UNITED NATIONS

ECONOMIC COMMISSION
FOR LATIN AMERICA
AND THE CARIBBEAN - ECLAC

Distr.
GENERAL

LC/G.1522
26 April 1989

ENGLISH
ORIGINAL: SPANISH

GUIDELINES FOR THE ANALYSIS OF WATER RESOURCE MANAGEMENT PROCEDURES IN LATIN AMERICA AND THE CARIBBEAN

(Based on Peruvian experiences)

88-8-1193

CONTENTS

SUMMARY

This is the first effort made so far to analyse, systematically, existing alternatives for improving the management of institutions that are concerned with water resources in Latin America and the Caribbean.

It begins with an attempt to classify the different levels of water management: the management of the physical system (specifically the water system); management of the user system; and management of the institutional system and of each institution. It also identifies the two aspects of water resource management: the management of supply, which is usually the responsibility of the State, and the management of demand, for which the individual public or private user is responsible.

The study provides guidelines to officials responsible for water resource management (for whose benefit it has been prepared) for improving the management of institutional systems. It stresses the importance of rigour in the identification of agents, problems, objectives, environments, constraints and solutions as well as in the formulation of strategies to achieve this improvement.

It also tries to show that it is useless to simply point out problems and solutions, without seeking to identify their interrelationships and the strategies for implementing such solutions. It draws attention to the tendency to propose constant changes in the structure of organizations, discarding, without serious study, what had previously existed and thereby precluding all possibility of improvement.

Generally speaking, users and government agencies in the region are both quite aware of the technical and physical needs for improvement of water systems. Nevertheless, since there is usually no clear definition of which agents and institutions are responsible for fulfilling these needs —or else such institutions either do no exist or are ineffective— the process is paralyzed and the ideas put forward are never implemented.

To avoid this situation, the study strongly recommends, inter alia, that the State promote the establishment of water resource agencies (each with responsibility for a particular basin or basin system) to manage the supply of the resource, leaving the management of its use to private or public enterprises. It stresses the need to name high-level water authorities in each of these agencies, whose decisions must take account of the views of consultative committees representing the users, and who must be advised by a team of professional and technical experts. In addition to the technical tasks of the agencies, their main responsibilities are to facilitate

consultations, encourage participation, and co-ordinate the activities of the agents in each basin.

The present study contains a brief description of a sequential method for evaluating the various processes of water resource management, as well as tables and annexes with lists of the actual problems and demands raised by users and water authorities. It also puts forward hypothetical situations in basins and organizations involved in water management. It thus contains information intended to facilitate the identification of training needs in water resource management.

I. THE NEED FOR IMPROVEMENT IN MANAGEMENT SYSTEMS

1. Purposes of water resource management

Water is one of the basic elements of the natural environment. Since it permits the development of life, its value cannot be measured in purely economic terms. Nevertheless, water is also an economic resource since it may be used to satisfy demands for such a resource, with its value being determined by its quantity, quality, location, and by the timeliness of its availability. Water courses, whether natural or artificial, are also an economic resource used for satisfying the demand for energy, navigable courses, drainage, recreation, fish breeding, and for the disposal of mineral and material waste. The purpose of water resource management is to preserve, protect or conserve water as a natural resource and as part of a hydrographic network or system (natural or artificial), while at the same time satisfying the legitimate needs of users, whose members include man, flora and fauna.

The management of water is done at two levels: resource supply management (sometimes simply called resource management) and resource demand management (management of its use or exploitation). Supply is balanced with demand in hydrographic regions consisting of one or more interconnected natural hydrographic basins and of the water systems constructed to regulate such basins. This management system makes it possible to reconcile the interests of, motivate, and co-ordinate the many different users of water.

The exploitation or use of water at the sectoral level is usually managed in a manner consonant with the needs of the individual user, which could be an urban zone, a mining or industrial zone, an irrigation and drainage district, one or more hydroelectric power plants, or a stretch of river (devoted to recreation, fishing, or to the extraction of building materials).

For the purposes of this paper, management is understood as a process of directing and supervising the technical and administrative activities which need be carried out in order to achieve established goals. The integrated management of water resources is usually the direct or indirect responsibility of the State. The responsibility for managing supply is usually shared by State or para-statal agencies with varying degrees of autonomy. Responsibility for the management of the use of water resources (hydroenergy, irrigation and drinking water, for example) is nearly always exercised through public, private or mixed enterprises although some non-enterprise centralized systems still exist for the management of certain uses, such as irrigation.

The role of the State is mainly to formulate policies and plans for rationalizing water use, to evaluate water resources, protect against extreme phenomena, control the quality, quantity, place and time of discharges, and to support the construction of water works in the public interest. Other State functions are to grant water-use rights, to provide guidelines for the adoption of water-related policies within a basin or system of interconnected basins, to promote or provide incentives for action in the public interest, and to co-ordinate the technical and administrative measures necessary for integrated water management.

At the technical level, the authorities responsible for the management of water supply have two options: to increase water supply by developing and constructing hydraulic-engineering works for the regulation, collection, conduction, treatment, distribution, re-use, and discharge of surface and ground water; or to do so by managing the collecting drainage basins and by the joint use of surface and ground water to regulate the availability of this resource. In both cases there is need to control the quantity, quality, timing and location of the supply by trying to maintain an ecological balance and to satisfy the demand for its multiple use.

For its part, demand or use management also has two technical alternatives for maintaining a balance with supply: to either reduce the increase in demand in water-deficient areas by limiting urban and industrial growth and, in general, by moving high-consuming or high-polluting users to areas where more water resources are available; or to increase the efficiency of water use per unit of production or consumption through better operation and maintenance of hydraulic-engineering works and better management, conservation, and re-use of resources, aimed particularly at preserving the quality of these resources and to facilitate their multiple use.

The management of these activities, aimed at achieving the general objectives of any process of management of water resources, requires action at three levels:

The first level is the process of "management of the physical system" or simply of the "water system". At this level training is required in the biological, sociological, hydrological, ecological, economic and productive aspects of water resources in order to structure, regulate, manage, exploit, protect, or preserve the supply of water with a view to satisfying the needs of man and his surroundings.

The second level is the process of "management of the user system" which is the responsibility of individuals or groups of individuals who are direct users of water. In order to participate in this system, personalized training is needed in the proper use of water; for example, in irrigation techniques for small farms, methods of saving water in the home, and unconventional water-tapping techniques. Such training is acquired through extension courses and by organizing users either individually or in groups.

The third level corresponds to the process of "management of the institutional system". This level requires training in interdisciplinary or cross-disciplinary work for the co-ordination and joint management of a number of different enterprises which share the use of the same water

resource in order to improve the efficiency and effectiveness of their joint work. This level also covers the individual management of each one of the participating institutions and requires training in classical management for the internal administration mainly of State or para-statal institutes, offices, and programmes.

The convergence of the three management levels makes it possible to achieve the objectives of water resource management at the least possible social, economic and environmental cost.

2. State of water resource management

In the management of water resources in Latin America and the Caribbean no distinction has usually been made between the management of the water supply and the management of its use. Traditionally, the user sector itself has been responsible for regulating and capturing the water supply, using it and then returning it to its channel with or without previous treatment. In other cases, management of the water supply is the responsibility of an entity which is itself user of water and therefore has a dual function. Thus each user sector administers the resource independently, regulating and capturing the water supply to satisfy its needs, with little co-ordination or control. This in turn has generated a series of conflict situations, both technical and administrative, in regions or river basins where there is no rationalizing strategy. Technical conflicts arising from this lack of regulation exist both in the supplying of and in the demand for water.

At the supply level, conflicts originate because, in addition to administering the use of water for their own purposes, the users themselves are obliged to regulate the supply of water, which they do independently, thus creating situations of interference. There are usually no recognized or duly authorized authorities to prevent and avoid conflicts caused by natural phenomena or by competition among users. In general, a multiplicity of institutions have a hand in the management of water systems. The competition among these institutions further reduces the possibility of reaching agreement on how to manage water resources.

At the demand level, conflicts arise through competition for the use of the same resource in terms of quantity, quality, time, or place, and through the presence of extreme uncontrolled natural phenomena which affect the supply. The most complex management problems arise in centralized and dependent systems (as in irrigation districts run by the State). In decentralized water-use systems there are also management problems, but it is relatively easier to trace their origin and solve them, since there are fewer external interferences in the system.

3. Recommendation for improving the management of water resources

The majority of existing proposals for improving water resource management systems lack sufficient elements to move from ideas to action. Normally, they simply relate the history and development of projects, point out how badly a given system works, or recommend partial measures to improve it.

In order to avoid these situations and to effectively tackle the problems it is necessary to apply rigorous methods so that the various components and interrelationships of a management system may be dealt wtih in a rational manner.

One of these methods, already explained in other ECLAC studies, consists in:

a) Identifying the actors or agents involved in water resource management.

b) Establishing the technical, social, economic, and environmental criteria which will guide the management process.

c) Identifying the technical and administrative problems as perceived by the actors or agents involved in the management process.

d) Determining, on the basis of the problems previously outlined, the objectives of the management process, separating the technical objectives from the management objectives.

e) Determining the ambit or ambits within which such objectives should be reached (e.g., a river basin, an irrigation district, a drinking water supply and treatment system, etc.).

f) Identifying the technical, political, legal, economic, financial, institutional, functional, social, and cultural constraints which prevent the objectives proposed by the actors or agents from being attained.

g) Proposing both technical and management solutions designed to overcome the previously identified constraints and indicating the order of priority of their application.

h) Designing and implementing the strategies necessary to bring about the proposed solutions specifying how, when, where, and with what resources they are to be carried out in practice and who will be in charge of their implementation (a management process properly speaking).

The rigorous application of this sequence reduces the possibility of isolated judgments and opinions being given which are inapplicable because they are unconnected. This will counteract current tendencies to broadly and superficially criticize the existing management, orally or in writing, to point out problems and their causes from the point of view of each individual, to recommend partial solutions, and to apply hasty and ill-conceived measures.

The superficiality and frivolity with which management questions are usually treated have resulted in innumerable documents whose conclusions are already common knowledge: lack of political support, failure to implement legislation, lack of trained human resources, discontinuity of programming, lack of financing, institutional interference; and other conclusions so general and obvious that they are of no help in the search for solutions. Other more radical conclusions suggest the need to change the entire existing

structure, to change the management personnel, to nationalize or privatize this or that agency, or simply to change the names of the organizations, without even retaining and conserving existing positive elements. The first observation that can be made about this situation is the instructured manner in which criticisms are made. Generally speaking, a distinction is rarely drawn between the levels of management about which observations are being made and there is no differentiation between: a) criticism of the management of the physical or natural system (for example, a hydraulic-engineering project which modifies an ecosystem); b) criticism of the management of the interinstitutional system (for example, the lack of co-ordination between various institutions concerned with water resources or located in the same river basin); c) criticism of the management of specific institutions (for example, the meagre budget of the national meteorological and hydrological service).

In addition to the above, the proposals and procedures on which such statements or criticisms are based are usually unsupported. It is even more distressing to see the high cost of the application of radical measures whose lack of clarity with respect to the objectives sought and what already exists makes them unjustified. This has been almost a national "sport" which has seriously affected the continuity of programmes.

Along with the need to make improvements, there is also the obligation to do so effectively. It must therefore be made very clear that, in order to achieve this goal, a rigorous and respectful approach must be adopted with respect to what is already existing and functioning.

4. Objectives of this study

The present work aims to make two contributions:

a) To apply a sequential method for analysing and proposing the necessary improvements to the existing water resource management systems in the region, with particular reference to institutional systems management and to individual institutions.

b) To identify the actors, problems, objectives, constraints, solutions, and strategies commonly associated with water resource management processes in the region (at the levels of the physical system, the user system, the institutional system and of each institution).

The present document refers to the natural or physical system related to water management only for purposes of evaluating the performance of the institutions responsible for its management.

II. ACTORS AND CRITERIA INVOLVED IN WATER RESOURCE MANAGEMENT

1. Actors involved in the management process

Management processes are carried out by and for human beings, and include a consideration of the environment which supports them. The persons or groups participating in the process may be defined as the actors in the process, and may be either active or passive. Those who intervene in some direct or indirect form in the management processes are active, while those who are affected by these interventions, which are either favourable or counter to their interests are passive. Direct active actors are easily recognized since they are clearly representative in matters pertaining to water, such as managers of companies that supply drinking water, energy, etc., directors general of water, irrigation, or forestry agencies, directors of natural resource institutes, heads of boards of water uses, and heads of irrigation districts. Indirect active actors involved in water management are not identified as easily: they may be the officials in charge of preparing the national budget, regional directors or intendants, mayors, health officials, land magistrates or the agents of agrarian banks.

Direct active actors (or agents) who may be formally identified in the process of water resource management, may be divided into two groups:

a) Actors involved in the process of integrated resource management, such as:

- secretaries or directors general of water or water resource agencies
- directors of water resource institutes
- heads of hydraulic laboratories
- heads of national meteorological and hydrological services
- water authorities in river basins or water systems
- heads of water resource planning agencies
- heads of natural resource evaluation institutes
- heads of water quality control in the health sector
- heads of academic programmes in hydraulics, hydrology, metereology and other water-related subjects
- heads of civil defense programmes, and others in charge of programmes for the control of extreme phenomena.

b) Agents involved in water use management:

- managers of water supply and treatment companies
- administrators of irrigation or similar districts
- directors of projects for irrigation and drainage, hydroelectric energy, navigation, water supply and treatment, fish breeding, etc.
- heads of recreation programmes in rivers and lakes
- heads of fish breeding programmes
- heads of river basin management programmes and soil conservation programmes
- others in charge of water programmes at the sectoral or subsectoral levels.

Indirect active actors (or participants) do not belong to bodies that are involved exclusively with water-related matters, and their participation in decisions can therefore be determined only by their participation in a specific management process. For example, a director general of water resources, who is in charge of the application of the general water law of a country, is apparently the chief authority for managing the supply of the resource. Nevertheless, the number of indirect active actors who have a hand in his decisions is so great that his real authority is greatly diminished, as will be seen in the following sample situations.

In practice, a director general of water resources is answerable to a minister or other high authority of the sector in which he operates, which in most cases is agriculture, economic development or environment. That minister or other high authority may legally be the "real" highest authority in water-related matters. He in turn, however, can only exercise his authority as far as his office and the law do so permit. The action of the director general and of the minister or equivalent head is circumscribed, as well, by the annual budget provisions (which are formulated by persons unknown to the director general of water resources, and vice versa); the legislation governing public employees (which regulates, among other things, the conditions under which specialized personnel may be hired and retained); and the rules of the auditor general's office (which require that a certain pattern and mode of expenditure be followed that are sometimes contrary to the hydrological cycle and which often make it impossible to deal with emergency situations). There is also interference and pressures from the highest regional authorities, the question of who have greater status than the director general himself or who are answerable to other sectors; regulations for bank loans to water users; interference from heads of special projects or autonomous regional corporations; requirements of credit agencies or international or bilateral donors; internal administrative rules (which, for example, regulate the acquisition of equipment); budget austerity norms (which, for example, prohibit the use of official vehicles on holidays, or reduce the supply of gasoline to two gallons a day, when the hydrological cycle does not stop either on holidays or on weekends); internal administrative rules of the ministry or corporation of which the director general's office is a part; public and political pressure to execute hydraulic-engineering projects in low priority or high cost areas; pressures exerted on municipalities to grant building permits in urban areas exposed to a high risk of flood; permits granted to the mining sector to extract or deposit construction material in riverbeds without measuring the

hydraulic consequences of such activities, and pressures from the mining sector to capture or discharge water from mines without considering the effects of pollution or the other uses of such water. These are some of the many possible interferences in the process of water management.

An outsider does not usually notice this great number of potential areas of interference, because he does not know which agents are involved. He could think, therefore, that most management problems fall within the responsibility of the internal organization of the general directorate. Consequently, he would be inclined to suggest a modification of the organizational structure of the directorate, personnel changes, etc., which varies only the internal and not the external factors affecting the management process. He does not understand that this will not improve the management processes, given that the greatest limitations come from outside the system and that, if hurried changes are proposed, the situation will probably be further worsened.

Generally speaking not even the director general himself, or equivalent water authority, ever learns exactly who are the persons or actors that have a hand in the water management process because the decisions come from outside or, if he does know, he has no authority to prevent it. Some of the most obvious cases are decisions of planning institutes to divide the national territory into regions without taking into account the boundaries of the river basins. The result is that a local water authority in a river basin ends up having two regional heads, if the river basin that he administers has been divided by a process of regionalization on which there was no consultation. Another case is that in which the director general finds it impossible, because of political pressure, to increase water tariffs to permit him to operate, maintain, or repair the systems that have been constructed (in addition to the recovery of the amortization costs of such works, where this is the case). It is sometimes even more difficult to make sure that the money which is charged for water is paid into the irrigation districts and not into the public treasury. Therefore, not knowing who are the actors that fix these rules of the game weakens the recommendations for solutions.

