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REPORT OF THE FRENCH DELEGATION

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## INTRODUCTION

Fresh water is relatively plentiful in continental France, notwithstanding seasonal and regional differences. The situation is much more varied in the Overseas Departments and Territories.

Water has always been necessary to Mankind which is the reason why we harnessed and regulated rivers, protected ourselves against floods and droughts, but we also polluted rivers and ground-water and drained wet-lands.

We have become more aware of our fragile living environment due to the excessive changes done to our natural habitat and our disregard for the natural water-purification cycle. Increased demand and public pressure have led to the implementation of a more careful policy.

The State is responsible for the legal and organizational framework, it defines the management and financial solidarity options after all points of view have been listened to; the State grants its permission, exercises its control and, if need be, enforces penalties.

The Public Committees which bring together the users and the Administrative Authorities at the level of the river basin or sub-basin are responsible for making decisions aimed at achieving management goals. These decisions are translated into development guidelines, pollution taxes and aid for works.

Public and private research is encouraged and expanded in order to meet the challenge of the pursuit of progress for Mankind, while respecting nature's natural balance.

### I - HOLISTIC MANAGEMENT OF THE WATER RESOURCE

The aquatic environment is extremely complex and must be managed as a whole and not by each user, in order to avoid creating imbalances in the environment.

The above-mentioned global management which integrates both upstream and downstream, surface and underground areas, must be incorporated into a long term-vision. This is why France has chosen the river watershed as the basic unit, while taking into account the estuary, the brackish and coastal waters which are affected by the upstream. The basins of small independent rivers are also tied in administratively with the basic unit.

WATER SUPPLY

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Holistic management may reach beyond borders: France has developed with its partners, action-oriented programs through International Conventions covering the Rhine and Lake Geneva and has actively participated in negotiating the Convention on rivers, the protection and use of cross-border rivers and waterways and International lakes within the framework of the United Nations Economic Commission for Europe.

The holistic management program France has been developing for nearly 30 years, is based on the following central concept: the water users and other concerned people are gathered in the same organization and can make real choices for the future:

- the State defines management goals within the framework of international rules and EEC directives;

- the basin committees bring together representatives of the local communities, manufacturers, farmers, consumers, fishermen, and other users, environmental groups and Administrative Authorities;

The committees draft an overall guideline for the basin, and decide on the fees; the Water Agencies enforce financial solidarity with the help of financial incentives and taxes, based on the principle: if you pollute = you pay.

The principle is applied by means of fees levied on pollution generated within the basin, the sums collected by the Water Agency are then redistributed as subsidies to the various groups which are investing funds to help reduce pollution or improve the management of the river.

This type of holistic management which associates all the people involved has been fruitful because, in spite of a substantial increase in taxes and in the gross amount of pollution generated, the quality of the rivers and streams has been maintained overall, although it is still insufficient.

The Government and the basin committees have decided on a two-fold increase in the Water Agencies' financial programs for 1992-1996, to meet the goals for environmental quality and for the supply of safe drinking-water, and to comply with EEC and International requirements, these increases should also help in dealing with new forms of pollution such as rainwater and scattered pollution.

The State contributes, through its external services, to the basin's structure and sets the goals to be reached by each river or stream section, but it must protect the future interest which reach beyond the basin.

The State determines the applicable regulations and ensures that they are enforced, if necessary through judicial means; it also becomes involved when emergencies occur, such as the droughts of the past several years, in order to serve as an arbitrator between the various users.

The Regional and General Councils are authorized to financially assist the local communities, the local industries and user groups which are reinforcing and cleaning-up the pollution in the water resource, developing and restoring the environment.

The following three conditions are required, in France, for water management to be more efficient: first, a clear and ambitious public policy, secondly, an increased focus at the basin level and thirdly, decentralization in favor of the local authorities which should encourage, in the future, long-term economic and social development while respecting the public's concern with water and yet preserving the natural environment. These policies were approved by all the participants in the "Assises de l'Eau", a national water symposium which took place in March 1991.

## II - EVALUATING THE WATER RESOURCE

Data relating to the volume and quality of the available water resources is need for holistic management, France has a well developed system in this area.

The data are increasingly gathered by computer methods and transferred by telephone to data management and storage centers, this allows for the remote management of river works, i.e., to counteract a flood at its beginning or to increase the water-flow for a river low in water.

One of the responsibilities of the State is to gather relevant water resource data. This responsibility is fulfilled by gathering all the local data and organizing it based on the users' needs, according to EEC and International standards.

Rainfall is recorded in more than 4,000 rain-gage locations by the Météo France network. The PLUVIO data bank gathers this data, which is available for consultation by the public.

The HYDRO bank fulfills similar functions for streams from nearly 2,800 locations where the flow and water height is measured continuously and the data coordinated by the Regional Environmental Departments.

