructures, which is synonymous with increasing the influence of their companies.

The success of this study was due to the excellent collaboration between the various actors implementing the project: the Rumanian authorities and the Constantza WaterAuthority, SCE - French consultancy group, and the Nancy Projects Office (OMS).

PERSPECTIVES AND IMPACTS

In conclusion, the debate in the Constantza region on the definition and implementation of new investments to upgrade and extend its drinking water and sanitation system in order to improve the quality of the water distributed and the respect for the treated water receptor environment has shifted as far as type of needs required is concerned.

Initially, the debate among the local authorities was about investment proposals:

– modernising the treatment stations, and ozonation equipment to treat surface water. The latter in fact accounts for 25% of consumption and needed significant treatment to meet quality standards;

– increasing the wastewater treatment capacity.

The technical study allowed the drinking water distribution and sanitation systems to be examined and studied and evaluated, and the treated water receptor environment to be observed. Modelling the system, which was done using existing data complemented by specific measurement exercises, enabled priorities to be redefined.

The investment proposals were therefore modified, giving new priorities:

– metering, upgrading the network, upgrading the pumping stations;

– it ultimately became clear that building an ozonation station and extending the wastewater treatment plant would could come second as a result of the reduction in the volume of water wasted.

This strategy is in line with preserving the resource, and reducing operating costs, whilst at the same time obtaining a better user service and reducing public health risks.

Possible courses of action 3, 6, 9 and 11

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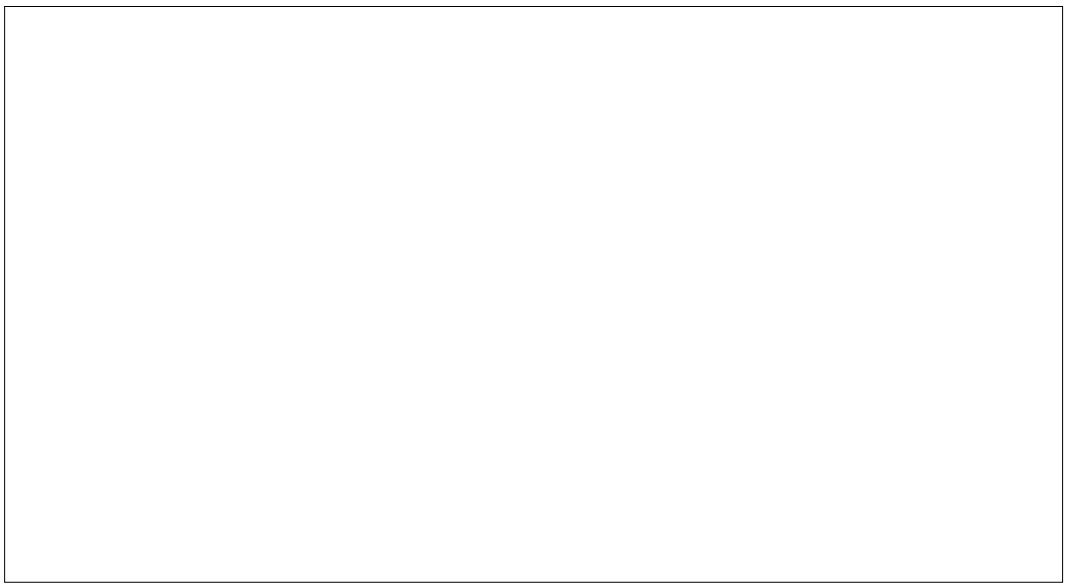

Abidjan and the Pont de Gaulle

Fam

8

Côte d'Ivoire water distribution company (Sodeci)

Context and stakes

Côte d'Ivoire is a West African country with a population of approximately 13 million inhabitants. Abidjan, the economic capital, with 3 million inhabitants, and Yamoussoukro, the political capital with 100,000 inhabitants, are the country's principal cities. Drinking water distribution to the various regions of Côte d'Ivoire, given the high concentration of the population in the cities (approximately 45% urban population), requires a strong organisation, capable of providing this service efficiently. Until the end of the 50s, the public water service was the responsibility of a State company. When Côte d'Ivoire achieved independence, in order to meet Abidjan's drinking water distribution needs under satisfactory conditions, it was decided to hand this responsibility over to the private sector.

At the time, only the city of Abidjan (177,000 inhabitants in 1960) had piped drinking water: just under 4,000 clients supplied by a network of approximately 180 km.

Objectives of the action

Following an international call for tenders, Sodeci (Saur Group) was charged with the provision of the water service. Its main objective was to provide Côte d'Ivoire with a modern public drinking water service, capable of meeting the strong increase in demand effectively, and doing so whilst "Africanising" the management of the company as quickly as possible.

Description of the action

Sodeci is a private Côte d'Ivoire company responsible for the public water service throughout Côte d'Ivoire, in the framework of a 20 year concession contract (renewed on 12 December 1987), with exclusive drinking water production and distribution rights in urban areas, excluding rural areas.

The company comes under the authority of the Côte d'Ivoire Ministry of Economic Infrastructures and its share distribution is as follows:

- Saur International : 46.06%
- Private Côte d'Ivoire shareholders : 37.20%
- Sodeci staff : 5.39%
- Sidip : 4.19%
- The State of Côte d'Ivoire : 3.25%
- Others : 3.91%

◆ Responsibilities of each actor:

The State:

- retains ownership of the infrastructures;
- sets the national water policy;
- retains decision-making power over the charging proposed by Sodeci;
- co-manages, with Sodeci, the National Water

Fund, intended to finance the sector's infrastructure investments;
– supervises work carried out by Sodeci, and more generally, monitors all of Sodeci's activities.

Sodeci:

– is responsible for the fixed assets it is given charge of;
– is responsible for the use and maintenance of all the installations placed under its responsibility according to the concession contract;
– is responsible for the quality and the continuity of the products and services provided;
– co-manages, with the State, the National Water Fund, intended to finance the sector's infrastructure investments.

RESULTS

◆ In quantitative terms:

– over 400 localities served today, compared with only one in 1960;
– over 380,000 clients today (i.e. 6.5 million inhabitants served), compared with under 4,000 clients in 1960;
– over 1,300 staff today, compared with under 400 in 1960;
– approximately 8,000 km of network today, compared with under 200 in 1960;
– over 30,000 new connections per year today, compared with under 3,000 in 1960.

◆ In qualitative terms:

– virtually total "Africanisation" of the management: the President, the Managing Director, all the Operations Directors and virtually all the Technical Directors are Côte d'Ivoire nationals;
– inclusion of African cultural values into the company's management philosophy;
– job feminisation;
– increased training;
– increased budgetary responsibility;
– shorter hierarchical lines of command;
– focus on results;
– introduction of social funds;
– launch of a quality guarantee approach which should lead to ISO9002 certification.

◆ Problems / lessons learned:

In order to improve the sector's unhealthy financial position, on the initiative of the World Bank, the National Hydraulic Fund was transformed into the National Development Fund in 1987. This new fund is managed directly by Sodeci, under the overall control of the Water Department. Its income is derived from a tax on consumption which raises approximately 78 million francs per year. This is used to finance small-scale extension and renewal works, and the construction of social connections.
There is also, it should be noted, a National Water Fund, with income from a supertax on consumption, which is managed by the Independent Investment Fund. The 44 million francs raised annually in this way are used to finance major sector investments.
Thanks to the introduction of these funds and to the management systems adopted, the water sector has now been self-financing for 10 years.

PERSPECTIVES AND IMPACTS

The managerial principles introduced into Sodeci since the company was created have not only allowed excellent management results to be obtained, but have also enabled the company to move beyond the traditional north-south dialogue, and to establish a south-south dialogue (Sodeci is involved in improving the water sector in other African countries) and a south-north dialogue (Sodeci has developed computer products for use by the Saur Group in France).

Possible courses of action 6, 8, 12 and 14

Localisation: throughout Côte d'Ivoire
Domain of intervention: drinking water distribution
Area of intervention: urban areas
Turnover 1996: 368 000 000 FF
Capital: 40 000 000 FF
Duration: from 1987 to 2007

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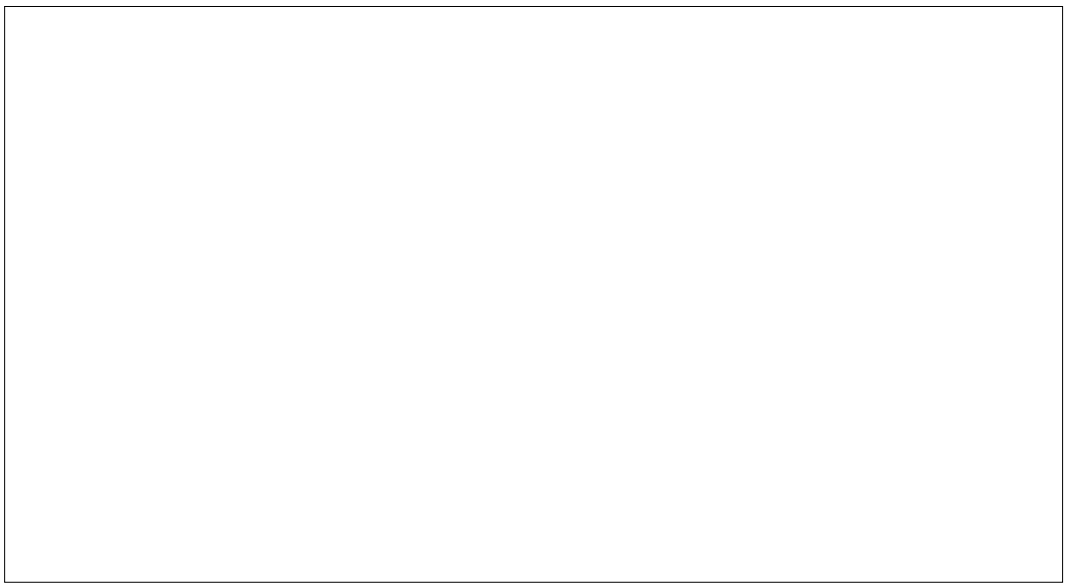

Local villagers participate in a community mapping exercise, planning the best locations for the wells.

Form 9

WaterAid experience in Tanzania

Context and stakes

For many years in Tanzania water was regarded as a basic service to be provided free of charge by the government. The government's villagisation policy raised expectations of free water provided even in villages with no nearby water sources.

In Dodoma many villages had deep boreholes equipped with pumps and diesel engines which were to be maintained by the Tanzanian government using central funds. Due to the economic downturn of the 1980s, government resources were stretched and centralised operation and maintenance of rural water supplies was not sustainable. Many of the pumps installed were inoperable. It was in this context that WaterAid began work in the Dodoma region.

The Dodoma region had the most urgent need for sustainable water supplies. It receives less than 600mm of rain per year with no rainfall at all from May to November. The women and children who are responsible for collecting daily water supplies had to walk up to 12 km to find water.

Objectives of the action

To provide drinking water, to improve sanitation and promote changes in hygiene behaviour through a sustainable community based approach. WaterAid planned to work in partnership with three departments of the Tanzanian government. Having analysed the context (as described in section 1 above), WaterAid aimed to help the staff of the three departments to work together with each other and with the communities.

A participatory approach was chosen, in order to create ownership by the communities in place of their previous dependency on the government. This would involve new institutional arrangements and capacity building of both the communities and the government staff.

Description of the action

In 1984 WaterAid had begun work in the Dodoma region under the auspices of the Anglican Church, initially funding purely technical work. In 1989 the Water Department became WaterAid's main partner and in 1990 WaterAid conducted a major evaluation of its work in the Dodoma region which identified the need to improve the work with a focus on an integrated approach and community participation (as described in section 2 above).

The policy context in Tanzania also changed at this time as in 1991 Tanzania adopted a National Water Policy that recognised this need for community management.

◆ Responsibilities of each actor:

Village communities set up water and health committees who then work with the government fieldworker team using participatory research techniques to develop a consensus on the most appropriate water scheme for the village. They then prepare a design for an integrated project covering water supply and sanitation and a formal contract is signed between the village and the government. The village must open a bank account and establish a water fund from which they make a cash contribution towards the capital cost of the scheme and to cover operation and maintenance costs. They also collect local materials that will be required. Construction of the water supply and sanitation / hygiene education is carried out by the village community with the fieldworkers arranging the necessary training.

Fieldworkers make follow up visits after construction is complete to provide further training and support for the water and health committees.

Fieldworker teams mobilise and enthuse communities and provide them with technical guidance and awareness of health and hygiene issues. They are the main contact between government and communities. Each team has 4-6 members, male and female from the Water, Health and Community Development departments.

Government provides qualified staff for fieldworker teams, some transport, most of the construction equipment and pledges an annual cash contribution. District and Regional committees meet quarterly to co-ordinate water provision and donor inputs and set regional policies and budgets

WaterAid provides financial support for some transport, some equipment, all construction materials and pays the government and support allowance for field staff. Trains government staff and provides ongoing professional advice to them.

RESULTS

The collaboration between the Tanzanian Government and WaterAid will have helped more than 340,000 people in 86 communities in the Dodoma region between April 1991 and March 1997.

Following the adoption of the participatory approach over the entire Dodoma region, WaterAid staff are now gradually withdrawing as the programme becomes self sufficient. As an indicator of ownership and sustainability there was a massive rise in the amount saved in community water funds. In 1991 there were no funds at all, in 1994 the funds stood at approximately £7,000 and by 1996 had risen to approximately £24,000.

After 7 years of working in partnership with the Tanzanian government the end result is an integrated water, sanitation and hygiene education programme that is progressively becoming self sustaining.

It is thought to represent one of the longest experiences to date of government / NGO co-operation in a water programme and it validates participatory approaches and community management principles.

◆ Strong points of the experience:

Capacity building is a major component of the programme. At the village level, communities have acquired skills such as community organisation, running public meetings and book keeping. They have gained experience in project planning and management.

The multidisciplinary teams are a marked success. Members from different departments work together effectively with a growing level of commitment and skill.

The regional Health Department now plays an active role in rural water supply and sanitation projects.

The attitude of senior staff has changed significantly. In the early days support from regional and district department heads was highly variable but and over time their enthusiasm and involvement has grown. They have more understanding of the participatory, community based approach and are more prepared to listen to views of junior staff.

◆ Problems / lessons learned:

Using interdepartmental teams to achieve more integrated projects created difficulties. Some districts had few staff available or found it difficult to release staff for the fieldwork. There was a shortage of women available for active field work making it especially hard to meet the criterion that each team should have both male and female members.

These difficulties were partly overcome by stressing that technical grade staff with little formal training were acceptable to the programme.

The Tanzanian government structure is relatively

complex and government staff tend to be poorly paid and many are demotivated. The Government is faced with serious resource constraints and is under pressure to reduce staffing levels. This created a number of problems for WaterAid when seeking to work in partnership with the government. Some managers were negative about the programme and provided minimal support for staff assigned to it.

WaterAid had to tread carefully and maintain a flexible approach to all its activities while trying to work within the bureaucratic constraints created by the government. WaterAid and the fieldworker teams began to produce impressive results and line managers were persuaded of the value of the approach and keener to become involved. The greatest incentive for co-operation was success.

The Dodoma experience shows that the individual strengths of the two partners (NGO's and the Government) can combine to deliver powerful support for community-based action. Bureaucratic constraints can be overcome with patience and flexibility.

The empowerment of fieldworkers makes them dynamic agents for change. The teams form the driving force of the Dodoma programme and have helped to overcome a legacy of distrust between villagers and government.

Motivated and empowered communities manage their own water and sanitation projects well.

Localisation
Dodoma Region, Tanzania

Domain of intervention
drinking water distribution, sanitation

Area of intervention
rural areas

Contracting authorities
the Tanzanian Government supported by WaterAid

Implementing agencies
the Tanzanian Government departments

Donor
both the Tanzanian Government and WaterAid

Total Budget
£2,400,000

Duration
from 1991 to 2001

Changing attitudes and working practices takes time. The Tanzanian government and WaterAid were patient and did not push for quick results. Participatory programmes need time to develop the right methods and relationships locally.

Adding the health dimension to water programmes calls for flexible and innovative approaches. The teams work closely with primary health care services and train their own volunteers. This collaboration shows that it is possible for a government programme to undertake good quality hygiene education work even when primary health care systems are functioning poorly.

Perspectives and impacts

The programme has attracted many visitors from other parts of Tanzania, including the National Minister, and there are signs that other regions are seeing it as a potential model for the favoured integrated approach to water project planning.

Possible courses of action 6, 7, 11 and 12

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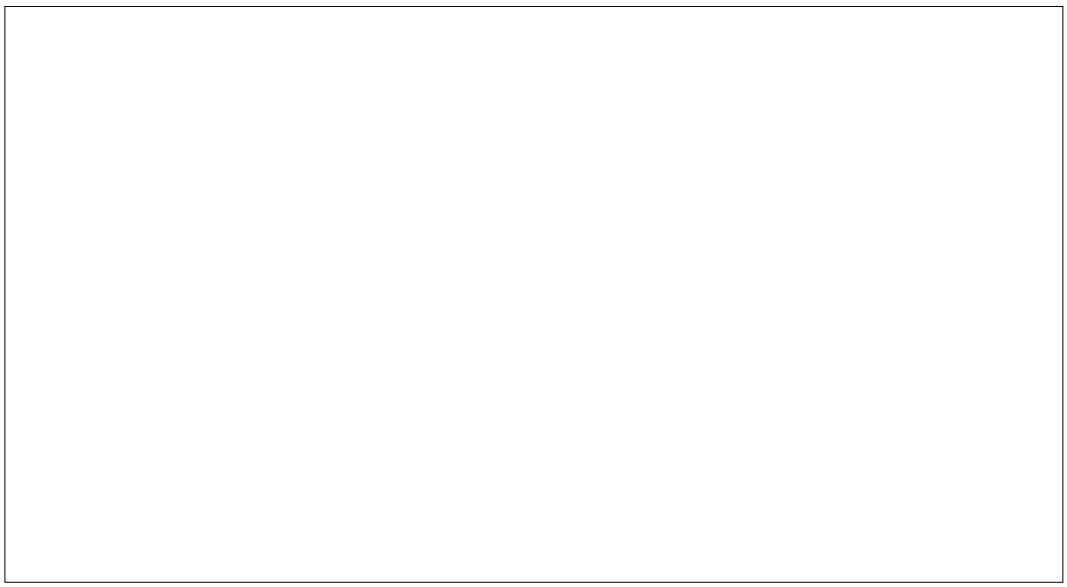

Port-au-Prince users make the most of the Camep leakages

Fam
10

Restructuring the water service in the slum areas of Port-au-Prince

CONTEXT AND STAKES

Port-au-Prince is a city of 2 million inhabitants which has experienced very rapid growth over the last thirty years. The water resource used to supply it is fairly high (110,000 m3 per day). Despite this significant availability of water (50 to 60 litres per day per inhabitant), the public service is very poor:

– many neighbourhoods (containing half the inhabitants) have no service at all and only 10 to 12% of families have a piped connection to their home; other neighbourhoods receive a poor service (a few hours a week), resulting in major wastage and bad water quality;

– not a single standpost was still in regular service in the city in 1994;

– the public company (Camep) has a major financial deficit; it charges for its services without metering water and its debt recovery rate remains low.