In annex 1, which contains part of a speech made in 1978 by the Director General of Water, of the Agriculture and Food Ministry of Peru, it can be seen that, in general, he puts forward only those problems and solutions he thinks necessary to improve the management of water resources, without specifying who is in charge of them. The first stumbling block to implementing such solutions comes up precisely from the moment that it is not known which person or persons should read and carry out the recommended action. This list of problems and solutions often is not even brought to the attention of the appropriate person. There is recourse to statements such as, "it is necessary to define an aggressive policy", "it is necessary to study the possibility of granting increased authority", "it is necessary to carry out a publicity campaign", "it is necessary to draw up a plan", "more authority should be given to Water Authorities", "information should be centralized", without indicating who should do it, when, how, and where.

This form of expression is due, above all, to a lack of knowledge or to the absence of communication channels between the active, direct, and

indirect actors involved in the proces of water management. A large part of the decisions of the indirect active actors which affect management of water resource are not even taken intentionally, but in a state of ignorance of the impact such decisions could cause. For example, a provision is included in an annual budget requiring tenders for public works, but whoever formulated it up forgot to include clauses for dealing with emergency situations caused by extreme phenomena.

The large number of possible interferences explains the effort to reduce the number of actors involved at the decision-making level of the process of water resource management, thus trying to achieve greater autonomy and authority for those in charge of water management. Nevertheless, these greater levels of autonomy and authority do not prevent the water management authority from having to resolve conflicts. It is true that they give him greater responsibility to enter into arrangements with multiple actors, reducing the number of uncontrollable factors and the diluting of decisions. Insofar as this responsibility is direct and controlled, it is possible to reduce interference without losing State control. The other possibility is to privatize the management process as far as feasible which has proved effective, above all in the management of water use, provided the State maintains a small highly technical team of specialists responsible for monitoring the application of the law.

2. Explicit and implicit criteria of the actors involved

The most difficult variables to pinpoint or define in a management process are the criteria which determine the decisions of the actors involved in that process, because these criteria are, for the most part, neither explicit nor obvious. In effect, they reflect the various interests, motivations and beliefs as well as the technical, political, economic, social, cultural, and environmental points of view of these actors.

The easiest criteria to identify seem to be those expressed publicly through conferences, plans, and laws. Nevertheless, and despite official declarations, the fact that they exist does not necessarily mean that they will be followed in practice. At times, for example, it is impossible to say that "a" water policy exists in a country, since, in practice, the application of this policy varies or is interpreted differently from one sector to another, from one ministry to another, and even from one local technician to another. This situation is even more complicated if there are constant changes at the directorate level or if the country is experiencing the constant dilemma between "privatization" and "nationalization", or between "decentralization" and "centralization". This results in some situations in which "public agencies" are created one day and sold to the private sector the next day; a little later some private agencies which had previously been sold are nationalized, successively passing from the private to the national, and vice versa. The same thing, but with other effects, happens in public departments, with the constant change of projects to programmes, of programmes to institutes, of general offices to general directorates, of special projects to development corporations, or of institutes to enterprises. In this way, some activities suddenly disappear,

while others reappear with other names, bigger or smaller, but almost always weaker as a result of the change.

Other fluctuating criteria are related to the remunerations of public servants. In general, those contracted for investment projects and programmes receive relatively higher salaries than career public servants. Nevertheless, not even national heads of large projects generally receive a salary that is commensurate with their level of responsibility (e.g., US$700 to US$1 200 per month, to head projects that involve more than US$500 million in investment). Career public servants are even worse off since they are paid up to one third of what they would receive on a project. This leads to a constant movement of career public servants to projects, from projects to national consulting agencies, and from there to other activities or countries. (Peru "lost" in less than 10 years more that 200 water resource specialists through migration to other countries, change of activity, moves to consulting agencies, etc.) Faced with this situation, the researcher asks himself what is the criterion that governs, for example, the attempt to save a few hundred dollars per month in personnel contracts, only to lose, on the other hand, thousands or millions of dollars through poor administration of the invested resources, or through lack of training to negotiate future investments? The answers may be "because of principle" or "in order not to create precedents" or "because he cannot earn more than the minister". Usually, while none of these criteria has a technical, economic, or social basis, they are nevertheless applied.

Other criteria are implicitly applied, for example, with respect to whether or not to charge the real value of water and of the hydraulic-engineering works constructed by the State. These criteria are difficult to detect, because the official position or the law can sometimes provide for exactly the opposite of what is done in practice. Thus, while officially and legally the farmers are charged the value of the water or of the hydraulic-engineering works constructed for their benefit, the State system simply does not charge or charges unindexed amounts, which in the short term are only symbolic or insignificant.

In summary, in several countries of the region, the criteria used are the most unforeseen, changeable, and least explicit variables of the water resource management systems. They will escape the unconscientious researcher who limits himself to evaluating the functioning of an organization only through its organizational structure, work plans, official statements, or progress reports. The reality is that behind each organizational structure there are other organizational structures which are invisible to the unconscientious observer, made up of commissions, work groups and groups of friends, unspoken agreements and rules of play, special interests in some zones of the country, and other factors which, although they may be logical to each actor or group of actors, can lead to situations exactly the reverse of the explicit government positions.

In light of this, the detection and constitution of a list of the criteria governing water systems management requires a meticulous research effort. This is important and necessary, because these criteria can explain much more clearly the behaviour of each actor involved in the management process.

III. PROBLEMS OF WATER RESOURCE MANAGEMENT

The consequences of inefficient water resource management are usually called "problems". To call the negative effects of a management process "problems", does not mean that the objectives pursued are clearly established, nor that these problems are sufficiently clear and explicit as to be tackled. It is therefore important to direct more attention to this aspect than is usually done.

On the question of water resources, two forms of expressing problems may be distinguished. The first is simply to point out some malaise, for example, the lack or excess of the resource or its bad quality. The second form is to point out the administrative problems which prevent the correction of these situations. These administrative problems will be a function of the prevailing management system (centralized or decentralized, private or public, etc.). Each expression of a problem will reflect only the particular objective of those who express it, which is not necessarily the feeling of all the actors involved. In practice, what is a problem for one of them is not necessarily a problem for the others.

In order to define the problems identified by the actors, it is important to have a system of classification and description for these problems, which indicates the objectives in the minds of those who identify them. Objectives and problems can be classified as technical, environmental, physical and administrative. These, in turn, can be political, legal, economic, financial, institutional, functional, social and cultural. The description of each one of them must in turn specify who identifies it as a problem, and why; what are its causes and effects; when are they observed, and who is adversely affected by them; what is the absolute and relative dimension of the problem, and what importance does it have in the context of other problems.

1. Technical, physical, and environmental problems

Technical, physical and environmental problems arise at the level of resource supply and of each one of its uses. Such problems are met through techniques of management of the physical (or hydraulic) system.

Problems inherent in water supply are caused by extreme natural phenomena, such as drought or floods, and improper use of river basins and of water. The most frequent negative situations at the level of the river basin are illustrated by the following hypothetical case:

A mining company located in the upper reaches of a river basin captures the water from the high slopes to treat its minerals. The washings are deposited in a small tributary of the principal river. The water circulating is contaminated with suspended and dissolved material. Farmers and rural populations on the shores down river cannot use the water from the main river because of this contamination and, what is more, some of them run the risk of being buried by the tailings which have been accumulating upriver. The construction of access roads to the mine and nearby towns increases the number of areas susceptible to landslides, and capable of sending sediments down to the river bed. Down river, a water supply company captures the river water and has to treat it at a high cost to decontaminate it and to eliminate the suspended sediment. Since the river is not regulated, the water capture system of this company suffers periodic damage caused by discharges of coarse water and sediment. The population and industries use the captured waters and then return them down stream without previous treatment. The farmers down river from the city use this contaminated water to irrigate vegetable crops, which are sold in the city markets. At the same time, the spread of urban zones and of paved areas into the higher parts of the city increases the surface run off, causing floods in the lower neighbourhoods because of the incapacity of the sewerage system to evacuate the rain water. Municipalities, pressured by urban-development and construction enterprises, grant urban-development licenses in flood-risk areas near to rivers. Other flood-risk zones are taken over by force by the poor, who construct flimsy dwellings. Both situations oblige the municipality to construct river defences which, unfortunately, confine the river and produce an accumulation of sediment deposits in less steep reaches of the riverbed which can cause floods from mere overflow. A number of narrow bridges increases this danger. For this reason, the municipality invests large sums of money to remove the sediment from the river. The increase in the discharge of water due to deforestation in the upper river basin and the run off from the urban zones expands the size of the areas downstream, which are liable to flooding. This seriously affects the farmers and rural localities situated in the low areas. These same farmers, who have irrigation systems for dry seasons, create salinization problems through lack of efficient drainage systems, which affect them as well as nearby localities and roads. At various points along the river, construction material is taken from the riverbed, without authorization which in some case has had positive results, but in others has led to flooding. At the mouth of the river sections of beach are not only highly polluted but also dirty as a result of the chemical, biological and solid wastes brought down by the river, which has reduced the flow of vacationers in these places.

In the same river basin other conflictive situations exist among the users, which are related to each one of the hydraulic-engineering systems built to use the water. These are, for example, sedimentation in reservoirs and a decreaase in their useful life; difficulties in avoiding contamination or in restoring water quality in the water system; the growth of undesirable aquatic plants in irrigation and drainage canals; accelerated deterioration of canals and pipelines through corrosion; the possible collapse of dams and tailing dumps, and, in general, of hydraulic-engineering works, on account of operating difficulties; abrasion or deterioration of hydraulic-engineering machinery; and other technical problems which occur daily as a direct result of inadequate management of the water supply.

To this already long list one must add environmental problems, which have been studied so extensively in recent years and which include situations of conflict related to inadequate management of supply and demand, and affect the ecological equilibrium and the health of man.

Putting forward the problems in this way, it is possible to set them down in the form of objectives. In this way, a "positive scenario" of the same situation can be offered, which is what was implicitly suggested in the exposition of the "problems". For example, a scenario based on the following statements may be drawn: "A mining company located in the upper reaches of a river basin captures the water from the high slopes to treat its minerals. The tailings are carried to relatively secure places and the water used is treated before being returned to the river. The river water thereby maintains its quality level ..."

2. Management problems (political, legal, economic, financial and others)

Managerial problems, within a management process, are those situations which are obstacles to or prevent the achievement of technical, physical, or environmental objectives which seek to enhance the quality of life and to promote development in general. Such managerial problems are divided into political, legal, economic, financial, institutional, functional, social and cultural categories.

These problems, identified in relation to a specific management and management organization objective, may be:

i) Problems associated with the integral or multiple management of water supply at the national, regional, river basin or water system level;

ii) Problems associated with the sectoral management of resource use.

Managerial problems will vary according to the degree of autonomy of the organization. Those agencies with less autonomy include, for example, general water directorates which are part of ministries, State secretariats, or national corporations. Other agencies such as water resource institutes and some public services, such as meteorological and hydrological services, and the hydraulic-engineering laboratories, usually enjoy greater autonomy. The so-called "special" programmes or projects, which are under the responsibility of ministries, institutes or corporations, are often governed by emergency laws, which enable them to make decisions without constant external interference. Public agencies are regulated by relatively independent systems.

Each level of independence has its advantages and disadvantages with respect to its management and, therefore, its own "problems"; the latter are expressed by the heads of each agency in various forms. When a head of one of these agencies, bodies or institutions says, for example, that he has "administrative problems", he will implicitly set a goal or objective of avoiding these problems, thinking that this will facilitate the achievement of his aims. In these cases, he may specify that his problems are lack of

authority, lack of autonomy, lack of resources, lack of representativity, lack of qualified personnel, lack of continuity of orders or lack of flexibility in decision-making. Equally he may decide to say the same thing in the form of requests, demands or suggestions, which, he believes, could help to overcome these problems. He could say, for example, that he "needs political support", that "the State should be made more aware of the importance of water management", that "more budgetary resources should be assigned", that "salaries should be increased" or that "water rates should be increased".

These same problems occur when efforts are made to co-ordinate action among the institutions concerned with water resources within a country, region or river basin. Statements concerning the lack of co-ordination or agreement among the various bodies are similar to the above. For example, it is said that it is necessary to "co-ordinate", to "ensure consistency" to "harmonize" to "adopt an interdisciplinary approach" and other similar expressions of good intentions.

Unfortunately, such statements rarely establish the order in which such problems should be resolved, or identify their causes or those responsible for their solution. The problems are only mentioned in a general manner, in the hope that "someone" will act upon the request or the message and translate it into a decision. The voicing of problems in this manner generally yields meagre or no results at all.

Much of the results of meetings, seminars and congresses loses its effectiveness precisely because the conclusions are expressed only as a long list of problems or demands, without specifying who should resolve the causes of the conflicts. Often, those who make these lists think or believe that they have already achieved the purpose of the meeting and, therefore, do not take measures to follow-up the inquiries in order to implement the proposed solutions. They limit themselves to publishing the conclusions and, at times, sending them to some authorities.

This situation changes radically when those who attend the meetings are the same ones who have direct authority to resolve the problems identified. For example, if the members of a user committee of an irrigation district hold a meeting, they may decide to impose upon themselves a tariff to maintain their irrigation systems. In this case the solution is direct.

Table 1 has been prepared to show the form in which the lists of problems or demands are usually expressed. This table shows a list of problems or demands such as would be put forward by: i) a user committee of an irrigation district and ii) a State director general responsible for establishing norms and providing assistance for the operation and maintenance of the same districts.

From table 1 it can be seen that, on both sides, there is ample knowledge of their problems and needs. Nevertheless, these are not sufficiently detailed to determine priorities for their solution; their causes and effects; the implicit objectives of each manifestation of the problems; whether or not there is a possibility of overcoming them all at once; the difficulties of doing so; possible ways of surmounting such

difficulties; those responsible for doing so. These are the principal elements which need to be known in order to pass from the stage of denunciation or demand to action. Therefore, precision in the definition of these elements is indispensable.

Table 1

LIST OF THE MOST COMMON PROBLEMS AND DEMANDS FOR SOLUTIONS IN PROCESSES OF WATER RESOURCE MANAGEMENT FOR AGRICULTURAL USE

From the point of view of the agricultural users

i) Physical-technical:

- Irrigation and drainage projects should be carried out in a large number of places where it is feasible.
- Studies should be carried out for the training or diversion of intermittent rivers to permit the more effective exploitation of water resources.
- A programme of rehabilitation and improvement of deteriorated irrigation systems should be considered.
- An evaluation of the urban, industrial and mining water used in agriculture should be programmed.
- Hydraulic-engineering works for the capturing, conduction and diversion of water towards scarcity zones should be carried out.
- Water which is carried to the fields should be measured.
- There should be an integral concept of the hydrographic river basin.
- There should be adequate control of groundwater and support for its exploitation.
- Machinery centres should be established to serve the water users committees.
- Measuring and climatological and hydrological information centres should be promoted in their sector.
- Projects for water diversion should be updated.

ii) Political-legal:

- The State should attach greater importance to better use of water in a country with extensive arid and semi-arid areas, and provide more support to farmers.
- Agricultural bank loans to improve field irrigation infrastructure should be rapid and at low interest rates.
- The management of water resources by the State should be conducted in a just and equitable manner. Everyone should pay the tariff provided for by the law, without waiving payment for large co-operatives.
- Technical management units lack equipment, personnel and even records, which disappear with each change of professional staff.
- Reinforce the water user committees, which should work in strict co-ordination with the State and which should be the real authorities over the water in river basins.

iii) Economic-financial:

- Pay such water tariffs and quotas as are fixed by the assembly and not those fixed by the State.
- The agrarian bank should continue the practice of carrying forward the debt of farmers who have had harvest problems, allowing them to receive new credit.
- The State should help to equip the users committees with machinery for the maintenance and repair of the canals and drains.
- The large sugar co-operatives should be forced to pay the water tariffs, which they have not done in the past, and which has been detrimental to the interests of other users.