The quality of the resource is measured by the National Basin Network ("RNB") over 900 locations 4 to 12 times per year by the National Observatory on Ground-Water Quality set-up by the Office of Mining and Geological Research ("BRGM").

The coastal waters are analyzed by the National Observation Network for the Quality of the Ocean Environment ("RNO") of the "IFREMER" (French Research Institute for the Utilization of the Ocean) and by the swimming-water quality monitoring network managed by the Ministry of Health.

Finally, a data-bank named "COURSE", gathers all the data related to the natural environment in the Departments.

The Ministry of the Environment coordinates the above-mentioned networks, harmonizes the data with other Ministries and with the help of the International Water Bureau ("OIE") and of the French Institute for the Environment ("IFEN"). The Ministry also ensures that the public always has access to the data, supervises research and development based on the data and publication of the findings.

There are other specific local networks, such as the warning networks located near the major water pumping stations of the water utilities.

All these specific or multiple-use networks allow for an overall view of the water situation in France for the better management of long-term investments and for legislation to be adapted as necessary. The fact that the data is sometimes available immediately helps reduce costs and flood risks, severe water-shortages and some forms of unexpected pollution.

### III - THE PROTECTION AND MANAGEMENT OF THE NATURAL AQUATIC ENVIRONMENT

Rivers, lakes and ponds are too often viewed as transfer or storage reservoirs for water, even though they represent a living environment containing large quantities of species structured in complex biological units. These water ecosystems, which are a part of the ecological balance, play a crucial role in whether the quality of water is preserved and available in the future. Thus, for the water users to continue with their activities, the preservation of the aquatic environment and of the nearby wet-lands must be an essential priority. These natural environments, because of their incredible diversity throughout France, constitute a precious asset and contribute a great deal to the quality and beauty of the scenery, and are highly valued by society at large.

Legal controls will help in protecting and managing the aquatic environment and should ensure that the ecosystems are functioning correctly, that the holistic management tools for these weakened environments are developed and that rehabilitation programs are launched to alleviate the damage already done to some of these natural areas.

1) Management based on the holistic programming of the aquatic environments.

Guidelines for the use of each river, aimed at determining the rules applicable to the aquatic environment during a ten year period, in association with elected officials, local residents, users of these environments (farmers, industries, fishermen, water-sports enthusiasts), environmental groups, the Administrative Authorities and the local Authorities.

For each large basin, guidelines for the protection and management of the aquatic environment are implemented after undertaking scientific studies and upon the recommendations of a committee of users of these environments, global management on the basis of the hydrographic unit replaces traditional management by geographical areas or types of use.

France has been able to develop, using the above procedures, methods for analyzing these environments, for determining the natural laws governing these ecosystems, taking into account the common interest of the river population thus confirming the usefulness of a negotiating process which enables a consensus to be reached between the different users of the aquatic environment after the choices at each stage have been validated.

2) Implementing Protective regulations.

The issuing of decrees regulating the environment, as they depended on local circumstances, did not permit, in the past, the implementation of a global and coherent policy for the protection and management of the rivers.

Preservation of the aquatic environment and the protection of the fisheries stock were declared in the public interest by the French law of June 29, 1984 on fisheries and the management of fisheries resources, thereby establishing the basis for a framework of coherent laws and regulations which protect the aquatic environment by requiring that water users follow specific rules for the facilities and management, not only for future construction projects but for current ones, in particular, the installation of passage ways for migrating fish, a minimum flow of not less than 1/10th of the module for the construction works, the protection of more than 25,000 km of rivers where no new hydroelectric plants can be authorized.

3) Programs for the rehabilitation of the natural environment

The State, in coordination with the regions and the fishermen, has provided for the carrying out of rehabilitation work and improvements of the natural aquatic environment in contract-programs. These programs are designed to re-populate the rivers with migrating species, which involve management of the environment and programs for the re-introduction of species or support for the existing fish species, with the help of the local communities, users and fishermen.

4) Research programs on the water ecosystems, stressing the importance of their living resources.

The State-owned research organizations are closely associated with the drafting of river and lake management models and with the development of biotechnologies for the rehabilitation and development of the water systems: teams at the National Center for Scientific Research of the National Institute for Agricultural Research ("INRA"), organizations for applied research such as the National Center for Agricultural Equipment, Rural Engineering and Forests "CEMAGREF", l'IFREMER and the BRGM for continental France, and the Center for International Cooperation in Developmental Agricultural Research ("CIRAD") and Bureau for Overseas Scientific and Technical Research ("ORSTOM), for the French overseas departments.

Research, surveys, and technical and scientific monitoring have help develop biological engineering methods for the rehabilitation of the fisheries environment, an increase in the fish population and a readjustment of the workings of the ecosystem with its biological diversity.

