

6. NATIONAL PROGRAMME FOR THE SUSTAINABILITY OF WSS SYSTEMS IN COLOMBIA

Between 1997 and 1998, the Ministry of Economic and Social Development (MinDesarrollo) and FINDETER (the Financial Agency for Municipal Development) financed the National Programme for the Sustainability of WSS Systems in Colombia. The objectives of the programme included: to apply the TLPs in different phases of the institutional project cycle; to analyse the problems in WSS projects that cause failures; to develop tools to be applied in the project cycle; and to develop an information system at local levels so that communities can monitor the sustainability of WSS services. All these objectives were part of the research presented in this thesis. The problems in the institutional project cycle were identified. Based on these problems, this study proposed a new project cycle and an information system at the local level. Three full-scale TLPs were developed as a result. Each followed a modified version of the strategy proposed in the TLPs carried out in Cali (Valle). The modified strategy incorporated the suggestions made during the evaluation of the Cali projects. In addition, a Manual for Community Participation in the Project Cycle was drawn up along with other manuals to improve the WSS service management.

6.1. INSTITUTIONAL VISION OF PROBLEMS AND SOLUTIONS IN THE PROJECT CYCLE ON WSS

Hitherto, a development project has tended to mean an externally funded initiative undertaken by the public sector, generally resulting in the creation of physical assets.

Cusworth and Franks (1996)

This institutional vision of the problems and solutions in the project cycle was developed in Phase I of the National Programme for Sustainability of WSS systems. Its target population was municipalities between 1,000-12,500 inhabitants. Financial support was provided by the Directorate of Public Services in MinDesarrollo, FINDETER, and FIU. CINARA participated as a facilitator in the process, which involved communities and institutions at local, regional and national levels. The activities were designed to contribute to the sustainability of the investments and interventions in the WSS sector in Colombia. The objective was to strengthen community and institutional capacities throughout the project cycle in order to

deliver sustainable services. The relationships between phases, stakeholders, and activities were analysed using structural analysis methodology. An initial list of problems was prepared based on the evaluation of 49 WSS projects carried out by FINDETER and work done by CINARA during the past 10 years. Two participatory workshops were held to complete and prioritise the problems. The methodology was developed with the participation of a multi-disciplinary and inter-institutional team composed of 16 professionals from national and regional institutions working in the WSS sector and 12 professionals from CINARA. All the professionals had wide experience with WSS projects in small municipalities, as well as rural and peri-urban areas (CINARA *et al.*, 1998a).

6.1.1 Methodology

To prioritise the problems in the WSS project cycle, the methodology was as follows:

- a) A first list of problems was defined based on FINDETER evaluations (FINDETER, 1996) and brainstorming by national and CINARA staff.
- b) The list was reviewed, discussed, and completed in two workshops. The first workshop was held in Bogotá (4th –5th December 1997). The second workshop took place in Cali (23rd February 1998).
- c) Structural analysis, a tool drawn from Systems Theory (Latorre, 1996; CVC, 1995) was used to choose the relevant problems.

6.1.1.1 Structural analysis

Structural analysis considers that the importance of a problem is related to its influence on other problems. Hence, problems with great influence are identified and the main problems are chosen according to the team's capacity to solve them. This tool is valid if the analysis is carried out by an inter-disciplinary team who is familiar with the situation being analysed. It is important to make decisions through consensus.

6.1.1.2 Procedure

The influence of each problem on the other problems was analysed and the most relevant and direct influences were identified. A double entrance matrix, which listed the problems in both rows and columns, was prepared. To prepare the matrix, the interdisciplinary team assessed the influence of each problem located in the rows on the problems located in the columns. Those problems that directly influence other problems are labelled "YES"; problems that 'stand alone', or have no influence on any other problems are labelled "NOT". The influence relations were the sum of "YES"s in the columns and the dependence relations were the sum of "YES"s in the rows. A graph was drawn locating each problem according to its coordinates (X: dependence, Y: influence). The graph was zoned according to the following lines (Figure 24):

$$X = Y = [(\text{Maximum influence value} + \text{maximum dependence value})/2] / 3$$

Four zones are defined:

Zone 1: Power zone

The problems with great influence and low dependence were located in this area. If these problems are solved, the repercussions in the system analysed will be great.