- The State should regulate the situation of unregistered "makeshift" farmers, who take water directly from the main canals supplying the reservoirs and irrigate areas which are unsuitable for farming without paying for the water.
- The State should help to drill wells to exploit groundwater in order to compensate for summer shortages in the river.
- The users committees, in order to achieve their goals and objectives, need national and international lines of credit, with preferential and convenient rates of interest.
- Efforts should be made to establish agricultural insurance.
- Economic incentives should be established aimed at introducing and intensifying the use of technically advanced irrigation systems, including the exploitation of groundwater.

iv) Institutional-administrative:

- It is necessary and important to achieve union and co-ordination among the representatives of the water users committees in the country.
- The participation of members must be encouraged in order to improve the irrigation and drainage infrastructure and fix the water tariff at its real value, and, in general, in the plans and programmes of each irrigation district.
- In order to implement a hydraulic-engineering policy it is absolutely necessary for the national users committee to have the services of a technical economic team.
- The government should establish a joint standing "State/users committees" agency to guide the development of priority projects for the recuperation and rehabilitation of productive areas.
- As a political and institutional guideline it is essential that the management of each river basin should be the responsibility of a single competent and appropriate authority.

v) Cultural-educational:

- The training and technical instruction of the agricultural producer should be encouraged.
- Constant research is necessary, through agreements with the national universities, for better use and management of water resources.
- It is necessary to train water users in irrigation techniques for small farms and drainage techniques.
- It is necessary to encourage the user to participate in water-use committees, concerned both with canals and with irrigation district.
- The user should become aware of the integral functioning of water systems and of the importance of managing the river basin as a whole.
- The head office of each river basin should be equipped with maps, models, and audio-visual aids to permit them a better knowledge of the water system being used.

From the point of view of the State water management officials

i) Technical-physical:

- It has not been possible to maintain and operate existing water systems as necessary, through lack of resources.
- Some water systems have been seriously damaged by extreme natural phenomena, particularly floods, and resources are still not available to repair them.
- The natural heterogeneity of the country makes it impossible to dictate standardized technical norms for all irrigation districts.
- Water quality is not permanently monitored owing to the lack of specialists and equipment in the country, and when contamination levels are known the resources to reduce them are not available.

- Agricultural planting seasons are not controlled by cultivation and irrigation plans, resulting in semi-arid zones being used for rice cultivation, which further compounds salinization problems and reduces the supply of water to other crops.
- Excessive demand for water and political pressure make it difficult to store the technical reserves of water to partly ensure supplies for the following seasons, which means that some reservoirs do not fulfil their regulatory function.

ii) Political-legal:

- The formulation of the national plan for the rationalization of water resources should be completed and, as part of that plan, a national irrigation programme should be designed in order to channel investment into this area.
- More technologically advanced systems should be used for the irrigation of fields in order to enhance water use efficiency, improve existing canals and stop the illegal use of the resource.
- To plan the development of the river basins in such a way as to ensure the rational and efficient use of water. This planning should be at the service of a water management system which is legally recognized.
- To study and propose to the congress a draft of a general land law which would permit an increase in production and productivity.
- Greater financial resources should be allocated to the implementation of the general water law, which for years has not been fully applied through lack of political support.
- The law is not applied or complied with equally in all the territory.
- Water authorities should be respected by all sectors that use this resource.

iii) Economic-financial:

- Water tariffs are inconsequential because the user committees propose minimal tariffs, less than 1% of the production cost of the crop. (It should be a minimum of 4%.)
- The collecting of water tariffs and quotas as well as being low, is delayed, and many large debtors use influence to avoid payment.
- The fact that the water resource is subsidized distorts its value and encourages its indiscriminate use, creating serious salinization problems in the low areas and reducing the possibility of extending the agricultural frontier.
- The sums thus collected are insufficient to cover the operating costs of the irrigation district, let alone the costs of the maintenance and repair of the hydraulic-engineering structures.
- The central policies of the government create a serious imbalance in the allocation of resources, clearly favouring the construction of large hydraulic-engineering works to the detriment of the construction of irrigation and drainage canals, the physical development of lands and, above all, the operation and maintenance of existing systems and the management and conservation of the river basins.
- Salaries paid to water management officials are extremely low in relation to the technical level and responsibility required, which causes a constant drain of specialists.
- There are considerable and serious distortions in the allocation of resources for the construction of large hydraulic-engineering works and the construction of water distribution and evacuation systems.
- There is ignorance of the total quantity of investment in water resources per river basin and per year, made by different sectors and agencies. No mechanism exists for maximizing the returns on such investments.
- There are no financial provisions or insurance to deal with emergency situations caused by droughts or floods, either to provide assistance to farmers or to repair the damaged structures.

iv) Institutional-administrative:

- The technical administrator in charge of the management of the water system has lost authority as a result of the creation of broader regional agencies, to which he is answerable.
- As a result, there is widespread interference in the functions of local water authorities, not only by regional heads of the agricultural sector, but also by land magistrates and authorities outside the agrarian sector.
- The number, pay and equipment of the personnel at the technical management level of the irrigation districts is inadequate, and the contribution of the central government budget is increasingly lower.
- While the national general directorate issues a list of technical tasks to be carried out in each irrigation district, as well as the norms for their implementation, these cannot be carried out owing to the lack of resources.
- While there are numerous programmes and projects related directly or indirectly to the water resources in each river basin or system, these are not co-ordinated.
- There are sometimes considerable delays in the implementation of parts of irrigation programmes and projects, due to the excessive centralization of the allocation of public funds, bureaucratic red tape, changes in the purchasing power of the currency, etc.
- The technicians responsible for water management are changed too frequently, some through political decisions and others because of the low salaries that prevail.
- There is no register of the number and type of personnel trained in water management in the country nor is there any information as to how many are necessary.
- The fact that the management of water is the responsibility of the Ministry of Agriculture limits or prevents the multisectoral handling of this resource.

v) Cultural-educational

- There are few irrigation districts in which all the users participate fully and consciously in the management of water.
- In many irrigations districts, a large number of users seek to pay minimum tariffs for water or not pay anything at all while demanding State funds for the repair and maintenance of hydraulic-engineering works to which they have not contributed either. They demand a form of paternalistic government.
- Following the same principle, many users insist on and demand the construction of hundreds of hydraulic-engineering works, principally for irrigation and drainage, as well as special credit and tax treatment, repairing of structures, flood defense, etc., for which no funds are available in the State budget.
- There is no extension service for irrigation, or resources to create one. Research and training or instruction are almost non-existent in the countryside. There are no training centres in each irrigation district nor are specific centres being constructed for the management of water.

Source: Conclusions and papers presented at the First National Congress of "Charles W. Sutton" User Committees, held in Chiclayo (Peru), 24 to 29 September 1987; "Special Report", Pulso Norteño (periodic review), Year III, No. 26, October 1987, Chiclayo, Lambayeque.

IV. OBJECTIVES OF WATER RESOURCE AND SYSTEMS MANAGEMENT

1. Ways of expressing the objectives

There is a wide range of modalities for expressing and proposing objectives related to water resource management. All these expressions of objectives are valid for daily communication, but do not in themselves help to achieve the objectives. Therefore, in order to actually achieve something, it is necessary to appropriately describe, classify, and set priorities for the objectives according to their importance and the sequence in which they will be carried out. In matters relating to water resources, it should also be made clear whether these objectives are related to the management of the physical system or to the institutional system and its elements.

The various actors, agents or participants in matters related to water resources rarely express their interests as objectives. As mentioned in the preceding chapter they are more likely to speak of "problems", which often reflect the effects of a situation and not the causes, and to demand a solution to resolve these "problems", also without identifying either who should do it or how. The logical course of action would be to identify the causes of the detrimental situation and to fix as an objective the elimination of these causes, proposing a sequence to achieve it.

There is also no concern to situate demands within the context of a water resource management process (physical, institutional, etc.). Moreover, each one expresses his personal point of view or that of the group, without knowing if, in order to resolve his problems or satisfy his demands, other persons or groups are necessary or are called upon to make sacrifices.

In practice, it has been shown that institutions and institutional systems which work in water-related areas are usually ill-prepared to identify and classify the objectives of the management of the physical system, which are often contradictory or mutually exclusive. In general, faced with multiple demands, they fall in the sterile game of saying yes to all demands, giving in to political pressures, as though it were possible to satisfy everyone (with the result that they can satisfy no one, since if everything is given priority, nothing is a priority).

On the other hand, if a system is available, objectives can be classified and ordered according to various accepted aspects and criteria. Technically, for example, it may be determined:

a) Whether they are mutually exclusive (because they occupy the same geographic area, depend on the same source for their economic resources, seek to use the same water supply, or other reason).

b) Whether they are complementary or mutually dependent.

c) Whether they are unrelated to or independent of each other.

d) Whether they have different levels of importance. For example, if they include other objectives of less importance or, inversely, if they are part of more significant objectives.

They can also be defined politically according to their contribution to the development of poor areas, the creation of jobs, strengthening of food security, saving of foreign exchange, etc.

A review of studies undertaken on water resource management shows, however, that little attention has been given to this classification exercise. One finds, for example, in addition to the objectives of managing the physical system (areas to be irrigated, reservoirs to be constructed, etc.), that an irrigation project is intended to "create employment", "increase exports", "generate foreign exchange", "promote social peace", "enhance food security", among various other aims. These global objectives are rarely related to each phase of the project, nor, in particular, is any mention made of how much additional investment is required to achieve each of these aims. A set of social and economic objectives are simply attributed to the "irrigation project" or to "water management", without making clear that employment can only be generated and production increased, for example, if other inputs and investments, which are not considered in the water-supply phase, are made available.

It is therefore very necessary to classify and rank the objectives by order of priority, separating the objectives of the management of the physical system (water system) from the objectives of the institutional system (management system), and establishing a mechanism for achieving them at each stage of execution. In the process of management of the physical system (or water system) the global or macro-objectives may be expressed, for example, in the following manner:

"To maintain a dynamic equilibrium between the supply of and demand for water, expressed in quantity, quality, place and time of occurrence, in order to satisfy the needs of man and of the environment which sustains him, and, at the same time, to prevent, control, or mitigate the external phenomena which affect them, such as droughts or floods."

This form of expressing an objective, which causes little controversy at first sight, implicitly expresses hundreds of goals, some of which are mutually exclusive. The phrase "to maintain a dynamic equilibrium" implies a system of management that involves the participation of many actors, each one seeking his own interest in the face of changing situations. Such management also includes technical and administrative aspects, which should be differentiated.

In practice, this global objective is sometimes expressed as a function of some partial or secondary objectives or goals, without establishing their relationship with the overall goal. For example, expressions of objectives may be found, such as:

"To ascertain the available water resource potential, or to augment the information base on such potential, as well as the possibility of using or reusing the water resources for multiple purposes without deteriorating or depleting them."

"To use in an efficient and equitable manner the water resources regulated by hydraulic-engineering systems constructed with a view to maximizing production per unit of water, the social welfare of the population served, and the conservation of the environment."

"To determine the possibilities and priorities of investment in water projects for irrigation purposes (or others, such as hydropower), in order to allocate available financial resources in such a way as to improve the living conditions of lower-income peasants or to increase production", etc.

The great challenge lies in breaking down these objectives of the management of the physical system, which are still too global into the hundreds of partial goals of which they are comprised. Only in this manner will it be possible to determine which institutional systems and institutions are most suited to the achievement of these objectives, and in what form. It is important to remember that it is first necessary to clearly define the functioning and objectives of the management of the physical or water system in order, secondly to determine the functioning and objectives of managing the institutional system and the institutions that will manage this physical system. One of the major errors to be avoided is the analysing of the institutions per se. It is not logical to first create an institution and then ask what it is going to do. The process should be reversed. The needs of men and nature are studied, and then institutions are created that are capable of satisfying these needs.

It must be remembered that, technically, water systems or river basins are open systems in which each one of the hundreds of users, public or private, feels he has the right to participate by seeking to fulfil his particular objectives, without worrying about the effects which such participation could have on others. As a consequence, many of the institutions working in water-related areas are well organized to fulfil the specific function for which they were created, but are not organized or equipped to work as a team. This means that an agency which works perfectly well, seen from its particular perspective, may be working very badly if it is examined, for example, in the light of its activities in a river basin. What has been termed in this article "institutional system management" must seek to avoid and correct these situations.

Although this is very necessary, unfortunately, water systems are still open in many countries to intervention by public and private agencies, whose activities are not co-ordinated, with each one deciding for itself what it will do with the water, thus leading to inefficiency and duplication of activities.

2. Agents and objectives

In order to rationalize the process of water management, there is need for a water (or environmental) authority, with sufficient technical and financial autonomy to permit it to co-ordinate the participation of the many actors that are involved, and thus to manage the supply of water and rationalize its use in function of shared needs.

The lack of authority leads to pathetic cases of confrontation even among government sectors themselves, which promulgate laws that are mutually contradictory. In one case, for example, the fishing sector granted a license for the installation of a trout-breeding station, which was built at a high cost. A little later the mining sector, without consulting, granted a license to exploit a mine and to discharge tailings in the same river, up-stream from the breeding station. One sector may create a reserve or a national park, while another grants licenses for petroleum exploration, another authorizes fishing, and a third promotes the construction of a highway in the same area recently declared a reserve. In some cases, the same sector simultaneously issues management instructions which cancel each other out or have the opposite effect to that intended. A minister, for example, in order to gain sympathy or avoid confrontation, may refrain from increasing the water rates, which serve to maintain canals and drains, thereby allowing these to deteriorate and ruining the very farmers who were supposed to have benefited.

The major difficulty in directing the process of water management and its multiple uses is due, in large part, to plain ignorance on the part of many of the actors of the effect of their decisions on the hydrological cycle, and to the freedom or impunity with which they can participate in that process on account of the absence of a visible authority to guide them, explain to them what may occur and, where necessary, not to authorize negative participation.

a) Some users are genuinely unaware of the repercussions of their decisions on other users and on the hydrological cycle.

b) Others have short-term political priorities and are not interested in the medium- or long-term effects of their decisions nor in their consequences on persons who are not political supporters.

c) Others have economic priorities, such as the construction of new hydraulic-engineering works or the appropriation of water for mines, because they mean loans and an inflow of funds, without being concerned about their adverse effects on the quantity or quality of the water used by the population downstream.

d) Others are simply incapable of implementing the measures which they know should be adopted, because they do not have an adequate institutional management system.

3. Breakdown of objectives and goals of a water management authority

To correct these situations it is necessary to make the actors aware of the repercussions of their measures on water resources. The first step is to identify and break down the explicit and implicit objectives expressed by the actors involved and to determine the technical and administrative viability of each objective, taking into account their interrelationships.

By way of example, table 2 contains a list of periodical and contingent activities which are necessary to operate and maintain an irrigation district, that is, a disaggregated presentation of goals which, taken together, permit the management of water use for irrigation purposes. Such activities may be detailed even further, specifying the practices, tasks, and steps which comprise each one of them. As in more complex situations, the execution of these tasks requires an institutional management system. The disaggregate list of goals makes it possible to establish what organization and resources will be necessary for achieving them.

The head of the irrigation district should also concern himself with management activities to ensure that technical activities are carried out at the appropriate time. Such activities include:

- Management and advisory services
- Formulation of criteria and policies
- Planning of periodic activities and projects
- Legislation or regulation
- Financing and budgets
- Contracting of personnel
- Teaching and training
- Research and experimentation
- Supervision
- Control
- Granting of water use rights.

Table 2

LIST OF ACTIVITIES TO OPERATE AND MAINTAIN
AN IRRIGATION DISTRICT

Organization of the district

- Preparation of the organization and function manual of the Water and Soil District (DAS)
- Preparation of the diagnostic study of the DAS
- Subdivision of the DAS up to the point of irrigation units
- Promotion, organization, andapproval of the establishment of organizations of users or beneficiaries of the irrigation systems
- Register of water use permits granted officially
- Service to water users
- Other functions which will be added as necessary

Hydrologic and hydrometric activities

- Preparation of a preliminary inventory of water resources
- Register of daily discharges of the rivers
- Monitoring the volume of water stored in reservoirs and regulated lagoons
- Piezometric controls
- Monthly balance of water in reservoirs and controlled lagoons
- Monthly register of ground water exploitation
- Taking and sending of water samples for quality control
- Control of well-drilling for the purposes of ground water exploitation

Operation, maintenance and improvement of the irrigation infrastructure of the DAS

- Preparation of the annual programme of irrigation, drainage, and shore defence works, etc., with inter-institutional co-coordination
- Programme of installation of mechanisms for the control and measurement of water
- Preparation of an annual programme of infrastructure maintenance
- Other activities which will have to be added as necessary

Operation of the land and water district

- Inventory and inventory updating of works for water use
- Inventory and inventory updating of irrigation and drainage infrastructure in each irrigation system, and of communication routes
- Preparation of agricultural use patterns per unit of irrigation and its updating
- Preparation of instruction manuals for the operation and maintenance of large and small hydraulic-engineering structures
- Preparation of operation and maintenance regulations for the DAS
- Drawing up of plans for cultivation and irrigation in each system
- Drawing up water distribution plans for each system
- Control of water distribution through canals and control points
- Daily monitoring of water distributed by each individual unit

- Monthly report on water delivered by each independent unit
- Monthly report on irrigation and crops

Rates

- To promote the introduction of charges for water used for agricultural purposes
- To begin preliminary economic studies to determine possible future tariffs per cubic metre of water, to ensure that such funds cover the operational, maintenance, and management costs of the DAS, through the user organizations

Concession of land for irrigation purposes

- Register of land made available for purposes of installing new irrigation systems using surface and/or ground water
- Granting of resources for new irrigation projects which have been approved

Other tasks according to future needs

- Making use of economic and financial incentives and of fines levied
- Encouraging participation
- Acquisition of materials, equipment, etc.