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The Ministry of the Environment intends to consolidate, pursue and extend the measures and initiatives which have been implemented during the last decade in connection with the natural aquatic environment. Particular attention has been paid to the management of large rivers for which ecosystem management models are being studied. The International Symposium held in Orléans (France) in September 1991 allowed for an exchange of views to take place between technicians, researchers and policy makers, and this proved the need to set-up an international network of experts in large-river management, which could meet, every five years, to discuss their most recent findings and progress in their technologies, which when implemented, would allow for some improvements while ensuring the long-term stability of the ecosystem, our only guarantee for lasting economic development.

#### IV - WATER SUPPLY AND TREATMENT

The holistic management of water requires, in addition to estimating the quality and volume of the supply, data concerning the effect of human actions on water, as small as said actions may be, and control over the most important ones. The sum of these human activities affects water availability, its quality and the conditions of the aquatic environment.

The procedure selected by France is that of State authorization or registration of a statement of use with the Authorities in low impact cases, where water is collected from surface and ground-water sources, when the river bed is modified (dam, sills, diversions,...), or if discharges occur, the maximum volume allowed must be specified, other procedures are also used in connection with the above, such as investigations, or implementing restricted zones.

The external services of the State are often asked to mediate, to impose restrictions on discharges, to request that changes be implemented in order to monitor the preservation of the natural environment, and to reserve space for the future, or in the event of emergencies, droughts or accidents.

The external services also apply administrative penalties and refer any offenses to the Courts for prosecution.

The Public Authorities cooperate with Manufacturers, local communities and farmers in matters related to water-pumping or waste discharges; contractors and the French Electricity Concern are likewise working with the Public Authorities when changes are to be made to the river bed, or when diversions are required. All of them manage and perform the work and receive contributions from the State, the Region the General Council or the Water Agencies.

The distribution of drinking water in France is carried out by the communes or groups of communes, and so is waste-water treatment for hamlets. Either together or individually, they undertake works that they manage themselves (close to 75 % of the cases), but often this task is carried out by service companies with public utility concessions or leasing contracts in connection with the service performed and for a limited duration.

These industrial concerns were the first to invest substantial sums for chemical pollution reduction. However, quite often, long-term and harmful sludge deposits have been present for long time. The pollution clean-up rate has been estimated at around 75 % for factory toxic wastes discharges. The manufacturers have also managed to control the organic pollution specific to some activities: the clean-up rate can reach up to 70 %.

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installing sewage drains and waste-water treatment plants which are increasingly effective and for which the "SATESE" gives management advice and recommend improvements. The pollution clean-up rate for the treatment plant in-take reaches 69 %, although all the connectable sewer-lines do not reach the plants.

The efforts made to promote more reliable systems, designed to treat pollutions which have not been taken into account until now such as N and P must be continued and the two-fold increase in the financing of the Water Agencies beginning in 1992, should help the local communities carry out these investments and abide by the requirements of the EEC directive relating to city waste-water.

Ground-water is increasingly contaminated with nitrates from agriculture in addition to trace compounds from organic chemistry used in agriculture.

An outline agreement will soon recognize the effort undertaken by the farmers and this common approach will open the way to the application of the EEC directive on nitrates.

Furthermore, the compounds used in farming are increasingly biodegradable, resulting in less harmful products.

The diversified management structures at the communal level enable this area of activity to constantly profit from progress made. The forceful application of the principle: the polluter must pay, is the condition under which the pollution clean-up of domestic and industrial waste may continue, and it is required under the international standards or the EEC directives, as well as for increasing the population's well-being.

#### V - WATER AND LONG-TERM URBAN DEVELOPMENT

The city cannot be developed on a long-term basis without keeping in touch with its environment - which when it comes to water, is extremely vast - upstream or ground-water resources, coveted natural environments, sensitive downstream areas which are vulnerable to changes in the river bed or to pollution.

France is increasing the level of its activities so that urban development continues to respect the fragile balance of the different environments and does not compromise future development.

This is done through administrative means, through technical efforts, but also through increasing consumer awareness.

#### FLOOD RISKS

Maps for zones subject to foreseeable natural

disasters ("PER") or maps for zones subject to flooding ("PSS") are drafted at the Administrative Authorities' instigation, and establish public easements limiting or prohibiting construction in areas covered by the local zoning ordinances which must incorporate these restrictions. These regulations do not specify the destruction of incorrectly located or inconveniently placed structures, nor do they allow for reducing the size of existing dikes.

Flooding is still a risk in valleys which cover 3.5% of French territory, and where 4 % of the population lives. France has implemented a flood warning system, keeping the Authorities and the population informed, by telecommunication and computers, lowering the number of victims and the damage, which totals an average of 1.5 billion French francs yearly.

In order to reduce the impact of these events, the networks allow long-distance control over the structures designed to lower water levels and enable the accurate computing for future structures.