Zone 2: Work zone

The problems located in this area have great influence but they also have great dependence. Hence, any actions considered in relation to them should be carefully analysed in light of their dependence.

Zone 3: Results zone

The problems with low influence and great dependence were located in this area. They could be interpreted as results of other problems. They are solved when other problems are solved.

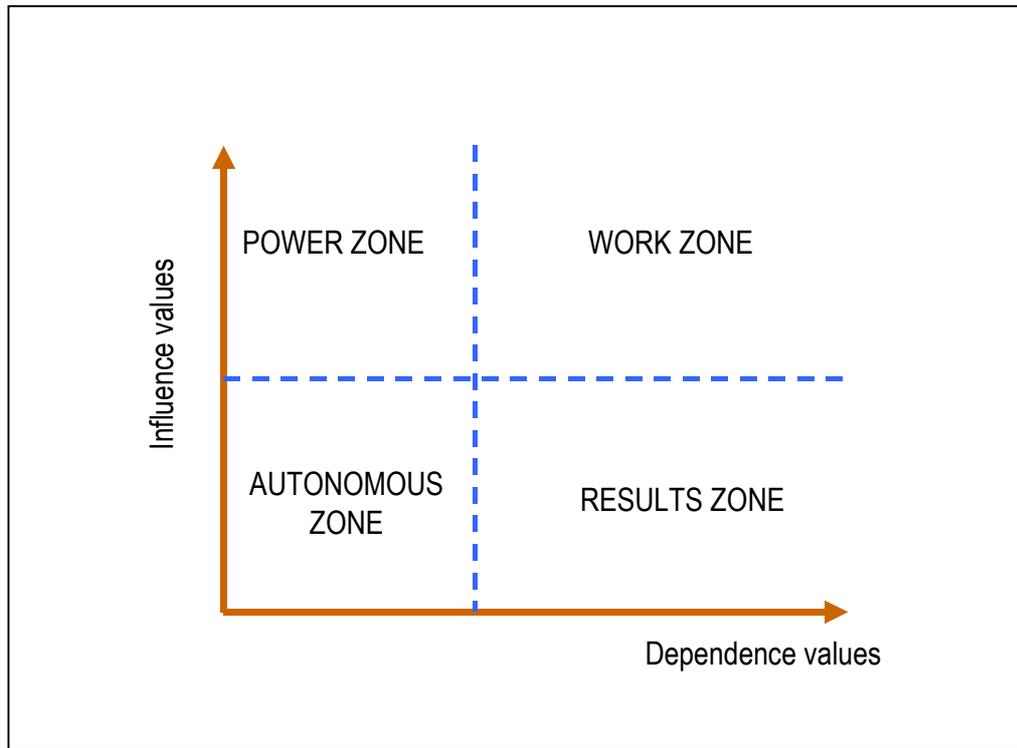


Figure 24 **Structural analysis graph**

Source: CINARA *et al.* (1998a)

Zone 4: Autonomous problems

The problems in this area have low influence and dependence. They could be foreign to the system analysed.

The problems in each of the project phases were prioritised using the structural analysis. Next, a new analysis that considered the prioritised problems together was carried out. Then, five problems were chosen for analysis and their causes, consequences, and possible solutions were identified. By means of discussions and reaching a consensus, the inter-disciplinary team chose five problems in zones 1 and 2. They were chosen based on the team's capacity to solve them.

6.1.2 Results

6.1.2.1 *The main problems affecting each phase in the WSS project cycle*

More than 150 problems were identified. Using the structural analysis applied to the problems in each phase, 42 of them were selected (Table 31).