The undertaking of all these activities, practices, tasks, and steps for irrigation purposes should, in turn, be co-ordinated with the objectives of multiple water-use management. Only in this way is it possible to determine the relative importance that should be attached to each goal or objective. The following steps will consist in determining the limitations, solutions, and strategies for achieving them.

Source: General Directorate of Water and Lands, Ministry of Agriculture, Peru, 1979.

V. ORGANIZATIONAL STRUCTURES AND ENVIRONMENTS WITHIN WHICH OBJECTIVES MUST BE ACHIEVED

1. Variants of organizational structure and management environment in the field of water resources

The systems which demarcate the limits of authority and characterize the organizations that participate in the process of water management in the countries of the region are many and varied.

Institutions or organizations involved in the management of water resources may exercise authority in the country (at the level of the region, state, department, or their subdivisions), in a river basin; or an interconnected system of river basins, or they may do so only in a city or town, or a part thereof. They may operate multisectorally, sectorally, or subsectorally, and their management system may be vertical or horizontal. They may, in addition, be public, private or mixed, and operate as a standard-setting or executory agency.

The proposals for improving the management of the institutions responsible for water management need models to evaluate their functioning at both the collective and private levels. These models may be designed on the basis of an adequate knowledge of the reality of the water systems of the country, or from models or scenarios brought in from outside. These models will give a "macro" or inter-institutional vision. Each one will present the same situation, with the only difference being that the scenarios of each one will correspond to different interests. Once the settings are available, proposals may be made with the aim of:

a) radically changing the structure of existing institutions and organizations and the environment in which each of these operate, by granting them, for example, greater autonomy and their own sources of financing, merging various scattered entities, privatizing some services, creating mixed agencies, or creating authorities with responsibility, for similar river basins;

b) improving the functioning of each one of the existing organizations without modifying its basic organizational structure and respecting its existing operating areas; for example, by training personnel, increasing budgets, acquiring modern equipment, granting the head of the organization greater facilities or authority to make decisions, and by adopting other reforms which strengthen its internal functioning;

c) improving the action of the multiple organizations that participate in the management of the physical system. As already mentioned, this means that the various units should work in a co-ordinated and concerted manner, avoiding duplication and interference, above all when they are operating in the same river basin or water system.

Annex 2 shows the efforts of a State agency —in this case, the General Directorate of Lands and Waters of the Ministry of Agriculture of Peru— to enhance the efficiency of water resource management without changing the basic structure of the system, as well as recommendations made to improve co-ordination with other institutions in the same sector and in other sectors.

2. The institutional environments of water resource management

In order to illustrate some of the variations in organizational systems operating in the region, four situations have been examined.

a) Authority for the management of the national water supply is shared among various bodies, as is the authority for the management of water use. This situation may be described, in other words, as the lack of a single responsible authority.

b) While the national management authority is administered by a single agency, the latter has neither the resources nor the strength to act. In some situations, this authority may also manage one of the uses of water (irrigation, energy, etc.).

c) The national management authority is exclusively sectoral, and is therefore only involved in one use, for example, drinking water and sanitation. This authority may or may not be empowered to manage the water supply in the river basin from which it is obtained, depending on whether or not an authority exists for the management of such supply.

d) The management authority exists exclusively for a river basin or system of river basins. In this case, the authority may be responsible for the management of not only the supply, but also of each of the many possible uses of water. These authorities are sometimes created alongside existing national authorities, which causes institutional conflicts.

Each of these four situations is examined separately below.

a) The case in which a number of different national authorities are responsible for the management of water resources

This is probably the most common situation in the region. Supply management is the responsibility of several institutions, each one of which is involved in multisectoral activities or in activities for the exclusive benefit of its sector. Moreover, there is no differentiation of authority between the management of supply and the management of each use; nor is there

any agency which manages both surface and ground water, at the same time, or undertakes all the stages of a project.

This situation covers agencies that are multisectoral, sectoral, and subsectoral in nature. At the multisectoral level, for example, some centres, institutes, or general directorates may operate, such as a meteorological and hydrological service, a national institute of natural resources, a national hydraulic-engineering laboratory (sometimes attached to a university and at other times an agency of a ministry or a development corporation), a multisectoral commission for the rationalization of and planning for the use of water resources, and a water quality control directorate dependent on the Ministry of Health.

At the sectoral level, principally in ministries and public agencies, there are corporations or institutes related to a specific sector; these bodies carry out studies, formulate projects, and execute hydraulic-engineering works separately. In many cases, some of these sectors have better professionals, equipment, and capacity than the national services themselves. For example, hydroelectric power agencies usually have greater resources for their teams of hydrologists and meteorologists than the national meteorological and hydrological service.

In this situation, each one of these sectors is in charge of the operation and maintenance of the existing hydraulic-engineering systems. In such cases, river basin management, resource conservation, and control of extreme phenomena, such as floods, constitute a "no-man's land", since, generally speaking, no user sector is responsible for dealing with the environmental problems caused by the water supply and by the different users, unless they are directly affected. At the national level, since in these cases there are no agencies in charge of the overall management of water supply, responsibility for river basin management, flood control, and water quality control is shared by various bodies, many of which perform only part of their work owing to the lack of resources to fulfil their functions.

In these circumstances, there is near anarchy in the management of water resources, to which a solution is being sought through the creation of co-ordination commissions, and direct accords or agreements between agencies to resolve the concrete situations affecting them. Generally, these are relatively unsuccessful stop-gap measures, lasting only the duration of the emergency.

b) <u>The case of a national authority with exclusive responsibility for the management of water supply and also responsible for a sectoral use</u>

This situation occurs when, in order to resolve the anarchic situation previously described, "a national water authority" is named, but this authority is located within a specific sector. The case of agriculture is an example. Since agriculture is at the same time one of the principal users of the resource, a situation of duality is created. In effect, responsibility for managing the overall water supply is shared with responsibility for the management of one of the most demanding uses-irrigation. Moreover, management of water use for irrigation purposes is divided up into the phase of

formulating and executing irrigation projects (executive) and the phase of operating and maintaining irrigation districts (technical/policy-setting). On the other hand, the designing of large irrigation projects is usually done by an institute or special project which is outside the agricultural sector (being either a semi-autonomous project or the project of a development corporation) while the execution of small irrigation and drainage works is performed by agencies located within the agricultural sector itself, which have a certain degree of independence. In other words, the actual designing and execution of hydraulic-engineering projects is divided up among various bodies within and outside the sector responsible for this function.

If the overall management of the water supply is, by law, the responsibility of the agricultural sector, the maximum authority over the resource is the Minister of Agriculture. This implies that the agricultural sector, by law, must ensure the rational use of the resource in keeping with the needs of the country. This does not mean, however, that this sector is able to exercise such authority, because it does not have control over all the aspects necessary to achieve an integral management process. Thus, for example, the meteorological and hydrological service may come under the Office of the Prime Minister, or the Ministry of Aeronautics. The office of renewable natural resources may also be the responsibility of the prime minister, while water quality and pollution control may be the responsibility of the Ministry of Health.

In practice, there is usually no office which has clear responsibility for flood and drought control. In fact, the agricultural sector is only involved in protecting agricultural fields and irrigation infrastructure, which is the responsibility of the general directorate of water and of the irrigation districts. This does not discharge them from the responsibility, however, of collaborating with the other sectors, in cases of catastrophe, or of carrying out works of river training and cleaning and flood control, which serve to protect urban areas and transport facilities, as well as to protect agricultural zones. The management of the upper river basins is not clearly assigned either. Theoretically, it is a responsibility shared by the general directorate of water resources, the general directorate of forestry resources, and multiple users, so that, in the final analysis, it is not clear where final responsibility lies. As in the other cases, the lack of expressly responsible authorities, or their failure to operate as such, leads to the emergence of national programmes ("paraformal") of river basin management, irrigation and drainage, flood control, soil conservation, and other aspects, which operate under special régimes.

By way of example, and in contrast to this situation, in some European countries, such as France, the global management of water supply, at the river basin level, is the responsibility of a non-user sector (environment) and is performed by semi-autonomous agencies. In the example offered, the double function of the director general of water as overall manager of the resource and as manager of the use of water for agriculture, leads to incompatibilities. Moreover, the control of the use of water for agricultural purposes takes up most of the director's time, thus lessening his capacity to manage the supply. This duality is better seen at the level of the so-called irrigation districts, which cover a river basin or river basin system. The technical manager of the irrigation district is the water authority for

multiple use and, at the same time, head of irrigation. This lessens his authority vis-à-vis users from other sectors, seems he is both judge and party and is responsible for a specific sector.

Although the water users committees in agriculture recognize the water authority in matters of the use of water for irrigation, they are not clear as to where they should submit their applications, for example, for the construction and improvement of multiple use or quality control hydraulic-engineering works, given that these are dependent on "other sectors" which are not represented in the river basin.

It is interesting, however, to note that, in this case, the country taken as an example has one of the most advanced water resources legislations; also, its territory is clearly divided by river basins; it possesses high-level technology and technicians; moreover, its agricultural users participate and organized themselves very actively.

Nevertheless, neither the water "authority" in each river basin or irrigation district, nor the national water "authority", has sufficient power to act as the law requires. This is largely due to the aforementioned sectoral dependency, to the duality of functions exercised by the director general, and to the high degree of interference in the process of water management by other sectors, or, conversely, to the absence of these other authorities in the regions.

c) Case in which the management authority is only concerned with one use of the resource, for example, drinking water and sanitation

In various cases it happens that a water user, such as a drinking water supply and sanitation enterprise, is only interested in capturing and evacuating water, without concerning itself with the management of its supply. In other cases, perhaps by law, it is not permitted to intervene in the capturing river basin, even though it may wish to do so, "because this is the responsibility of another agency", which, as often happens, is unable to fulfil its obligations owing to a lack of resources. In other cases, this stumbling block does not exist, and drinking water and sanitation enterprises invest in the regulation of the water supply by constructing reservoirs, treatment plants, and drainage canals (especially when the enterprise is responsible for supplying large urban centres), and even by undertaking the activities of managing municipal river basins and controlling the quality of water.

The first case usually occurs in river basins with abundant supplies of good quality water, that is to say, the drinking water supply enterprise only has to capture the available water supply, without the need to regulate the discharge of water from the river. The second case also occurs in river basins with an abundant water supply, but in zones in which the capturing river basins have greatly deteriorated, so that the drinking water supply enterprises and the municipalities, instead of capturing clean water, receive sediments or suffer floods. In these cases, there is generally little which the "sector responsible for the resource" can do. If the municipalities want to take over the management of the river basin, they have to opt for

declaring it "municipal", a solution still little used in the region. Neither is it customary, with few exceptions, to treat waste water before returning it to the rivers or reusing it in agriculture, nor to replenish the ground water layers during periods of high river-flow. It is also common to "prohibit farmers from using water contaminated by the city", without considering that it would be more just for the city itself to decontaminate this water before discharging it into outlet channels and rivers. The pumping of ground water is also permitted without the establishment of replenishment zones. Often the city itself, with its growth, destroys agricultural areas and the irrigation systems which were natural replenishment centres, while at the same time increasing the pumping of water. With this system, the city has condemned itself to a situation of water shortage in a relatively short period of time (the case of Lima, Peru).

In some cases, urban centres take over or use almost free of charge, the water supplied by hydraulic-engineering works constructed by other sectors, such as dams for irrigation and energy and water conductors for hydroenergy purposes. Where an integrated management system does not exist, the agencies in charge of these works are not compensated for the benefits they provide. Neither are these agencies sanctioned if they cause effects that are harmful to the interests of the city.

d) <u>The case in which there is an authority responsible for the management both of the supply and of the multiple uses of water</u>

Ideally, a State or para-statal water authority should be in charge only of managing the water supply and should allow each use (in keeping with the norms established for the benefit of all) to be managed by independent management systems, which should be private where possible, reserving a supervisory function for the State.

In Latin America and the Caribbean conditions are still not ripe for the creation of "water authorities" dedicated exclusively to the management of the water supply and to the regulation of its multiple uses. In Europe, as in the case of the country already mentioned (France), river basin agencies or water authorities have enough "clients" or users capable of paying for water use, for the control of the effects of extreme phenomena, and for preserving the quality of the resource. This provides the water or river basin authorities with the income to build large works for the regulation of discharges and for water quality treatment, as well as to operate the hydraulic-engineering systems constructed. In the rural river basins of Latin America and the Caribbean, although there is relatively less need to control the quantity and quality of water, often there is not even a minimum capacity to carry out this control. In fact, a small industry in Europe is more capable of paying for its water treatment systems than a small mining company located in a remote Andean region. Both can cause similar damage, however, and the damage may even be greater in the second case by contaminating previously intact zones. In river basins which supply large urban centres, the situation of Latin American and Caribbean users is similar to that of Europe, that is to say, there is a sufficient number of users who pay for the use of the resource, even though, without doubt, the economic power per inhabitant is different.

Another important aspect is the extent to which the national territory is effectively occupied and the relative size of the hydrographic river basins located in the zones under the authority of the river basin or water authorities. Two European countries (France and the United Kingdom) have been able to divide up their territory into six and 10 river basins or water regions, respectively. In many countries of Latin America, above all the Andean countries, there are dozens of independent river basins, in both the Pacific and Atlantic watersheds. While this constitutes, on the one hand, a technical advantage, since contamination problems and the need to regulate discharges are independent, it creates, on the other hand, the administrative problem of supervising 10 or 20 river basins, which though nearby are of difficult access, or, otherwise, the problem of having to create 100 or more independent "river basin agencies" in a single country. On the other hand, the larger basins, such as those of the great tributaries of the Amazon, and of the Orinoco, are so extensive, since they cover the territory of more than one country, that they cannot be managed by the authorities of a single country. On the contrary, exclusively national and relatively large basins, such as the Cauca in Colombia, or very large ones but which fall entirely within one country, such as that of the San Francisco river in Brazil, have been the most suited to having autonomous and semi-autonomous management systems, which in many cases permit them to manage both the supply and the multiple uses of the water. While the relative size and the degree of effective occupation of the territory of a basin are not the only elements that determine the creation of a management system, they undoubtedly contribute to it.

Communication and transport difficulties, which still exist in many river basins in Latin America and the Caribbean, constitute obstacles to the integral management of the water supply. This problem is accentuated when it is a question of managing two or more interconnected river basins located in regions of high mountains, such as the high Andean zones, or of managing very large river basins, even those wholly located within the territory of one country, such as those in Brazil and some of those in Colombia.

On account of these restrictions, the process of establishing a system of global management of the water supply in each river basin or interconnected system in the countries of the region will be, relatively slow in attaining a national scale. Meanwhile, as may be expected, it will proceed in those river basins or interconnected systems which fulfil the following requirements:

a) A sufficient number of users in the river basin (urban, industrial, energy, mineral, and agricultural), interested in controlling the quantity and quality of the discharge of water, both to use it and to provide protection from negative phenomena, and who have the economic resources and necessary interest to invest in it.

b) A river basin or river basin system that is sufficiently large in terms of its physical size and the size of its population, but above all, one which provides an adequate supply of water to areas of high demand, as to become the object of political and economic attention. This river basin may be inhabited, or serve an inhabited region through hydraulic-engineering works for water transfer or hydroelectric power. In the first case, it is more likely to be the object of attention.

c) A communications and transport system that is efficient enough to permit global management of the water supply and to control the use of the resource in one or more river basins.

The process of global water management in a river basin or in interconnected systems is usually initiated with the formation of "river basin commissions" or equivalent agencies, the creation of special river basin development projects, or the creation of river basin development corporations.

The main function of many, if not all, existing hydrographic river basin authorities in the region is to manage water use (demand management), which means that they manage the water supply only in function of their particular interests. If these users belong to a single sector, e.g., a hydroelectric power generation enterprise or the agricultural sector, they will manage the supply in such a way as to satisfy only their own sectoral needs. Since they are responsible for some phases of the supply, however, they are obliged to control floods and droughts, to decontaminate the water which they are going to use, to construct hydraulic-engineering works for multiple use, or to take action to prevent the sedimentation of reservoirs (as in the Paute river basin, in Ecuador).