The increasing impermeability of the surfaces is reducing the gathering time and producing flash floods, which can sometimes be dangerous and are always a disruption of the distribution network. Cities are required to enact regulations for controlling these flows, in particular through new urban design options, research into new surface coverings, the construction of new buffer reservoirs, etc.

#### DRINKING WATER

Drinking water reaches close to 100 % of city dwellings. The current goals are: the search for water which can easily be made drinkable, a risk-free distribution system where drying-up, pollution and incidents are eliminated and at the best cost for now and for the future.

Water collecting stations which are the most sensitive to the above risks or where water quality is low are being abandoned and replaced by more easily protected and secure ones.

The surface or ground-water sources are being diversified, whether they serve a single major city or several small ones with interconnected networks.

The water distribution services, and in particular the private utility companies, have set-up procedures to quickly stop the water intake on or in the river for as long as the risk persists, with the help of the emergency warning network authorities, in the event of discharges into the surface waters of harmful or unidentified elements (due to: fire, operator-mistakes, malicious acts, traffic accidents,...)

The long life-cycle of the networks requires that they be correctly maintained and that their replacement be planned. It is necessary to correctly estimate and account for these

costs, by avoiding unnecessary leaks with timely up-keep and the heavy renewal costs by allotting sufficient financial reserves.

### POLLUTION

Urban waste-water, which is still discharged without being treated into the natural environment (rivers or coastal areas) pollutes the environment and can even destroy all forms of aquatic life, however, these untreated discharges should be eliminated due to the two-fold increase in financial contributions for the Water Agencies for the period 1992-1996; at the same time the construction of plants equipped to filter out nitrogen and phosphorus will be encouraged. The sludge from waste-water treatment plants, with the possibility of specific treatment for industrial wastes connected to the urban network, may be ultimately employed for agricultural use, and eventually, stabilized and methanized.

In the urban areas, rainwater collects specific types of pollution which requires special treatment because it flows into the waste-water networks and has a disruptive effect on waste-treatment plant operations and causes harm to the natural environment.

For this reason, the law requires that the urban communities specifically treat rainwater.

### GREATER AWARENESS

Far too often, city dwellers are not aware of where their water comes from nor where it goes. In order to increase the awareness of the urban population regarding water and the aquatic environment, funds are being spent on canals, on river banks, on ponds, to give water a more valuable image through rehabilitation projects and by better integrating water into the urban network, whether through sporting activities, games, fishing or leisure.

This action in favor of water's image must also be carried out in rural and coastal areas where city dwellers travel; in France, the "Blue Flag" program awards quality labels to fresh and salt water beaches.

## VI - LONG-LASTING WATER FOR FOOD PRODUCTION AND FOR RURAL DEVELOPMENT

### A - WATER AND LONG-LASTING FOOD PRODUCTION

Mankind has attempted to limit, through agricultural reclamation the variations in the availability of water for increasing agricultural production.

In water-logged soil, underground drainages, which are costly, result in higher production and lower farming costs but increase soil leaching.

In damp swamps where peat bogs have been established to increase cultivation following the same methods, while lowering the level of the open-sky emissions. Persuasive or preventive actions are currently being undertaken to prevent these valuable wet-lands from disappearing.

Irrigation which attempts to compensate water deficiency in the soil, due to the temperature and the high water consumption of the crop at certain periods is rapidly increasing, mostly in France. The potential for increases in output, the stabilization of volume and quality are welcome economic benefits and are the reasons why irrigation is used in France, even on an irregular basis (less than once a year on average).

A large volume of surface water is pumped during the low-water level season, which requires the construction of water storage reservoirs upstream to meet the agricultural, industrial and urban needs, while still preserving life in the aquatic environment.

Local Authorities and State-owned corporations (CNBRL, the Corporation for the Development of the Gascogne Hillsides "CACG", the Provence Canal Company "SCP"... ) generally are in charge of the upstream reservoir works. France has developed a management system for these works so they can be used for several purposes in order to meet demands while sustaining minimum losses.

However, during the 1989, 1990 and 1991 droughts, because of the volume of water pumped, many streams and rivers were "dried-up" and for others, the remaining trickle of water did not allow for sufficient dilution of the discharges, nor for enough aquatic life.

The agricultural professionals and scientists, including the "CEMAGREF", have thoroughly studied the following problems: water requirements for the crops, the type of soils required, irrigation strategies according to each plot, what type of equipment is less water consuming, the reduction in the rate of fertilizer leaching or soil erosion, training for the person responsible for irrigation and breaking bad habits.

Fish and shellfish, which are rich food sources, need water rich in oxygen, but can collect chemical or organic pollutants harmful to people. The location of enclosed aquaculture installations must meet specific requirements, and administrative investigations. The quality goals for rivers are aimed at encouraging the preservation or return of wild aquatic life, as rich and as diversified as possible, whether in the fresh or brackish water or in the coastal areas.