6.1.2.2 *The most relevant problems in the project cycle*

A new structural analysis was carried out using the 42 problems to prioritise the most relevant problems (Table 30).

Table 30 **The most relevant problems in the project cycle**

No.	PROBLEM
9	Weaknesses in professional education (G)
14	Institutions have little interest in capacity building (G)
15	Professionals and institutions are not committed to work with communities (G)
22	Deficiencies in the technical, administrative and management capacities at the local level (G)
5	Lack of conceptualisation (P)
8	Urgency to spend the institutional budgets at all levels (D)
27	Concepts and strategies for institutional development are not clearly stated (A,O&M)
32	Scarce economic resources for institutional development (A,O&M)
41	Deficiencies in monitoring and evaluation procedures in the projects (M, E)

G: General; P: Planning; D: Development; A,O&M: Administration, operation and maintenance; M: Monitoring; E: Evaluation

No. : Number in Table 31

Problems 5 and 15 depended on problem 9. Problems 14 and 32 depended on problem 27. The others were independent of one another. Thus, the team selected problems 9, 27, 22, 8, and 41 for further analysis. These problems were closely linked to general concepts: problem 9 was related to the educational system, problem 27 was closely related to concepts about development that were implemented worldwide, and problem 22 reflected the deficiencies in the application of the decentralisation process. Finally, problem 8 was associated with planning at all levels and problem 41 was connected to the predominant concepts regarding the project cycle, which was 'supply-driven'. Very visible problems such as "the system does not function" were completely dependent, so the potential solutions to these problems depend on being able to solve the problems on which they depend.

Table 31 Principal problems in each phase of the WSS project cycle out of 150 prioritised problems

1. Employee corruption (G)	3. Frequent personnel changes in institutions (G)	6. Lack of analysis (G)	7. Information does not flow in the project (G)	9. Weakness in professional education (G)	10. Little time to reach objectives (G)	13. Lack of advice (G)	14. Institutions have little interest in capacity building (G)
15. Professionals and institutions do not feel a commitment towards helping the communities	22. Deficiencies in the technical, administrative and management capacities at the local level (G)	25. Community do not know about the project (G)	29. Municipalities do not have capacity to support rural areas (G)	30. The administrative organisation does not understand what its function should be (G)	35. The administrative organisation does not communicate with community and institutions (G)	39. The training programmes are isolated if they exist (G)	4. Previous information about the problem is insufficient (P)
5. Lack of conceptualisation (P)	33. Lack of knowledge about planning tools	12. Pre-diagnosis and diagnosis information is not valued enough (P)	2. The development bank (FINDETER) considers the approach as commercial proposition, rather than a development project (D)	8. Urgency to spend the institutional budgets at all levels (D)	11. Designers know very little about the technology (D)	26. Recommendations of advisors and designers are not taken into account (D)	24. Deficiencies in the preparation of bidding tools and contracts (D)
16. The bidding and contracting processes are carried out by untrained personnel (D)	20. The work Controller does not defend the community's interests (D)	18. The work Controller does not have enough experience (D)	19. The work Controller does not visit the project (D)	21. There is not community supervision at the construction stage (D)	17. Municipalities are unaware of the mechanisms for contracting and controlling the work (D)	23. The construction firms are not fully trained in the technology to be built (D)	32. Scarce economic resources for institutional development (A,O&M)
27. Concepts and strategies for institutional development are not clearly stated (A,O&M)	34. Scarcity of tools and programmes for community management (A,O&M)	28. Few training programmes on management and administration of the WSS systems are offered (A,O&M)	36. Insufficient resources for the continuous support of O&M (A, O&M)	37. Institutions do not have specialised departments to provide support for O&M (A,O&M)	38. Lack of programmes in O&M to support communities (A,O&M)	31. Poor understanding of administrative forms in institutions (A,O&M)	40. Administrative organisations do not request training (A,O&M)
41. Deficiencies in monitoring and evaluation procedures in the projects (M, E)	42. Evaluation is not considered because of the cost involved (E)	43. Monitoring and evaluation are not considered as part of the project (M, E)	44. Monitoring and evaluations are limited by the lack of information (M, E)				