With the low credibility it enjoys, this public service mirrors the State of Haiti itself, after 40 years of state appropriation under the Duvalier governments and the years of political instability which followed. Since the return to democracy in 1994, there have been attempts to upgrade this public service, with difficulties again mirroring those of the State, still trying to find its feet; (at the time of writing, Haiti has had no government for over 6 months, as a result of the failure of the members of parliament of the various parties to reach agreement).

Given the difficulties the State has to guarantee public service, there has been an intense increase in private water distribution in Port-au-Prince.

Some half-dozen private boreholes supply water (using hundreds of lorries) to the city's thousands of private cisterns, a large proportion of which are used to sell the water on to the end-users. These have therefore replaced the standposts abandoned by the public company. A very large number of individuals also sell water on their doorsteps and there are a great many pirate connections.

The total length of these alternative distribution networks has been estimated at 600 km, i.e. three times the length of the public network.

These private operators meet the demand for water from the underprivileged sections of the population fairly well, but at a high cost: 15 to 25 FF / m^3, compared with 3 FF for the public network.

Objectives of the action

Against this difficult background, the programme steered by the Group for Research and Technological Exchanges (Gret) (with technical assistance from Hydro Conseil) focuses precisely on supplying water to the slum areas, i.e. areas which still have no public services. The objective is to introduce a distribution system using paid standposts, managed by neighbourhood associations.

Description of the action

The action summarised here consists of three successive, integrated programmes, funded by the European Union (Echo, DG8) and the Caisse française de développement (CFD). These three programmes all had the vital and unfailing support of Camep, thus demonstrating its capacity for change and its determination to meet the needs of the poorest end-users. 14 neighbourhoods of Port-au-Prince, with a total population of 200,000, have been reached by these programmes, which took place as follows, with amendments and improvements gradually being incorporated since 1994:

- analysis of demand from the neighbourhoods with Camep, of its technical feasibility (the discharge rate and pressure available in the network) and of its social feasibility (consensus with the neighbourhood);
- mobilisation of all the community based organisations of the neighbourhood, to prioritise needs, identify sites for standposts and a reservoir, and introduce a management system;
- installation of a distribution network within the neighbourhoods, according to the following principles:

– the neighbourhood networks are fed from Camep's main network, using a direct connection fitted with a meter;
– a volume of water corresponding to at least 24 and preferably 48 hours is stocked in the neighbourhood, to overcome the daily pressure cuts;
– responsibility for monitoring and maintaining the secondary distribution networks handed to the neighbourhood committee;
– public standposts, water supplied to cisterns and sold on to the public, and soon, home connections (paid for by the end-users);

- these networks are managed by the neighbourhood using the following principles:

– the entire network within the neighbourhoods (1.5 km on average) is the responsibility of the water committee, representing all the neighbourhood's community organisations;
– Camep's responsibility ends at the general meter installed at the entry of the neighbourhood; the water is charged at a "wholesale" rate: 2 FF per m^3;
– a water seller, selected by the neighbourhood, distributes the water to each standpost, at a cost of 5 FF per m^3; he is paid or remunerated according to the volume sold;
– the committee collects the money taken in, settles Camep's bills, pays the water sellers' wages, as well as for repairs, bleach for chlorination; the margin achieved (15 to 20%) is invested in small local sanitation works (ditches, gullies, etc.)

Results

Approximately twenty kilometres of network have been built, supplying some sixty standposts. The additional connection of 50 cisterns and 500 homes is planned for early 1998. 1,000 m^3 of reservoirs have been built in the neighbourhoods, allowing 2 days' supply of water to be stocked and thus to overcome daily pressure cuts.

These 14 networks can distribute 500m^3 per day and thus form the main source of supply for 50,000 people (at 8 litres per day per inhabitant) and an occasional supply for 150,000 other inhabitants. In addition, these standposts have a regulatory effect on the cost of water in these neighbourhoods, by providing the service at 5 FF / m^3, compared to 15 to 25 FF / m^3 beforehand. 14 neighbourhood committees manage the water service, some of them have been doing so for over two years. They include leaders from all the community based organisations (political parties, churches, youth associations, women's groups, major figures in the community, etc.). These committees have demonstrated great maturity and the rate of payment of Camep's bills is 100%.

- Strong points of the experience:

The programme has had the unfailing support of Camep (and in particular of its general management), although on the face of it, it was not part of the strategy which had been presented

Localisation
14 underprivileged neighbourhoods of Port-au-Prince

Domain of intervention
drinking water distribution

Area of intervention
underprivileged urban areas

Contracting authority
Camep

Implementing agency
Gret

Donors
European Union (Echo and DG8) and CFD

Total Budget
17,000,000 FF

to funders and to the Ministry responsible. The consensus commitment of all the community based organisations is also noteworthy, particularly as they are well-known in Haiti for the very fierce and bitter competition between them. Water distribution is a sufficiently important and concrete issue for these organisations to set aside their differences in order to achieve a tangible result.
It was possible to hand responsibility for the study, and for the construction and monitoring of all the building works to Port-au-Prince consultancy offices and companies, and their skills came to the fore in the very particular conditions prevailing in the slum areas, despite their lack of experience in this relatively new field.
Competition from the new standposts was accepted by the owners of cisterns, and there have been no reported cases of sabotage. This has been possible thanks to the strong mobilisation of the community-based organisations "protecting" the networks.

◆ Problems / lessons learned:

Pressure in Camep's network is low, irregular and unpredictable, and this is the main stumbling block to increasing the quantities distributed in the neighbourhoods. The legal status of these areas is very confused (there are no cadastral plans) which means prolonged discussions and difficult negotiations when choosing each site. Camep staff are poorly trained in managing clients, meters, invoices, etc. and it is therefore difficult to apply this public service approach (which seeks to match demand closely) to Camep's field agents, who are used to exchanging money for giving adequate pressure to neighbourhoods or even for pirate connections.
The explosive political and social context makes it very difficult to run operations in Port-au-Prince's underprivileged areas. In 1994, few local NGOs had the required skills and experience, and Gret therefore had to promote a local structure which is little by little specialising in the field of social engineering in the slum areas.

PERSPECTIVES AND IMPACTS

We estimate that Port-au-Prince needs between 500 and 1,000 standposts; there is therefore still much to do. Fortunately, many funders have expressed their interest in the programme, as it is one of the rare examples of the genuine upgrading of a public service, since the return to democracy in 1994. Thus, Caisse française de développement (CFD) gave an extra 6 millions FF to Camep in December 1997.
Developing the system will, however, require a more determined strategy on the part of Camep, which has certainly included this form of distribution into its global strategy. It will also depend on the dynamism and performances of the Haitian operator(s) prepared to be committed over time to the demanding field of social engineering.

Public standpost

Possible courses of action 6, 7, 8 and 14

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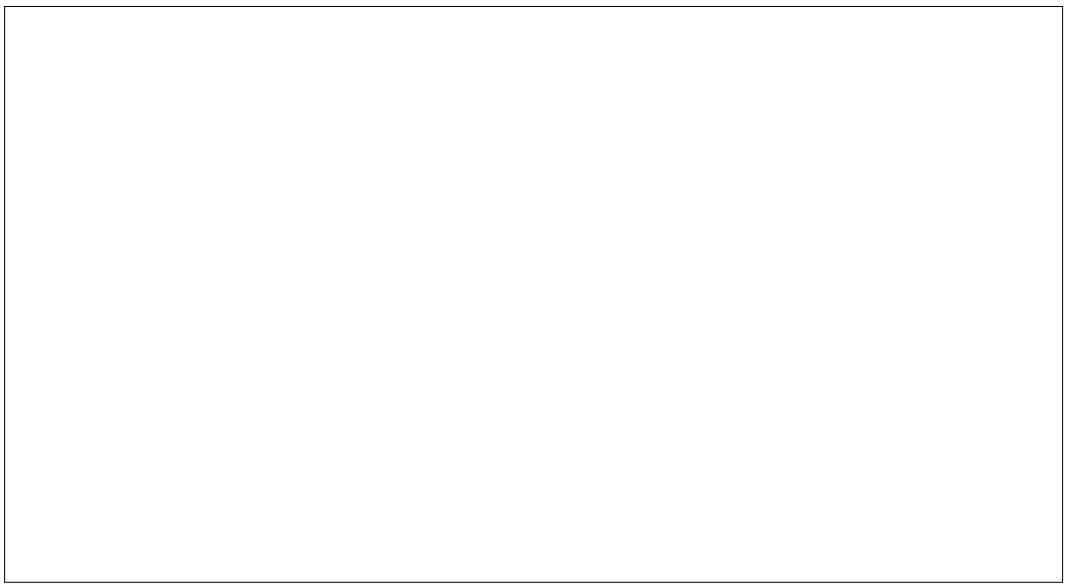


Village community taking water from piped water systems, planned and implemented by villagers themselves

The Barefoot College watermanagement project in Tilonia, India

CONTEXT AND STAKES

In a sense Tilonia is a very typical village in India. More than 70% of the 600,000 villages in India have an average population of nearly 2,000 people – like Tilonia. It has the same problems emerging from a multi-caste society, the problems of poor and non-existent infrastructure, the problems of safe drinking water and the same problem of dependency on government for almost everything.

Yet in another sense Tilonia is quite unique. Its the village where the Barefoot College started 25 years ago to tackle the acute and urgent problems of potable drinking water. After having faced two severe droughts of 6 years each when not a drop of water fell resulting in water table dropping drastically drinking water has been a major problem in the desert of Rajasthan where Tilonia is based.

Since 1972 the Barefoot College has acquired some practical experience on how to plan, implement, manage, repair and maintain community water supply systems. The experience covers installation, repair and maintenance of hand pumps: testing of water for potability: planning and implementation of piped water supply systems: construction of traditional water harvesting structures. With the variety of drinking water supply systems the Barefoot College has experimented with, direct benefit goes to nearly l00,000 men, women and children living in nearly 100 villages spread over 500 square miles.

Over the years the Barefoot College has seen a gradual but fundamental change in the perception and attitudes of poor rural communities towards the problems of drinking water. With government services on the verge of collapse, with virtually little or no technical support from urban based engineers this has had a good effect on the long run. It has made rural communities realise the weakness of the system and the need to look for solutions from within and depend on themselves rather than depend on others.

Thousands of hand pumps are out of order for months: piped water supply systems shown to be working on paper have not been functioning from the day it was officially commissioned leading to a colossal waste of public funds: water being supplied to people have been found to be contaminated and the engineers do not think it is a priority to tackle this problem.

The answer is NOT allocating more funds. It is not to provide an opportunity for governments to absolve themselves of their constitutional responsibilities.

The weakness the communities have realised lies in their depending too much on government to

solve their problems when they have the power to solve the problems themselves.

OBJECTIVES OF THE ACTION

The major objective of the Barefoot College was to convince communities that they had the knowledge and skills to solve their own problems of drinking water. What did villages do over 100 years ago when there were no urban trained paper qualified engineers? Villagers solved the problems by themselves. As a result India's villages individually and collectively have a vast bank of knowledge and skills that are totally unutilised today. Indeed in every community all over the world this is the case. Like war is too big an issue to be left to the generals alone drinking water is too big and issue to be left to the engineers.

The objective of the Barefoot College is to identify the knowledge and skills available that will drastically reduce the dependency on government. This meant on the job training of village personnel in rediscovering their skills and making them feel these skills were very useful and necessary.

It meant sitting with them for long hours and weeks of discussion and interaction convincing them they had the right to make a choice, chose the technology option best suited for their community (instead of leaving this decision to Government) and deciding on how much they should collectively contribute-instead of expecting the water to be provided free.

Most important the objective was to develop this confidence in the communities itself to resist change that is likely to threaten local cultures and lifestyles and compromise indigenous institutions.

DESCRIPTION OF THE ACTION

Because the technology was relatively new the Barefoot College started with the drilling of hand pumps for safe drinking water. From the hot deserts of Rajasthan to the cold deserts of Ladakh in the Himalayas the Barefoot College has disseminated hand pump technology directly benefiting several thousand people in the process.

With this technology came a move to demystify the repair and maintenance of hand pumps by introducing the "barefoot mechanics"-a semi-literate villager repairing cycles, diesel pumps in his village was trained to repair the hand pump as well thus reducing costs of maintenance.

Another action taken a little later on was to train unemployable rural youth to carry out simple water quality tests of the water the rural communities were drinking and sending the report to the Government-accepted with a great deal of hostility and refused to be acknowledged.

Yet another action was to move into rain water harvesting in areas where the water was found to be brackish and not potable for drinking. In many parts of Rajasthan especially in villages close to the largest inland salt lake (Sambhar Lake) the solution the engineers have implemented is to bring water through pipelines from hundreds of miles. In this very area villagers have introduced rainwater harvesting and shown remarkable results.

Community piped water supply schemes have also been tried with a great deal of success. Where government has insisted on providing water free of charge because the general belief is that rural communities are too poor to pay villagers have planned and implemented piped water supply schemes on their own and carried out the repair and maintenance of these schemes with community contribution. A remarkable feat that government refuses to learn from.

RESULTS

The lessons the Barefoot College has learnt from this collective experience that we could classify as strong points are:

– the problem of drinking water is not a technical problem. It is primarily a social problem. The Social problem includes access to potable drinking water, distribution, wastage, contamination, corruption, larger involvement of women and the process of demystifying technology;

– the move to allow control over the resource, over the planning and implementation process to be handed over to the community is long overdue. Where government interference and involvement is least there it is most likely to succeed;

– the most low cost sustainable solution to the problems of drinking water depends on the extent to which the community of users are involved from the very beginning;

– the community MUST have control over the source of water and this source must be as close to the community as possible;

– a code of conduct on how partners (Governments, donor agencies, companies, industry) should behave with the rural communities must be honoured and observed.

The biggest threat to solving the drinking water problems in rural communities is the urban based paper qualified engineer. The Barefoot College is convinced that if the communities are left to themselves and a choice of technologies is offered to them they will chose wisely. If their involvement is assured from the very beginning of the planning process and the implementation is left to them there will be no problem in the future in that village. When solutions are thrust on them, when they are only recipients and when they are only observers the scheme is bound to fail. It will be expensive, counter-productive, wasteful and doomed to fail.

Globally this lesson has yet to be learnt by all water experts who think they can decide on the limits to which communities can be involved. In fact if the water experts / engineers just let the communities have the funds and supply them the necessary information(not the expertise) the community has the knowledge and skill to carry out the task without outside interference.

Perspectives and impacts

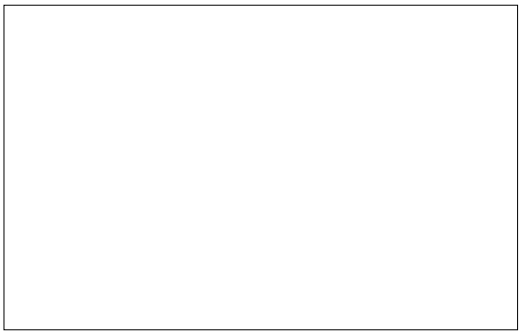
All fundamental and lasting change comes out of conflict and contrast. Not to be confused with violence conflict of ideas, methods, approaches and systems. The Barefoot College has provided this contrast of approaches and methods that are innovative(for the government not the community)low cost and totally dependent on the knowledge, skills and wisdom of the rural communities. The Barefoot College believes it is the ONLY sustainable solution facing communities who are having to face acute drinking water problems all over India.

By setting an example the impact has been felt at the policy making levels. It has become a policy in the State of Rajasthan to repair hand pumps through Hand Pump Mechanics.

The Government of India has agreed to support schemes on rainwater harvesting and piped water supply submitted by community groups all over the country. This is not only because of the efforts of the Barefoot College but because the Director of the Barefoot College sit in government committees at the All India level this has been accepted faster.

For the first time in the history of the Government of Jammu & Kashmir as a result of the Barefoot College's efforts at installing hand pumps in Ladakh the Government is investing in sophisticated rigs to install more hand pumps.

Rural women hand pump mechanics - repairing hand pump



100,000 litre water tank being constructed by villagers, without any engineers

Localisation
Tilonia, Ajmer and Jaipur Districts, Rajasthan, India

Domain of intervention
drinking water distribution

Area of intervention
rural areas

Contracting authority
the Barefoot College

Implementing agency
rural communities

Donors
German Agro-Action, the Government of India, Save the Children Fund, State Government of Rajasthan, private foundations

Total Budget
$250,000

Duration
beginning : 1979

Possible courses of action 6, 7, 10 and 11

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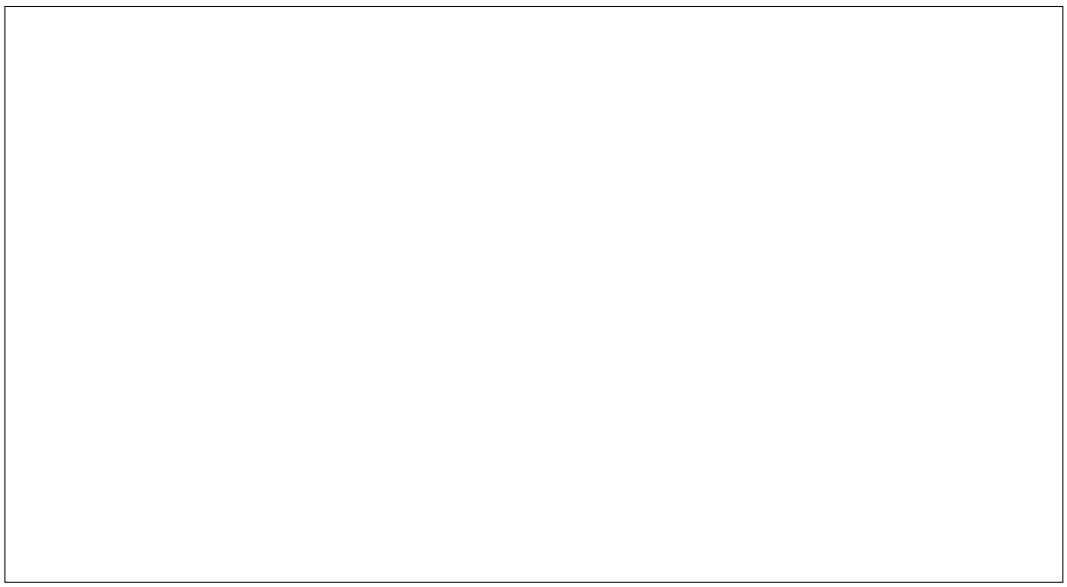

Fruit tree plantation using localised irrigation

Farm
12

Irrigation assistance in Jordan

Context and stakes

In Jordan, as in many countries of the Mediterranean basin, the rational use of water resources is a major challenge, particularly where irrigation is concerned.

Irrigation in the valley of the Jordan river is used across approximately 30,000 hectares. During the past few years, most irrigation networks have been converted into pressurised networks. This change enables the spread of modern irrigation techniques, such as localised irrigation or sprinkling, which allow higher yields than traditional surface irrigation.

However, to take advantage of these techniques, farmers need training and technical assistance in designing the installation, in setting up and maintaining the equipment, and in irrigation steering techniques.

It is with this objective in mind that for some years the French Embassy, through the activities of the Regional Water-Agriculture Mission, has been designing a programme of cooperation aimed at exploiting French engineering and research skills in these areas.

Against this background, modern techniques for steering irrigation using soil water content measurements have been introduced on a pilot farm in the Jordan river valley. This experiment has been successful (approximately 50% of water saved, better yields and better quality production) and has attracted the attention of the Jordanian Ministry for Water and Irrigation which wishes to extend these methods throughout the Jordan valley.