The increased presence of nitrates and pesticides in the ground-water and surface water supply is one of the current major problems; the reduction of these pollutants by preventive means is a real challenge for intensive farming in the future.

In France, preventive steps have been taken, and incitement plans established (labels or trademarks indicating the region of production), policies which are a deterrent to intensive farming are implemented in the high-profile areas and the location of water-collecting stations is strictly regulated, but it appears that a lot of time will be necessary to repair previous damage.

#### B - LASTING RURAL DEVELOPMENT

The inhabitants of the rural areas are increasingly as demanding as city dwellers regarding the volume and quality of their drinking water. Longer distances between dwellings mean longer networks, and the small size of the communities means that the supply systems are less reliable except when they have been interconnected, the water-collecting station locations are sometimes less reliable, the decline in the rural population and their lesser financial resources make it harder to maintain the networks correctly, to improve and up-date them and to install new ones or seek more protected water resources.

In order to alleviate these hardships, France has set-up a transfer system for the benefit of rural communes with the sums provided by a tax levied on water sales for funding the "FNDAE" (National Fund for the Development of Water conveyance).

Some groups of communes, and even Departments, try to counterbalance the additional costs of securing a water resource and sometimes of organizing its distribution, by adjusting the price in their area.

The prevention of industrial pollution or pollution by caused by stone and gravel quarries or refuse dumps, must be as strict as possible, in the rural areas as in the city, even if the amount of free space could lead one to believe that there are less risks involved. In France, the law applies the same standards to the entire territory.

Waste-water from rural communes is less often collected and even treated less often than city waste-water. However, serious efforts have been made and the two fold increase in the Water Agencies programs which allows for additional fees and aid should help in the effort to lower this type of pollution. As for dwellings that cannot be connected to the communal network, France has implemented regulations which require that communities be prepared to give technical advice and inspect the installations.

In the past local, residents could up-keep rivers and streams which were not part of private lands, as they were in contact with water daily and constantly needed it, however this is not feasible today, in particular because of the decline in the rural population, so the local communities have taken on the task. France has been forced to regulate these activities so they can take place without hindrance and at the lowest costs possible, the costs being passed on.

Many vacationers stay for several months in the rural environment, and more particularly the mountain and coastal areas. Increased aid is given to these communities which undertake works and promote incentives such as the "Blue Flag" to signal that a beach is healthy and pleasant.

The attraction which water has for tourists cannot be denied and the local communities are also encouraged to undertake works to improve their rivers and lakes in order to respond to the public's needs.

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## REPORT ON FRENCH CO-OPERATION

Robert S. Mac NAMARA in his April 1991 report on the development crisis in Africa and the damage being caused to the environment, stressed the need for long-term soil, plant and water management, so that our descendants are left with a living environment.

He insists, in particular, that rural areas must be equipped with water supplying facilities. In order for these facilities to be installed and maintained, they must be built under the direction of the public works and rural waterworks departments as well as the municipal councils, but must also be backed by individuals, co-operatives and local communities (cf. page 24).

### I - OFFICIAL CO-OPERATION

French co-operation efforts, have for years followed a similar approach, based on the management of the water resource's volume and quality with the aim of making the resource available to the user while encouraging responsible use.

Moreover, French co-operation is active in all large waterworks areas, dealing with the States as well as the projects, with the help of the local communities and the users.

In large projects, such as the basin agencies and inter-State organizations such as the Inter-State Committee for waterworks studies ("CIEH"), the Organization for the Improvement of the Senegal River ("OMVS"), the Nigeria Basin Authority ("ABN"), the Sahara and Sahel Observatory ("OSS"), the AGRHYMET center, French co-operative efforts are mostly preoccupied with giving expert advice, either through resident experts, or by funding studies, French efforts are increasingly concerned with promoting holistic management of water resources, keeping in mind an environmental perspective.

On the one hand, France is helping set-up coordinating organizations for the management of water resources at the hydrographic basin level. This form of co-operation rests on experience gained with the basin agencies which bring together

the various water users (farmers, manufacturers, local communities) and the different Administrative Authorities in charge of water management and coordinate the water related investments using the funds from the specific fees paid by the users.

Several "basin agencies" have been formed or are being formed according to this pattern: the Brantas river basin in Indonesia, the Rio Doce in Brazil, the Valencia lake in Venezuela and several rivers in Poland.

On the other hand, French co-operation is contributing to the inventorying and monitoring of water resources in many countries using various geophysical and teledetection methods. Teledetection has been more particularly developed within the framework of the Sahara and Sahel Observatory, created in 1990 with all the countries bordering the Sahara and Sahel. Consequently, several of these countries have set-up regional satellite receiving and image-processing stations.