Numbers and abbreviations shown are those used in the workshops. G: General; P: Planning; D: Development; A,O&M: Administration, operation y maintenance; M: Monitoring; E: Evaluation

6.1.3 Recommendations

6.1.3.1 *Weaknesses in professional education*

An action plan to solve this problem should involve the development and educational institutions in both social and technical areas. The action plan could begin specifying the preparation of a background document to be discussed in workshops co-ordinated by the Ministry of Economic and Social Development (MinDesarrollo). Directors of engineering, economics and social science faculties, and others should participate in both the preparation of the background document and in drawing up the action plan, along with engineering associations and other professional bodies. The results of the workshops could include a list of the basic aspects to be introduced or changed in the curriculum in response to the needs felt in the WSS sector. Likewise, the National Training Plan by MinDesarrollo could take into account the weaknesses identified in the National Programme for Sustainability. The Plan should involve research and development institutions related to the sector. Research in harmony with the local conditions is necessary to enrich professional curricula. On the other hand, requirements about updated training should be required by the government institutions as part of any tender process.

6.1.3.2 *Deficiencies in technical, administrative and management capacities at the local level*

The most important consideration for strengthening the capacities in small municipalities is the definition of clear policies recognising their real conditions. This could allow changes in institutional development programmes, which are now based only on legislation. The programmes actually are tool-based in their essence although they were created to strengthen capacities. Achieving high municipality coverage at the regional level is a fundamental factor for strengthening the local capacities to deliver good quality WSS services. Under the current policies in the WSS sector, it is not possible for the Ministry of Economic and Social Development and other national institutions to support each municipality. On the other hand, it is necessary to promote associations between WSS organisations. For instance, community-based organisations can work together to form regional and national

associations. In addition, the municipalities should establish a specific public office to support WSS services in both the urban area and the rural area. This office should deal with local needs, develop programmes to solve problems and strengthen the WSS capacities at the local level. Municipalities should play a more active role in service delivery, planning, regulations and supervision of WSS projects. It is important to strengthen the decision-making capacities at the local level. Likewise, as the political situation in Colombia stabilises, the diversity of the country should be borne in mind to produce specific programmes according to the regional conditions.

6.1.3.3 Urgency to spend the institutional budgets at all levels

It is necessary to promote planning for the WSS sector at all levels, based on the needs expressed by the communities. Thus, institutions should promote participatory methodologies for planning. A pre-requisite for extending participatory planning is strengthening the planning capacity at the regional level, so that regional authorities can serve as direct contact for municipalities. On the other hand, methodologies to monitor and evaluate plans are also required.

6.1.3.4 Concepts and strategies for institutional development are not clearly stated

A first step in solving this problem is to include the topic (institutional development) in the curricula of both professional education programmes and the National Training System of the MinDesarrollo. Private consultants have to be trained because they are the ones who apply the institutional development programmes at the local level. On the other hand, it is necessary to adapt frameworks regarding legislation, policies, planning and financing to reflect the situation on the ground in small municipalities. TLPs can be used to generate new strategies and tools to support community management of WSS services.

6.1.3.5 Deficiencies in monitoring and evaluation procedures in the projects

This topic should be included in the curricula of professional education programmes and in the National Training System. However, it is necessary to recognise that monitoring

and evaluation procedures are not fully developed, especially in sanitation projects. This emphasises the importance of TLPs as a learning exercise. The National Programme for Sustainability produced a tool to monitor the administration and the O&M phase. Nevertheless, it should be tested and further adjusted in other projects (CINARA *et al.*, 1998b).