Of the various options examined, the creation of autonomous river basin authorities currently seems to be one of the best ways of improving the integral management of water resources, especially if it is compared with the near anarchy that exists under other systems.

VI. IDENTIFICATION OF CONSTRAINTS FOR THE ACHIEVEMENT OF OBJECTIVES

1. Differentiating between problems and constraints encountered in water resource management

Extreme natural phenomena, such as the flooding of an inhabited and cultivated valley, have a series of harmful consequences, such as loss of human life, destruction of communication routes and dwellings, and the loss of harvests, which in turn result in economic losses, food shortages, and the proliferation of disease. These effects, as mentioned at the beginning, are usually categorized as "problems".

In order to avoid, mitigate, or prevent these problems, man can adopt a number of measures simultaneously. The first is to try to deal with the causes of all these problems, which would be achieved if floods are prevented by regulating water discharge through dams, managing the river basin, and channelling the river. If man could be sure of preventing floods nothing else would be necessary. If it is not possible to be completely sure of this, he may choose, as a second solution, to avoid the effects of the floods, by making himself more resistant to their effects, creating insurance systems to compensate for losses, and establishing an early-warning system for when they occur. Finally, as a third solution, he may avoid being subjected to floods, by not occupying areas that are liable to flooding. (The situation is similar to the attitude towards diseases: wipe them out, live with them, or avoid contagion.)

The three options constitute some of the objectives of a process of water management within an area defined as a river basin. The limitations are the constraints which must be overcome in order to achieve these objectives within the area. Such constraints can be physical, technical, political, juridical, economic, financial, institutional, administrative, social, or cultural. Also, a difference must be made between those constraints which are endogenous to the area and those which are exogenous.

Among the constraints or limitations (arising from the management of the institutional systems) on the achievement of the choices mentioned in the example of floods, are: the lack on the part of the responsible institutions of financial resources to build defenses, the ignorance of the persons who settle without municipal assistance in areas liable to flooding, the lack of earth-moving equipment, etc. Exogenous constraints which may also be mentioned and which indirectly affect this matter are those aspects which appear to be quite unrelated to the problem, such as the external debt,

poverty, the lack of political support, and many other obstacles which make it difficult to achieve the objectives of overcoming, avoiding, or preventing the problems or effects of floods. However, since they are so remote, there is little point in analysing them in order to enhance institutional efficiency.

Even putting forward all these ideas, this long list of constraints is not useful for decision-making if each point is not previously ordered and given a priority. Generally, this is not done or is done only superficially. It is claimed, for example, that everything would be solved with a change of head, with more money, with more education, or with more personnel. This is also expressed conversely, since, to the question as to why the objectives are not achieved, it will be pointed out that it is because "there is no equipment", "nobody is interested", "there is no personnel", "there is no money", "everybody is leaving", "there are constant changes of head", or "nobody listens to us". These statements are made without study or support and, therefore, are not taken into consideration.

The lack of rigour and seriousness in seeking out and identifying the real obstacles to achieving the goals weakens the statements and prevents solutions from being found and proposed. The identification of obstacles is not necessarily easy, but it is necessary. The real stumbling blocks are not always evident and are sometimes hidden in individual or group interests which are not explicit. Nevertheless, they can be discovered by systematic work.

2. Training as one of the options for overcoming constraints

An example which illustrates how little purpose is served by not researching the real constraints to improving water resource management is the case put forward by Neil F. Carefoot (in Developing World Water, Grosvenor Press International). According to this author, on the subject of the management of water resources for the purpose of supplying populations, the reports of many countries persistently point out that the greatest obstacles to improving the operation of drinking water and sanitation systems are the "lack of qualified human resources and the lack of financing". While recognizing the seriousness of these two obstacles, the following questions must be asked:

- Are the country's human resources qualified in water resources employed according to their capacity? Do they remain in the country?

- If more personnel and more financial resources are assigned will existing problems be resolved?

- Are the technicians highly qualified and duly trained, and have they the aptitude to carry out management tasks, such as motivating personnel, developing public relations, and managing budgets?

- Are the ministries or institutions equipped to provide their specialized functionaries with the necessary conditions and support to adequately carry out their work and not abandon their country?

In the great majority of cases, however, highly qualified personnel may be and even if financing exists, the answer to these questions will be a categorical no.

Among the explanations of these negative answers are the following:

- The existence of innumerable unwritten constraints resulting from conflicting authorities and from regulations which are uniformly applied to the entire public system, without taking into account the particular characteristics of water system management, and which preclude the possibility of applying high-level technical measures at the precise time and place (auditing regulations, budgetary spending laws, public administration laws, as well as political pressures, for example, to build in zones liable to flooding, exploit ground water in areas subject to sea-water intrusion, etc.).

- The lack of incentive to make a career in the public or private sector in the field of water resources on account of the subordination to a hierarchy that is determined by a ranking system which takes account only of one's position in an organigram and not of the responsibility inherent in the task performed. (For example, to situate the head of an irrigation district of 150 000 hectares —responsible for the management of two reservoirs which store more than 1 billion cubic meters of water— at a hierarchical level located various steps below the level of the regional director. This means that he cannot receive a salary of more than US$50 per month and that everyone above him in the hierarchy feels he has the authority to take away from him even his work vehicles. He is nonetheless responsible for managing hydraulic works valued at millions of dollars!)

- Having qualified and well paid technical personnel who cannot work because of the lack of equipment with which to work, the lack of assistants, and the lack of support for putting their ideas into practice.

- The lack of policies and working guidelines to orient the institution towards team work with clear goals. Lack of a system which rewards or removes personnel, according to their degree of competence. Lack of incentives to undertake advanced training.

Faced with this set of observations, it can be appreciated that the objective of "personnel training", in itself will not improve the existing situation, if it is not accompanied by other measures which ensure the integral organization of the management process.

In other words, global goals cannot be met by eliminating only one constraint, but rather a set of interrelated constraints. Constraints must also be identified and overcome by establishing priorities. Otherwise, and pursuing the example of training, a situation may arise in which, following a programme of scholarships, 500 specialists are available, but there is nowhere to place them and no budget with which to pay them. Provision must also be made, where vacancy and budgetary conditions so permit, that if a person receives training, he must thereafter be promoted to a higher position with increased pay.

Water supply and sanitation systems, especially in rural areas, face similar constraints to those mentioned in connection with the use of irrigation systems. For example:

- Lack of human resources trained in water resource management, particularly in its operational aspects and in dealing with users.

- Difficulties in maintaining and repairing large hydraulic-engineering systems.

- Conflicts with other institutions, e.g., a water supply company with a mining company which contaminates the water.

- Difficulties in increasing water tariffs for users who feel that they have natural rights to its use.

- Difficulties in obtaining financing for repair of deteriorated hydraulic structures.

- Lack of co-operation from users, e.g., unauthorized connections, dumping of industrial contaminants in drains, blockage of sewers, etc.

- The low priority accorded to the sector in the government budget, particularly in marginal and rural zones.

These are the most frequently mentioned constraints. Additionally, there are physical and technical problems peculiar to each region, such as water shortage in arid and semi-arid areas; cities located very high above sea level or on small islands and, therefore, with few source areas; rivers with great variations in discharge régime and high sediment content, which lead to high regulation and treatment costs and other technical problems, making the supply and discharge of water more expensive. In more developed areas, the worst technical problem is caused by water contamination and the need to treat it for reuse.

The disperse management of water supply by many different users, apart from reducing technical efficiency and ensuring impartiality in water distribution, prevents many countries from having personnel who are highly specialized in water quality control, river basin management, flood control, and, in general, in the integral management of this resource. This situation is compounded by the lack of incentives for embarking on a specialized career.

To summarize this chapter, it is only necessary to reaffirm the importance of identifying the constraints and their interrelationships in order to achieve the objectives and not simply to mention some of them in isolation. The examples given illustrate the futility of this approach.

VII. SOLUTIONS AND STRATEGIES FOR OVERCOMING CONSTRAINTS

1. The constant search for solutions and the difficulties encountered

The search for solutions to the problems of water resource management in the region has been characterized by the constant modifications it has caused in the structure of State and para-Statal institutions and organizations dedicated to water-related activities. These modifications, which are relatively minor due to the speed with which they are adopted, do not appear to have brought about significant improvements in organizational efficiency, and in many cases they have resulted in more disadvantages than advantages.

The changes constantly being made include:

- Frequent change of qualified technical personnel in charge of the institutions dedicated to water management, on the grounds that their positions are political or "confidential" and that they should therefore be removed with each change of minister or government.

- Constant expansion or merging of agencies, and the creation of new ones by absorbing others, without any detailed study of the advantages and disadvantages that would result.

- Constant changes in the names of organizations, including the names of the subagencies of which they are comprised, thus causing confusion, delays, and unnecessary expense.

- Frequent changes in the relationship of dependency between ministries and regions, and modifications in regional boundaries.

- Constant creation of programmes and projects with special prerogatives, which are of limited duration and under which special activities are undertaken which run counter to the activities of the central agencies.

- The creation of "co-ordinating committees", higher counsels, "working groups", and other temporary management systems, which seek to guide decisions but are non-functional owing to the lack of resources and specialized technical support.

It is amazing to see the speed with which, in some cases, organizational changes are approved, even before such changes have been fully implemented. New modifications are proposed. In most cases, this is done without really determining whether the existing organizations are performing well or not, and if their shortcomings are due to reasons beyond their control. In large part, the new proposals are mere "cosmetics", which do not attack the root cause of the obstacles.

Care must therefore be exercised in proposing solutions, avoiding the adoption of measures which, while appearing to offer easy solutions, may in fact worsen the situation.

The proposal of solutions is relatively direct if a list of the constraints has been prepared together with a set of possible management solutions for overcoming them. The various management tools may include the training of users and professionals, economic incentives, water tariffs, the creation of private agencies or systems, the establishment of river basin directorates, the organization of public services, support for the operation of private consultancies, legal recognition of users, etc. What is important is that the solutions be applied in such a way as to remove the constraints in a sequence that would permit the previously established objectives to be achieved.

In addition to needing to be aware of the above-mentioned sequence, it is also necessary to know how to apply each one of the solutions. For example, the "training" solution has a wide range of options and requirements for selecting and ensuring the availability of candidates and teachers: the method of training, the sources of financing, the type of training that will be provided, the material, place and time of instruction, etc. If these factors are not taken into account, a course may, for example, be programmed for the personnel of a water management agency, and the professionals to whom the course is directed cannot attend for lack of time.

The large number of steps necessary to put into practice a solution which is sometimes so glibly referred to as "the need to train personnel in the field of water resources" is explained, for example, in several documents presented to the Regional Symposium on Human Resources for the International Drinking Water Supply and Sanitation Decade held in Panama, in July 1982, under the auspices of the World Health Organization. The first step is to decide whether training or teaching is at this time a suitable mechanism for eliminating or minimizing an obstacle. To establish this, a sequential procedure, explained by F.J. Hickerson and J. Middleton in their work "People learn: A module for trainers" may be followed. Another step consists in determining who is going to provide the training. This approach requires prior knowledge of what is going to be taught and to whom. The process for selecting the personnel which will provide the training also has a sequence which includes:

- determining the needs for trainers and the objectives;

- considering the resources available for training;

- identifying the best candidates for training;

- interviewing the candidates (theoretical and practical experience, motivation of the candidate, etc.);

- examining the references of the candidates;

- requesting from candidates a prior work programme and discussing it;

- selecting the candidate or candidates;

- establishing a detailed work programme (objectives, output indicators, the means of achieving the objectives, the system for determining objectives, responsibilities, dates or timetable, costs of the programme, forms of payment, etc.).

This sequential modality makes it possible to clearly identify the mechanism for implementing a solution and thus to pass from a simple declaration if "there is need for training" to a coherent and realistic programme.

In general, in order to propose and consider possible solutions, it is useful to have available water management models used in other national units or in other countries. The following section looks at this aspect.

2. Future scenarios for water management

Latin America is in a stage of transition towards the rationalization of the structures for the management of water resources and for the use of these resources, which could eventually lead it to adopt patterns similar to those which exist in France or in the United Kingdom.

For example, in France it was decided, by a law of 16 December 1964, that water resource management should be carried out by hydrographic basins, for which purpose the territory was divided into six large river basins for which bodies called "Agences de Bassin" were responsible. These units are managed autonomously, but under the guidance of the Ministry of the Environment. The water policy in each river basin is based on agreements reached in the river basin committees, in which water users, residents' representatives, and State representatives participate. The main instrument of control exercised by these units is financial, and one of their most complex goals is the preservation of water quality.

The United Kingdom has recently put in place its structures for river basin management. Under the 1973 Water Act, 10 Regional Water Authorities were created. According to B.R. Thorpe, in a paper presented to the Fourth International Conference on Hydrographic River Basin Management, held in São Paulo in August 1985, this step was unique and courageous, and could not have been taken before, because it is based on current communications and rapid transport facilities, and the fact that it is now possible to view hundreds of square miles as a single unit, not only from the point of view of resource management, but also from that of the needs of the users. Many politicians were opposed to it, but it was a high-level political decision which ensured its passage. The situation which permitted the establishment of those

structures was also similar to that in France, where abundant supplies of water are available, but where it was necessary to recuperate and control the quality of the water. This is what, in both countries, underscored the need for integrated water management and provided the impetus for action.

The regional water authorities in the United Kingdom were given the following powers and functions in the area of water resource management:

a) To oversee the rational use of water resources by granting licenses for all extractions and taking measures where necessary, to conserve, redistribute, or, where required, to increase the quantity of usable water in the water region.

b) To provide water in sufficient quantity and of suitable quality for the use of the population.

c) To establish the necessary water evacuation systems for drainage, as well as systems for the disposal or, where necessary, treatment of waste water.

d) To prevent pollution of rivers and other waters, by putting into practice the norms agreed to by consensus governing the discharge of water into rivers and estuaries, which are generally ratified by law.

e) To maintain, improve and develop conditions for the reproduction of salmon, trout and other species of fish.

f) To ensure, as far as possible, the efficient use of water and to reserve the adjacent lands for recreational purposes, as well as to promote interest in nature conservation.

g) To continuously evaluate the drainage needs of the land in the water region and to have the capacity to carry out drainage and sea-defense works, with government resources.

With the exception of the activity described in paragraph g), all the other functions should be self-financing, that is, they should be paid for by the consumers. The founding act establishes that the charge to the consumers must be equitable. Water tariffs are levied by the water authority to cover costs. The water authorities are subject to government supervision only with respect to financial matters (auditing of accounts) and pollution control (health). Otherwise, they have complete autonomy to manage the water cycle. Mention should be made here again of the importance for the creation of these water authorities of the financial capacity that exists in France and the United Kingdom to pay for water supply management and of the direct interest and need which the users themselves feel for preserving the quality of the water and, therefore, for accepting a regional authority.

These two situations justify the resources used and act as motivation for improving the management system in the countries taken as examples, but do not in themselves suggest the road to follow to achieve this improvement. This road is the one which must be found for the countries of Latin America and the Caribbean. The question is how to change the existing situation to

achieve, perhaps, the scenarios found in the countries mentioned above? It is necessary to start from the current reality of the region, which does not have the resources available in those countries nor an equivalent State and private apparatus.

In the region an effort has already been made to remove many of the limitations mentioned as obstacles to better management, even at the level of details, as the annexes show. In many cases, however, as in Peru, there has also been retrogression after the achievement of notable levels of efficiency in water management on the part of the State and individuals. Detailed research will be necessary to determine why these situations occur and how they can be avoided. One of these unknown quantities is how to determine the appropriate balance between the responsibility and participation of the State in water management and of the users of the resource on the other hand, in the current situation of each country of Latin America and the Caribbean. In any case, all the agents involved in the management process, that is to say, users and direct and indirect participants in the process, must participate in the research and give their opinions, and a rigorous system of identifying situations that are similar or comparable to those described in this study must be followed in order to be able to formulate concrete strategies. Administration and management schools, both private and public, have this task in their hands. The rewards of the effort could be of enormous value to the countries of the region, from a social as well as economic and environmental point of view.

VIII. REFLECTIONS ON THE NEED FOR IMPROVEMENT OF WATER RESOURCE MANAGEMENT PROCESSES

1. The integral management of water resources covers a minimum of three management levels: management of the physical system, management of the user system, and management of the institutional system. The purpose of management of the physical system, specifically the water system, is to direct all activities related to the use and conservation of water. Generally speaking, it is undertaken by professionals trained to make optimal use of water resources and in the integral development of river basins as well as by the users themselves. The management of the user system is undertaken by the actors directly involved in the use of water, such as the administration of an irrigators board or an association of canal users. The management of the institutional system seeks to direct and co-ordinate the actions of the many agents involved in the management of the physical system (water resource institutes, general water directorates, public hydroelectric power agencies, drinking water supply companies, etc.). There are no professionals specialized in this area, except those who have been trained through practice and who are familiar with public administration in general. The management of each institution is part of the institutional system and its purpose is to attain standards of efficiency and effectiveness within each one of them. This level of management is undertaken by professionals trained in business administration and public administration.