In Africa, South of the Sahara and at the State level, France intervenes on an official basis and in a relatively substantial manner (around sixty agents are stationed there) to help the waterworks services set-up and implement computer-aided management methods for the water resource and the waterworks.

## II - ENVIRONMENTAL FACTORS ARE TAKEN INTO ACCOUNT WITH THIS TYPE OF COOPERATION

The water resource is increasingly seen as limited in volume and as a component of the overall concept of natural resources, the backbone of our environment. Within this context, substantial efforts have been undertaken to manage and coordinate the resource in the best possible way (data banks, regional co-operation, etc.).

With the NGOs becoming increasingly involved in the field of water resources, a new approach has been necessary and a new way of analyzing problems has emerged, using various methods: keeping in closer touch with the population, based on exchanges of view and a long-term approach; the NGOs have, in particular, helped introduce the concept of water quality as opposed to the volume required to meet the population's needs.

French aid, for its part, is increasingly working with the NGOs, especially with the program WATER SOLIDARITY ("SOLIDARITE EAU"), the aim of which is to involve the local communities in development aid programs.

### 1) Promoting a national water policy

One of the developments to expect by the end of this decade will be that water has become increasingly scarce, as different users are compete for the resource. And quality problems, which were ignored for a long time, have become crucial: salinity of the ground-water supply due to overuse, organic and chemical



pollution of the ground-water supply and the rivers...

More often than in the past, the State should be encouraged to take an overall approach to water, and to implement this approach with appropriate policies in each area:

- to improve the monitoring of the resources and to maximize the management of its quality and volume, in close co-operation with the rural communities.

- to better justify the investment programs and the choice of works.

As for village waterworks, preservation of the current achievements will be a priority over new investments. However, problems in the near future will involve supplying the water needs of the large rural centers and the city suburbs, this will require specific investment solutions - local water supplies - and with regard to management - e.g., private concessions.

While promoting a national water policy, French aid has helped carry out a certain number of important technical studies and developments. The success achieved in drilling for water in fractures in rock platform zones, in Burkina Faso, make it possible to envision the supplying of water to large towns and the city suburbs at a flow-rate of 5.3 m<sup>3</sup>/h or more.

## 2) Re-focusing water policies within the general context of space and environmental management.

In this area, the concerns and initiatives of French aid have been mostly focused on management problems of the resource within the hydrographic basin context and on agricultural lands.

A specific initiative has been undertaken, jointly with the EEC and Italian co-operation, to discover under what conditions the fractured areas are replenished in rock platform zones; here again, the most up-to-date methods have been used to preserve the resource and new and effective techniques have been developed. Prospecting with Radon gas, the most efficient use of high-resolution satellite data, etc...

So that water may be fully included in environmental policy-making, it must be fully understood and monitored. For this purpose, we recommended:

- The installation or up-grading of monitoring and measuring networks: piezometric, hydrologic, rain gage networks;

- That studies always be required on the impact of large projects on the water resource;

- That data on large underground and surface water systems be completed.

- That data gathering, processing and storage technologies be improved.

Overall, it will be necessary to increase the number of monitoring tools installed in the sector.

The next decade should focus on this point since without the right data good management is not possible.

The Sahara and Sahel Observatory is, in this respect, an essential tool for developing North-South initiatives, research and exchanges.

3) Insisting on the importance of water as a developmental factor for the well-being of the populations and as a structuring force in the rural sector.

French financial aid is developing a participatory approach which turns the local community into an essential partner in the design, implementation and up-keep of the equipment.

Management of the water-well is often the first project which can bring villagers together for a shared goal. This method has been developed and tested with the help of French aid and the EEC. Up-keep depends on three entities being increasingly made aware of their responsibilities:

- The village committee, which benefits from a promotional campaign,
- Artisans with repair services covering approximately twenty villages, after training,
- Distributors for spare parts.

This is also an area in which French co-operation has involved all the French partners in discussing the problems of drinking water and health in rural waterworks projects.

### III - RURAL WATERWORKS

#### 1) THE ACHIEVEMENTS IN RURAL WATERWORKS

##### Completed projects

More than 50,000 drillings have been completed in the African Sahel, 8,000 with the help of France. Water supply to villages has unquestionably improved with modern, healthy and permanent water wells.

##### Qualified managers

In becoming a full fledged economic sector, rural waterworks has attracted dynamic private managers and encouraged the development of new technologies.

During the entire design, execution and inspection phases the works are a training ground for firms, which thereby heighten their skills. Through conditional financial requirement, more firms may be encouraged to participate, notwithstanding the risk of overly increasing the number of methods employed.

### Scientific and technical achievements

A serious effort has been made in acquiring better understanding of the water resource, in storing and processing the data and in developing new management tools.