6.2. INFORMATION SYSTEMS AT THE LOCAL LEVEL

Data are a record of a primary transaction... Such data have a cost in their collection, and do not, by themselves, provide information. Information, by contrast, involves the aggregation, analysis and presentation of data, and the transmission, receipt and interpretation of data by receivers in such a form that the data are of value to them in their particular situation.

Cusworth and Franks (1996)

The preliminary information system (IS) at the local level was developed during the course of this PhD research project jointly with Alberto Benavides, a CINARA professional in charge of water service surveillance (CINARA *et al.*, 1998b). It was based on the experience gained in the full-scale projects developed by CINARA. The IS was tested in two of the TLPs developed by the National Programme for Sustainability of WSS Systems, in Ventaquemada (Boyacá) and El Bordo (Cauca). It was also applied in El Hormiguero (Cali), in the TLP carried out in Mondomo (Cauca) and in the Tolima Department with the Health Secretary.

Traditionally, the ISs have operated in Colombia at the national level. However, they do not provide useful information for the WSS organisations and neither the national level nor the regional level received feedback from WSS organisations. The information generated at the local level is essential to identify the deficiencies and limitations in the WSS systems. This information makes it possible for the organisations to make timely decisions in order to correct problems before they affect the sustainability of the WSS services. On the other hand, the decentralisation process and Act 142/94 placed the responsibility for ensuring good quality services in the hands of the municipalities, which need local ISs to plan their actions and budgets. The Act opened opportunities for community participation in monitoring the quality of the services through Social Control Committees. However, community monitoring needs ISs

to produce indicators in order to survey the sustainability of WSS services. The law in Colombia makes a distinction between control by the organisation that is delivering the service; State surveillance; and the monitoring carried out by the community, all of which are management tools to improve service delivery and support instruments in the search for sustainability.

An IS is defined as a set of elements and procedures directed to obtain results so that better decisions can be made. It opens communication channels amongst its users in order to facilitate co-ordinated actions. An IS for controlling services is a useful tool for the WSS organisation because it processes and consolidates the information needed to administer, operate and maintain WSS services. Thus, information is collected at the operative level, processed and consolidated at the managerial level and selected for feedback to the ISs at municipal, regional, and national levels.

6.2.1 Methodology

Several workshops were held with local, regional and national institutions and WSS organisations to identify the main problems in information management (Table 32). Based on this information, a first IS was designed and discussed with the institutions and organisations participating in the programme. Adjustments were made and the preliminary IS was produced. Tools were prepared with the help of relevant institutions and organisations. The participants were trained in the use of field equipment to carry out water testing. Visits were made to each of the localities selected by the participants in order to validate the ISs. Tools were adjusted on the basis of the observations made by the participants.

6.2.2 The information system

6.2.2.1 Users

The users of the IS at the local level are the WSS organisation, the *Vocal de Control*, the Social Control Committees, the service users, and the local authorities.

Table 32 Problems regarding information management at the local level

PROBLEM	CAUSE	LEVEL
Insufficient internal and external communication	Information is not shared between institutions because there are no communication channels between them and with the WSS organisations	Institutional and local
Overlap between functions and responsibilities amongst the institutions in the WSS sector	The functions and responsibilities of institutions at the local level are unknown	Institutional
Lack of financial, human, and technical resources and tools and instruments to collect and update information	Information programmes at institutional level are not continuous	Institutional
There is no feedback to the community	There are no communication channels	Institutional
Visits to rural area are infrequent	Scattered settlements and lack of resources for visits	Institutional
At the local level, people are not trained in the collection and analysis of information	There are not enough resources available for training at the local level	Local
Loss of information	There is no consolidated information system with appropriate tools and techniques	Local
Information generated at the local level is not being systematically collected and analysed	There is no consolidated information system with appropriate tools and techniques	Local
Local data are not collected	There is no data culture	Local
Solutions do not correspond to the existing problems	There is no historical data series	Local