2. The first level of management or management of the physical system, has been the subject of intensive study and extensive information is therefore available for proposals for the multiple use of water resources, study techniques, project formulation, execution of works, operation of existing systems (reservoirs, canals, etc.) and river basin management.

3. Little information is available to the second level of management, or management of the user system. There are few studies which explain the modality of user participation, in both rural and urban areas, in the management of water at the river basin level. There is a greater tendency, at this level, to justify the action of the large users and not of the little ones, especially in the rural areas.

4. The third level of management, that of the institutional system, has also been little studied, as can be seen from the many examples cited in this study. In practice, there is no school for institutional or interinstitutional systems management in the area of water. The best efforts at interinstitutional co-ordination have been made indirectly in the form of the creation of river basin commissions and planning commissions. This is an

area where much research remains to be done. Water and water capturing river basins are elements that promote interinstitutional co-operation within the State apparatus. At the level of each institution, the management processes in public agencies are relatively well understood, but this is not true of institutes, general directorates, and State services, in which ideas acquired in business schools are not applied. These ideas, moreover, are not widespread in development corporations programmes and projects, user associations, etc.

5. The methodology proposed in this study seeks to introduce elements for understanding and improving the process of management of the institutional system with respect to water. The principal purpose is to try to propose strategies for rationalizing the process of management of both public and private bodies. The purpose of this rationalization is to enhance the effectiveness of these organizations so that, in turn, they can improve the efficiency of the management of the user system and of the physical system.

6. The methodological approach outlined here has been kept to a basic level to facilitate its understanding; this does not mean that it should not be strictly applied and that quantitative and more complex systems of evaluation cannot be used. The enormous investments by the State and the private sector in water, as well as the contribution its adequate use makes towards improving the quality of life of the inhabitants of a country or region, provide ample justification for undertaking the works carried out.

7. The application of the proposed approach requires a high-level State decision, since it involves many different sectors. The team charged with applying it should first project the scenario for the management of the physical system which they want for the country, region, or river basin, with the participation of the actors involved in the process. These settings should serve to evaluate whether the user system and the existing institutional system permit the proper management of the existing and projected physical system. It should be determined if there is overlapping between users and institutions, and if, in general, they work in a co-ordinated manner to achieve those objectives which need combined efforts.

8. The use of water resources and river basins or river basins systems as a basis for the co-ordination of the activities of various sectors facilitates the process of analysis, by centralizing it into a natural resource and a space which is shared by the participating actors.

9. The study has concentrated on an analysis of the processes of management of the institutional system with respect to water since it was felt that in the majority of the countries, this is the area that needs preferential attention. The management of the physical system has been sufficiently analysed and undertaken at various levels with difficulty being encountered precisely on account of deficiencies in the institutional and user systems. An examination of the latter must be undertaken in another study in order to complete the present work.

10. The application of the proposed approach could significantly enhance the efficiency of State institutional systems operating in water-related areas. To achieve this goal, it is necessary to train the authorities in the methods

and positive consequences which could be achieved with this efficiency in order to facilitate their participation in the application of the approach. This can be done through the combined support of business schools (public and private) and specialized water resource training centres.

ANNEXES

Annexes 1 and 2 which are attached to this study are based on the speech delivered in 1978 by the General-Director of Land and Water of Peru and on the results of a co-ordination meeting between the technical administrators of the irrigation districts of Peru. The annexes reproduce verbatim the conclusions of these works. For the better understanding of the reader, it should be pointed out that the role of the General-Directorate of Land and Water is officially technical and policy-setting (even though it also formulates and carries out various programmes and projects) in order to provide guidance to the technical administrations of the irrigation districts. These districts consequently have a series of "tasks" whose performance is supervised by the General-Directorate of Land and Water. Nevertheless, the heads of these irrigation districts are, at the local level, under the authority of the regional directorates of the agricultural sector, and these, in turn, on the regional corporation (or equivalent) of the department or region where they are located. The head of the irrigation district therefore has two bosses: one national, responsible for technical and policy-setting matters (the General-Directorate of Land and Water) and the other regional, with responsibility for administrative matters (the regional corporation or directorate).

Annex 1

PROBLEMS OF WATER-RELATED ACTIVITY DESCRIBED IN 1978 BY THE DIRECTOR-GENERAL OF WATER a/

Description	Solutions
1. Application of the General Water Law (Decree Law 17752)	
Since this law constitutes a legal, technical and political tool for the planning, use, and rational administration of water during its nine years of operation, it has not received the necessary economic support for its application. Incipient problems of sectoral conflict over use of the water resource are growing steadily worse, to the point where development in some areas will be impeded by the incorrect use of the resource by other sectors. In spite of the existence, by Law, of authorities charged with the management of the resource, these do not act efficiently and, when necessary, with the necessary strength and firmness, through lack of familiarity with the Law and lack of economic, technical and political support. Their lack of technical and political attributes thus becomes evident for these and other reasons. The agrarian sector is the greatest user of the resource, and for this reason the water authority is located within the Ministry of Agriculture and Food;b/ even within the Ministry, however, few functionaries give the resource the value it possesses, given its scarcity, considering it a marginal input in agricultural and livestock production. A similar distortion of values can be seen on the part of functionaries of other ministries, with very few exceptions. Even though the Law has been in force and has been applied for nine years, no evaluation of the resource has been undertaken owing to the lack of economic resources and installed capacity.	The formulation of an aggressive policy, setting out work stages for the implementation of the law, for which greater political and economic support is necessary. In the economic sphere, tariff reversion and implementation of the Technical Administrations of Irrigation Districts (TAID). Examination of the possibility of granting the body that manages the resource a greater level of authority in view of its multisectoral activities in the use of the resource; and of granting the Superior Water Council a greater power of decision-making in the area of determining preferential uses and in other water-related intersectoral areas, instead of being a mere consultative body of the Executive Power. In this way sectoral conflicts would be overcome, with the resulting benefits. Undertaking information campaigns to teach the real value of the resource; also organizing training activities at every level: professional, middle-management and users. To secure the support of international and other organizations for carrying out an evaluation of the content and application of the General Water Law.

a/ Annex extracted from: Ministry of Agriculture and Food, General Directorate of Water, Address by the Director-General of Water, Lima, Peru, 1978.

b/ With the exception of the administrative jurisdiction in respect of mineral/medicinal waters and of health matters, which are within the competence of the Ministry of Health.

Annex 1 (cont. 1)

Description	Solutions
As regards the expansion or extension of the agricultural frontier (mainly large irrigation projects) the projects being studied or carried out for this purpose are, moreover, multisectoral and consume a large percentage of the funds allocated to the Ministry, making it impossible to implement programmes to increase agricultural and livestock productivity in the area presently cultivated, to consolidate it definitely, through the installation of sufficient irrigation and drainage infrastructure, the operation and maintenance of such new and existing infrastructure, and the efficient management of resources, together with the setting up of adequate technical assistance and extension services in these areas.	
2. Planning for the development and use of land and water resources	
Although there is an ever increasing interest in the planning of water resources, basic studies, inventories, and evaluations of this resource are still undertaken in a dispersed manner at the institutional level. In practice, sectoral planning continues because there is no single authority which ensures the co-ordination of the multiple and integral use, mainly of the water resource. The Superior Water Council, created by the General Water Law, was inactive until 20 April 1977, on which date it resumed its work; nevertheless, because of the limited activity of other sectors, this consultative organ of the Executive Power will not be able to fully carry out its functions. The decision to carry out hydraulic-engineering projects is generally the result of pressure from the backers of such projects, without a clear criterion of intersectoral and intra-sectoral priorities. No mechanism exists to regulate the possibility of managing projects involving the exploitation of these resources by the private sector. There is no ad hoc legislation governing land resources.	Complete the drawing up of the National Plan for Regulating Water Resources which is being carried out by the Multisectoral Commission of the National Plan for the Rationalization of Water Resources (COMPLANORH). Design and execute a national plan for the development and use of water and land resources, with strong emphasis on the high jungle region. The Executive Power should grant the Superior Water Council greater decision-making power to determine preferential uses and in respect of other water-related questions of an intersectoral nature. Legislation should be prepared governing the justifiable and rational use of the land resource and, taking into account the responsibility of the General Water Directorate (DGA), the name of this General Directorate should be changed to "General Directorate of Lands and Waters". All the information relative to land and water resources at all levels should be centralized in the DGA, to allow them to adequately plan the use of these resources, independently of those who carry out and execute specific project studies as a consequence of the above-mentioned planning.

Annex 1 (cont. 2)

Description	Solutions
3. Water resource conservation is at present very limited	
The General Law on Water establishes that the preservation of the resource is the responsibility of the "Sanitation Authority"; in practice this responsibility is exercised in a very limited manner, causing the serious problems of water pollution which currently exist, resulting from the destruction of flora and fauna, and the delay or paralyzation of possible projects involving the use of the resource for different purposes.	Authority over water resources should not be shared, since presently the Ministry of Food and Agriculture conserves and administers the resource and the Ministry of Health preserves it. It is therefore recommended that the preservation function be also assigned to the Ministry of Agriculture. In this way it would assume responsibility for detailed regulation for all water uses.
4. Charging for the use of water resources for energy purposes, in two different ways: taxing energy use and imposing tariffs for the use of the resource	
The tax on the use of water for energy was introduced by Laws No. 4391 and 6549, promulgated on 22-X-1924 and 1-III-1929, respectively; both are governed by the Superior Decree of April 1929. Law No. 4391 refers to the amount of tax which users should pay per horsepower, a sum which was later increased by Article 8 of Law No. 11195, the amount being paid today, which is considered to be very low. Law No. 6549 provides that water concessions for the mining industry should thenceforth no longer be governed by the Mining Code, but by the Water Code, now replaced by the General Water Law, which provides in Article 135 of Chapter IV, that the granting of licenses for the use of water for energy generation shall require permission from the Superior Water Council and, in Article 153, that the Ministry of Agriculture shall annually determine the tariffs to be paid by users of water for energy generation, mining or industrial activities. Charging of both taxes and tariffs has been creating problems.	Authority over water resources should not be shared, since presently the Ministry of Food and Agriculture conserves and administers the resource and the Ministry of Health preserves it. It is therefore recommended that the responsibility for preservation should also be given to the Agriculture Ministry so that aspects of it could assume responsibility for the regulation of all aspects of water use. For this it will be necessary to repeal the legal provisions mentioned in the description of the problem and to provide for a single volume charge through tariffs, eliminating the charge per horsepower levied through taxes, which represent minimal amounts that can be automatically added to the tariff.

Annex 1 (cont. 3)

Description	Solutions

5. Inadequate operation and maintenance of irrigation and drainage infrastructure and poor management of water resources

There are no irrigation areas in the country with adequate irrigation and drainage infrastructure, and such as there is, is neither properly maintained, nor efficiently operated.

In building irrigation systems in the past no account was taken of the vital need to ensure that they complemented drainage systems, nor that they were integrally planned (only surface drainage was taken into account). This fact, added to bad water management at the farm level, has caused the deterioration of several production areas (247 000 hectares on the coast are presently affected by salinity and flooding).

The irrigation systems built to date have not been periodically evaluated, which indicates that the responsible departments have been incapable of following up on such projects; as a result, we do not at present have a performance record and results that would provide us with the detailed and necessary knowledge to enable us to foresee present needs and future consequences for these irrigation systems, or for those which are presently under construction or in the planning stage.

Where irrigation and drainage infrastructure exists, the Technical Administrations of the Irrigation Districts (TAID) are not properly equipped to carry out their functions, or adequately financed to fulfil their obligations.

This is an obvious fact, since any investment project must provide for a percentage of between 2% and 5% of the investment, depending on the particular case, for conservation and protection of the investment made; this is not done in any irrigation and drainage system in the country, which are consequently in a very bad state of maintenance.

The operation and maintenance of irrigation infrastructure, in general, should be the responsibility of the TAID's, as part of their responsibility to guarantee the strict observance of such regulations as may be established on this matter. For this it is necessary to clearly define the sources of financing, as well as to establish the form and degree of user participation.

The degree will depend on whether the irrigation works are large or small and on the size of the infrastructure.

The form will determine whether the participation of the users in such activities will be direct or indirect.

Direct participation, for example, will be through actual work or the contribution of labour.

Indirect participation, through the payment of quotas (both forms are presently being used for small-scale irrigation infrastructure), or financial contribution on a percentage basis by the users (for all uses), which will be indicated when the larger-scale irrigation infrastructure is examined.

For operation and maintenance activities it is necessary to distinguish between the requirements of large-scale irrigation infrastructure and small-scale irrigation infrastructure. Generally speaking, in such cases, infrastructure for storage and diversion canals, conduction canals and principal intakes, are considered major irrigation infrastructure, since it is a complex system and therefore requires for programming, monitoring, operation and maintenance, specialized technical personnel and the availability of machinery and special tools. In this case, the financing of the operation and maintenance activities should be shared between the State and the users of water (for all uses and not only for agriculture).

Annex 1 (cont. 4)

Description	Solutions
The irrigation infrastructure which exists in the greater part of the area currently under cultivation is complex and not very technical, since it was constructed without planning and to meet succesive needs through the years: this also means that its operation is not very efficient, since it does not permit proper economic use of the resource, and contributes to a significant increase in losses which, for this reason, are estimated to be 30% of the total volume of water. The General Water Law provides that the conservation and improvement of irrigation and drainage infrastructure should be paid for directly by the users (quotes) and under the control of the Technical Administration of the Irrigation District. For the conservation and improvement of the smaller-scale irrigation infrastructure, the farmer must also participate directly in the work (labour principally for the cleaning of canals). These two forms of user participation do not guarantee effective results, since the TAID cannot provide the necessary technical assistance because of the lack of installed capacity and adequately trained technical personnel, with the result that activities of programming, monitoring and implementation of irrigation and drainage infrastructure maintenance works with these two components are not undertaken in an integral and timely manner.	For this purpose, the percentages of participation should be established in monetary terms for each specific use. The funds should revert to the TAID, as the body responsible for its execution. In general terms, diversion, conduction and secondary intake infrastructure are considered for this case, secondary irrigation infrastructure. The system is not considered complex and, therefore, although its operation requires technical guidance (which should be provided by TAID, but which is absent at present owing to the lack of operating capacity), it does not need specialized personnel or the use of special machinery. In this case, the financing for the operation and maintenance should be provided solely by the user (as is currently done in most cases), by the imposition of tariffs and the direct participation by users through the supply of labour. The TAID should be implemented in order to guarantee the minimum technical assistance required for a more rational and efficient use of these resources. The water tariffs which users pay (all sectors and on a case by case basis), should revert to the TAID in order to guarantee their implementation and overcome the problem. Only those funds corresponding to a recovery of the investment the State makes, funds which to date have not been collected, should revert to the State. It is equally important to train or prepare specialized personnel in the techniques of the different phases of maintenance, as well as to adopt a much more scientific approach to the operation of the irrigation and drainage systems. New irrigation projects (including small and medium-sized irrigation works) should include and take into consideration in every case and without exception, previous studies and the execution of surface and underground drainage works according to technical requirements.

Description	Solutions
	Stricter regulations should govern approvals for the execution of works to expand existing irrigation systems (area currently exploited), in order to ensure that partial expansion works do not consolidate complex systems which do not meet minimum technical requirements. Investments should be directed towards the remodelling of the outdated and technologically primitive irrigation systems which still exist in most irrigated areas, principally on the coast, and towards the execution of such remodelling with minimum irrigation and drainage works where such works do not exist (technical consolidation of the area currently exploited). It should not be forgotten that the recouping of investments made to consolidate areas presently cultivated is faster; the projects require less maturing time and the results (increase in productivity) are also obtained in a much shorter period. These measures should be structured by previous categorization.

6. Irrigation and drainage techniques, practices and methods in areas under irrigation, as well as soil conservation in the entire country, are not sufficiently understood by the State technical personnel and by users, causing a negative effect on its use and administration and on the value which is assigned to these resources (principally water)

There are two essential conditions for the rational use of water and land resources; one is related to the physical aspect of the territory, and the other to the method of assigning value to these resources.
The value assigned to these land and water resources on the part of the users is blatantly low, since not only should the latter enjoy the use of these resources but they also have the responsibility for preserving and maintaining them.
Until now only agricultural and livestock production and/or productivity were considered very important, and due importance and support were not given to the rational use of the resources which constitute the State's patrimony, causing very serious problems of land deterioration, water contamination, and significant losses of these resources through poor use and management.