Objectives of the action

The objectives of the project are to extend the experiments underway to other types of crop (arboriculture) by equipping two new pilot farms; to use these pilot farms as demonstration and training tools to introduce new techniques to the farmers of the Jordan valley; to train the managers of pressurised water networks to match the quality of the water delivery to the requirements of the farmers adopting these techniques.

French experience in research engineering and agriculture popularisation is a major asset here.

Description of the action

The project focuses on irrigation networks recently converted to work under pressure in the northern par of the Jordan valley. Amongst these, one network – regarded as a pilot scheme – supplies 131 farms, including the demonstration farms, i.e. approximately 400 irrigated hectares in all.

The project has four components:

1 / A detailed survey of the farms connected to the pilot network: types of crop, irrigation equip-

ment, techniques, requirements, steering methods, etc.
2 / Continuing and extending experiments currently underway on the leguminous crops of the Middle Ghor. Developing new experiments on fruit arboriculture and the introduction of other demonstration farms.
3 / The training in France of several farmers and engineers from the JVA who will be responsible for technical assistance to farmers using irrigation. This training in France is complemented by local training for the farmers connected to the system.
4 / Training the JVA engineers responsible for the management of the pressurised network, particularly on modelling and introducing this new "on demand" water delivery system rather than the traditional water tower.

◆ Responsibilities of each actor:

The project is steered by the French Embassy in Jordan (Regional Water-Agriculture Mission). The Mission plays an active part in both financial and technical aspects.
Three further partners are involved:
– two organisations in charge of the management of hydraulic networks: the JVA (Jordan Valley Authority), a public agency in charge of the introduction and maintenance of networks in the Jordan valley; the Provence Canal Company, a Regional Upgrading Company for the Provençal Region in charge of the introduction and maintenance of networks in Provence (France);
– and one research organisation: Cemagref, the Research Centre for Agricultural and Environmental Engineering, which has for many years been carrying out research on the performances and the implementation of modern irrigation and drainage techniques and of irrigation management

Localisation
Jordan

Domain of intervention
irrigation, integrated resources management

Area of intervention
rural areas

Contracting authorities
draft agreement between the Embassy, the Jordan Valley Authority, the Provence Canal Compagny and Cemagref

Implementing agencies
the Provence Canal Company and Cemagref

Donor
the Ministry of Foreign Affairs

Total budget
300,000 FF in 1997, plus missions in Jordan

Duration
from 1997 to 2000

Results

Monitoring the experiments currently taking place in the pilot farms in Jordan, and the training in France of JVA farmers and engineers, are the key points of 1997. Training brought together 17 people for three weeks and was run jointly by the SCP, Cemagref and the Carpentras CFPPA. Training covered:
– the management of networks under pressure;
– the introduction of modern irrigation techniques to agricultural farms. Particular attention was paid to providing teaching aids usable in Jordan to enable the trainees to disseminate the data they received during the course.
No major problem to report and the actions planned should continue according to the planned timetable. Contacts and partners are working well.

Perspectives and impacts

This cooperative action enjoys the benefit of highly motivated partners and should lead to:
– the introduction of technical support structures for Jordanian farmers who use irrigation, allowing the growth of new irrigation methods to be assisted;
– better concertation between the organisations responsible for the management of water resources and the management of the networks, and farmers expressing new needs in the light of the new techniques introduced and the crops planted;
– a contribution to the national objectives of economising and making best use of water resources.

Possible courses of action 3, 7, 11 and 15

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Dam Rong marsh in Danang

Fam

13

Building a waste stabilisation pond in Danang neighbourhood n° 1, Central Vietnam

Context and stakes

The project forms part of the decentralised cooperation initiative launched in 1993 between the Nord-Pas-de-Calais region and the Province of Quang Nam Da Nang in an underprivileged urban neighbourhood area of approximately 80,000 inhabitants. This extremely densely populated, emergency settlement was built to the north of the city of Danang during the war, with no urban plan. In the middle of it, a marsh has survived, and this collects the water for most of the area through gravity. The surface area of this marsh had been falling from year to year, and would inevitably have disappeared were it not for the decision to turn it into a waste stabilisation pond.

There were several issues at stake: purifying wastewaters, the need to preserve the last open spaces of the area, and the desire to improve the living conditions of the inhabitants, without at the same time breaking with traditional practices of growing aquatic market products.

Objectives of the action

To prevent the marsh from being filled in and to improve its role of purifying wastewater by natural stabilisation. This was therefore an integrated project embracing wastewater management, landscaping, urban regeneration, preservation of the local economy and social integration.

Description of the action

Originally, this project was the fruit of the joint determination of the city of Danang and the Nord-Pas-de-Calais region to resolve environmental; and especially rubbish disposal and wastewater; issues. It was also a reaction to the intention to completely fill in the marsh, whereas an intuitive observation of the locality suggested that the existing aquatic environment was capable of naturally purifying the drain-carried polluting input, provided the inhabitants maintained their existing practice of using it for market produce, since harvesting this ensured the regular removal of organic matter. The project can be seen as making best use of a system which works naturally, notably by making water flow across the whole of the available surface.

Results

- Strong points of the experience:

The project is in its final phase, and the first measurable impact is the added land value that the project has brought to the area, which can be

seen in the number of housefronts and houses currently being upgraded around the pond since work began. The other positive aspect is maintaining a high quality natural environment in an urban centre, whilst using local skills and knowledge handed down through generations.
The project provided the opportunity to set up a management committee, run by those living by the pond, responsible for the maintenance of the site.

◆ Problems / lessons learned:

It proved difficult to make local technicians feel committed to a purifying technique which was on the face of it archaic rather than innovative. A sufficiently long time must be allowed for communication in this kind of approach, so that the technicians are committed from the outset of the project.

PERSPECTIVES AND IMPACTS

The project was designed in response to a given situation, and in particular to local habits: the inhabitants currently throw little water away. We already know that in future, behaviour patterns will probably change and the surface area of the pond will no longer be sufficient to purify the waste water of all the inhabitants. It will then be necessary to imagine a new technical solution, whilst preserving this last space being used as a genuine water garden.
In addition, this pilot station is not yet operating since not all the aquatic plants have been planted. However, the authorities of the city of Danang are considering a new neighbourhood to the south of the city, at the heart of which would be an other waste stabilisation pond.

Possible courses of action 6, 7, 9 and 12

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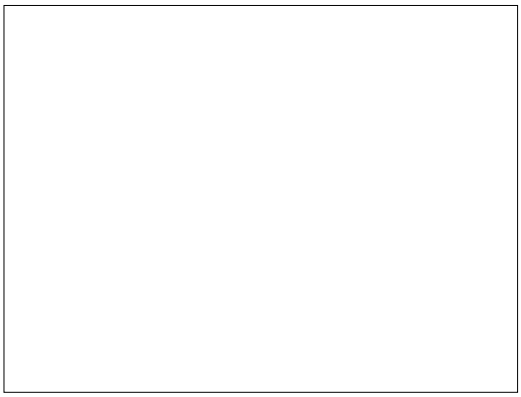

Dam Rong marsh in Danang

Localisation
City of Danang, Central Vietnam

Domain of intervention
sanitation, environment

Area of intervention
underprivileged urban areas

Contracting authorities
the province of Danang and the Nord-Pas-de-Calais Region

Implementing agencies
Project Nord-Pas-de-Calais Region - Site City of Danang, under the joint control of the Nord-Pas-de-Calais Region - the City of Danang

Donor
the Nord-Pas-de-Calais Region

Total budget
2,785,500 FF

Duration
from 1995 to mid 1998

Fam
14

Strategic sanitation planning in project replication : the Kumasi experience

CONTEXT AND STAKES

Kumasi, located 300 km north-west of Accra (the capital city), is the second largest city in Ghana and the capital of the Ashanti Region. The metropolitan area covers 150 km^2 and is made up of four districts. Kumasi has been the crossroads between the northern and southern sections of Ghana since its establishment as the heart of the Ashanti Empire around the turn of the eighteenth century. The city is now a budding industrial center. Kumasi's services and infrastructure have also deteriorated over the lean years of Ghana's economic development. Roads, water, environmental sanitation and lately community upgrading is receiving urgent intervention.

Kumasi has a unique housing pattern with well-defined contiguous sectors. This feature lends itself to sanitation planning and four sanitation planning areas have been identified; tenement, indigenous, new government, and high cost. These have been defined on the basis of predominant housing characteristics and spatial continuity. This attribute of Kumasi was relied on in the initiation of a demand-driven strategic sanitation approach for Kumasi. Kumasi is the forerunner to the adoption of the strategic sanitation planning process owing mainly to the involvement of the World Bank's Regional Water and Sanitation Group (RWSG-WA) in the execution of the UNDP / KMA-Kumasi Sanitation Project (KSP). KMA with the assistance of RWSG-WA produced a Strategic Sanitation Plan for Kumasi (SSP-Kumasi) for the period 1990-2000. The SSP-Kumasi has been reviewed in line with the principles of startegic sanitation planning, and the current SSP-Kumasi is for the period 1996-2005.

The basic tenets of SSP-Kumasi are that priorities change over time and strategies will be refined as experience is gained. Accordingly, the SSP is to be updated regularly. This iterative process makes planning dynamic with the changing aspirations of beneficiaries and evolving government inclinations and policies. The intent is to consider a range of proven technologies recognizing resource constraints, and paying due attention to willingness and capacity of users to pay for improved services.

Kumasi's unique experience with this approach made it the choice for the preparatory workshop for the inception of the Urban IV Project which was organised by the RWSG-WCA (Abidjan). The preparatory workshop itself is recognised as a major event in the strategic sanitation planning cycle.

The Urban IV project formulation for Kumasi (as well as four other main municipalities of Ghana) and implementation strategies was influenced by the SSP-Kumasi experience and will be illustrated in the following sections.

OBJECTIVES OF THE ACTION

The objectives of the Urban IV project are as follows:

– to improve productivity and raise the living standards in the Kumasi metropolis, especially for lower-income people, by improving drainage, sanitation, and solid waste services;

– to promote the establishment of better institutional and financing mechanisms and more effective policy frameworks so that improvements are sustained over time;

– to build capacities of the Kumasi Metropolitan Assembly departments to manage environmental sanitation services and;

– private sector development, by inducing private sector participation in various waste collection and sanitation services.

DESCRIPTION OF THE ACTION

The Urban Environmental Sanitation Project (UESP), Urban IV Project, is part of the World Bank's Country Assistance Strategy (CAS) for Ghana. The project was identified as a result of the Urban Development Strategy Review conducted by the Government of Ghana and the World Bank. In 1993-94. The Review involved a series of seminars with representatives of central and local institutions involved in the sector. The project covers Ghana's five main cities of Accra, Kumasi, Sekondi -Takoradi, Tema and Tamale. For Kumasi the project involves interventions in:

– storm drainage;

– sanitation (household, schools and public facilities, septage treatment and sewerage rehabilitation);

– privatisation of solid waste services and development of sanitary landfills;

– community infrastructure upgrading for four deprived areas of Kumasi;

– institutional strengthening and capacity building.

The project's development involved client consultations and participation and project preparation workshops, which identified priority areas for intervention.

The project scope for Kumasi, particularly, the sanitation and solid waste management components were derived from the SSP-Kumasi (1996-2005). The strategies for implementing a home latrine promotion programme for households and the concept of franchise or "affermage" was also derived form the successful franchise management of public toilets in Kumasi initiated as part of the Kumasi Sanitation Project.

◆ Responsibilities of each actor:

The concept of decentralisation is central to the institutional and political structures for administration and governance in Ghana. The 1992 Constitution of Ghana and the Local Government Act 1993, Act 462 in line with the vision of decentralisation place municipalities (categorised into district, municipal and metropolitan depending on population) as the pivot for local development and as such assign oversight of all municipal services under district assemblies purview. The decentralisation policy's main point, of transferring some state responsibilities, functions and activities, with appropriate financial, staff and technical resources to district assemblies (DAs) requires strengthening and capacity building of the technical institutions responsible for the delivery of urban infrastructure services. Under the District Assemblies Common Fund Act, Act 561, not less than 5% of total government revenues are to be passed on to municipalities. This act has increased the ceiling of projects previously handled by municipalities and towns.

In line with Government of Ghana's decentralisation policy and the increasing fiscal thresholds assigned to the Kumasi Assembly's management, the SSP-Kumasi (1996-2005) recognises the added responsibilities of the KMA. One important aspect of Urban IV in which the replication of SSP-Kumasi concepts is significant is the franchise of sold waste management services. Under the Kumasi Sanitation Project, the management of public toilets were franchised based on the French concept of "affermage". There was marked improvement of these facilities under private franchisees. Under the Urban IV Project, the concept of franchise management of solid waste management is to be implemented.

RESULTS

The Urban IV project is on going and scheduled targets are achievable. For example, Kumasi has achieved conctruction of 200 units of household facilities within 6-months as against the 2001 target of 1,700. The dynamics of strategic sanitation planning has been applied under the household latrine programme.

Localisation
Kumasi, Ghana

Domain of intervention
drinking water distribution, sanitation

Area of intervention
urban areas, underprivileged urban areas

Duration : from June 1996 to July 2002

Under the Kumasi Sanitation Project (1989-94) beneficiaries were assisted with loans if upfront-payment of 20% was fulfilled. Although loan recovery was satisfactory (75% and more), the management cost of this recovery effort implied that the real recovery is in the range of 50%. Under the Urban IV project, this realization brought about an adjustment in procedures.
Beneficiaries (households) make 50% contributions towards household facilities while the project supports households with a grant of 50%. Households' indicate their commitment by initiating construction up to 25% (or more) cost of the facility before the release of project grant. In this manner the demand-driven requirement of SSP-Kumasi is achieved.
The drainage, Community infrastructure upgrading, landfill and septage treatment facilities development and privatization of solid waste are at various stages. The drafting and finalization of a Franchise Agreement for solid waste management as against the more familiar traditional contract agreements was very challenging. More so, where the agreement should be accommodated within the stipulates of the Local Government Act, Act 462.

◆ Strong points of the experience:

One of the main achievements of the Urban IV Project is the shifting of identification and implementation responsibilities on municipalities. The process of client consultation and project preparation workshops have accelerated Urban IV Project schedules compared to earlier urban projects. The use of Strategic Sanitation Plans previously prepared by the Kumasi Metropolitan Assembly in needs assessment place the project as the city's own. Capacity building and required 10% contribution by the municipality is also inducing a planned approach to project financing by the KMA.
The larger civil works components of Urban IV are delivered by consultants and contract managed by the Ministry of Local Government and Rural Development, however, each stage of a consultants output follows a presentation and deliberation by the KMA and require a "no-objection" from the Assembly.

◆ Problems / lessons learned:

One major problem is the 10% contribution to be provided by KMA and other assemblies. That level of financing is beyond KMA's traditional revenue sources. The participating assemblies like KMA are being bailed out by allocation from the District Assemblies Common Fund (DACF) which is a central government's revenue source. In future projects requiring substantial inputs by the KMA (and other assemblies), levels of contribution should be linked to achievable targets of traditional revenue allocations by the cities.
Another concern, which needs addressing, is the contract award threshold set by the Ministry of Finance and Economic Planning, for Tender Boards like that of the KMA. The levels are comparatively lower than a number of Urban IV project component's cost, such that while management oversight of the Community Infrastructure Upgrading component, as an example, is KMA's responsibility, the award of contract and payments is at the sector ministry. The review of thresholds set by the Ministry of Finance should solve this problem since with the infusion of more capital from government sources (the DACF) most Tender boards are operating beyond set limits.

PERSPECTIVES AND IMPACTS

The follow-up to this project may cover community infrastructure upgrading in more low-income and deprived areas of Kumasi, as without doubt sustainable development and its' impact are more appreciable if community involvement and maintenance management roles are enhanced. The direct involvement of cities in project identification, planning and execution as in Urban IV supports the government's decentralisation policy. Capacity building has also helped Kumasi in the preparation of a Five-Year Development Plan (KMA-FYDP:1996-200) and thus will shorten future project preparation schedules.

Possible courses of action 1, 2, 3 and 6

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Form
15

Water, urban upgrading and sustainable development

Context and stakes

The Academy of Water has observed in most cities the lack of concertation between those responsible for water and for urban planning over the course of history, and has sought to highlight the ways in which this mitigates against harmonious urban growth. The links between water and planning were undoubtedly recognised, but international conferences on water encouraged the water cycle managers only to take concerted action amongst themselves, and not to enlarge this inner circle to include urban planning.

This "globalisation" was recommended at the 1992 Rio Conference and at the 1996 Istanbul Habitat Conference.

The objective of the Academy's study was to assess the possible gains in cost and in efficiency resulting from closing these gaps in concertation, both for water and for urban planning, and then to suggest ways in which this could be achieved.

Notably, how to persuade urban specialists that although water problems can be resolved once the urban clan has made up its mind, there would be much to be gained from taking water constraints into account when considering options. And how also to teach the water people to bring their own priorities into sharper focus.

Objectives of the action

The debate was to be based on concrete, actual cases of cities willing to be frank about the difficulties they have encountered, and which remained unresolved, in relation to their urbanisation and their water cycle management.

The analysis could therefore use monographs prepared for each city, using the same framework, describing problems and solutions over their history, the problems still to be resolved today and probably in the future.

Using these case histories, our study would consider defects and remedies in the five areas listed below, which are vital to urban management…:

– urban organisation and concerted action;
– the city and its citizens confronting water problems;
– socio-economic and financial aspects;
– water and urban planning;
– how to use the techniques available for water distribution, sanitation and flood control.

…in order to draw from these the recommendations they give rise to for the introduction of a policy on the sustainable growth of the city.

DESCRIPTION OF THE ACTION

Firstly, choosing volunteer cities, but making up a representative sample of the cities of the world, with the necessary spread from climatic, socio-economic, cultural and political points of view. Finally, the 23 partner cities chosen, of which 19 have more than 1 million inhabitants, are located in 19 countries across 4 continents and from both hemispheres, and do cover all the possible situations well.

Then, in partnership with each city, preparing the monographs and getting them validated so that they can be used to draw conclusions and make recommendations in the light of their experience at each period of their history.

Finally, explaining and commenting the seven recommendations to emerge from this analysis:

– that a co-ordinating structure for the conglomeration as a whole should be set up;

– that urbanists, water experts and financial specialists should be encouraged to consult and to dialogue in order to set common objectives;

– that concertation should be organised between authorities within the conglomeration and outside it;

– that global water cycle management should be introduced;

– that water should be locally regulated;

– that a low-cost management system should be organised thanks to realistic charging, staggered investments and efficient maintenance.

Notably, priorities should be set to implement these recommendations in the light of the socio-economic level of each of these cities and a system for monitoring these measures should be introduced. Finally, partner cities and other world cities should consider the ways in which they can share experiences.

◆ Responsibilities of each actor:

The study has been steered by the Academy of Water through a working group which met approximately ten times; financial and technical help for travel and visits was provided by the Seine-Normandie water agency and the five other agencies; the urban planners of the Ile-de-France Institute for Planning and Urbanism (IAURIF) also contributed their advice. The 23 monographs and the combined data validated for each city were distributed to Unesco; the synthesis prepared by Mr Valiron and M^{lle} Verdeil was published in IAURIF's Cahier n°116.

