

# Operation and maintenance of water projects and services in Latin America

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*This paper concentrates on two aspects of the vast subject of '... water projects and services'. Even though the questions tackled may affect different water uses, this analysis is focused on operation and maintenance of water supply systems and the institutions that service them. The paper seeks to analyse some of the obstacles which impede the attainment of better performance in the operation and maintenance of water projects. It tackles the institutional problems and restrictions which must be overcome to speed up the adoption of operational patterns which will lead to a better use of available capacities.*

It is generally agreed that if we are to reduce the fiscal deficits of the water supply services now provided, the institutions responsible for water management must adopt more efficient criteria and mechanisms for the operation and maintenance of their systems. From this viewpoint, it is relevant to analyse the obstacles encountered and the modifications which must be made to practices currently perceived as inadequate. Most experts in the field agree that in Latin America there is a lack of resources available for the efficient operation and maintenance of water systems. There are two main causes for the shortfall: one concerns the problem of the state allocation of resources; the other concerns the people's capacity to pay.

However, while not neglecting its importance, we do not wish to centre this paper exclusively on lack of resources as a basic restriction to the improved efficiency of operational and maintenance services. That would narrow the scope of the analysis and restrict consideration of the factors which produced the exist-

ing situation and thereby restrict the prospects for improvement in the future. We must remember that simply to show that water operations and maintenance are inefficient because of lack of funds does not explain why they are inefficient; nor does it explain the reasons why, in relative terms, the state allocates more resources to new projects than to the maintenance of existing ones.

On the basis of those considerations and with a view to broadening the scope of the analysis to reveal major restrictions within the Latin America region to more efficient water services, we have adopted, as a working hypothesis, the assumption that in the processes followed by different countries a number of cultural factors have emerged. Those cultural factors have had a negative effect on the operation and maintenance of existing water systems because of the expectations that water services should be provided free or below cost. In examining this hypothesis, it will be useful to take into account the present position of most Latin American countries.

For years, many countries in the region have been undergoing a crisis, which became more acute and more widespread in the 1980s. As a result, they have adopted what are known as 'adjustment policies'. Basically, those policies consist of a series of measures designed to reduce budgetary deficits and increase economic efficiency through keener competition. Because of that trend, it is obvious that the state must be

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the centre of attention. However, a discussion of the role of the state goes beyond the scope of this study. But in dealing with the operation and maintenance of water systems in Latin America, we must give some consideration to the state's activities in this area. It is clear that any investigation of perceived failure in the operational and maintenance tasks carried out by water management institutions must be identified as a failure for the state.

Such considerations are not taken into account in the rationale invoked at the present time. That rationale maintains that the mere reduction of state activities, by their transfer to the private sector, provides an immediate solution to current problems. This argument disregards a basic element of adjustment policies: the efficiency of private enterprise may also be questioned.

Any criticism of the efficiency of the private sector in Latin America is not intended to ignore its capacity to make an important contribution; rather that certain public services, by their very nature, must be run by the state. While the state may assume responsibility for such services, this does not mean necessarily that it must manage them directly. On the contrary, it may be natural for the state to delegate specific activities to the private sector if it has suitable control machinery and clear objectives. Undoubtedly, the private sector is more flexible and can adapt to change. In the tasks of operation and maintenance, at least from the analytic viewpoint, it may maintain higher standards of efficiency. In fact, from the moment that private enterprise accepts the logic that efficiency is essential for profitability, its operations must have that aim.

These observations do not seek to place the analysis in a vast unfathomable context: Rather they serve to sharpen the analysis, to point out that the current characteristics of the operation and maintenance of water systems in Latin America are the result of the responses of the state to the needs of society in this field. The fact that these characteristics at the present time are inefficient implies that the responses given were incorrect, that the overall model was inappropriate to present needs or that changes have taken place in the needs of society.

What is clear now is that the operating model of the state is undergoing a crisis. But this does not mean that the responses given were always incorrect. Rather, it means that they were not appropriate as regards their capacity to adapt themselves to changing conditions or their capacity to anticipate changes in the context in which they must operate. In the field of water supply systems, it was the state which was responding to the needs of society, making investments in major water projects and building the institutions

responsible for their operation and maintenance. Profitability, as conceived in the private sector was not the basic aim of those investments. There were requirements that had to be satisfied and which, to a certain extent, constituted the reason for an institution's existence. The increase in the population, with its impact on urban growth and food demand, broadened and diversified the investment needs at a time when nearly all Latin American countries were building up a state model which, unlike the previous models which were inspired by *laissez-faire* principles, involved a pronounced intervention by the state through the promotion of industrial activities and economic and social development. At the same time, in the political field, new horizons were opened and new social groups were formed with effective machinery for asserting their demands.