Mass promotional campaigns, training at all levels, instruction and preparation, the creation of awareness, the teaching and training of functionaires and users in general of the resources, that WATER on the coast is a limiting and limited resource, and needs to be used intelligently.
Moreover, the same measures should be used to create an awareness that the SOIL is a non-renewable resource which should be conserved as the permanent patrimony of future generations.
It is therefore indispensable to improve and complete irrigation and drainage infrastructure in areas currently exploited, reclaim degraded soil, train personnel, and retain those already trained, duly implement the TAID in order to ensure the efficient operation and proper maintenance of irrigation and drainage infrastructure and the proper

Annex 1 (cont. 6)

Description	Solutions
The term productivity, referring to surface yields when applied to dry agricultural areas, is also used erroneously in irrigated areas, instead of yield per unit of water volume, since this and not the soil is the limiting factor. The low cost of water (currently less than 1% of production costs) does not oblige users to use it responsibly, causing low use efficiency and making it impossible to introduce modern and efficient irrigation methods. There is no adequate field service to teach users modern techniques of water and soil resource utilization both in irrigated areas and in dry areas and pasture land. With the exception of CRIA II, VISTA FLORIDA, no research in irrigation and drainage is being carried out; if such research is being undertaken the results have not been publicized.	management and efficient use of these resources, and to teach and train users. Strengthen the field service for irrigation, drainage and soil conservation a start to which is being made in the DGA. Strengthen applied research in irrigation, drainage, and soil erosion control. Progressively increase the amount of the water tariffs by introducing the concept of differential tariffs and to develop a system to ensure the reversion, make every effort of the amounts charged through such tariffs, in order to guarantee the due implementation of the TAID, to make possible, among other things, the introduction of modern and efficient irrigation methods. To introduce ad hoc legislation on soil-related matters.
7. Complexity of planning agricultural seasons in irrigated areas. Establishment of measures without taking due account of the availability of water in irrigated areas	
Two Decree Laws, General Water Law No. 17752 and Law No. 21169 on the Agricultural and Livestock Production System which govern the planning of agricultural seasons, are still in force. The General Water Law establishes planning of crops and irrigation as the only planning mechanism for areas under irrigation. The Law on the Agricultural and Livestock Production System establishes plans for crops and/or breeding, only for specific crops and farmers. The Crop and Irrigation Plan has been expanding since 1971, with an organizational structure and a user participation system that are already well-known by all those who participate directly or indirectly, in the planning of the agriculture. The Agricultural and Livestock Production System establishes another planning structure with different levels of participation and/or decision-making. The lack of co-ordination at the management level between the production agencies and the districts, subdistricts or irrigation sectors, as well as the fact that the production system is applicable only to specific	Since the 1975-1976 agricultural season, the problems mentioned are being overcome through joint transitory regulations for each agricultural company. The new law for the sector should clearly define the application of each one of these regulations; Law No. 21169 should be considered the normative framework for agricultural and livestock policy, and the Crop and Irrigation Plans (Decree Law 17752) should be considered the mechanism for the implementation of the agricultural aspects of this policy in areas under irrigation, in co-ordination with the Tupac Amaru Plan. The Breeding Plan would be the instruments of execution with respect to livestock. A programme for the improvement of planning should be formulated at the highest level.

Description	Solutions
crops and farmers, are obstacles to the smooth formulation of Crop and Irrigation Plans, as well as the periodic evaluation of the progress of irrigation with respect to sowing or crop development. It has not been possible to update existing regulations governing the formulation of crop and irrigation plans for the planning of agricultural programmes, because no clear solution has been found to the problems caused by the above-mentioned lack of co-ordination; furthermore the current reorganization of the Ministry of Agriculture and Food will preclude its realization this year.	

8. Failure to pursue the development of programmes aimed at increasing agricultural productivity in areas currently exploited since the greater part of investment funds is allocated to large irrigation projects (expansion of the agricultural frontier)

Projects are currently being carried out and action taken in the country aimed at extending the agricultural frontier and consolidating the area currently under cultivation.
The situation of the area currently cultivated is critical (as mentioned before) and may be summarized thus:

- There are no irrigation districts in the country with adequate irrigation and drainage (surface and underground) infrastructure.
- The operation of the irrigation infrastructre is inefficient and its management inadequate.
- The use and management of water and land resources are equally inefficient.
- The failure to make the TAID operational is glaring and without exception, making it impossible for them to attend to their business rationally and efficiently.

As a consequence:

- Significant volumes of water are lost annually (with the resource being limited and limiting).

To paralyze new projects for large irrigation schemes, reassigning these funds to an intensive programme for increasing productivity in areas currently exploited through the introduction of the measures described above.
To seriously consider agricultural development in the high-altitude forested areas, starting with dry land livestock agriculture and later consolidating it with irrigation agriculture where this is feasible and necessary.
To promote a policy of protecting human capital; for this, attractive competitive alternatives should be very seriously studied which either prevent or significantly reduce the flight of skilled and trained personnel.
To permit greater flexibility in the internal management of funds for wages and salaries to facilitate the redistribution of allocations according to the level of competence and real effort of each functionary.

Description	Solutions
- The process of soil degradation is continuous, and this is already requiring huge investments for reclamation (the agricultural frontier is being significantly reduced in terms of yield capacity and probably at the same rate at which it is hoped to expand the frontier through new irrigation). - It is not possible to apply appropriate techniques for irrigation, drainage, and the operation and maintenance of existing irrigation infrastructre; the use and management of resources is inefficient. - With regard to the increase or expansion of the agricultural frontier (principally large irrigation projects), the projects being studied or carried out are multisectoral and consume a large percentage of the funds assigned to the Ministry, thus making it impossible to implement programmes to increase agricultural and livestock productivity in areas currently under cultivation, by consolidating such productivity definitively through the installation of adequate infrastructure for irrigation and drainage, and the operation and maintenance of both the new and existing infrastructure and the efficient management of resources, together with the prevision of adequate technical assistance services and extension services in these techniques. As areas for seasonal agriculture production are running out in other Latin American countries, these countries are beginning to develop irrigation agriculture, and thus require professionals skilled in this technique. The two countries with this tradition and technique are Mexico and Peru, the latter supplying most countries with experts. At the country level, the development of irrigation programmes executed by the State has led to an exodus of technicians from the General Directorate into Special Projects and into consultancies for these projects, drawn by attractive salaries, to the detriment of the operation of these same works. This situation has led to the loss of a large number of highly trained professionals both at the national level and at the level of agricultural areas.	

Annex 2

PROBLEMS OF WATER-RELATED ACTIVITY RAISED IN 1977 - MEASURES ADOPTED TO OVERCOME THEM. OBSERVATIONS ON AND SUGGESTIONS FOR AGRICULTURAL ZONES */

Problems and recommendations 1977	Measures adopted to overcome them in 1977	Observations on and suggestions for agricultural zones, 1978
	Technical aspects - functional relationships	
a) National Meteorological and Hydrological Service (SENAMHI): Problems - Lack of information owing to centralization at the national level. - Stations are not set up. Recommendation - To establish a joint directorate with SENAMHI to allow a free flow of information. - Construction and expansion of hydrometric stations.	Co-ordination with SENAMHI in establishment of a working mechanism.	Observations: There is still a lack of daily information on river discharges. Suggestions: The General Water Directorate (DGA) and SENAMHI should jointly establish a standard for the remittance of hydrological and meteorological information to the Technical Administrations of the Irrigation Districts (TAID's) and of Water and Irrigation Departments (SDAI). The General Directorate of Water should establish an order of priority for the establishment of new meteorological and measuring stations based on the requirements of the agricultural zones for the information of SENAMHI for its programming.
b) General Department of Irrigation (DGI): Problem - Lack of co-ordination in the drawing-up and carrying out of projects.	General Directive No. 01-78-OR-DS has been prepared. Norms for global linear co-ordination between small- and medium-sized irrigation systems and agricultural zones during the execution and delivery of irrigation works.	Observations: There are still no norms governing the DGI. This leads to overlapping between the functions between the technical administrations of irrigation districts TAID's and the integral projects of

*/ The annex is extracted from: Ministry of Agriculture, General Water Directorate, Final Report, Second General National Co-ordination Meeting - Water Activities, Lima, 25-28 April, 1978.

Annex 2 (cont. 1)

Problems and recommendations 1977	Measures adopted to overcome them in 1977	Observations on and suggestions for agricultural zones, 1978
Recommendation · Better co-ordination between the DGA, DGI, and SDAI.		small- and medium-sized irrigations works, in water management matters. Suggestions: The technical administrations should receive shortly directive No. 01-78-OR-DS. The DGI should define the specific functions of project personnel and should inform the departments of water and irrigation of this in order to harmonize their activities.
c) General Production Department Problem · Lack of complementarity between activities of production agencies and those of irrigation districts. Recommendation · A study should be undertaken with a view to harmonizing the respective areas of activity.	The General Department has already presented proposals for such harmonization to the Agrarian Planning Office (OSPA). Activities are now being co-ordinated and the problem will be corrected with the integration of agriculture and food.	Observations: The proposals for harmonization presented to the OSPA should be communicated to the agricultural zones. Suggestions: An approach should be made to the Chief Authority with a view to harmonizing the work areas of the production agencies with those of the irrigation districts at the local level.

Annex 2 (cont. 2)

Problems and recommendations 1977	Measures adopted to overcome them in 1977	Observations on and suggestions for agricultural zones, 1978
Problem · The existence of too many programming and/or decision-making levels within the national production system. Recommendation · Review and evaluation of Decree Law No. 21169.	A working group was set up comprising representatives of the Programming Office, Directorate of Irrigation Districts of the Legal Council Office of the DGA, OSPA, and the Peasant Enterprise Support Agency, which, after a careful study of the above-mentioned Decree Law formulated relevant recommendations which were transmitted to the Chief Authority.	Observations: The problem persists because of the existence of two organizations: the Local Production Council and the Local Co-ordination Committee. Suggestions: The representatives of single crop and multiple crop farmers should be integrated in a single organization.
	Relationship of co-ordination between DGA/SDAI and ATDR	
Problem · Lack of co-ordination of technical assistance, supervision and control in the achievement of goals. Recommendation · Follow-up of the programmed goals.	The delay in approving the 1977 Work Programmes of the Agricultural Zones (ZZ.AA.) by the OSPA impeded compliance with General Directive 033/77-OR, which was not implemented until the third quarter. For the same reasons, the situation still exists this year.	Observations: The problem persists. Suggestions: The OSPA should promptly approve the work programmes of the Agricultural Zones to permit compliance with Directive 033/77-OR.
	Operating capacity	
Problem · Lack of personnel, equipment, and infrastructure in the irrigation districts.	The ZZ.AA. were asked to outline their needs for implementation. The General Directorate of the Public Treasury was consulted on this, and it indicated that first the 120 million soles allocated as income to the Treasury should be covered and an increase in the budget for water-related activities should be negotiated	Observations: The Technical Administrations of the Irrigation Districts are still not being established, and the situation has worsened because of budgetary cuts.

Annex 2 (cont. 3)

Problems and recommendations 1977	Measures adopted to overcome them in 1977	Observations on and suggestions for agricultural zones, 1978
Recommendation - Budgetary provision and/or financing through the collection of tariffs as their own revenue.	to cover the balance. This negotiation has not been carried out since these surpluses occurred in the last months of 1977, when the budgetary year was coming to an end. A way of overcoming this impasse is being sought.	Suggestions: Every effort should be made to ensure that the surplus funds from tariffs should be used to establish the Technical Administrations. Economic resources from any other source should be provided for the establishment of the TAID's. Current late payment charges should be increased.
	Training and extension services	
Problem - Lack of training at the different levels. Recommendation - The formulation of training and extension programmes.	Starting in 1977, training activities will start again at different levels, and will continue in 1978.	Observations There is no integral irrigation extension programme. Suggestions The DGA, in co-ordination with the ZZ.AA., should programme joint extension irrigation activities. The ZZ.AA. should make budgetary provisions for training in irrigation.
	Applied research	
Problem -Absence of an applied research programme. Recommendation - The DGA should conclude co-operation agreements for co-ordinated research programmes.	Agreement No. 24 with AID which expired in 1977 continues as Agreement No. 1 coming into effect in 1978 for water management at the farm level, and fulfills these requirements with activities in Lima (La Molina), Cañete, and Huancayo. The results will be disseminated at the national level.	Observations: Improper water use persists in irrigation agriculture Suggestions: The results of the research carried out should be applied to agricultural users with priority being given to those irrigation districts with water shortage problems.

Annex 2 (cont. 4)

Problems and recommendations 1977	Measures adopted to overcome them in 1977	Observations on and suggestions for agricultural zones, 1978
	Formulation and execution of investment projects	
Problem - Restriction on the formulation of bankable investment projects. Recommendation - Implementation of the SDAI, agreements and consultancies.	Technical assistance was provided to the Agricultural Zones which requested it and training in CRI-3 course. A bulletin "Guide to the evaluation of investment projects" is being printed.	
	Management aspects of DGA, SDAI and TAID's	
Problem - The DGA does not participate in the preparation of the budgets of the Water and Irrigation Departments. Recommendations - That the DGA request the participation of the Chief Authority in this activity. - That DGA should ask the Chief Authority to delimit the administrative functions of the Heads of Subzones.	The DGA participated in the review of the investment budget for the Agricultural Zones. The working budget has been exactly the same as in 1977. Document 003, item 1, requested the budgets for the years 1976, 1977 and 1978 in order to comply with the recommendation of the first meeting. Given the budgetary directives of the present year, it has not been possible to propose modifications, and the regulations governing the new sector are expected to be modified.	Observations: The DGA has limited itself to reviewing the budgets of the TAID without becoming involved in their preparation as was recommended at the first meeting. Suggestions: The Chief Authority should direct the DGA to participate in the establishment of SDAI and the TAID's. The DGA should support efforts to secure the transfer of funds to those SDAI that request it to enable them to better discharge their duties.

Annex 2 (cont. 5)

Problems and recommendations 1977	Measures adopted to overcome them in 1977	Observations on and suggestions for agricultural zones, 1978
	Legal aspects	
Problem - Lack of legal assistance in the SDAI. **Recommendation** - Give consideration to the establishment of a post of legal advisor in the SDAI.	The Chief Authority and the Zonal Headquarters were asked to adopt the necessary measures. It was not possible for budgetary reasons to create new posts.	**Suggestions:** Budgetary provision should be made for the post of a lawyer for the SDAI.
Problem - The TAID are taken to court and do not have legal advice. **Recommendation** - Provide legal advice through the Zonal Legal Advisory Offices.	Direct technical assistance has been provided in the stages and training courses by the Legal Advisory Office of the DGA. The Zonal Headquarters were asked to supply the necessary technical assistance.	**Observations:** The problem persists. **Suggestions:** An approach should be made to the Agricultural Zones for them to provide legal advisory services until such time as the SDAI's are provided with their own legal advisor.
Problem - The provisions of Chapter III of Section X of the General Water Law establish that the users of each Irrigation District should be required to join together in User Associations. This causes many difficulties. **Recommendation** - This provision is too general and should be modified.	Draft provisions were drawn up and these will be presented and explained at a forum for studying them and for receiving suggestions by the ZZ.AA., with the latest date of reply being 31/05/78.	**Observations:** The problem of organizing bodies that represent users has worsened. **Suggestions:** Approval of the modification of Chapter III of Section X should be completed, taking into account the observations of the Technical Administrations and the SDAI.

Annex 2 (cont. 6)

Problems and recommendations 1977	Measures adopted to overcome them in 1977	Observations on and suggestions for agricultural zones, 1978
Problem - The Agricultural Bank is authorized to make loans to the User Associations, but not to the Irrigators' Associations. Recommendation - The DGA should negotiate the granting of judicial personality to the Irrigators' Associations so that they become eligible to receive credit.	A draft Supreme Decree (DS) was formulated which made the Irrigators' Associations eligible for credit. It is now in the Advisory Committee of the Minister of Agriculture (COAMA) awaiting the reply of the Agricultural Bank with which it has been co-ordinated. The draft regulations on Users' Associations are expected to contain provisions governing legal personality.	Observations: The problem persists. Suggestions: The Chief Authority should take steps to facilitate the promulgation of the DS, by granting credit to the Irrigators' Associations.
Problem - Chapter II of the provisions of Section VIII of the General Water Law indicates that rights should be established by Ministerial Resolution (RM). Recommendation - The authority to grant rights should be delegated to the Local Water Authority.	This matter was taken up with the Chief Authority but no solution was found because of the failure to establish the Irrigation Districts.	Observations: The efficient management of the resource requires that the rights should be conferred by the Local Water Authority. Suggestions: It should be insisted that the authority to grant all types of rights should be delegated to the Local Water Authority.