RESULTS

The Symposium was attended by over 300 delegates from 50 countries – water managers, urban planners, doctors, sociologists … and elected representatives – to discuss "water, the city and urban planning", taking as their starting point the monographs of the 23 world cities. The conference adopted the "Paris Declaration" which endorses all the suggested recommendations and also refers back to earlier conferences. Finally, it recommends closer links between water and urban planning, using a sustainable development policy and suggests that a system to aid urban management should be set up. The objective of this would be first to use it as a communication tool between all partners and citizens in concrete cases, and then extend it further to exchanges and transfers between cities using a subject-based network linked to the existing networks between cities.

These proposals complemented those of another conference also held at Unesco in March 1996 on "Water in the 21st century" on the initiative of the "Universal Movement for Scientific Responsibility (MURS) and the Academy.

◆ Strong points of the experience:

Despite the major differences between the cities studied, in the course of their history they have all faced, or face today, similar problems, often at 20, 30 or 50 year intervals. Thus the solutions adopted to resolve them use similar principles but suited to their own particular context. This shows how much the cities of the world have to gain from these lessons. Hence the advantage of organising a network for exchange between them, together with top experts complementing its role of assisting other cities.

◆ Problems / lessons learned:

The people responsible for water are very widely dispersed, specialising in drinking water, sanitation, rainwater, flooding; they often vary from one part of the conglomeration to another, and thus also from those responsible for roads, housing, etc. This makes concertation between them difficult even within their administrative boundaries. This is even more the case with outsiders, even if they are involved in mobilising

water resources or in combating the forms of pollution caused by the concentration of man and of his activities.
We must therefore use existing structures for concertation, those which already bring together the main water and planning decision-makers. These include district urban or community urban councils, or indeed in France the "local water committees" set up for "planning and water management schemes", so-called SAGE .

PERSPECTIVES AND IMPACTS

The Academy is continuing to implement these recommendations with French cities such as Paris, Lyon, Lille, Marseilles, Nancy, Nantes, etc. and a few foreign cities which believe that this kind of policy of sustainable development is an excellent way of establishing a broad dialogue between all the sectors of the conglomeration.
The advantage of the methodology proposed is that it makes those responsible for urban planning, water managers in the areas of the study and end-users work together with associations representing citizens to establish three documents:
– a snap shot of urban links;
– an analysis of the gaps and malfunctions observed and remedies to be applied;
– indicators for monitoring the policy decided upon which together form an urban management "control panel".
The Ile-de-France region, which decided to proceed in this way in late 1997, with assistance from the Academy, has chosen to apply the approach to the Marne downstream SAGE scheme in order to prepare a management tool which can be transposed to other parts of the conglomeration, and then to the whole of it.
The Academy of Water together with the Academy of Agriculture is currently extending its studies on water and land use to rural areas in France and abroad.

Localisation
case analysis of 23 cities in 19 countries : Paris, Bordeaux, Marseilles, Limoges, Annecy, Budapest, London, Madrid, Munich, Saint-Petersburg, Boston, Brasilia, Buenos Aires, Mexico, Casablanca, Cairo, Ouagadougou, Delhi, Hanoï, Djakarta, Osaka, Seoul, Shanghaï

Domain of intervention
integrated resource management

Area of intervention
urban areas

Donor
the Seine-Normandie water agency

Total budget
3,000,000 FF

Duration
from 1995 to 1997

The Academy of Water was created in 1993 on the initiative of the French Ministry for Environment and the French River Basin Committees. It gathers specialists in biology, human sciences, urbanism and water science, together with managers of water and land use companies or organisms.

Possible courses of action 2, 6, 7 and 12

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Citrus fruit plantation

Fam

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Agricultural irrigation in Morocco: the innovative project "El Guerdane"

CONTEXT AND STAKES

At the request of the Moroccan government, in late 1996 the Caisse Française de Développement (CFD) agreed to provide funding for a project to safeguard 10,000 hectares of citrus fruits near El Guerdane, in the Souss Massa region. This area, which is farmed by nearly 600 farmers, is ultimately jeopardised by the regular drop in the water table, the level of which is falling annually by 1.5 to 2 metres, forcing farmers to adopt various strategies to safeguard their orchards: excessively deep well-digging (sometimes up to 120 metres), drilling boreholes, transferring water, and sometimes abandoning their farm. The El Guerdane region, however, which benefits from an ideal agroclimatic environment for citrus fruit farming, provides the equivalent of approximately 20% of Morocco's citrus fruit exports and is a major player in the economy of the region, through both the direct and indirect jobs it provides.

OBJECTIVES OF THE ACTION

The objective of the project is therefore to bring 45 million m^3 of water from the Aouloz and Chackoukene dams (the latter currently under construction) to the 10,000 hectares of citrus fruit plantations which are the most in peril. The project includes:

– building an intake structure on the West Souss level with Aoulouz;

– building a 90 km intermediate canal;

– introducing an irrigation network using underground conduits under pressure to irrigate the area.

The total estimated cost is 443 million FF, including 350 million FF refinanced by the CFD (i.e. nearly 80%). CFD funding in fact covers two elements:

– 95% of the budget going to the farmers (265 million FF), which will transit through the CNCA, i.e. a total of 252 million FF;

– 55% of the part budget going to the State (178 million FF), i.e. a total of 98 million FF.

DESCRIPTION OF THE ACTION

The project is particularly innovative for several reasons. In the first place, the beneficiaries will be financially implicated in the project to an extent which is rarely equalled in Morocco, since from the outset they will take on 60% of the cost of the project, i.e. 270 million FF, in the form of individual long-term loans from the Caisse nationale du crédit agricole (CNCA). This financial involvement, which represents a

heavy burden for the farms to bear, together with a long-term commitment on their part, is something new in Morocco for a project of this scale. It requires the farmers to make an immediate financial contribution, which is far more restrictive than the classic application of the agricultural investment code, i.e. farmers contributing to hydro-agricultural investments in the form of an annual payment spread over 21 years, four of which are delayed after the water system starts up. This scheme meets the State's concern to reduce funding pressures on public investments, by encouraging private funding to pay for their implementation.

Results

The farmers permitted and accepted the project for several reasons:

– it takes account of the farmers' concerns, which are not only to save their orchards in the long term, but also to bring an end in the short term to the continual increase in their irrigation costs as a result of the falling water table;

– the crops grown, citrus fruits, are aimed mainly at export markets and enable significant profits to be made, particularly when modern production techniques are used;

– the region's farms are well-known for their dynamism and their organisation (exporting groups, co-operatives, packaging units, etc.).

The institutional set up is also innovative: an Association of Users of Agricultural Water (AUEA) has been set up, uniting all the farmers of the area. It acts as the main interlocutor with the authorities, in this event the Ministry of Agriculture and of Agricultural Exploitation, represented by the Rural Engineering Department (AGR) and the Souss Massa Regional Office for Agricultural Exploitation (ORMVA).

The State will hand over responsibility for the management of the irrigated area to the farmers' association, which will seek assistance, for more technical tasks, from the Souss Massa ORMVA. This approach, which will be the subject of a formal contract, coincides with a shift towards beneficiaries assuming greater responsibility in the use of installations and in particular for water management, water being a rare and precious commodity in the region.

Perspectives and impacts

The option of a total franchise was raised during the project preparation phase, but the government chose not to use this option for this project. It is, however, undeniable that following this path will become more and more attractive for similar projects in the future.

The AUEA has also been closely involved in the technical preparation of the project and will take part in monitoring the work.

The impact of the project is considerable. Apart from the economic effect mentioned above, its key achievement lies in the expected stabilisation of the water table. This will be required less since half the water needs of the irrigated areas will be provided by the surface water being stocked upstream. The project will also contribute to the adoption water saving techniques such as micro-irrigation or drip-feeding.

Localisation
Souss Massa region, near the town of El Guerdane, Morocco

Domain of intervention
irrigation

Area of intervention
rural areas

Contracting authority
the Moroccan Ministry of Agriculture

Implementing agencies
upgrading work carried out by private companies, the irrigation systems are operated by the Water Users Association

Donors
CFD, Moroccan public authorities and end-users

Total budget
443,000,000 FF

Possible courses of action 4, 8, 11 and 15

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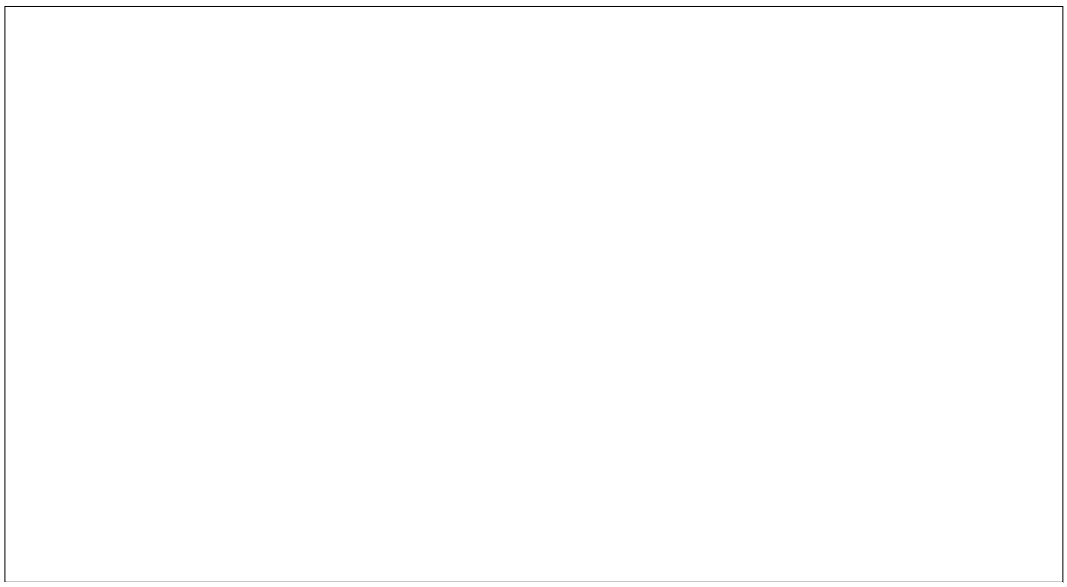

The inhabitants of a neighbourhood participate in building their water distribution network

Fam
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Water distribution in the low-income neighbourhoods of Buenos Aires

CONTEXT AND STAKES

The water and sanitation services of the city of Buenos Aires were sub-contracted in May 1993. Aguas Argentinas became the new operator, according to a contract clearing setting the objectives of expanding the services. The contract amongst other things defined infrastructure costs which were to be passed onto the client when connecting him to a service. These infrastructure charges were intended to cover part of the costs of constructing secondary networks. Charges were in the order of $500 for being connected to the water service and $1000 to the sanitation service.

It very quickly became apparent that certain categories of the population could not pay these amounts. This is the case for approximately 800,000 people whose monthly income per family is below $240, and some 3,100,000 people, whose monthly income is below the poverty line ($500 / month / person).

OBJECTIVES OF THE ACTION

Faced with this self-evident fact, the city's various stakeholders launched a dialogue to find alternative funding solutions enabling these families to gain access to the services. The IIED-AL (International Institute for Environment and Development - America Latina), an NGO which had been working for several years not only on studies and investigation (urban poverty, community action, the environment), but also on actions in underprivileged neighbourhoods, was one of the partners involved in defining and implementing solutions.

DESCRIPTION OF THE ACTION

Using a pilot project to install a water and sanitation network in a neighbourhood of 2,500 people, IIED-AL helped Aguas Argentina to draw up an action plan for serving the other underprivileged neighbourhoods of the Buenos Aires conglomeration. This action plan includes:

– identifying priority neighbourhoods;

– finding technical and institutional solutions which suit each neighbourhood, and using a tripartite collaboration between the franchise holder, the public institutions and the inhabitants, with the NGO (IIED-AL) acting as a catalyst for this participatory management.

In small neighbourhoods, the "Consensus Water Service" was introduced; this involves the inhabitants swapping their labour for a free water

connection. In larger neighbourhoods, work is carried out by a building and public works company which is responsible for recruiting unskilled labour from amongst the inhabitants of the neighbourhood, through a workers' cooperative ("Job Creating Unit"). In this case, the user has to pay back the cost of the labour, but has the benefit of a paid job. In other cases, according to the "Fiscal Compensation Agreement", the franchise holder carries out the work in return for a municipal tax credit.

◆ Responsibilities of each actor:

Activities are shared between the various stakeholders according to their areas of competence:
– Assessing demand : IIED-AL.
– Technical input: Available resources and technical solutions: Aguas Argentinas.
– Resources implemented: Assessment of attitudes to participation: IIED-AL and other NGOs. Action plan: all.
When the work is being carried out, the franchise holder supervises and trains the staff. The public institution (communal or at another local government level) is responsible for general organisation and funds the materials. The neighbourhood provides the labour for carrying out the work. IIED-AL provides assistance at all stages of the project, acting as an interface between the various actors.

Localisation
Buenos Aires (Argentina)

Domain of intervention
drinking water distribution

Area of intervention
underprivileged urban areas

Contracting authority
the franchise holder Aguas Argentinas

Implementing agencies
the inhabitants or companies

Donors
jointly the commune, the franchise holder and the inhabitants of the neighbourhoods involved

Total budget
$ 250,000

Duration
from 1996 to 1998

RESULTS

Following a successful pilot project (Barrio San Jorge, with a population of 2,500, receiving funding from bilateral cooperation organisations MISEREOR, German and Swedish cooperation), four projects were implemented in 1996 (6,000 inhabitants) and six additional projects in 1997 (10,000 inhabitants) using the "consensus water service" formula.

◆ Strong points of the experience:

These are innovative experiments, mainly because they occur in the context of a franchise concession in which the various partners (public, private, NGOs, population) carry out the project together. The search for new funding mechanisms enabling the poorest population groups to gain access to the services is the key focus of these Argentinean experimentations.

◆ Problems / lessons learned:

We can draw certain conclusions from this experience:
– the importance of the contractual and legal framework;
– the time needed to raise awareness at operational levels, to develop contacts, etc, and to obtain the commitment of all the partners;
– the need to define the responsibilities of each party involved;
– if the project is to be sustainable, the need to establish and maintain contacts in the neighbourhoods involved.

PERSPECTIVES AND IMPACTS

The institutional tools being used require the contractual framework within which the franchise holder continues to evolve; this is currently changing. Nevertheless, the success of the first projects has increased the number of potential partners (NGOs, national and international organisations, etc.) and should enable the participatory management set up to become sustainable.

Slum areas - Buenos Aires

Possible courses of action 6, 8, 9 and 14

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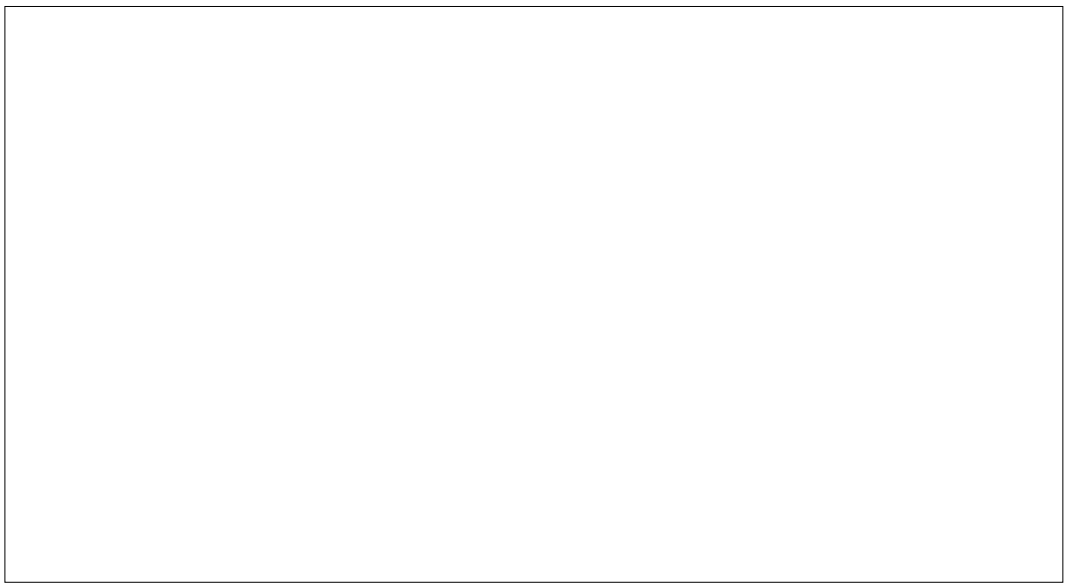

Searching for leaks in Aguascalientes

Fam
18

Water distribution in Mexico: the Aguascalientes experience

Context and stakes

Mexico is notorious for its over-exploitation of between 50 and 100% of available natural resources. The World Bank has identified 80 aquifers of the largest cities which are serious threatened. The initiatives launched in Aguascalientes (Mexico's first franchise, signed in October 1993) aim to reduce, or even to resolve the serious problem of the continuing fall (4 / 5 metres per year) in the levels of the aquifer of a city of 800,000 inhabitants which is growing at a rate of 3-4% per year, with no other resource to replace it.

Objectives of the action

– To study the management of the aquifer: to ensure rational management, compatible with the resources available and to reduce the over-exploitation of the aquifer.

– To test the sectorisation of the networks: to help to reduce demand and to improve the service offered to the inhabitants.

– Charging: to find a charge rates system suited to households' financial means.

– To set up a social aid fund: to help the poorest families who cannot pay for their water consumption at the minimum rate (without going so far as to make it free).

Description of the action

– Aquifer study:

Fact: the aquifer has fallen by 150 metres since 1960 without any measures being taken to prevent this.

Action stages: synthesising and analysing over 100 previous studies carried out on the Aguascalientes valley aquifer (with no decision being taken); devising a aquifer management tool (mathematical model) and arranging how it is used improving and increasing the city's water production (building catchment areas outside the urban area); establishing a regulatory framework on using underground water (institutional approach); defining technical specifications for drilling boreholes.

– Sectorisation:

Fact: a very high volume of water is lost in the network (65% of production).

Action stages: analysing the quality of metering and locating pirate connections; setting up hydraulic distribution sectors in which incoming volumes are metered; finding non visible leaks and repairing them; assessing the overall hydraulic situation to quantify the reduction in water loss

– Charging : defining 3 socio-economic levels in the city; establishing a charge rate for each.

– Setting up a social fund: defining the needs of this fund and where its resources are to come

from; rules to be applied for allocating this financial aid to settling bills

◆ Responsibilities of each actor:

– The aquifer study is collegiate. It is directed by a French engineering practice, Burgeap, in association with: the state head of the CNA, the State of Aguascalientes, the municipality, the university students and the franchise holder responsible for initiating the programme.
– Thanks to sectorisation a communication project has developed with the population and their participation can be requested: refraining, for example, from consuming any water during nighttime rates of flow measurements.
– Charging: the franchise holder must ensure that the equation is properly applied: economic level = corresponding charge rate.
– Social aid fund: the regulatory organism must ensure, without political pressure, that the rules for allocating this aid to the poorest clients are correctly applied.