In this process, which saw the consolidation of the basic characteristics of the state's operating model, new credit mechanisms created by donors were developed for state investments. These sources of financing paved the way for huge water projects designed to promote economic and social development. The state also assumed responsibility for the financial undertakings made. However, emphasis on projects meant that the institutions that were to operate them did not obtain sufficient funds from the donors to ensure their maintenance and indeed their operation. The state had to help finance the latter activities.

With greater or less clarity, the governments of most countries perceived the problem and began to seek solutions. Although in some cases this effort started in the early 1960s, it was only in the 1970s that specific measures were adopted. Basically, they consisted of the decentralization of functions, the simplification of administrative processes, the transfer of certain activities to the private sector and the imposition of certain self-financing rules on the institutions. All this, however, took place in a context of broad international liquidity, with credits available at reduced rates of interest. This availability of financial resources, which gave rise to an unprecedented level of indebtedness and which would cause a crisis in the following decade, not only concealed the gravity of the situation but also made it worse, because it increased infrastructural investment without changing substantially the conditions under which the infrastructure would be serviced. The 1980s, with the debt crisis, made the situation clear and revealed the need to give special attention to the operation and maintenance of infrastructure. Meanwhile, substantial services deficits persisted, problems arose with existing installations and the sources of additional financing became limited.

The author believes that the attainment of appro-

priate levels of efficiency in the operation and maintenance of water systems requires a change in the cultural patterns of the region which expect water services to be free or of low cost and which have determined, to a large extent, the characteristics of the water services now seen as inefficient. Culture may be understood to mean a complex mix of things, institutions, ideas and images used by a given society. Leaving aside those more related to technology, we can envisage the 'things' included in the concept of culture. We may also see ourselves in a time when society has certain expectations of state institutions. In this case, the institutions are concerned with water management and are considered to be inefficient because their services, in both quality and quantity, are inadequate. The existing 'institutions' were established by the state in accordance with the ideas and images prevailing in society at the time of establishment. It will be clear, however, that new ideas have effectively pushed aside previous ideas held by society. In this particular case, the ideas relate to the role that the state must play, through its institutions, in water management. As we shall see, the need is to establish new operating conditions which in their turn imply more efficient forms.

As pointed out, large water projects were undertaken by the state without consideration of profitability, as understood by the private sector. There may be exceptions, above all as regards hydro-electric development, but in general terms, those do not invalidate the general conclusion. The promotion of economic and social development projects by the state extended itself to the institutions established to operate those projects. User fees were kept low to extend benefits to all. As a result, the costs required to run those works were not recovered by tariffs or fees applied to users. Furthermore, a principle was established with regard to water management services. According to this principle, first, efficiency was no longer a requirement; and second, as the state became less able to finance the operating deficits, efficiency had to be tailored to existing resources. The result was that water services were not economically priced. They were provided by the state at reduced charges and were not tied to the real costs of operation.

Of course, it is quite possible for any state to divorce its water rates from operative costs. It can finance the deficits out of general tax revenue. But we must remember that if it adopts such a course, efficiency, as conceived in economic theory, becomes to some extent meaningless: input values are no longer related to the price of the finished product. In the particular case of water services, the application of a tariff unrelated to production cost, and, as often

happens, unrelated to the volume of water supplied, makes it difficult for the institution concerned to use criteria of efficiency in the treatment of inputs, to programme its investments and to ensure that the consumer makes the best use of the service.

However, apart from the transformations that would have to be made by many Latin American countries in order to allow them to adopt efficiency criteria in their water services, we may ask: what are the implications for society? How much is society ready to pay in order to change the 'image' that it has of existing institutions through the initiation of 'new ideas' regarding the operation of such institutions? Can society easily accept that, in order to provide water services, a productive process of greater or less complexity must be launched? That it would impart an entrepreneurial character to the institutions providing such services? If that happens, those services will become economic goods for which society must pay a price commensurate with the operational costs involved. The answer to the question of costs will depend on the specific characteristics of each service and of each specific locality. Some countries have made considerable progress. They have brought on line a number of water services, together with others, such as energy and telecommunication services, which are practically free of the characteristics usually attributed to water institutions and which are run on an accepted economic basis. But, in other cases, the aim of achieving efficiency, which necessarily implies achieving efficiency under the present economic conditions of the region, may run afoul of the cultural habits rooted in society. Those habits make it difficult for water services to abandon their promotional character, or to cover the cost of their services through fees.