- Data-base and programming software, "ACTIF" of the "BRGM" and "PROSPER" of the "BURGEAP", have both produced improvements.
- Limnometric stations for automatic measuring and transmission by satellite;
- Mathematical modeling of the aqueous zones and the surface waters;
- Computer-generated hydrologic maps: pin-pointing the water-sources by satellite;
- Experimental solar water-pumping stations adapted for large-scale use.

A large selection of decision-making and management tools is now available for those in charge of decision-making in each nation. The tools are the result of recent technological breakthroughs designed to implement a rational water policy in each country. A complete list of the available tools goes beyond the scope of this report.

## 2) WATER CONTRIBUTES TO THE STRUCTURING OF THE RURAL ENVIRONMENT FOR UP-KEEP AND MANAGEMENT

Aid donors all agree that waterworks improvements must be up-kept. Most have listed maintenance as a priority in their initiatives or make it an important condition of their investments.

The strategies of the different donors vary considerably:

- either maintenance is free and paid for by the donors and the pumps are replaced by the organizations set-up by the financing agencies;
- or the administrative services are reinforced so they are able to maintain the wells;
- or artisans are trained to do the repairs.

Financial contributions from the users are an essential requirement for the system to work properly.

#### IV - THE LIMITATIONS OF VILLAGE WATERWORKS THE NEW APPROACHES

##### 1) A well-tested model

Village waterworks are essentially aimed at villages with traditional structures, with populations of a few hundred. They are developed following a model, which will sooner or later be chosen by countries for which the standard water source is a drilled well equipped with a manual pump.

The above model, if it is implemented with care, functions satisfactorily, without the need for State intervention. Its primary advantage is the low investment needed, for each person served (around FFr 300). The reason for its success is that it strikes the proper balance between supply and demand, available equipment and local human abilities, technology and financing.

Its weak point is nearly always in the supply of external commercial networks: this is the link connecting the traditional and the modern world.

##### 2) Limits to increased use

The manual pump has a low output (1.3 m<sup>3</sup>/h) which restricts its use to 200 or 300 people. Therefore, for larger villages, a pump must be installed in each quarter, while maintaining the principle of one committee per pump. Large villages of more than 2,000 people can be easily equipped in this way, as long as the residents adopt or maintain the necessary communal spirit.

However, a problem may arise; some member of the community, usually the most influential ones, may require better service. Either by requesting private connections, which the installation cannot accommodate, or by having the water carried to their homes, which totally compromises its quality.

##### 3) Service to secondary communities

###### **The institutional structure**

For the village sector with a community-spirited approach to water, it is crucial that the installations be financially sound: the equipment must function and be renewed at the cost of the user, however, the State must pay for most of the investments.

For rural centers, a joint system may be implemented. Subsidies could be added to the users' sizable participation in the investment, and applied to the long life-cycle infrastructures (drilled wells), this would make sound financing and cost recovery possible, on short life-cycle equipment (pumps).

#### **An increased role for the local communities**

A more dynamic approach requires examining whether the State should transfer its powers to the local communities, in stead of analyzing the current institutional constraints. Eventually, communes will certainly have to be established. The responsibilities of the new municipalities will be similar to that of a client in a construction project.

For the smaller cities, one of the only ways of improving the surroundings is for the community to help organize the users. This should allow for all the aspects of organizing the living conditions in small cities, including sewage treatment and zoning and the financing and management of the improvements. The users' contributions to the investments and its effective adoption by the users will be facilitated. This is confirmed, for instance, with the case of the first improved waterworks installations in the Ivory Coast (small-scale electrical supply lines, contributions of 30 % of the costs).

#### **Different systems of management for the secondary centers**

Regardless of the equipment, hand-pumps, independently powered stations, small-scale networks or inter-community networks, the centers should be classified according to the way in which they are managed

##### **Management by a community association**

Costs can be recovered by regular contributions, by the subscribing of user-rights for the equipment. Sales may be made by volume of water (particularly for temporary users), but the system is still managed by a traditional committee.

##### **Private informal management**

The costs are systematically recovered by volume of water sales.

The community grants to a private person or a local firm, whether of a commercial nature or not, the management and distribution. Specific rates are applied for private connections, sales through small outlets (water shacks), or by water-carriers.

## **A combination of the two systems**

In the case of small networks, it is possible to consider separating production and distribution. Production is granted by a concession to the informal sector (in fact to a dynamic or competent person) or to the modern sector, a regional firm, or even a national water distribution company. Distribution is managed by an association (of users), in particular for the management of the local milestone fountains.

## **V - URBAN WATERWORKS - MORE CONSTRUCTION IS NEEDED**

**The number of African cities, south of the Sahara are increasing and so is their size...**

The French Ministry of Co-operation and Development is active in thirty countries with a total population of nearly 170 million people. The urban population in these countries has reached 45 million. This urban population has increased during the last twenty years, at an average yearly rate of 5.6 %, which equals more than twice the yearly birth rate (around 3 %).