Source: CINARA *et al.* (1998b)

- According to Colombian law, the WSS organisation is directly responsible for the service delivery, independent of the organisational scheme. In Colombia, small urban centres usually have a public institution, which very often form part of the municipal administration, in charge of the WSS services. On the other hand, rural settlements generally have community-based organisations in charge of the WSS services.
- The *Vocales de Control* are the representatives of the Social Control Committees established in the municipality. They represent the voice of the citizen within the Boards of the WSS organisations.
- The Social Control Committees are established by the Mayor and the committee members are popularly elected. They represent the users in services monitoring. The Social Control

Committees were created by the In-house Services Act. This Act regulates the nature of community participation, which was included in the Constitution.

- Service users have the right to participate in service monitoring through the election of the Social Control Committees. The Social Control Committees are required to keep service users informed about service quality.
- The local authorities represented by the Mayor and his/her staff need the information to plan investments and support. This information is also fed back to the Municipal Development Plans.

6.2.2.2 Content

The criteria measured were service quality and sustainability (Table 33). Variables and indicators were identified. Some of the goals have been defined by Colombian law such as those related to water quality, either in drinking water or wastewater. Many others should be defined at the local level based on historical data series constructed using cumulative data collected when the ISs are implemented.

6.2.2.3 Instruments

Forms to collect data were designed and the information flow was identified in each of the municipalities where the IS was tested and validated. It was notable that the nature of the information flow in different localities varied depending on the organisational structure existing in the municipality and in the settlements. Data processing was defined from the datum origin to the datum final destination in order to make decisions. Figure 25 is an example of the final presentation of the information which is handed over to the Manager, the Board, and the users. Figure 26 is an example of the information flow relevant to the caretaker's activities.

The main challenges were identified as follows:

Table 33 Criteria, variables and indicators in the IS at the local level

CRITERIA	VARIABLE	INDICATOR		
Service quality	Water quality	Water supply	Turbidity	
			Faecal coliforms	
			Residual chlorine	
			pH	
		Wastewater system	BOD ₅	
			TSS	
			Grease	
			pH	
	Sustainability	User satisfaction	Continuity	
			Water quantity	
No. of requests				
Time to solve requests				
System status		No. of incidents of damage/month		
		Time take to repair damages		
		No. of leaks		
Administration		Revenue/expenses		
		No. of bad debtors		
		O&M available resource/O&M costs		
Functioning	No. of components operating			
	No. of components maintained			

Source: CINARA *et al.* (1998b)

- Information should flow towards the municipal level from each one of the WSS systems. At present, in most of the small municipalities, there are no offices in charge of WSS support at the municipal level.
- Departmental Water Units and similar offices or institutions at the regional level should route the information for feedback into regional as well as national plans.
- The application of the proposed IS should lead to the development of training materials and the adaptation of the forms and instruments appropriate to the diverse characteristics of small settlements in the five regions of the country.