The cultural pattern built up in society as a result of the state's operation of the water sector is not all that must change in order to attain appropriate standards of efficiency in the operation and maintenance of water services. At a second level of analysis, we must consider how the institutions, as they developed, tended to depart from the cultural patterns that produced them. It therefore becomes relevant to examine ways in which existing institutions can put into practice the new ideas which may now be held by the society in which they operate. Our second level of analysis concerns the organization of the institutions themselves.

### Organizational factors

Our aim is to consider the objections arising within water management institutions to the adoption of the changes required to achieve a substantial improve-

ment in their standards of operation and maintenance. For this purpose, it is pertinent to take into account the conditions in which these institutions were established, their characteristics and their general policies.

It is hard to conceive of a model institution which is valid for all countries of the region and for all areas of the water sector. It may, however, be assumed – at least in a wide range of cases – that the institutions were established during an initial phase of socio-economic development. They were closely linked to central government and took the form of public bodies. Under those initial conditions, they acquired a series of special characteristics and a policy which, while presenting natural differences depending on the country and the type of water use, nevertheless had a kind of organization and an operational logic which can be analysed in general terms without distorting the basic elements of each particular case.

The institutions were established during an early phase of economic and social development. As a result, they were promotional in nature and geared towards construction. Both characteristics were necessary because priority had to be given to the building of infrastructure. Those characteristics had certain operational effects which complicated their subsequent capacity for action, when the priority was to operate and maintain services and to find the means to do so. As a result of those initial promotional characteristics, an organizational hierarchy was established which gave great importance to the design and construction of projects. The areas of operation and maintenance were relegated to a secondary position. Furthermore, the promotional activities involved no requirements for the commercial organization of their services. They were in no way bound to achieve a return on investment.

Their establishment as public bodies linked to the central government imposed on water institutions other operating conditions that affected their ability to respond to changing needs. They had to be organized administratively according to rules imposed by the state. Those rules usually concerned the control of legality and budget accountability. Instead of following action-oriented procedures, the water services were often bogged down in red tape unsuited to their needs. The central government link meant that their structure was over-centralized. There was little margin for regional decision-making. Most of them had to operate with a good deal of political interference. This applied not only to their general policy but also to details of their internal administration.

All these characteristics became stronger when combined together to give shape to the institution's operating machinery. They became difficult obstacles

to overcome when, as development advanced, their initial promotional character became less important and the need to introduce more efficient methods and to maintain and improve existing systems became more important.

While nearly all countries of the region had to face this situation, the times when they began to take action and the nature of that action varied. Nevertheless, basically, they tended to introduce organizational changes which could enable the institutions to adapt more efficiently to the conditions in which they had to operate and to the needs they had to meet. For example, the institutions adopted measures of a more entrepreneurial character – with new legal systems – designed to decentralize their operations to allow and indeed to promote the participation of private enterprise, to impose patterns of operative self-financing and patterns of efficiency etc.

The adoption of all those measures brought about changes in the operation of some water service institutions. In some countries and water sectors such changes were substantial. However, there is still general concern about the operation and maintenance of water systems in Latin America. Higher standards are needed and better results must be achieved in order to reduce existing deficits.

In view of this situation and despite the desire of governments to find solutions, it is clear that the processes of institutional change involve requirements that are not easy to satisfy. From the viewpoint of this study, the nature of those requirements is linked to the degree of institutional rigidity, to the operating policy of each institution and to the systems, relationships and organizational structures that are to be transformed.

The particular dynamic assumed by each institution results from a complex of relationships shaped over time. But a theoretical model can be sketched of some forms of water service organization in which political decisions can bring about institutional changes. However, it must be assumed that the degree of change sought will in turn determine the degree of institutional resistance to change.

In order to outline the model, we may picture our theoretical institution in question as being made up of three sectors: executives, intermediate-level staff and workers. In addition, we must take into account, in the operational system, the contractors and suppliers, the government and the users. We may consider that, in an operation based on traditional patterns, it has been decided that the institution should become a services organization which is self-financing in operating costs and in future investment costs. To make this decision viable, we may suppose that the administrative rules are made more flexible, incorporating directives

reflecting a policy of intended change.