At this rate, the cities in these countries must accommodate 2.5 million new residents each year.

With the following consequences:

- a rapid increase in the number of towns;
- a concentration of the urban population in the cities and in particular, in the capitals.

**...The living conditions of the city-dwellers are deteriorating,...**

The economic problems of the Developing Countries during the last few years have substantially lowered the rate of investments in urban facilities. Even if urban growth has slowed down, the lack of facilities has worsened. Maintaining the current level of service in the city centers that already have facilities is becoming increasingly difficult, even in the capital cities.

The inaptitude of the urban services in keeping-up with the rate of urban expansion is damaging to the health, hygiene, quality of life and security of city-dwellers.

**...even so, urbanization a privileged area for development...**

Cities must be furnished with the proper installations to improve the living conditions of the city-dwellers and encourage economic development.

The necessary facilities must be installed in cities for two

reasons: to improve the living conditions of the city-dwellers and to offer installations and equipment which encourages economic development.

As for the installations providing water and waste treatment, technical, organizational and financial problems are sometimes critical: which water resource is available for the city? Is it still possible to develop centralized services capable of furnishing volumes of water and then evacuating the waste, especially if the quantities are sometimes computed to the standards of wealthy Western cities, with low growth rates? What level and type of service should reasonably be furnished to the population? By what means can the service be financed on a long-term basis?

**Two sectors require different approaches: the regular zones and the suburban zones, for water distribution and management methods.**

#### Regular urban zones

In older city centers or in new developments built according to official development procedures, and which both offer adequate installations, water distribution and waste treatment is carried out by government or quasi-governmental or even private companies, through traditional networks. These companies are granted a de facto monopoly which must be tampered by ensuring that the State Authorities, which protect the general interest, clearly define the terms under which these industrial activities may be carried out.

However, very often, these companies run into problems which prevent them from maintaining the initial level of service and from improving the network: in most cases, financial problems have increased while service quality has not improved. Plans for adapting the public utilities' water distribution and waste treatment to each sector should encourage more efficient management based on marketing principles and less dependency on the State, through a complex process which will only yield results in the long-run.

Setting this new direction in the management of public utilities creates new problems, because of the two aspects of the companies: both commercial and public utility. The Authorities must therefore supervise all the more efficiently and competently. The quality of the institutional climate under which the service is carried out appears to be a determining factor.

A proper institutional framework which does not condone the de facto monopoly of an administration, a State-run company or even a private firm, should encourage the temporary concessionaire to be creative, to reduce costs, to adopt the appropriate technologies, and to train the right managers. In the long-run, improving the qualifications of the personnel will be an essential factor in increasing performance for these specialized

firms.

French co-operation fully backs the necessary development of professionalism in all its aspects by:

- stressing staff financial management and marketing training;
- backing the regional organization such as "UADE", so they become training centers teaching competency and awareness of the necessity of improving performances;
- encouraging joint North/South and South/South activities, between entities of similar sizes.

A number of basic principles applied to the management of these companies should help improve their performance and efficiency. These principles, which were drafted by a working committee of the French co-operation, which included French professionals in the sector, can be outlined as follows:

- separate the companies carrying out the activity from those owning the assets;
- use the help of specialized foreign managers, if they are willing to invest sufficient capital and to take real risks;
- use the potential of private African companies in addition to the large institutional monopolies;
- reinforce solidarity links between the local communities and these public utilities;
- prepare for financing of the (improvement) "ESP" with African savings;
- ensure truthful accounting practices by including external aid in the overall cost;
- develop communications with the local urban planning services.

The private manager should be responsible for both the technical aspect and financial costs of the water and waste treatment services when they are centralized. Using the same techniques, with a single location (the meter in the user's home), where it is feasible to figure out the volumes used and to bill for the cost of the service.

#### **Type, cost, terms and conditions for the management of the installations**

From an economic perspective, the limit for building urban waterworks should be set at a population ceiling under which centralized networks would not be financially able to furnish their services. This ceiling could be artificially lowered by evening out the costs with the profitable sectors.

With a rural distribution system, regular costs and equipment maintenance are borne by the users: this scheme has proved itself over thousands of water-wells in rural Africa, as we have previously explained.



The implementation of a decentralized maintenance and management system of this kind meets the criteria defined for rural waterworks.

It requires:

- a) that the populations maintain a community spirit;
- b) that the users have the necessary financial capabilities;
- c) that the necessary technical abilities exist for maintaining the works;
- d) a maintenance contract between the users and the private service. Various contracts can be used, from a total guaranty of services, to leasing (of equipment owned by the service provider), and to services furnished on an occasional basis only, at the users' request;
- e) the availability of a spare-parts distribution network.

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This report was drafted using the opinions and experiences of the French Co-operation, Ministry for Co-operation and Development, Foreign Affairs Ministry, The Central Bank for Economic Cooperation.