Results

– Aquifer: the experiment is ongoing, nevertheless the productive participation of the Mexican authorities is to be noted.
– Sectorisation: the number of leaks discovered, using the methodology which will be described elsewhere, is approximately 50 leaks per night, which makes an increase of 15 to 20% in the output of the network seem likely within 2 / 3 years (i.e. an increase from 50 to 65 / 70%).
– Charging: thanks to a carefully considered charging system, matching subscribers' financial possibilities, complemented by a marked improvement in service, the rate of recovery for 1997 has been consolidated, and stands at over 88%.
– Social aid fund: all of the funds available have been allocated, which has contributed to the debt recovery rate mentioned above.

◆ Strong points of the experience:

– Aquifer: ongoing.
– Sectorisation: training young Mexican engineers in this technology. The positive attitude and the participation of the inhabitants of the neighbourhood, which is of great help to the staff, working essentially at night.
– Charging: ensuring that the socio-economic levels are correctly applied.
– Social aid fund: the inhabitants' excessive enthusiasm for this subsidy, boosted by the politicians craving for popularity which tends to deflect the way the funds for this aid are used from its original purposes.

◆ Problems / lessons learned:

– Sectorisation: . the major discovery of anomalies and the advanced state of wear and tear of the hydraulic installations (poor quality materials, defective repairs) . thanks to the level of detail of our investigations, we now have a precise understanding of replacement needs and where they are located. Investments can therefore be accurately targeted.
– Social aid fund: the need to ensure that the rules for allocating the aid subsidies are rigorously applied.

Perspectives and impacts

These ongoing experiments have been used for the first time in Mexico City and launched on a modest scale in other cities.
Sustained efforts will need to be made to overcome the authorities' fears that any responsibilities for failures might be exposed and the technocratic environment, and to give these experimentations a firm foundation.

Localisation
Aguascalientes, located 450 km north-west of the Mexico City

Domain of intervention
integrated resource and distribution management

Area of intervention
urban areas (sectorisation / tariff setting: Aguascalientes conglomeration), rural areas (aquifer study: Aguascalientes water valley)

Donors
the aquifer study is funded by the Fasep of the French Ministry of the Economy and Finance, the franchise holder CAASA is responsible for the sectorisation of the drinking water network

Duration : ongoing

Possible courses of action 6, 7, 8 and 9

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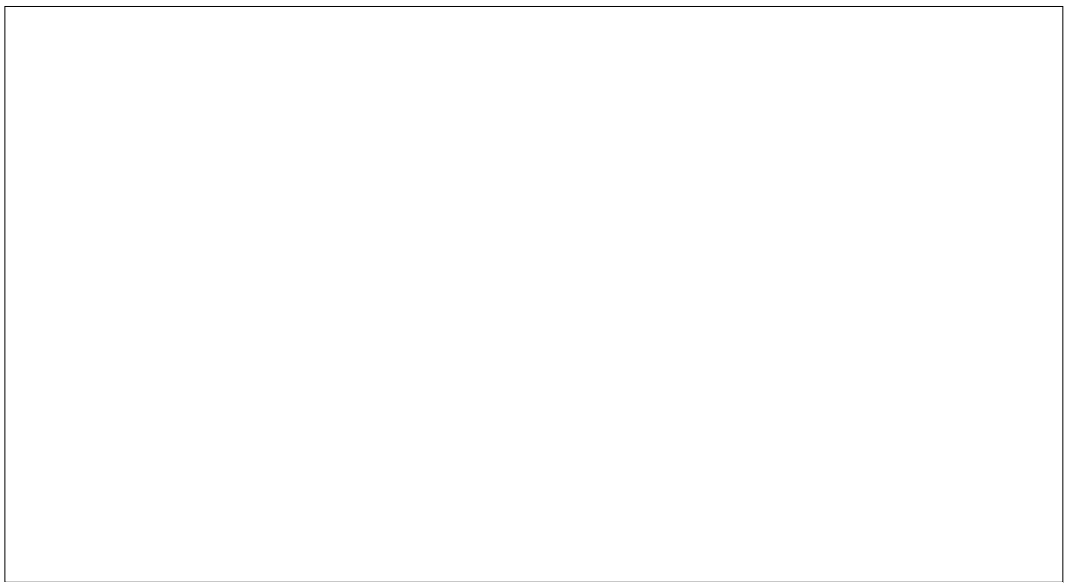

Client reception

Fam

19

Wastewater collection and treatment in the City of Gdansk and its suburbs

CONTEXTE AND STAKES

The political system in force in the countries of Central and Eastern Europe during the decades following the 2nd World War has caused major malfunctioning in the public services and in particular in the water and sanitation services: bad resource management, insufficient maintenance of installations, very poor quality of the products and services distributed, unsuitable technical and financial management, and no policy capable of motivating human resources. In Poland, and particularly in Gdansk, the introduction of democracy was accompanied by very high expectations on the part of the consumers, expressing their concerns regarding the public health problems caused by the frequent failures of the drinking water and sanitation services.

OBJECTIVES OF THE ACTION

Given the dissatisfaction being expressed by the inhabitants of Gdansk, the city municipal authorities decided, against the background of introducing a privatisation policy, to hand the city's water and sanitation service over to a private operator. The main objective was to bring the water and sanitation system up to European standards within a very short time-scale and at the lowest possible costs.

DESCRIPTION OF THE ACTION

Privatisation of the water and sanitation service of the city of Gdansk and creation of a joint venture, Saur Neptun Gdansk (SNG), between the city of Gdansk (49% shareholder) and Saur (51% shareholder). SNG has a capital of 77,551 million zlotys (approximately 3 million US $). (Note: when Saur International was created, all the shares held by Saur were transferred to Saur International.)

◆ Responsibilitis of each actor:

Under the terms of a 30-year franchise, responsibilities are shared between the various actors (the city and SNG) as follows:

The city of Gdansk:

– owns the water and sanitation infrastructures;

– decides on infrastructure investments and on how to finance them;

– decides the price of water and sanitation, based on SNG proposals.

Saur Neptun Gdansk:
– is responsible for the fixed assets it is in charge of;
– is responsible for the quality of the water distributed;
– guarantees the city the quality and the continuity of the products and services provided;
– is in charge of relations with its clientele;
– is responsible, under the overall control of the city, for implementing new network investments or reinforcements.

Results

The contractual obligation to reduce operational costs by 7.5% within 3 years has been met well beyond expectations. Costs have in fact been brought down by 15.5% during the first 18 months, and by a further 14% over the following two years. In addition, the reduction in rates (in real terms) together with the fall in consumption (from 230 litres / inhabitant / day to 160 litres / inhabitant / day) has resulted in an average fall of nearly 31% in the amounts being billed. This fall in consumption, as a result of meters being installed throughout, is a key factor in combating wastage and preserving water resources. Finally, over a 4-year period of activity, the company has reduced the number of technical failures by 32%, and repairs are in most cases made within 5 hours.
It is noteworthy that these various results have been obtained whilst at the same time introducing new services to improve the technical skills and overall quality of the Joint Venture:
– a Technical Department has been set up, and is responsible for developing new technologies to improve the performances of the network;
– a Laboratory has also been set up; it carries out 6,000 analyses per month and matches the water produced to European Standards (currently, 80% of the water treated meets European standards);
– a training centre, where more than 1,000 trainees (from SNG and other companies) receive training each year, has been created;
– a powerful computer tool has been introduced: more than 100 linked PCs are being used both for technical and management applications.

Localisation
Gdansk, Poland

Domain of intervention
drinking water distribution, sanitation

Area of intervention
urban areas

Capital
$ 3,000,000

Duration
from 1993 to 2023 (end of the contract)

◆ Problems / lessons learned:

Amongst the many difficulties SNG encountered when it launched its activities in 1992, leakages within the network was a key challenge, since these totalled over 100 million m^3. There were two main reasons for this level of leakage: the age of the networks (over 20% of the pipework was over 100 years old), and an unsuitable technical organisation.
Action was therefore taken on both technical and organisational fronts:
– technical: new investment to modernise installations and a technical prevention policy;
– organisational: introduction of highly mobile specialised teams (locating leaks and recording the condition of the network using vehicles and radio communication).
The modernisation of the networks, the introduction of a prevention policy and the reduction in damage intervention time thus enabled leakages to be reduced to approximately 60 million m^3 after 5 years' operation, i.e. a fall of 40% compared to 1992.

Perspectives and impacts

This successful example of a partnership between the public sector (a municipality) and the private sector (a private enterprise) is the result of:
– the joint determination of both partners to replace the restrictive and administrative approach of a public body with the dynamic, client-oriented approach of a private enterprise;
– direct negotiation and signature of a contract guaranteeing that risks and rewards would be fairly shared between the public and the private partners;
– a partnership set up with a long-term perspective.

Possible courses of action 3, 6, 7 and 8

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Future directions and actions to be taken

THEME 1: IMPROVING KNOWLEDGE OF WATER RESOURCES AND WATER USES FOR SUSTAINABLE MANAGEMENT

It is universally recognised that it is vital to make an exhaustive "inventory" of the resource and of the ways in which it is used in order to set up a genuine sustainable water management system in the world.

A process started over 20 years ago

Since Mar del Plata (Argentina) in 1977, many international conferences have suggested actions aimed at improving our knowledge and protection of world water resources (the January 1992 Dublin international Symposium on "Water and the environment", the 1992 Rio de Janeiro United Nations conference on Environment and Development, the ministerial conference on "Drinking water and sustainable sanitation" in Nordjwick, Norway, in 1994).

The Mar del Plata and Dublin conferences most particularly pinpointed the mismatch between our basic knowledge and understanding and decision-taking. At the special session of the United Nations in June 1997, it was stressed that integrated water management should be a priority: "[...] Priority must be given, in accordance with national needs and realities, to formulating and introducing integrated water management policies and programmes".

Against this background, given that priorities have been defined, according to civil society, the Conference "Water and sustainable development" must focus on putting forward a concrete plan of action, including an institutional mechanism, a financing plan and a timetable for implementation.

Many experiences exist throughout the world

◆ The Agrymet programme aims to introduce a sustainable early warning system in the countries of the Permanent Inter-state Committee for Drought Control in the Sahel - CILSS . It incorporates both hydrological and agro-climatological data.

◆ The FAO's Aquastat programme uses national level data to provide global estimates.

◆ Eurowaternet, a future European water network, has been launched to assess the state of the environment in this sector in Europe.

◆ The Flow Regimes from International Experimental and Network Data programme (Friend) addresses the integrated management of surface water, using regional bases.

◆ Unesco's International Hydrological Programme seeks to encourage the international circulation of data.

◆ The National Programme for Hydrological Research (PNRH), a French programme, is developing an integrated, and therefore non "compartmentalisable", approach to the continental water cycle in several countries (France, Bolivia, Niger, Senegal, etc.). This programme requires an extended observation period (several years or even decades), high technology metrological systems (satellites, radar, automatic measuring stations, etc.), and sophisticated mathematical methods. It has enabled numerous laboratories (including BRGM, Cemagref, Inra Météo France, Orstom, and over 20 academic teams) to network and to run workshops open to all, in order to make their data available and to compare results[1].

◆ The African research network (Coraf) and its R3S water / drought component.

◆ The National Water Data Network (RNDE, Réseau national des données sur l'eau), based in France, links up the dozen or so existing specialised databanks.

◆ The European Tedis programme allows computerised exchanges of water data.

◆ The ultimate objective of the World Meteorological Organisation's World Hydrological Cycle Observing System programme (Whycos) is to introduce regional databases.

Finally, there are many exchange systems within international protection committees covering trans-boundary geographical areas (Lake Geneva, the Rhine, the Meuse, the Baltic watershed basin, etc.).

Using existing networks as our base, we must now decide upon a world networking policy enabling all of these mechanisms to function in harmony with each other, by restricting the number of one-off or superfluous operations. There is now an urgent need to achieve standardisation of data research methods, and to open such research up to fields related to our knowledge of water resources and water uses.

A still deteriorating situation

The programme for the evaluation of water resources in sub-Saharan Africa, implemented on the initiative of several funders and international organisations, identified a very significant fall in the number and the quality of the data being collected since the beginning of the 80s.

Both in the project for techniques for soil management and hydric supply of cultivated areas forwarded by Cirad in the fact sheet on the national hydrology research programme (PNRH), and in

[1] PNRH, Michel Vauclin, Hydrology transfer and environment studies laboratory (Laboratoire d'étude des transferts en hydrologie et environnement, LTHE) and Philippe Ackerer, Institute of fluid mechanics.

the "Regional management of lakes in the Sahel using remote sensing" project, the problem of the lack of the medium to long-term future of local data collection networks is underlined. As in the case of Agrymet, the main issue is to make field data collection systems sustainable.

At present, there is clearly a lack of commitment on the part of States. Unless these networks rely solely on external funding, their sustainability cannot be guaranteed. For States to commit themselves in the long term to supporting these measurement networks, they have to make sense to the people they govern, and the results obtained have to be made accessible locally, in a suitable form.

Meeting local demand

Private investment in these networks, however desirable, will only happen if the research centres in charge of managing them become more attentive to meeting demand. Once again, educating the public, a better understanding of what is at stake in protecting the resource, and above all improving the capacity of the users to participate in decision-making is the best guarantee of the long-term commitment of governments to operating measuring networks. As in other, apparently more "social" subject areas, we have to involve users in understanding the resource and how it is used, as well as in managing it.

Measuring networks should not be set up solely in the light of the specific needs of one user (a project, programme or particular sectors, etc.) but should rather meet the expectations of a wide audience. Arbitration between users (industrialists – including water used for power stations – farmers, drinking water consumers) should be able to occur on common bases, familiar to each of them.

We have to analyse the "upstream" needs and demands of these user groups in order to be able to provide clear and understandable answers using in agreed ways and at agreed intervals. Knowing and understanding meteorological data has become part of our daily lives; the same must become true of the state of the resource and how it is being used. We must identify users and their specific needs by involving as many potentially concerned sectors (land use planning, agriculture, industry, energy, environment, etc.) as possible.

Taking what is actually happening locally as our starting point

If measurement and surveillance systems are to become sustainable, we must start by dissecting the way they operate at present, highlighting their weaknesses (lack of continuity in measurements, systems which are inconsistent with each other, often delayed results, etc.) and their strengths.

To improve the capacities of national hydrological and hydro-geological data collection and handling services, we must set up high performance measurement networks, introduce an appropriate computer environment and strengthen human resources[2].

We need to have a world-wide agreement before we can select the data management and synthesis system. In addition, this system must be appropriate to countries' resources and designed in the light of existing infrastructures and the degree of monitoring it will require. For example, Internet communication systems can only work if there is an efficient and reliable national telephone network[3].

Beyond quantitative assessments

Another dimension to the local capacity to respond to user expectations is the need to include factors additional to purely hydraulic or climatological data. Users now expect data which is more qualitative than quantitative, and more socio-economic than strictly technical.

The AFVP's programme in Yaoundé[4], the capital of Cameroon, stresses the need for a qualitative understanding of the resource and the ways in which it is used in managing and protecting the resource. The consumers notably use traditional water collection points which are outside the water distribution service. With this fact in mind, the population is involved in the decision-making process, alongside the municipality and the water company.

As for the "Water, source of life and of development" project[5] in Côte d'Ivoire, this stresses the training of local stakeholders and the link between water and health. Here again, what is required is socio-sanitary data rather than hydraulic data. Hydraulic data alone do not enable those involved locally to take relevant decisions with regard to durability and sustainable development in their region.

Giving priority to integrated management

Integrated data management systems must become a priority at national and international levels, and particular attention must be paid to developing countries. Such information systems are above all a tool for communicating between data suppliers and users of this data, which should

[2] Regional management of lakes in the Sahel using remote sensing, Christian Puech, Joint remote sensing laboratory.

[3] Techniques de gestion du sol et alimentation hydrique des cultures annuelles tropicales, [Land management techniques and water supply for annual tropical crops], Jean-Louis Chopart, Cirad.

[4] Upgrading public standposts in a large city, Thomas Adeline, AFVP.

[5] Water, source of life and of development, Philippe Lecomte, Ardecod.

be dynamic rather than static. Their role is in particular to redistribute real time data in a form which is directly usable by data consumers.

Expert companies such as the Société Hydrotechnique de France which includes both public and private industrial and agricultural companies, service companies and public establishments, can be of invaluable help in better understanding users' expectations and constructing relevant responses. Setting up such companies – which are neither academic, nor businesses or research consultancies – should be encouraged in other countries[6].

Interesting integrated development experiments have taken place throughout the world. The Programme for the improved use of water resources in south-west Burkina Faso (RESO)[7] is a good example of this. This experience shows how difficult it is to implement integrated planning in an overall context which, whilst being favourable to this, is scarcely used to it. On the one hand, structured local concertation and negotiation on water usage is unusual, and on the other the external agents – who traditionally provide assistance to such programmes – are disconcerted by the implementation of an integrated approach relying on local capacities, on behalf of the users, and taking their demands as a starting point.

In the N'Djamena declaration[8], the participants indicated that: "Particular assistance should be provided in training for user associations, the private sector, and new water skills".

Even if a world political will does emerge in this area, we will need to rethink the way in which we use and exploit data so that knowledge of the milieu can become part of local decision-makers' constant concerns, on a par with the dollar rate or the cost of a barrel of oil. In this respect, the assistance project of the French WHO office in Constanta (Rumania)[9] demonstrates the advantages of carrying out a diagnostic study of the immediate environment and of the behaviour of the population before making major and costly capital investments in water rehabilitation and sanitation. A better awareness of what the resource actually is, together with user understanding of the quantitative and qualitative data, are the only ways of meeting their needs and preserving the quality of their environment.

Redirecting investment

The cost of introducing these policies for better understanding and therefore better utilisation of the resource is universally recognised to be modest compared with the economies which they would enable to be made in the resource.

This realisation is still too confined to specialist circles. If tax-payers, and civil society in general were made aware of it, government priorities might change.

Although investment costs are high (measuring stations, laboratories, modern means of transmission, etc.), the on-going operating costs of these networks are by far the highest.

[6] Le rôle d'une société savante, [The role of learned societies], Société hydrotechnique de France (SHF), René Coulomb, Chairman.

[7] Programme for the improved use of water resources in south-west Burkina Faso, Thu Thuy Ta, Consultant.

[8] Gestion de l'eau en zones défavorisées. Quels appuis aux options durables ? [Water management in underprivileged areas. How can sustainable options be encouraged?], N'Djamena, 12th-13th of January 1998.

[9] Partnership with the independent water authority of the Constanta region (Rumania), Patrick Marchandise, World Health Organisation (WHO), France.

Particular attention should be paid to funding continuous training for operators, as well as training and informing data users, and particularly women[10].

An information system can only function if it is in the hands of competent staff, and if they respond adequately to demands for this data from users.

External funding should firstly be aimed at encouraging States and the private sector to invest in measuring networks[11]. Such encouragement could take the form of funding training and information sessions for users (entrepreneurs, elected representatives, civil servants, user representatives, etc.) or of introducing conditions for aid which promote national and private efforts to take part in setting up sustainable networks.

If a measuring network has to be subsidised, regular evaluations will need to be made using objective criteria of responses to demand, so that the organisations responsible for the operation of these networks do not become isolated from local users.

Another approach could be to introduce taxes on economic activities which have an impact on the water resource; these would then be used to maintain the data collection systems.

In Australia and in Brazil, we find examples of funding such measurement networks using a percentage levied on the investment made in large hydraulic works; the levy is then allocated to introducing and maintaining measuring networks[12]. Brazil has developed a new approach to funding measuring networks, by introducing a small percentage levy on the amounts allocated to the operation of hydroelectric installations.