One of the first insights to emerge in the effort to launch change is the fact that it is not rapid. One may for example discover that the information systems are useless because they were established to comply with previous administrative norms. They cannot provide data that is useful for the adoption of newly inspired decisions. We must remember that we can expect to be dealing with an institution in which we have no cost accountability; commercial information is precarious; investment programmes are not designed on the basis of the evaluation of economic and financial alternatives etc. However, the institution must continue to operate. This means that the essential decisions must be taken on the basis of information available, while at the same time the functional information systems, with the new characteristics to be imposed, are being established. The system of operational self-financing must be achieved rapidly and this can only be based on an increment in the price of services, which obviously can be applied only to registered users.

We can see that difficult situations may arise during this first phase. To the extent that self-financing may require substantial tariff increases, there may be political resistance, and the users will naturally be opposed to increases. The alternative of lowering operating costs has its limits, especially if management is unwilling to carry out the requirements of policy-makers. There will be problems in setting up new information systems. The existing institutional regime leaves no time for re-organization. The recruitment of qualified staff to handle the information systems or the hiring of outside professionals may be difficult because the existing staff may be reluctant to provide needed information or to cooperate with 'outsiders'.

Similarly, because self-financing will also include the future costs of investment, another measure designed to meet the new conditions will include the review of investment programmes from an economic and financial viewpoint. There will need to be a reprogramming of projects under way in order to relieve financial pressures. To achieve the aim of transforming the institution into basically a services organization, there will need to be a reallocation of staff – especially intermediate-level staff – along with the appropriate resources. Such decisions, however, are bound to have immediate effects. The reprogramming of projects under way will cause an immediate reaction from management, especially in the areas of projects and services. Management will maintain that the rapid completion of projects is essential. Senior management staff will take this view as well, because they have been involved in the

programming and their whole structure is geared to projects. Project staff will have assumed a privileged position in the organization and cannot run the risk of not having the required projects. There will also be a reaction from contractors. Those who are affected will begin a series of financial claims and will begin lobbying for this purpose. The review of investment programmes, although not immediately, will give rise to similar adverse reactions. The analysis of alternatives to each project will undoubtedly show that the one included in the investment programme was the best of the lot and that income projections from the sale of new services on the basis of the new commercial policy, will ensure solid financing.

Difficulties will also be encountered in the service area when the new policy is imposed. Trade unions will resist alterations in their work procedures. The means for maintaining the existing installations will become precarious. Structural problems will not be solved rapidly because the need for self-financing will lead to the postponement of purchases. Moreover, the staff available are more qualified to work in the project and construction areas than in the services area. They prefer such work because in those areas they have traditionally had better career prospects.

The above conditions – and many others that may arise – will be typical. They stifle the initial impulse for change. Change ends up becoming bogged down in institutional inertia. Undoubtedly, at each stage, some modifications will be incorporated into the work of the institution. But rarely do the new procedures acquire the momentum necessary to impose the required changes quickly. Political requirements seldom allow the time required to bring about institutional action. Hence the time available to adjudicators of change is consumed in preparatory tasks and in an institutional routine that cannot be paralysed. Often it is the routine which prevails.

### **Human resources and suitable technology**

As stated above, cultural and organizational factors affect the possibility of change in water service institutions. This in turn affects the attainment of operational and maintenance standards required by the current level of water development. Those same factors generate operating conditions which produce similar problems as regards human resources and the technology to be employed. Because those two elements exert a special influence on institutional policy, it is necessary to examine them in detail.

#### *Human resources*

The original emphasis on building water systems by water institutions has resulted in a privileged position

for the project and construction sectors. Thus, it is common to find that the experience and technical training of the management staff have been developed in those areas. It is also common to find that for much of the life of many water institutions, management has been in the hands of project and construction personnel. These characteristics have imposed themselves upon the institution because professionals within the institution had better chances for advancement in the project and construction areas. A vicious circle was thus created: young professionals sought jobs in projects or construction and, as they rose higher and achieved greater levels of responsibility, their own experience and qualifications reinforced the privileged position of the project and construction areas. Moreover, international bodies contributed to this state of affairs with their lending practices until operational and maintenance problems became apparent and improvement programmes were instituted.

There is an apparent paradox in the position of technical staff, both those with formal university training and those with long experience – foremen, skilled workers etc. In many cases, the hierarchical structure reflects the excellent qualifications previously maintained at the technical level, especially as regards the operation of systems, but this has produced complaints about their present qualifications. The situation is apparently paradoxical because there is a tendency to forget the growing complexity of the systems and the need for technological change as staff are promoted.