Annex 2 (cont. 7)

Problems and recommendations 1977	Measures adopted to overcome them in 1977	Observations on and suggestions for agricultural zones, 1978
Problem - The user does not pay the fines imposed and the National Bank does not enforce the charge. Recommendation - The imposition of a fine should include a provision for threatening the interruption of the water supply in case of continued non-payment.	A general interpretation of the legislation suggests that there is no impediment to formulating the suggested warning. Once the Supreme Decree for raising the amount of the fines is approved, the Ministry will give specific guidelines.	
Problem - There is conflict between the land courts and the TAID's in water matters. Recommendation - That the Agrarian Tribunal be asked to adopt the appropriate measures.	Contact has been made with the Agrarian Tribunal and arrangements made for it to decree that Land Magistrates should intervene in water matters only when all administrative recourses are exhausted.	Observations: Conflicts between Land Courts and the TAID's in water matters persist. Suggestions: The DGA should ask the Chief Authority to request that the Agrarian Tribunal instruct the Land Magistrates to abstain from interfering in water matters until administrative recourses were exhausted.
Problem - Lack of diffusion of the General Water Law at the user level. Recommendation - That the scope of the Law be publicized.	Water users were allowed to participate in some courses. Budgetary restrictions have prevented massive diffusion campaigns from being undertaken.	

Annex 2 (cont. 8)

Problems and recommendations 1977	Measures adopted to overcome them in 1977	Observations on and suggestions for agricultural zones, 1978
Problem - There are conflicts with other sectors in the application of the General Water Law. Recommendation - That they co-ordinate their activities in order to resolve these conflicts.	With respect to the granting of licenses for the extraction of material brought down by rivers and other water courses, an analysis was made of the legal provisions by both the General Directorate for Mining and the DGA. The Superior Directorates for Agriculture and Mining have provided that a multisectoral commission, appointed by the Prime Minister, should elaborate the draft regulation to put an end to the problem.	Observations: The problem persists. Suggestions: The DGA should ask the Superior Directorate of Agriculture to request that the Superior Directorate of Mining ensure that the representatives of the General Directorate of Mining agree to meet with the representatives of the DGA, in order to resolve the problem.
Problem - The problem of the small farm makes it difficult to apply the Irrigation Cultivation Plan (PCR) and to update the guidelines. Recommendation - The Chief Authority should be asked to take action to reorganize landholding patterns.	This problem was put to the General Directorate of Agrarian Reform and to the Chief Authority. It was decided to grant a temporary water use to the person who provisionally occupies the land, with the provision that he regularize his water use after he acquires definitive possession of the land. Moreover, in order to facilitate the updating of the regulations through Ministerial Resolution, water use is being granted based on the draft regulations adopted by the DGA.	Observations: The problem of the small farm persists. Suggestions: The Chief Authority should be asked to adopt the necessary measures to solve the problem.

Annex 2 (cont. 9)

Problems and recommendations 1977	Measures adopted to overcome them in 1977	Observations on and suggestions for agricultural zones, 1978
Problem - The General Water Law provides for higher fines than its regulations allow. Recommendation - That regulations of Section X be modified to provide for higher fines.	As mentioned under item 18, a draft Supreme Decree has been formulated which establishes minimum and maximum fines of 800 soles and 15 000 soles respectively. The draft is being studied by the Chief Authority.	
	Tariffs	
Problem - Receipts for water tariffs collected are not issued promptly. Recommendation - The DGA should adopt the necessary measures so that tariff receipts are issued annually.	Supreme Decree 397/77-AG of 18 September 1977 provided that the amount to be paid for the water tariff for 1976-1977 should be the same as that charged in 1974-1975 which was approved by Supreme Decree 2236/76-AG. The draft of the Supreme Decree approving the water tariffs for 1978 is being prepared by the Chief Authority.	Suggestions: It is recommended that the DGA expedite passage of the Supreme Decree adopting the 1978 tariffs in order to facilitate their collection.
Problem - The National Bank has no facilities for the users to pay their water tariffs Recommendation - The DGA should ask the National Bank to solve this problem.	The anomalies detected in the charging process, including this problem, were brought to the attention of the General Collections Manager of the National Bank. This bank official instructed his provincial office heads to correct these errors. Instructions of the Management of the National Bank to provincial agencies contained in ON No. 47-77-EF-72-54/09-1-77.	Suggestions: The DGA should request that the general management of the National Bank ensure that a copy of the instructions to the provincial offices concerning the collection of tariffs is sent to the TAID for co-ordination purposes.

Annex 2 (cont. 10)

Problems and recommendations 1977	Measures adopted to overcome them in 1977	Observations on and suggestions for agricultural zones, 1978
Problem · Agricultural production co-operatives and other farmers organizations do not pay their water rates. Recommendation · The DGA should take up this matter with the farmers organizations and with the Advisory Services and Control System of the Agricultural Production Co-operative (SAF-CAP), in order to ensure that these rates are paid.	The Centre of Agricultural Co-operatives of Sugar Producers of Peru (CECOAAP) has been asked to encourage the Agricultural Production Co-operatives of Sugar Producers (CAP) to pay their tariff and more generally, to assist officials of the DGARC to prepare for the seminar on water tariffs which was held in the middle of June 1977. These initiatives have had extremely positive results.	Observations: The problem remains. Suggestions: The DGA should continue negotiations so that co-operatives and other farmer associations comply with their obligation to pay water rates.
	General aspects	
Problem · Technical Administrations are constantly being charged with undertaking activities which correspond to other programmes. The carrying out of these additional jobs uses up a large part of the time of the Irrigation District's personnel, causing delays in the discharge of their own duties. At the request of the Agricultural Zone III, with the approval of the plenary. Recommendation · That the Chief Authority should instruct the Technical Administrations to give priority to the achieving of their programmed goals.	It was discussed in a meeting of zonal directors, prior to the formulation of the 1978 budget.	Observations: The problem remains. Suggestions: A definitive solution to the problem should be negotiated with the Zonal Directorates.

Annex 2 (concl.)

Problems and recommendations 1977	Measures adopted to overcome them in 1977	Observations on and suggestions for agricultural zones, 1978
Problem - Status of the Technical Administrations of the Irrigation Districts. The low wages and salaries received by the personnel who work in water-related activities bears no relation to the importance of their function and the high responsibility of their jobs. Recommendation - The DGA should communicate this concern on the part of the Technical Administrations to the Minister of Agriculture so that the expected reclassification could be soon implemented and the salaries of personnel in the water subsector improved.	The necessary steps have been taken for it to be dealt with by the Management Office.	Observations: The personnel of the TAID's have not yet been reclassified. Suggestions: The salary level of TAID personnel and those in water-related activity, in general, should be negotiated with the Chief Authority.

Annex 3

PROBLEMS OF WATER-RELATED ACTIVITIES RAISED IN APRIL 1978 AND THE RECOMMENDATIONS MADE BY THE AGRICULTURAL ZONES */

Background	Problem	Recommendations
	Technical aspects related to the degree of functional relationship with other organizations	
Food production zones		
The Production Agencies provide global information on progress in sowing crops under irrigation without reference to the irrigation sectors or subsectors.	It is necessary to compile the information from farmers in the irrigation sectors.	The Food Production Zones, through the Information and Statistics Units, should collect monthly, at the level of the subsector or irrigation sector, information on the progress of sowing all crops under irrigation for transmission to the Technical Administration of the corresponding Irrigation District.
Rural land assessment		
No cadastral information is available either because such information has not been sent to the zone or because the relevant cadastral surveys have not been carried out.	Directives Nos. 31/77-OR and 18/76-OSPA-OR cannot be carried out. The DGA should transmit to the SDAI of the Agricultural Zones, the available cadastral information so that the Agricultural Zones could request the information that is still lacking, and the Rural Cadastral Office could carry out the remaining surveys.	

*/ Annex taken from: Ministry of Food and Agriculture, General Water Directorate, Final Report, Second General National Co-ordination Meeting - Water-related Activities, Lima, 25 to 28 April, 1978.

Annex 3 (cont. 1)

Background	Problem	Recommendations
Projects of local interest		
Some projects are approved without the knowledge of the Agricultural Zone, and others do not meet the legal and technical requirements for their execution.	Certain projects lack feasibility studies while others do not have the required priority. This constitutes a major obstacle to the development of the Irrigation District (DR). They draw off personnel, time, and equipment, making it difficult for the Technical Administration of the Irrigation Districts (TAID) to carry out their programmed activities.	Projects of local interest should be programmed by the DGA in co-ordination with the Agricultural Zones.
The General Department of Irrigation		
The Agricultural Zones are implementing irrigation projects under the rubric of local interest projects.	The lack of guidelines for drawing up terms of reference for carrying out irrigation studies, at all levels, the absence of technical directives for the design of works and technical specifications for their execution, makes it difficult to carry out studies to execute the works.	The DGI should issue the relevant directives for the proper execution of studies and works.
Co-ordination between the DGA and the Agricultural Zones (SDAI and TAID's)		
Formulation of Crop and Irrigation Plans (PCR) (Agricultural Zone VI)	Forecasts of water availability are not available on time.	The DGA should make the forecasts available prior to the formulation of the P.C.R.

Annex 3 (cont. 2)

Background	Problem	Recommendations
The lack of water resources in the Alto Piura Irrigation District is aggravated by the delay of the Project for the Extension of the Agricultural Frontier, especially this year because of the drought affecting the northern region.	The cultivable lands in the Alto Piura cannot be used. There are invasions of rests, serious social problems and unemployment.	The DGA should urgently complete the first stage of rehabilitation and well-drilling of the Project for the Extension of the Agricultural Frontier in Alto Piura.
<u>Current management capacity of the SDAI and TAID's in relation to the priority actions to be carried out</u>		
The resignation and retirement of personnel causes a constant shortage of human resources and, because of legal and economic restrictions and the low level of user participation, it is not possible to fill vacancies or to acquire necessary equipment.	It is not possible to achieve the programmed goals or to properly administer and operate the Irrigation District.	The DGA should take the necessary steps to ensure that the SDAI and TAID's are fully staffed and equipped, bearing in mind the provisions of Article 4 of Decre-Law 22088. Money collected by way of licences for the extraction of sediment material and the levying of fines for non-compliance with the General Water Law should be considered income of the TAID's. A new organizational scheme should be designed for water activities, which must be dynamic, decentralized, and self-financing by means of water rates and other income.
<u>Training and Extension Programme in the Operation, Maintenance and Management of Irrigation Districts</u>		
Training needs in Agricultural Zone X.	The TAID do not have suitable personnel.	The DGA should support the organization of a training course for the personnel of the SDAI and of the Production Department.

Annex 3 (cont. 3)

Background	Problem	Recommendations
Orientation of applied research at the national level		
There is no irrigation research programme for the Peruvian High Plateau Region.	The water resource is not used rationally.	The Agricultural Zone has 14 ha under irrigaton made available for use under the Agrarian Reform set for irrigation in the Pirapi region, where it is planned to instal experimental fields. The amplification of Agreement 24 with AID in that area is therfore being requested.
Other technical aspects		
Agricultural Zone V has 2 000 tubular and open wells. Most of them are not in use.	The wells that are not in use no longer supply irrigation water to a considerable area in the Irrigation Districts of Ica, Pisco, Palpa-Nazca, especially this last, which are currently experiencing a serious drought.	The DGA should undertake the necessary discussions with the appropriate agencies to expedite the duty-free importation of pumping equipment and spares.
All irrigation works in the Department of Puno were contructed by companies which have since closed down without having delivered the technical and economic specifications of the works.	The amortization component cannot be calculated for purposes of applying the tariff.	The DGA should request the National Office for Supporting Social Mobilization (ONAMS) to deliver the above-mentioned information on the irrigation systems constructed by the National Economic Development Fund, since the Regional Office for Supporting Social Mobilization (ORAMS) in Puno does not have this information.

Annex 3 (cont. 4)

Background	Problem	Recommendations
	Management aspects	
The management problem between the General Water Directorate, Water and Irrigation Departments and Technical Administrations of Irrigation Districts		
The DGA was asked for the loan of its power drill (Agrarian Zone XIII).	The lack of this equipment on the local market causes a delay in the progress of work on the irrigation projects.	The DGA should make this equipment available on loan with the zone bearing the cost of any necessary repairs.
Other management problems		
Because of the budgetary situation, travelling and fuel allowances for the TAID's are very low.	Technical administrators who have to make visual inspections find themselves economically out of pocket.	A legal directive should be issued to permit the technical administrator to be reimbursed for expenses arising from visual inspections.
Overtime work	There are water-resource personnel who work beyond normal hours (irrigation sector).	A way to provide them with financial compensation should be found.
	Legal aspects	
Problems in applying the General Water Law and directives under preparation and/or pending		
Decree Law 17752-Article 14, Section IX (Agricultural Zone III).	The mining companies pollute water thus endangering health and the flora and fauna, and the penalty for doing so is insignificant since the minimum fine imposed is 300 soles.	The amount of the fine should be increased and the water use license for mining activities should be suspended until the work on the waste water treatment plant is completed.
There are areas suitable for temporary crops on river banks and exploitable marginal strips (Agricultural Zone XI).	As a result of permits granted by the Technical Administrations of the Irrigation Districts for provisional occupation of these lands and their annual renewal, certain possession rights are protected thus creating social conflicts.	A directive should be issued to regulate the use and granting of permits for farming on river banks and marginal strips.

Annex 3 (cont. 5)

Background	Problem	Recommendations
Decree Law 22169 National Production System	The agricultural season begins on 1 August and ends on 31 July.	The beginning of the agricultural season (PCR) (Crop and Livestock-raising Plans (PCC)) should coincide with the hydrological year, that is, from 1 September to 31 August.
The User Associations are empowered to negotiate the establishment of water quotas.	Since it is impossible to elect User Associations at the DR level in the high plateau region, it is impossible to fix the water quota, in spite of the fact that means exist to ensure the financial participation of the users in repairing and maintaining the irrigation district.	A legal provision should be formulated to permit the application of a water quota at the level of the Irrigators' Associations.
	Water rates	
Due to the current economic crisis, the cleaning of the canals cannot be fully financed this year since the users do not have the money and the Agricultural Bank does not want to grant loans because of the outstanding debts of the Irrigators' Associations.	It will not be possible to undertake the cleaning and maintenance of the irrigation infrastructure of the DR, or the work for the 1978-1979 season will not be completed for lack of money, or will be late in completion.	Examine the possibility of the Tariffs and Quotas Department taking steps to obtain loans for the Irrigators Associations, or User Associations for the sole purpose of executing a cleaning and maintenance programme. Such loans will be repaid during the first quarter.
An appropriate operating mechanism has not so far been found for the TAIO to effectively collect the water rates (Agricultural Zone I).	The users of Agricultural Zone I owe the sum of 43 530 657 soles, in water rates. Most of these users are companies.	The Tariffs and Quotas Department should co-ordinate with all agencies that have a direct economic relationship with associated companies (Public Agency for Agriculture and Livestock Services (EPSA), Agricultural Bank), in order to be able to directly withhold the debt from the users, including companies.

Annex 3 (concl.)

Background	Problem	Recommendations
The National Bank does not provide services to users with the necessary efficiency, obliging them to return several times to pay their debts.	The mechanism of collecting through the banks is inoperative.	Collection should be made in the offices of the Administration of each Agricultural Zone, which will forward the deposits to the Agricultural Bank on behalf of the irrigation district.
Extension of due date and reduction in amount of the water rate.	This leads to complaints from users who make their payments on time and creates a precedent for the payment of the next bill due when a possible reduction in the amount payable may be expected.	That the DGA set deadlines for payments, which are not subject to extension.
	Others	
Water users are obliged to pay their quotas to the corresponding User Association.	The companies supplying drinking water do not pay their quota to the User Association.	The DGA should regulate the payment which the drinking water supply companies should make or should co-ordinate with the company in question to ensure that the corresponding rate is collected.
The section on Urban Construction of the National Building Code is incomplete due to the absence of an annex dealing with irrigation waters.	It is difficult to get approval for studies and for the execution of canalization and other engineering works owing to the lack of technical specifications in urban and pre-urban zones.	The DGA should arrange for the drafting and presentation of the annex concerning irrigation water.
Water pollution in the Locumba river.	The Agricultural Zone has no information about the progress of the work of the Special Commission.	The DGA should keep Agricultural Zone VII informed of the results of the work of the High-Level Commission.
Drought.	Problems of water shortage in Agricultural Zone VII - Tacna.	The DGA should decide as soon as possible the minimum flow required for a request to be made to have a state of emergency declared.