[10] Toward optimizing water resources management for sustainable development of rural water supply and environment sanitation in Vietnam, Le Van Can, Center for Rural and Environmental Sanitation, Hanoï.

[11] Expert Group Meeting on strategic approaches to freshwater management, Harare, Zimbabwe, 27th-30th of January 1998.

[12] Specialist workshop, preparatory document for workshop I, International Conference on Water and Sustainable Development. J.-M. Fritch, Orstom ; J. Margat, BRGM.

THEME 2: FAVOURING THE DEVELOPMENT OF REGULATORY TOOLS, AND INSTITUTIONAL AND HUMAN CAPACITY BUILDING

Taking a thorough look at existing regulatory tools

Before we can develop regulatory tools and institutional capacity building, it is important to carry out an inventory and analysis of existing regulatory tools, in order to make best use of any interesting institutional features they present.

This requires notably integrating local practices into institutional changes. Institutional change will occur best if horizontal and complementary skills are used (sociologists, jurists, engineers, etc.)[13].

A key factor to preserve the resource and help practices evolve

The institutional and regulatory backgrounds against which water management stakeholders are changing are the key to enabling this sector to develop[14].

Until now, most States have provided the planning, organisation and funding of the entire management of the water cycle. With urbanisation and the growing need for irrigation water, it is often difficult for States themselves to ensure access to water. States are therefore increasingly withdrawing from the management of the sector as a whole, and in many countries leaving behind a lack of institutional organisation, which jeopardises the need to respect the basic principles of good water management[15].

The need for greater interaction between public and private organisations

Water service management, particularly DWS, but also sometimes for irrigation, increasingly depends on the users themselves or on private companies. Opening up the water extraction and treatment industry to the private sector, with a view to optimal management, and allowing free competition in the sector, comes up against certain principles, as follows:

– water is above all a social asset, to which all should have access. The common interest cannot be defined solely as the sum of individual needs, regulated by market forces;

– managing this natural resource, and taking account of the many interactions such management presupposes (food security, risk prevention, land use planning, public health, etc.) requires a form of public regulation in which all the stakeholders must be involved.

The changes therefore required in the institutional framework and in the regulatory tools go far beyond links between public or para-public institutions. What is needed is an evolving framework linking up the many organisations gradually becoming involved at local level (private organisa-

[13] The Laos experience, Richard Pollard, Senior Program Officer, RWSS.

[14] Étude institutionnelle des pratiques de gestion des eaux usées dans les pays du bassin méditerranéen [Wastewater management practices in Mediterranean Basin countries: an institutional study] et Gestion de l'eau en Méditerranée, [Water management in Mediterranean countries], G. Lacroix, IME.

[15] Processus d'amélioration globale de l'environnement, [A global environment improvement process], Malick Gaye, Enda Rup, Dakar, Sénégal.

tions, community groups, non-profit associations, public organisations, local service providers, etc.) and at national level[16].

There are many lessons still to be learnt from experiences of privatising drinking water and sanitation services. These experiences show a marked change in the private companies coming into the larger cities of developing countries. The need to find new management models, suited to the precarious situation of the inhabitants of underprivileged neighbourhoods, has led these companies to develop partnerships with intermediate organisations which are better placed to meet this kind of demand[17].

Applying genuine decentralisation

At present, the most promising approaches for meeting demand for rationalising water management rest on decentralising consultative bodies. This brings the level of decision-making closer to users and avoids an increasing number of decision-making locations within the same geographical area[18].

The process of "de-concentration" - which reflect national level splits - must not be confused with decentralisation, which gives local assemblies powers similar to national level powers with regard to land use planning. All of the stakeholders concerned have a voice in this decentralisation of powers and of decision-making and consultative bodies[19]. But arbitration is necessary (on managing the water supply service, urban sanitation, etc.)[20], as locally as possible, if users are to be involved.

Promoting consumption control is not yet part of the culture of many stakeholders, either private and public. Because of this, we have to move on from selling a product, to genuinely managing a public utility service.

It is up to individual States to continue to accomplish their public service mission, which is notably to set up institutional and regulatory frameworks, which reconcile the imperatives of systems viability when exploiting the resource, and the social dimension of access to water. Public authorities must retain the control and management of decisions in the common interest. Debates within the Water Utility Partnership reveal the importance of respecting and rethinking the role of the State, whilst strengthening private involvement in drinking water distribution and sanitation services[21].

The need to clarify the role of each of the stakeholders involved, and the links which must be set up between them, at both national and local level, is being increasingly clearly voiced in certain regions of the world. In Senegal, for example, the entire water industry chain (from government to farmers, and taking in external assistance agencies) has decided to meet annually to

[16] Programa estadual de saneamento rural do estado do Ceara, Dominique Hauteberg, Kittelberg Consult.

[17] Sodeci Côte d'Ivoire water distribution company, Michel Maruenda, Saur International.

[18] Expérience de développement et de gestion de systèmes d'alimentation en eau potable dans les centres ruraux et semi-urbains au Mali, [Drinking water supply development and management in rural towns and semi-urban centres in Mali], Daniel Faggianelli, Gauff Ingenieure.

[19] The WaterAid experience in Tanzania, Jon Lane, Director.

[20] The Ados Proadel programme in Sinthiou Bababe in Senegal, Sylvie Bonnassieux, Director.

[21] Capacity building, Water and Sanitation Partnership, Fouad Djerrari, Jan G. Jansen, Water Utility Partnership.

agree jointly on priorities and modes of action[22]. This concertation requires the decentralisation of decision-making locations and assisting the structures representing users.

How to help rapidly expanding local skills

Such measures can only work if locally representative bodies (municipalities and inter-communal trade unions, for example) have sufficient expertise of their own to be able to make fully-informed decisions about the way in which they manage the resource[23]. It should be possible to fulfil this responsibility within a legislative and regulatory framework which ensures that decisions are in line with the more global management imperatives of States, or even of international bodies in charge of arbitrating the way water is used and harmonising ways of protecting it.

From Africa[24] to Latin America, developing skills within the various groups involved is now actually taking place. There are still obstacles, notably inertia, due more often to fear of the unknown (on the part of users as well as of the governments) than to any lack of technical or financial resources[25].

Particular attention must therefore be paid to developing decision-making tools and courses aimed at elected representatives and other local decision-makers, and to training community groups[26], which are becoming increasingly responsible for the water sector, but who often lack the necessary training and planning resources[27].

The programme for the "Community management of water supplies in the secondary towns of the Senegal river valley"[28] highlights the importance of training grass roots communities in managing water collection points in small towns in rural areas. Such training should go hand in hand with changes in the legal and regulatory tools to suit local decision-making. Similarly, in the context of the restructuring of the rural world in Morocco, training needs for resources and distribution managers are being put well to the fore[29].

[22] Mise en place d'un mécanisme de concertation entre les différents acteurs de l'eau, [Introducing a mechanism for concertation between different water stakeholders], Didier Allély, pS-Eau.

[23] Formation et encadrement technique des associations d'usagers de l'eau agricole, [Training and providing technical back-up to agricultural water users' associations], Michel Ducrocq, Cemagref.

[24] Ashyr Programme, Mohamed Ould Tourad, Tenmiya Mauritanie.

[25] Gestion participativa del Riego: el caso de los campesinos de Cayambe Ecuador, Ivan Ermes Cisneros, IEDECA Ecuador.

[26] The Barefoot College's water management project in India, Sanjit Bunker Roy.

[27] Conflicto ambiental por el uso del agua : el Arroyo Pantanoso, Ricardo Carrere, Alvaro Gonzales Gervasio, Aguas, Uruguay.

[28] La gestion communautaire des adductions d'eau dans les centres secondaires de la vallée du fleuve Sénégal. Laurent Girard, AFVP ; Régis Taisne, ISF.

[29] Normalisation, essais et démonstrations en hydraulique agricole, [Establishing norms, testing and demonstration for agricultural hydraulics], Maroc, Michel Ducrocq, Cemagref.

Vocational training must occur alongside training, information and awareness-raising campaigns for users, and particularly for women and young people, on water management and on respecting the resource. Universal access to information is the key to this better understanding, whether for technical, economic or methodological and social tools[30].

Using the demand being expressed as a starting point

Increasingly awareness of the importance of taking action on demand, and not only on increasing supply, is in fact a key factor in institution building and in designing new regulatory tools[31]. Water often plays a part in the social cohesion of a population. Any impact on water implies considering the entire economic chain which follows on from it. Analysing demand will dictate approaches in the light of a broader understanding of users' needs[32].

The particular attention which must be paid to local decision-making bodies must be based on the demand being expressed, and in consequence, on local experiences in management and procedures[33]. This sharp increase in participation in decision-making will only occur if a body of sufficient data is available at local level[34]. We must recognise and carry out our duty to train and inform users, of all kinds[35].

It is not enough to inform and to raise awareness amongst users, and notably women and young people[36]. These women and young people must also take part in the decision-making bodies, failing which any awareness-raising is in great danger of being dissipated in exercises of pure form[37].

Promoting management by river basin

Using watershed basins as the correct scale for identifying the resource available and for regulating its use is increasingly being put forward. Choosing to do so, however, often comes up against existing institutional and administrative schemes:

◆ Within a single country, the basin or secondary basin approach often does not coincide with political boundaries; in addition, water management responsibilities are very fragmented (very often, three or even four different Ministers are involved in one or more phases of the water cycle). There therefore seems to be a need on the one hand to introduce master water management plans at basin or secondary basin levels, and on the other to encourage exchanges and concertation between administrative services.

[30] Irrigation assistance in Jordan, Pascal Augier, Igref.

[31] Restructuring the water service in the slum areas of Port-au-Prince, Bernard Collignon, Hydroconseil.

[32] L'eau comme catalyseur du développement local dans le Haut-Atlas, [Water as a catalyst for local development in the Atlas mountains], Philippe Statsen, Enda Maghreb, Cellule Marrakech.

[33] A wellspring of initiatives for sustainable water in community, Lilia Ramos, Approtech Asia Philippine.

[34] Building a waste stabilization pond in Danang, central Vietnam, Alain Villain, direction de l'Environnement, de l'Énergie et des Déchets de la région Nord-Pas-de-Calais.

[35] Mise en place d'un système d'irrigation et de développement rural au Nicaragua, [Introducing and irrigation and local development system in Nicaragua], Edwin Zablah, Fundacion Augusto Cesar Sandino (FACS).

[36] Gender aspects in the management of water resources, C. Van Wijk, E. de Lange, D. Saunders, IRC.

[37] Women and water project, Ouadane, Mauritania, Annabelle Boutet, Hydraulique sans frontières.

◆ When managing a trans-boundary river, it has proved vital to develop international co-operation, in order to better manage a common resource. This "internationalisation" will require setting up arbitration and ad hoc management organisations, and these forms of arbitration will be of great importance for resource sustainability upstream and downstream of major river courses. This will require devising new legal and normative frameworks suited to all of the countries concerned with the basin in question.

The meeting of the International network for basin organisations (RIOB) which will be held from the 19th to the 20th of March 1998, on the fringe of the conference on water and sustainable development, will no doubt provide an opportunity to suggest where progress can be made in this field[38].

THEME 3: DEFINING STRATEGIES FOR SUSTAINABLE WATER MANAGEMENT AND IDENTIFYING APPROPRIATE FINANCIAL RESOURCES

Financing requirements exceed funders' response capacity

The very broad estimates made by international institutions such as the World Bank suggest that financing requirements far exceed the resources available from international funds and from States. These projections show clearly that to bridge this gap the whole of civil society will have to be financially involved, from producers (industrialists, farmers, etc.) to consumers (users).

Priority must be given to private investment, particularly from small and medium-sized economic operators active in local life[39]. Guarantee mechanisms should enable these small entrepreneurs to have access – on a par with large groups – to the national and international investment funds which have been set up.

Why the failure to take up loans currently available?

A large proportion of the loans available from the World Bank and other lending organisations in this field is not taken up. In the area of user training and awareness-raising in water saving and hygiene, this proportion of unused loans becomes extremely high.

It seems important to try to understand why more and more countries, notably developing countries, hesitate to take out loans. The problems they have in repaying in hard currencies while their

[38] Contribution from the French Chairman of the Commission on Sustainable Development, Christian Brodagh.

[39] Affermage du réseau de distribution d'eau de Sao Domingos, [Franchising the Sao Domingos water supply system], Janique Étienne, Burgeap ; Hilario Sana, Enafur.

internal solvency is low, is certainly one reason. There is even more reticence when it is a question of borrowing to meet expenses for restructuring services, training or operating infrastructures which have already been built.

Developing the water sector requires setting up new funding procedures helping States to improve their skills and knowledge and to equip themselves, without at the same time increasing their external debt.

Situations do, however, differ

In the absence of adequate financial guarantees, rates of investment are collapsing in economically unattractive areas (secondary towns, peri-urban areas). By contrast, there is fierce competition amongst companies specialising in water mobilisation and distribution to win contracts in the world's largest cities, against a background of service privatisation.

Although the scale of the problems found in these megalopolises undoubtedly makes it necessary to turn to companies capable of responding to these, some situations – from those of the underprivileged neighbourhoods to those of medium sized towns – require other responses. Until now, the size requirement for tenders submissions and the way in which calls for tender were constructed around financing by international funds has scarcely allowed any flexibility in the responses received.

For local decision-makers, it is a lot simpler to follow tried and tested procedures suited to large cities and to the few big, internationally active operators, than to have to deal with a large number of small contracts with companies which cannot offer the same financial guarantees. And yet, if "local" is to come first – turning to techniques better suited to the immediate context[40] and allowing local entrepreneurs to emerge[41] – contracts must be adapted to local operators[42]. Some large groups have understood this and have set up subsidiaries specialising in marketing alternative technologies and research into different ways of responding which are more accessible to underprivileged populations[43].

Alongside these large contracts, there is now a recognised need to turn to intermediary organisations to facilitate dialogue and to seek less costly solutions, suited to the user needs of secondary centres and towns[44].

Reform is needed

To meet the demand of these potential, modest income users, planning and funding regulations must change. Implementing these solutions generally requires much greater participation on the part of users.

[40] Évaluation multicritère des systèmes existants et proposition d'une nouvelle approche, [Multi-criteria evaluation of existing systems and a proposed new approach], Amadou Hama Maiga, EIER.

[41] Alimentation en eau potable et assainissement en milieu rural au Bénin, [Drinking water supply and sanitation in rural areas in Benin], André Toupe, Director of Hydraulics.

[42] Promote low cost appropriate technologies, Boghos Ghougassian, Mectat.

[43] Water distribution in low-income neighbourhoods, the Buenos Aires experience, Ricardo Schustermann, IIED-AL.

[44] L'affermage des réseaux d'alimentation en eau des petits centres : une solution d'avenir pour le développement durable, [Franchising water supply systems in small towns: a promising solution for sustainable development], Hervé Conan, bureau d'études RéA.

Much more intense training and awareness-raising activities, well in advance of physical implementation phases, are needed.

Current mechanisms leave the lion's share to capital investment, at the expense of training and maintenance operations, and more broadly operations of a social nature (awareness-raising on hygiene, on saving water, on rational irrigation, etc.). Non-reimbursable international aid should be devoted to such activities. An evaluation of the results of these programmes using pre-set criteria would then allow access – or not – to preferential loans.

Wide use of more flexible and locally more suitable procedure guides should be based on regulations encouraging co-operation and partnership between structures (States, service providers, companies, non-profit associations, researchers and international funders)[45].

Traditional schemes are expensive

States are generally put off by the cost of resulting from state-controlled awareness-raising and training of users and their representatives. They are even more reticent given that requests are fragmented, and that no major international aid mechanism meeting this kind of demand is available to them. Inducement mechanisms should be introduced to enable calls for tender to be launched on local markets, which cannot benefit from the economies of scale of major projects[46].

Promoting low-cost techniques suited to the context

Suitable technical, low-cost solutions can be adopted, but they must benefit from the same funding conditions as classic, large scale operations. Tools to aid decision-making should be available locally so that choices are genuinely available[47].

In the field of water management in rural areas, there are many examples throughout the world of successful transitions from public to private, and of rehabilitating resource intakes and irrigation systems, both traditional[48] and other. Such examples should be more widely known and used to help the transition towards private management whilst at the same time reactivating user participation[49].

Promoting solidarity

To avoid neglecting the most underprivileged areas, cross-subsidy between rates applied to the best and the worst-off users should be used. This option has been tested in many countries, in-

[45] Kumasi - Almere, micro-entreprise refuse collection scheme, Salifu Luckman, Project Urban IV, Ghana.

[46] Fondo rotario de agua potable, Humberto Vargas, Ceres.

[47] Micro-barrage irrigation project 2000, Laos. Sengdao Vangkeosay, ASDSP ; Alain Lemoal, CFD.

[48] Gestion concertada para abastecer de agua la Quebrada de la Ensenada, Arq. Silvia de Los Rios, B. Cidap.

[49] Restructuration de BRL, société d'aménagement régionale, [The restructuring of BRL, a regional planning company], Jean-Pierre Nicol, BRL (Compagnie nationale d'aménagement de la région du Bas-Rhône et du Languedoc).

cluding Columbia and Côte d'Ivoire. Understanding initiatives in microfinance and in setting up local assistance funds based on the determination of the poorest users to gain access to urban services also need to be better understood[50].

Encouraging respect for the resource

There remain a number of problems; these include state administrations or certain major consumers (irrigators, for example) being in the habit of paying for water only at a highly subsidised rates, if at all. Introducing environmental taxes or levies will only be well received if most of these taxes are used locally to improve the environment, with only a small proportion going to more global funds, rather than the other way around.

As far as development or industrial implantation projects are concerned, a ceiling, above which a percentage of the capital invested would systematically be set aside for preserving and improving the environment, could be introduced.

Making decentralisation work

Decentralisation is really happening in most countries. Local service providers are increasingly demanding, and rightly so, the transfer of skills and responsibilities to which States have committed themselves[51]. Although there has been a transfer of responsibility, particularly for water management and distribution[52], the same cannot be said of technical and financial resources. States withdraw, and responsibility for investment and maintenance is handed over to local service providers, without any suitable fiscal and regulatory measures being implemented.

Fiscal income often continues to bypass – to a very large extent – local level bodies (company head offices are all to often located in capital cities), reinforcing the difficulties communities have in meeting equipment requirements. We expect user participation, but local resources mostly bypass the very bodies they have elected.

In addition, for many local service providers, the main obstacle to investment lies above all in the fact that they are in debt. It therefore seems important to see how we can encourage local service providers to obtain direct access to bearable loans or to subsidies. This requires making national administrative measures more flexible, and introducing major measures to assist this, such as preferential loans with differed repayments.

Although the need to turn to private sector funding has now been recognised; legislative and regulatory instruments facilitating the sustainable mobilisation of such funding need to be introdu-

[50] Sectorisation and social funds in Aguascalientes, Mexico, Jacques Coutelle, Director, Omsa (ICA / CGE).

[51] La gestion de l'eau au Bénin, [Watermanagement in Benin], Hydraulic department, Cotonou.

[52] Wastewater collection and treatment in the city of Gdansk and its suburbs, Michel Maruenda, Saur International.

ced. Revised policies on charging should make managing the water service attractive to private investment, whilst still taking account of users' ability to pay.