The current level of unskilled workers, inasmuch as they participate in the personnel structure of the areas of operation and maintenance, is generally inadequate to meet current requirements. Such staff, moreover, have not been trained in a formal educational system. The present need is for skilled workers who can operate complex, high-efficiency equipment. This gives rise to an additional requirement: the classic problem of training human resources within sectoral institutions.

These observations summarize some of the problems facing water institutions in their efforts to improve operational and maintenance standards. So far we have dealt only with traditional areas. But the problem does not stop there. The attainment of a new operating model requires qualified personnel in new areas, linked to administration. As self-financing service organizations, water institutions must change their form and system of administration. This requires staff who are specialized in different branches related to the social sciences. It also implies a need for staff who can resolve harmoniously conflicts that will necessarily arise with traditional employees, who

must accept decisions and requirements recently incorporated into the life of the institution. The ability to solve such problems is a qualification that both directors and managers must have: beyond their professional skills they must have an overall view of the institutional situation and the needs they must meet within the restrictions to which they are subject.

#### *Suitable technology*

Technology is another field in which institutional structure has imposed conditions which do not help to improve the operation and maintenance of the systems. As a result of the pivotal position traditionally maintained by project and construction personnel, advances made in technology were rapidly incorporated into the design of water-works. However, in the services area practices failed to keep up with technology. Consequently, it is not hard to find high-cost and technologically advanced systems in a non-operational condition, or in conditions where they are operated rudimentarily without the use of the technological innovations they incorporate. One of the reasons for this is a lack of coordination between designers and operators. This is often aggravated, in strongly centralized institutions, by a similar unawareness of the environment in which the project is to operate.

Obviously, it is not for the designers to reduce their level of technology to that of the operational and maintenance area. Rather, operation and maintenance must improve. Even so, the designers must adjust themselves to the capacities of the institution. They must be totally functional as regards the environment in which they work; the latest technological innovation on the market is not necessarily the most suitable. This appreciation may seem obvious and unnecessary to explain. But in many cases throughout the region, that condition is not fulfilled.

In the last analysis, the concept of suitable technology is implicit in these considerations. The determination of what is suitable, however, is not the exclusive domain of the design area. It must emerge from a joint effort by those who design, operate and maintain the projects, those who market their services, those who plan their development and those who evaluate the alternatives from the economic and financial viewpoint. Except for rare exceptions where teams have been formed to handle specific projects, it is almost impossible to find such a joint effort in the region today.

#### **Conclusions**

We have considered the restrictions derived from organizational factors, the conditioning which affects

human resources and the use of technological development. We have examined the attainment of increasing levels of efficiency in the sectoral institutions within the framework of a redefinition of the state operating model. We are now faced with two possible paths: we can transform institutional operations fairly rapidly or we can carry out a radical modification of the sector, which will imply, in fact, the disappearance of many institutions.

To bring about a transformation in the operation of the institutions, there are two basic requirements. First, the different sectors that make up each institution – basically, management, intermediate-level staff and trade unions – must understand that the present situation in the region is qualitatively different from previous situations. In a wide range of cases, it will be difficult for institutional inertia to stifle the impulse for change. The unsatisfied demands are great: states do not have the resources to finance new undertakings; and governments are developing socially expensive programmes to achieve improvements in the overall efficiency of the economy. Second, the politicians must understand that institutional change is not an immediate solution. It will require time and the establishment of gradual objectives. Without prejudice to this understanding, there is no

doubt that the politicians and the directing staff, who reflect their views within the institutions, must sound a clear alarm whenever existing institutional routine threatens the basic objectives of change.

In present circumstances, the transformation of sectoral operations is coming about through the transfer to private enterprise of all, or large parts, of the tasks now performed by state institutions. Undoubtedly, this path is tempting for governments faced with pressing needs and determined to bring about change in state operations. The possibilities for following this path vary from country to country, depending on the capacity and interest of existing private companies, the characteristics of their services etc.

Whatever path is followed, the traditional pattern of water operations in Latin America is destined for profound change. The 1980s brought out clearly the magnitude of the structural weaknesses and the impossibility of correcting them with palliatives. This fact is recognized not only by the governments of each country, but there is also a growing awareness of it in each society. In this process of transformation, it will be difficult for the water institutions to survive without modifying their policy and establishing new conditions of operation.