Decentralisation raises other problems which cannot be resolved unless there is a change in the legislative and regulatory framework. As far as water management is concerned, although handing responsibility for decisions and results to locally elected bodies has become a necessity, the political dimension of the water service must not be neglected.

The temptation for local authorities to pass responsibility for results to the private sector, whilst maintaining rates at levels which prevent capital investment from becoming sustainable, but which shield them from any potential conflict with the electorate, is potentially strong. The State must therefore maintain its role of guarantor of universal access to clean water and to participation to local decision-making bodies.

From the point of view of planning and technical responses, there is a clear gap between urban experts and those responsible for local water management in many cities.

Funding for integrated water management should emphasise the need to promote local concertation spaces[53].

How to help rapidly expanding local skills

The determination to decentralise administrative and decision-making locations must go hand in hand with vast training and information campaigns.

Most experiences cited stress that the main brake to development is still the lack of ability to plan, to manage and to maintain locally. Similarly, every time it is thought useful to involve users, the dearth of local organisations capable of taking part in primary decisions is the first limiting factor cited. Priority must therefore be given to funding the training and education of technicians, of elected representatives and of users. At the same time, financial instruments must encourage States to set up bodies responsible for integrated water management.

Finally, the participation of women in management and in key decisions, which is universally desired, will only occur if equality of access to such training and information is respected.

Greater user participation, taking demand as a starting point

If users are to be committed to saving water and to preserving the resource, they must be able to take part in decisions and must also feel materially affected by the management of water networks. Whether in agriculture or in drinking water supply, organisations providing a structure for users and thereby the way they express their demand, must not be involved solely in decision-making, but also in carrying out the management of the service[54].

[53] Water, urban upgrading and sustainable development, François Valiron, Academy of Water.

[54] Agricultural irrigation in Morocco, Jean-Yves Grosclaude, CFD Rabat.

It is because they are directly affected that they will play an active part, and promote lower charges or levies for the group they represent. For example, the task of managing standposts (which is allocated by the supplier companies) is highly sought after in the urban areas of cities in less developed countries, because it provides regular incomes. The way in these allocations are made does not always, however, take into account the benefits to users or how representative they are.

Favouring the application of the "polluter pays" principle

The fact that sanitation lags behind drinking water supply is in large measure due to the lack of sufficient financial resources to meet needs in this sector. Adopting the "polluter pays" principle would launch capital investment in this sector.

Contrary to what might be believed, the urban population of developing countries is very aware of sanitation in their environment. Quite simply, they do not usually have the means to fund the classic sanitation and waste collection services which they are offered. Introducing levies would enable a fund co-managed by users in a given area to be set up. A means of inducement combining subsidies and loans would then allow local service providers to meet the requirements of their electorate.

Considering the "user pays" principle

The "user pays" principle is based on the assumption that water is above all an economic asset, and that only being forced to pay for it will reduce wastage and allow distribution services to become sustainable. In urban areas, this principle could be adopted provided a cross-subsidy system were introduced, so that the poorest population groups could have access to water. Although it is true that the poorest pay the most for their water by m^3, because of their limited budgets, they consume only small quantities. If we want to give these users access to sufficient quantities of water, it is their ability to pay that will need to be taken into consideration when setting rates, and not the real cost per m^3.

In rural areas, the gap between rich and poor countries precludes any international measures being adopted. We can, however, state that a distinction could be made between small-scale producers and industrialists.

Setting a reasonable price for irrigation water, while subsidising more water-saving techniques, is certainly one way of ensuring better management of the resource.

Possible courses of action

1. To decide at international level to create a fund equivalent to the same percentage of GNP per country, to be devoted to making clean water available to the poorest.

2. To decree that the water resource is a social, economic and environmental asset which countries must manage in an integrated manner.

3. To encourage the setting up of bodies, in each country, specifically charged with integrated water management.

4. To adopt the watershed basin as the scale relevant to integrated management.

5. To decide to adopt at world level, the joint data collection protocols necessary for our knowledge of the water resource and water uses, such data collection to come under the control of the bodies cited in point 3.

6. To finance a long-term training programme for technicians, elected representatives, and non-profit associations, in management and in the understanding and controlled use of water resources and water uses. To train users, their representatives, and most particularly women, in taking part in decision-making.

7. To encourage the setting up of local bodies open to all users, for consultation and decision-making with regard to the management of water resources and water uses.

8. To promote local, private investment by setting up a guarantee fund enabling local service providers and companies to gain access to loans at rates identical to those granted to States.

9. To make loans for capital investment in the water sector conditional on first implementing various forms of training for civil society and elected representatives in integrated water management.

10. To fund programmes to make a range of low-cost technological choices available by giving priority to improving indigenous techniques and modes of operation.

11. To promote water saving through information about, and tax exemption for water-saving techniques.

12. To catch up the delay in sanitation in the world, by introducing the "polluter pays" principle and by promoting passive energy-savings techniques.

13. To launch a programme for investment and training in the use of renewable energies for drinking water supply.

Annexes

Table of papers submitted

The documents are listed in order of: workshop; nature of the paper; location and alphabetical order of the submitting institution. For further information, visit the Conference web-site (http://www.eaudd.com).

THEME 1: IMPROVING KNOWLEDGE OF WATER RESOURCES AND WATER USES FOR SUSTAINABLE MANAGEMENT

Experience forms

N°	TITLE	INSTITUTION	CONTACT	ADDRESS
	AFRICA			
1	◆ Utilisation de moyens modernes pour la connaissance et la protection des ressources en eau potable ◆ Assistance technique à la communauté urbaine de Tétouan (qualité de l'eau, assainissement) ◆ Intégration des données environnementales dans la politique des collectivités territoriales en vue d'assurer une gestion intégrée des ressources en eau ◆ Actions de sensibilisation de formation et de connaissance des ressources en eau et de l'environnement	Centre d'études et de recherches appliquées aux sciences de l'eau et de l'environnement (CERASE)	Djouai Abderrahmane, President	BP 5007 Rabat - Soussi, 10000 Morocco. Tel./fax: (212) 7 75 20 29. E-mail: djouai@acdim.co.ma
2	Techniques de gestion du sol et alimentation hydrique des cultures annuelles tropicales	Centre international de recherche agronomique pour le développement (CIRAD)	Jean Louis Chopart, Agronomist	BP 5035, 34032 Montpellier Cedex 1, France. Tel.: (33) 4 67 61 71 48. Fax: (33) 4 67 61 71 73. E-mail: chopart@cirad.fr
3	De l'eau pour la Namibie	Société d'aménagement et de gestion des eaux de Paris (SAGEP)	Antoine Montiel	9 rue Schoelcher 75014 Paris, France. Tel.: (33) 1 40 48 99 20. Fax: (33) 1 43 22 24 22.
4	◆ Gestion des réservoirs de la Basse-Moulouya (Maroc) ◆ Ressources en eau, évaluation hydrologique de l'Afrique sub-saharienne, pays de la CEPLG (Burundi, Rwanda, Zaïre).	Société Grenobloise des aménagements hydrauliques (SOGREAH)	P. Verdet, Joint Director	Département Aménagement et Environnement, BP 172, 38042 Grenoble Cedex 9, France. Tel.: (33) 4 76 33 40 00. Fax: (33) 4 76 33 42 96.
	AMERICA			
5	VERSeau au Chili	VERSeau	Michel Soulie, Director of the International Cell	859 rue Jean-François Breton, 34093 Montpellier Cedex 5, France. Tel.: (33) 4 67 61 04 00. Fax: (33) 4 67 52 28 29. E-Mail: verseau@mnet.fr

N°	TITLE	INSTITUTION	CONTACT	ADDRESS
	EUROPE			
6	Synthèse hydrogéologique du Crétacé inférieur du bassin de Paris	Bureau de recherches géologiques et minières (BRGM)	Jean-François Vernoux	Europarc, 23 rue Eugène Dupuis, 94043 Créteil Cedex, France. Tel.: (33) 1 45 13 90 75. Fax: (33) 1 43 77 70 58. E-Mail: jf.vernoux@brgm.fr
7	La banque régionale de l'aquifère Rhénan (BRAR)	Bureau de recherches géologiques et minières (BRGM)	Philippe Elsass	15 rue du Tanin, Lingolsheim, BP 177, 67834 Tanneries Cedex, France. Tel.: (33) 3 88 77 48 90. Fax: (33) 3 88 76 12 26. E-Mail: ph.elsass@brgm.fr
8	Création d'un réseau de stations d'alerte et de surveillance en continu sur la Vistule, Pologne	Environnement S.A.	Marc Le Pennec, Head of Hydro Products	111 boulevard Robespierre 78300 Poissy, France. Tel.: (33) 1 39 22 38 24. Fax: (33) 1 39 65 38 08. E-Mail: hydro@environnement-sa.com
9	Un programme de recherche fédérateur : le Programme national de recherche en hydrologie (PNRH)	Laboratoire d'étude des transferts en hydrologie et environnement (LTHE)	Michel Vauclin	BP 53, 38041 Grenoble Cedex 9, France. Tel.: (33) 4 76 82 50 56. Fax: (33) 4 76 82 52 86. E-Mail: lthe@hmg.inpg.fr
10	Utilisation de biomarqueurs pour l'évaluation de la qualité d'un milieu aquatique	Mairie de Nice, Université de Nice Sophia Antipolis	Marc Lafaurie, Joint to the Mayor	Mairie de Nice, 5 rue de l'Hôtel de Ville 06364 Nice Cedex 4, France. Tel.: (33) 4 93 13 23 31. Fax: (33) 4 93 13 29 87.

Synthesis notes

	AFRICA			
11	Évaluation multicritères des systèmes existants et proposition d'une nouvelle approche et d'une nouvelle alternative	École inter-États d'ingénieurs de l'équipement rural (EIER)	Amadou H. Maiga, Director of Research and Engineering	03 BP 7023 Ouagadougou 03, Burkina Faso. Tel.: (226) 30 20 53. Fax: (226) 31 27 24. E-Mail: eier@eier.univ-ouaga.bf
12	Connaissance des ressources dans les villes des pays en développement	École nationale supérieure polytechnique de Yaoundé (ENSP)	Émile Tanawa	BP 8390 Yaoundé, Cameroon. Tel.: (237) 22 45 47. Fax: (237) 23 18 41. E-Mail: etanawa@camnet.cm / etanawa@polytech.uninet.cm
13	Étude sur Addis-Abeba	G2C Environnement	Christian Laplaud	Parc d'activités, Point Rencontre, 13770 Venelles, France. Tel.: (33) 4 42 54 00 68. Fax: (33) 4 42 54 06 78. E-Mail: laplaud@iname.com
14	La gestion des ressources hydriques en zone aride, cas des oasis de la région de l'Adrar (grand sud Algérien)	Touiza - Développement	Zoubir Sahli	18 rue Abdelaziz Mouzaoui, Alger, Algeria. Tel./fax: (213) 2 69 87 90.
	ASIA			
15	◆ Water ressources and monitoring systems in Vietnam ◆ Towards optimizing water resources management for sustainable development of rural water supply and environment sanitation in Vietnam ◆ Groundwater and rural water supply in Vietnam	Center for Rural Water Supply and Environmental Sanitation	Le Van Can, Director	C10 nam Thanh Cong, Lang Ha, Hanoï, Vietnam. Fax: (844) 8355964.

N°	TITLE	INSTITUTION	CONTACT	ADDRESS
	DIVERSE			
16	De nouvelles révolutions techniques, pour un développement économique par la mise en valeur des ressources en eau souterraine des aquifères discontinus : aquifères des roches de socle et aquifères karstiques.	Bureau de recherches géologiques et minières (BRGM), CNRS	Patrick Lachassagne, Michel Bakalowicz	Direction de la Recherche, département Hydrologie, Géochimie et Transferts, 1039 rue de Pinville 34000 Montpellier, France. Tel.: (33) 4 67 15 79 73. Fax: (33) 4 67 64 58 51. E-Mail: p.lachassagne@brgm.fr
	EUROPE			
17	Eau et développement durable : le témoignage d'un élu	Centre international de l'eau de Nancy (NanCIE)	Claude Gaillard, President	149 rue Gabriel Péri, BP 290, 54515 Vandoeuvre Cedex, France. Tel.: (33) 3 83 15 87 87. Fax: (33) 3 83 15 87 99.
18	Comment la recherche conduite en France sur les hydrosystèmes peut-elle contribuer à une gestion intégrée des ressources en eau ?	GIP Hydrosystèmes	Jean-Louis Verrel	12 rue Cuvier 75005 Paris, France.
19	Le rôle d'une société savante : la société hydrotechnique de France (SHF)	Société hydrotechnique de France (SHF)	René Coulomb, President	25 rue des Favorites 75015 Paris, France. Tel.: (33) 1 42 50 91 03. Fax: (33) 1 42 50 59 83. E-Mail: shf@club-internet.fr
20	Sustainable Groundwater Management Using Artificial Recharge in the Paris Region	Suez-Lyonnaise des eaux	Lisette Provencher, Technical and Research Direction; Élisabeth Jaskulke, General Water Direction	72 avenue de la Liberté 92000 Nanterre, France. Tel.: (33) 1 46 95 50 14. Fax: (33) 1 46 95 52 65.
21	Le développement durable appliqué au domaine de l'eau	Union nationale des associations familiales (UNAF)	Simone Sitbon	28 place Saint-Georges 75009 Paris, France. Tel.: (33) 1 49 95 36 00. Fax: (33) 1 49 95 36 44.

THEME 2: FAVOURING THE DEVELOPMENT OF REGULATORY TOOLS, AND INSTITUTIONAL AND HUMAN CAPACITY BUILDING

N°	TITLE	INSTITUTION	CONTACT	ADDRESS
	Experience forms			
	AFRICA			
22	Gestion de bornes-fontaines : étude comparative et évaluation de projets réalisés ou en cours de réalisation	Action Mopti	William Hinojosa, Project Manager	7 rue Paul Drussart 78310 Maurepas, France. Tel.: (33) 1 30 62 62 42. Fax: (33) 1 34 82 69 24. E-Mail: action.mopti@wanadoo.fr
23	La gestion communautaire des adductions d'eau dans les centres secondaires de la vallée du fleuve Sénégal	Association française des volontaires du progrès (AFVP) et Ingénieurs sans frontières (ISF)	Régis Taisne, Project Manager at Ingénieurs-sans frontières	1 place Valhubert 75013 Paris, France. Tel.: (33) 1 44 24 06 82. Fax: (33) 1 44 24 26 94. E-Mail: isf_fr@club-internet.fr

N°	TITLE	INSTITUTION	CONTACT	ADDRESS
24	Maintenance et gestion des puits cimentés au Niger	Association française des volontaires du progrès - délégation régionale du Niger (AFVP Niger)	Frédéric Louvet, in Charge of Operations at AFVP Niger	BP 11468 Niamey, Republic of Niger. Tel.: (227) 75 30 69. Fax: (227) 75 29 66. E-Mail: aubrac@intnet.ne
25	PROADEL : programme d'appui au développement local, outil d'accompagnement au processus de décentralisation. Fiche liée aux 3 thèmes.	Association Drôme Ouro Sogui Sénégal (ADOS)	Sylvie Bonnassieux, Director	6 rue André Lacroix 26000 Valence, France. Tel./fax: (33) 4 75 55 99 90.
26	Expérience de développement et de gestion de systèmes d'alimentation en eau potable dans les centres ruraux et semi-urbains au Mali	Bureau d'études Gauff Ingenieure	Daniel Faggianelli, Drinking Water Supply Project Manager	BP 701 Bamako, Republic of Mali. Tel./fax: (223) 22 31 51. E-Mail: daniel.faggianelli@malinet.ml
27	◆ La gestion de l'eau au Bénin ◆ Alimentation en eau potable et assainissement en milieu rural au Bénin	Direction de l'Hydraulique du Bénin	André Toupe, Director	01 BP 385 Cotonou, Benin. Tel.: (229) 31 32 98. Fax: (229) 31 08 90. E-Mail: gmale.dh@bow.intnet.bj
28	◆ Formation et encadrement technique des associations d'usagers de l'eau agricole ◆ Normalisation, essais et démonstrations en hydraulique agricole	Institut de recherche pour l'ingénierie de l'agriculture et de l'environnement (Cemagref)	Michel Ducrocq, Director of the Cemagref (Aix-en-Provence), Responsible for the Operations inscribed in the Convention Cemagref-AGR	BP 31 Le Tholonet, 13612 Aix-en-Provence Cedex, France. Tel.: (33) 4 42 66 99 12. Fax: (33) 4 42 66 99 23. E-Mail: michel.ducrocq@cemagref.fr
29	Sensibilisation de journalistes pour les questions de l'environnement : l'eau et la pollution	Centre d'études et de recherches appliquées aux sciences de l'eau et de l'environnement (CERASE)	Djouai Abderrahmane, President	BP 5007 Rabat - Soussi, 10000 Morocco. Tel./fax: (212) 7 75 20 29. E-Mail: djouai@acdim.co.ma
30	Latrines et éducation sanitaire à La Réunion et à Mayotte	Direction départementale des Affaires sanitaires et sociales, Loire Atlantique (DDASS 44)	Jean Duchemin, Sanitary Engineer	18 rue Paul Ramatier 44200 Nantes, France. Tel.: (33) 2 40 99 86 02. Fax: (33) 2 40 89 58 11.
31	Développement intersectoriel en milieu scolaire	Eau agriculture et santé en milieu tropical (EAST)	Thomas d'Aquin G. Yameogo	EAST/CCOBF, 01 BP 182 Ouagadougou 01, Burkina Faso. Tel.: (226) 30 17 10/30 98 29. Fax: (226) 31 80 22.
32	Développement socio-sanitaire dans l'arrondissement de Sig Noghin, Ouagadougou, Burkina Faso	Eau, agriculture et santé en milieu tropical (EAST)	Loïc Monjour, President and Founder of EAST	35 rue de Broca 75005 Paris, France. Tel.: (33) 1 43 29 76 02. Fax: (33) 1 43 29 76 02.
33	Le programme d'approvisionnement en eau potable dans l'ancien royaume du « Bandial »	Environnement et développement du tiers monde - Actions en Casamance (ENDA ACAS)	Daniel Mané	BP 224 Ziguinchor, Senegal. Tel.: (221) 991 14 07. Fax: (221) 991 24 94. E-Mail: acas@enda.sn
34	L'eau comme catalysateur du développement local dans le Haut Atlas de Marrakech	Environnement et développement du tiers monde - Maghreb (ENDA Maghreb)	Philippe Staatsen	Bât. B2, Appt D1, Cité Ennakhil, rue du Bani, Marrakech Guéliz, Morocco. Tel./fax: (212) 4 43 29 23. E-Mail: philippe@endamag.gn.apc
35	Processus d'amélioration durable de l'environnement (PADE)	Environnement et développement du tiers monde - Relais urbain participé (ENDA RUP)	Malick Gaye, Programme Coordinator	54 rue Carnot, BP 3370 Dakar, Senegal. Tel.: (221) 822 09 42. Fax: (221) 823 51 57. E-Mail: rup@enda.sn
36	Projet « Femmes et eau » à Ouadane, Mauritanie	Hydraulique sans frontières (HSF)	Annabelle Boutet	20 route du Sècheron 73000 Jacob Chambéry, France. Tel.: (33) 4 79 69 51 35. Fax: (33) 4 79 69 35 08.

N°	TITLE	INSTITUTION	CONTACT	ADDRESS
37	Mise en place d'un mécanisme de concertation entre les différents acteurs du service de l'eau dans les centres secondaires du Sénégal	Hydroconseil, pS-Eau	Bernard Collignon, Director Hydroconseil; Didier Allély, Secretary of the Bassin du fleuve Sénégal Programme of pS-Eau	213 rue La Fayette 75010 Paris, France. Tel.: (33) 1 40 05 61 23. Fax: (33) 1 40 05 61 11.
38	◆ Étude institutionnelle des pratiques de gestion des eaux usées dans les pays du bassin méditerranéen ◆ Étude « Gestion de l'eau en Méditerranée »	Institut méditerranéen de l'eau (IME)	Georges Lacroix, President of the Orientation Committee	Les Docks, Atrium 10.3, 10 place de la Joliette 13002 Marseille, France. Tel.: (33) 4 91 59 87 77. Fax: (33) 4 91 59 87 78. E-Mail: 101732.155@compuserve.com
39	Programme hydro-agricole de Darou SAM	Réseau africain pour le développement intégré (RADI)	Dame Sall, Secretary General	Rue 10x11 Amitié II, BP 12085 Colobane, Dakar, Senegal. Tel.: (221) 825 75 33. Fax: (221) 825 75 36.
	AMERICA			
40	Programa Estadual de Saneamento Rural do Estado do Ceara (Brésil)	Béture - Cerec / Centro CAPE	Dominique Hautbergue, Project Manager; Flavio Gouvea	17 rue des Villas 25000 Besançon, France. Tel./fax: (33) 3 81 65 74.
41	Réhabilitation des systèmes irrigués d'Urcuqui et de San Blas (programme RIEGUS)	Centre international de coopération pour le développement agricole (CICDA)	Frédéric Appolin, Representative for CICDA in Ecuador, Responsible for the RIEGUS Programme	CICDA - Ecuador, Toledo 14.36 y Coruña, Apdo 17.12.821, Quito, Ecuador. Tel./fax: (593) 2 234 049. E-Mail: cicda@uio.satnet.net
42	Mise en place d'un système d'irrigation et de développement rural au Nicaragua	Comité catholique contre la faim et pour le développement (CCFD)	Thomas Liebert	4 rue Jean Lantier 75001 Paris, France. Tel.: (33) 1 44 82 81 85. Fax: (33) 1 44 82 81 45. E-Mail: ccfdproj@ globenet.org
43	Gestion participativa del riego : el caso de los campesinos de Cayambe, Ecuador	Instituto de ecologia y desarrollo de las comunidades andinas (IEDECA)	Ivan Ermes Cisneros	Sergio Mejía 415, Apartado 17 025 12, Cayambe, Ecuador. Tel.: (593) 2 36 10 82. Fax: (593) 2 36 07 24. E-Mail: ivanc@uio.telconet.net
44	Conflicto ambiental por el uso del agua : el Arroyo Pantanoso (Departamento de Montevideo, Uruguay)	Instituto del tercer Mundo, AGUAS	Alvaro Gonzalez Gervasio, Teacher and Researcher	Tel.: (598) 2 409 61 92. Fax: (598) 2 401 92 22. E-Mail: alvarog@chasque.apc.org
	ASIA			
45	Exemple d'une Coopération entre villes européennes et asiatiques dans le domaine de l'adduction d'eau et assainissement : ville de Plaisir (France), ville de Lowestoft (Royaume-Uni), ville de Tansen (Népal)	Cités unies France (CUF)	Xavier Fernagu, Responsible for Exterior Solidarity, City of Plaisir	CCAS, 2 rue de la République, 78370 Plaisir, France. Tel.: (33) 1 30 79 63 23. Fax: (33) 1 30 79 62 50.
46	IRRIFRANCE en Chine sur un partenariat en matière de formation avec l'Université de Chine à Pékin	Irrifrance	Francis Testa, Chairman and Managing Director	34230 Paulhan, France. Tel.: (33) 4 67 49 79 79. Fax: (33) 4 67 49 79 45. E-Mail: irrifrance@irrifrance.com
47	Service Improvement Project for Water and Wastewater Systems in the Gaza Strip	Lyonnaise des eaux, Khabib & Alami (LEKA)	David Weston, Engineer, Resident Director	PWA Building Shifa Street, Remal, Gaza City, Palestine. Tel.: (972) 78 27 369. Fax: (972) 78 26 630. E-Mail: leka@palnet.com

N°	TITLE	INSTITUTION	CONTACT	ADDRESS
48	Rural Water Supply and Sanitation Fund Development Board (RWSSFDB)	Rural Water Supply and Sanitation Fund Development Board (RWSSFDB)	Shrestha, D.B., Executive Director	PO Box 12414, Kathmandu, Nepal. Tel.: (977) 1 535190/525475. Fax: (977) 1 535190. E-Mail: pani@khaskosh.mos.com.np

Synthesis notes

AFRICA

49	◆ Note de synthèse sur la gestion internationale de l'eau ◆ Note de synthèse sur la concertation	Institut méditerranéen de l'eau (IME)	Georges Lacroix, President of the Orientation Committee	Les Docks, Atrium 10.3, 10 place de la Joliette 13002 Marseille, France. Tel.: (33) 4 91 59 87 77. Fax: (33) 4 91 59 87 78. E-Mail: 101732.155@compuserve.com
50	Programme d'amélioration des services de l'hydraulique rurale (ASHYR), Mauritanie	TENMYA (Programme mauritanien)	Mohammed Ould Tourad, Head of the Ashyr, Directeur of Tenmya	s/c Gret-Mauritania, BP 5261 Nouakchott, Mauritania. Tel.: (222) 2 584 96. Fax: (222) 2 596 50.
51	◆ Capacity building. Water and sanitation partnership Africa ◆ Overview paper on institutional options for urban water and sanitation services in Africa	Water Utility Partnership (WUP)	Fouad Djerrari & Jan G. Janssens	05 BP 2642 Abidjan 05, Côte d'Ivoire. Tel.: (225) 24 08 28. Fax: (225) 24 50 63. E-Mail: uadewup@africaonline.co.ci

AMERICA

52	Water Resource Protection Model. The Massachussets Watersheds Initiative	American Planning Association, représentée à la Commission du développement durable des Nations unies	Lyn Billman Golemme	Billman-Golemme Associates, 114 Ruggles Street Westborough, MA 01581-3525 United States. Tel.: (1) 508 799 0500. Fax: (1) 508 366 2021. E-Mail: billman-golemme@worldnet.att.net

ASIA

53	A Wellspring of Initiatives for Sustainable Water in Communities	Approtech Asia	Lilia O. Ramos, Executive Officer	Tel.: (63) 2 527 37 44. Fax: (63) 2 527 65 14. E-Mail: loramos@sun1.dost.gov.ph / Aptechmnl@phil.gn.apc.org
54	Plaquette d'information sur le Centre national de formation aux métiers de l'eau et de l'environnement (Vietnam)	Centre national de formation aux métiers de l'eau et de l'environnement (CNEE)	Claude Mauvais, Director	Yen Thuong, Gia Lam, Hanoi, Vietnam. Tel.: (84) 4 878 06 19. Fax: (84) 4 878 08 02.
55	The Laos Experience : Indigenous, Sustainable, Replicable	UNDP / World Bank Water & Sanitation Program, Regional Water & Sanitation Group for East Asia & the Pacific	Nouanta Maniphousay, Manager	National Water Supply and Environmental Health Program, Ministry of Public Health, Corner of That Luang & Nongbon Roads, Vientiane, Laos. Tel.: (856) 21 41 33 10. Fax: (856) 21 41 37 10.
56	◆ Note de présentation du protocole de coopération avec le Centre national de l'eau rurale du Vietnam ◆ Protocole avec le Centre national de l'eau du Vietnam ◆ Compte rendu de mission au Vietnam, septembre 1996.	Syndicat des eaux d'Ile-de-France (SEDIF)	Jacques Cavard, Head Engineer	185 rue de Bercy 75579 Paris Cedex 12, France. Tél. : (33) 1 53 33 84 40. Fax : (33) 1 53 33 84 79.

N°	TITLE	INSTITUTION	CONTACT	ADDRESS
	DIVERSE			
57	Gestion de l'eau, aménagement du territoire et développement durable	Académie de l'eau	M. Dausset, President	51 rue Salvador Allende 92027 Nanterre Cedex, France. Tel.: (33) 1 41 20 16 30. Fax: (33) 1 41 20 16 09.
58	Rapport sur la promotion internationale de l'école française de l'eau	Centre international de l'eau de Nancy (NanCIE)	Claude Gaillard, President	149 rue Gabriel Péri, BP 290, 54515 Vandoeuvre Cedex, France. Tel.: (33) 3 83 15 87 87. Fax: (33) 3 83 15 87 99.
59	Partage des eaux, cultures et développement : l'action du CCFD dans le domaine de l'eau.	Comité catholique contre la faim et pour le développement	Thomas Liebert	4 rue Jean Lantier 75001 Paris, France. Tel.: (33) 1 44 82 81 85. Fax: (33) 1 44 82 81 45. E-Mail: ccfdproj@ globenet.org
60	Application du concept du développement durable au domaine de l'eau	Commission française du développement durable	Christian Brodhag, President	100 avenue de Suffren 75015 Paris, France. Tel.: (33) 1 42 19 17 79. Fax: (33) 1 42 19 17 90.
61	Charte CIGB sur les barrages et l'environnement	Commission internationale des grands barrages (CIGB), International Commission on Large Dams (ICOLD)	Jacques Lecornu, Secretary General	151 boulevard Haussmann 75008 Paris, France. Tel.: (33) 1 40 42 68 24. Fax: (33) 1 40 42 60 71. Web : www.icold-cigb.org
62	Gender and Integrated Water Ressources Management	International Water and Sanitation Centre (IRC)	Jennifer Francis	PO Box 93190, 2509 AD The Hague, The Netherlands. Tel.: (31) 70 30 689 30. Fax: (31) 70 35 899 64. E-mail : general@irc.nl
	EUROPE			
63	Le contrat de rivière, des possibilités d'implication pour la société civile	Fondation universitaire luxembourgeoise	Christine Dasnoy	Socio-économie, environnement et développement, avenue de Longwy 185, 6700 Arlon, Belgium. Tel.: (32) 63 23 08 67. Fax: (32) 63 23 08 18.
64	La déclaration de Strasbourg : réapprendre l'eau	Solidarité eau Europe	Andreas Kraemer	Ecologic, Friedrich Strasse 163, 10117 Berlin, Germany. Tel.: (49) 30 226 51135. Fax: (49) 30 226 51136. E-mail: kraemer@ecologic.de

THEME 3: DEFINING STRATEGIES FOR SUSTAINABLE WATER MANAGEMENT AND IDENTIFYING APPROPRIATE FINANCIAL RESSOURCES

Experience forms

N°	TITLE	INSTITUTION	CONTACT	ADDRESS
	AFRICA			
65	Affermage du réseau d'alimentation en eau de Sao Domingos	BURGEAP, Ingénieurs conseils eau - sol - environnement	Janique Etienne, Engineer, International Department	27 rue de Vanves 92772 Boulogne Billancourt Cedex, France. Tel.: (33) 1 46 10 25 47. Fax: (33) 1 46 10 25 49. E-Mail: bgpinter@worldnet.fr
66	L'affermage des réseaux d'alimentation en eau des petits centres : une solution d'avenir pour un développement durable ?	Bureau d'études RéA	Hervé Conan, Associated Consultant	142/35 Bach Dang, District Binh Thanh, Ho chi Minh Ville, Vietnam. Tel./fax: (848) 89 96 603. E-Mail: 113350.2400@compuserve.com
67	Amélioration de l'approvisionnement en eau potable de la ville de Gabu (Guinée Bissau)	Empresa Nacional de Pesquisa e Captaçao de Agua (ENAFUR)	Sanha Hilario, Managing Director	Gabu CP 052, Republic of Guinea Bissau. Tel.: (245) 51 12 60. Fax: (245) 51 11 48.
68	Kumasi-Almere (Netherlands), Micro-entreprise Refuse Collection (MERC) Scheme	Kumasi Metropolitan Assembly (KMA)	Dina Hammond, Director of the Metropolitan Coordination	PO Box 1916, Kumasi Ashanti, Ghana. Tel.: (233) 51 24 304. Fax: (233) 51 23 707.
69	◆ Gestion des ressources en eau : stratégie nationale (Bénin) ◆ Bassins du Guir, Ziz, Rheris et Draa : plan directeur d'aménagement des eaux (Maroc) ◆ ORMVA de Tafilalet : amélioration de l'exploitation des systèmes d'irrigation (Maroc) ◆ ORMVA de Ouarzazate : amélioration de l'exploitation des systèmes d'irrigation (Maroc)	Société grenobloise des aménagements hydrauliques (SOGREAH)	P. Verdet, Joint Director	Département Aménagement et Environnement, BP 172, 38042 Grenoble Cedex 9, France. Tel.: (33) 4 76 33 40 00. Fax: (33) 4 76 33 42 96.
	AMERICA			
70	Fondo rotario de agua potable	Centro de estudios de la realidad economica y social (CERES)	Humberto Vargas, Academic Co-ordinator	Tel.: (591) 42 93 148. Fax: (591) 42 93 145. E-Mail: ceres@albatros.cnb.net
71	Gestion concertada para abastecer de agua a la Quebrada de la Ensenada	Centro de investigacion, documentacion y asesoria poblacional (CIDAP)	Silvia de los Rios B., Coordinator; Ricardo Bentin, Director	N° 763 Rímac, Lima, Peru. Tel./fax: 48 14 704. E-Mail: postmaster@cidap.org.pe
72	Urbanizacao da Favela Fim de Semana	Escola Politecnica / Universidade de Sao Paulo	Alex Abiko, Professor	Av. Prof. Almeida Prado, Ed. Eng. Civil, 05508-900 Sao Paulo, Brasil. Tel.: (55) 11 81 85 234. Fax: (55) 11 81 85 715. E-Mail: alkabiko@pcc.usp.br
	ASIA			
73	Projet micro-barrages d'irrigation an 2000	Association de soutien au développement des sociétés paysannes au Laos (ASDSP)	Sengdao Vangkeosay, President	11 rue Diderot, 94300 Vincennes, France. Tel.: (33) 1 43 28 21 18. Fax: (33) 1 43 65 34 33.

N°	TITLE	INSTITUTION	CONTACT	ADDRESS
74	MECTAT Project in Beirut - Lebanon	Middle East Center for the Transfer of Appropriate Technology (MECTAT)	Boghos Ghougassian, Co-ordinator	PO Box 113-5474, Beirut, Lebannon. Tel.: (961) 1 34 13 23. Fax: (961) 1 34 64 65. E-Mail: boghos@mectat.com.lb
	EUROPE			
75	Restructuration de BRL, société d'aménagement régional	Compagnie nationale d'aménagement de la région du Bas-Rhône et du Languedoc (BRL)	Jean-Pierre Nicol, Member of the Directory of BRL	1105 avenue Pierre Mendès-France, BP 4001, 30001 Nîmes Cedex 5, France. E-Mail: brl@brl.fr

Synthesis notes

	AFRICA			
76	Experience from the Cohort for Research on Environment, Urban Management and Human Settlement	Cohort for Research on Environment, Urban Management and Human Settlement (CREUMHS)	Nicky Nzioki, Research Co-ordinator	PO Box 48974 Nairobi, Kenya. E-Mail: creumhs@elci.sasa.unon.org
77	Définir les stratégies pour une gestion durable de l'eau et identifier les moyens de financement appropriés	Empresa Nacional de Pesquisa e Captaçao de Agua (ENAFUR)	Hilario Sanha	Gabu CP 052, Republic of Guinea Bissau. Tel.: (245) 51 12 60. Fax: (245) 51 11 48.
	ASIA			
78	Strategies for Sustainable Water Supply for all : Indian Experience	Housing and Urban Development Corporation Ltd. (HUDCO)	V. Suresh, Managing Director	HUDCO Bhawan, Lodhi Road, New Delhi-110 003, India. Tel.: (91) 11 469 30 22. Fax: (91) 11 469 73 78.
79	Water and Sustainable Development: ICID Efforts	International Commission on Irrigation and Drainage (ICID)	K.N. Sharma, Joint Secretary	48 Nyaya Marg Chanakyapuri, New Delhi 110021, India. Tel.: (91) 11 611 5679. Fax: (91) 11 611 5962. E-Mail: icoiad@giasdl01.vsnl.net.in
	DIVERSE			
80	Politique régionale de l'eau et aménagement du territoire	Cercle français de l'eau	Jacques Oudin, President	83 avenue Foch 75116 Paris, France.
81	Enjeux et marges de progrès pour l'agriculture irriguée	Institut de recherche pour l'ingénierie de l'agriculture et de l'environnement (Cemagref)	Thierry Rieu	361 rue J.-F. Breton, BP 5095, 34033 Montpellier Cedex 1, France. Tel.: (33) 4 67 04 63 00. Fax: (33) 4 67 63 57 95.
82	◆ La femme et l'eau ◆ Concepts on the Sustainability of Traditional Water Management ◆ Projets d'adduction d'eau potable et reconstruction du centre de santé, financés par CIF (Bénin)	Conseil international des femmes (CIF)	Carola de Boulloche, Representative accredited to the United Nations	7 route de Pressy, 1253 Vandoeuvres, Switzerland. Tel.: (41) 22 750 14 38. Fax: (41) 22 750 24 81. E-Mail: carola.de_boulloche@span.ch
83	Clearing the Water: A New Paradigm For Providing The World's Growing Population With Safe Drinking Water	Natural Ressources Defense Council	Barbara Bohart	1200 New York Avenue, NW, Suite 400, Washington, DC 20009 United States. Tel.: (1) 202 289 2402. Fax: (1) 202 289 1060. E-Mail: bbohart@nrdc.org
84	Water and civil society. Towards strategies of sustainable and equitable development and financing.	Secrétariat international de l'eau (SIE)	Raymond Jost et Gabriel Regallet	54 rue Le Royer West, Montréal (Québec), Canada H2Y 1W7. Tel.: (514) 849 42 62. Fax: (514) 849 28 22. E-Mail: isw@web.apc.org

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At the extraordinary session of the United Nations General Assembly in June 1997, the President of France offered to host, in France, an international conference for all public and private bodies and individuals involved in water policy. The objective of this international conference on water and sustainable development is to make a concrete contribution to the elaboration of strategies necessary to improve the protection and management of freshwater resources, in both rural and urban areas, so that drinking water supply, sanitation and irrigation are better understood and managed, by including the objectives of combating desertification in the debates.

Using the fruits of previous international meetings as their starting point, the ministerial recommendations, the proposals of specialists and the recommendations of civil society drawn up by the Paris Conference delegates will enrich the debates of the 6th Session of the Commission on Sustainable Development.

We are grateful to the many organisations and individuals from civil society who willingly responded ? at very short notice ? to the call for papers issued by the Water Solidarity Network. A selection of these representative accounts of innovative experiences from civil society has been made and is presented in this document. Contributions which, despite their interest, could not be included are also listed at the end of the document and can be consulted on the conference's Internet site. Using all of these contributions, the document then puts forward possible courses of action.

Pierre-Marie Grondin, pS-Eau Executive Secretary

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