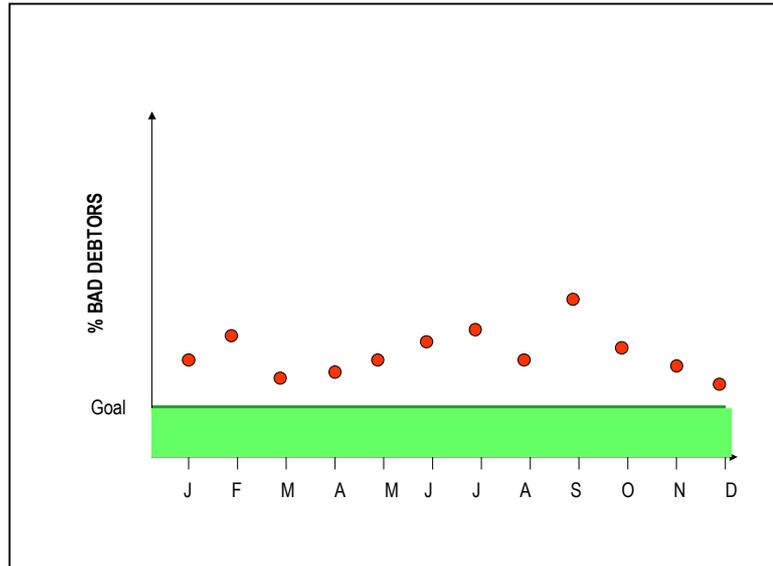


Figure 25 Final presentation of the indicator Bad debtors

Source: CINARA *et al.* (1998b)

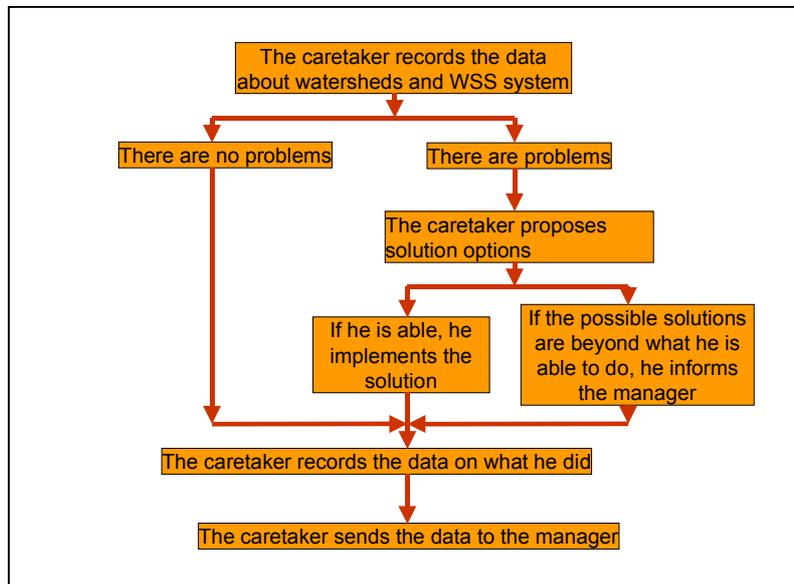


Figure 26 Information flow relevant to the caretaker's activities

Source: CINARA *et al.* (1998b)

6.3. TEAM LEARNING PROJECTS

It is not possible to develop people. People have to develop by themselves because, while it is possible for an outsider to build a man's house, an outsider cannot give the person pride and confidence in him/herself as a human being.

Nyerere, J. (1973)

The National Programme for the Sustainability of WSS Systems developed three TLPs (Figure 27). They were located in Mistrató (Risaralda), El Bordo (Cauca), and Ventaquemada (Boyacá). The objectives were to incorporate the TLP methodology into the WSS projects financed by FINDETER in the different phases of its project cycle, and to develop tools needed to bring about widespread dissemination of the knowledge gained in each project. The TLP in Mistrató was developed in the planning and design stages, the TLP in El Bordo was undertaken during the construction stage and the TLP in Ventaquemada was carried out in the service-management phase. The projects were selected through a process that involved carrying out an institutional inventory. The information was systematised and analysed by a regional team established in each Department to participate in the programme.

6.3.1 TLP in Mistrató

Fortunately, this project was not imposed from central government. For the first time we have been consulted, we have made decisions, we have decided if we want the project, and where to locate it, but especially how we will sustain it.

CINARA et al. (1998c)

6.3.1.1 Description

The process followed in the TLP in Mistrató was drawn from the final report by CINARA *et al.* (1998c). A regional team, co-ordinated by the Health Secretary, was established. The team carried out the inventory in the Risaralda Department, based on 16 localities that were pre-selected in the planning and design stages. Four settlements fulfilled the criteria to serve as a TLP for the Department, as defined by the team and CINARA.

Mistrató was selected on the basis of its accessibility, tradition of community participation, and WSS management.

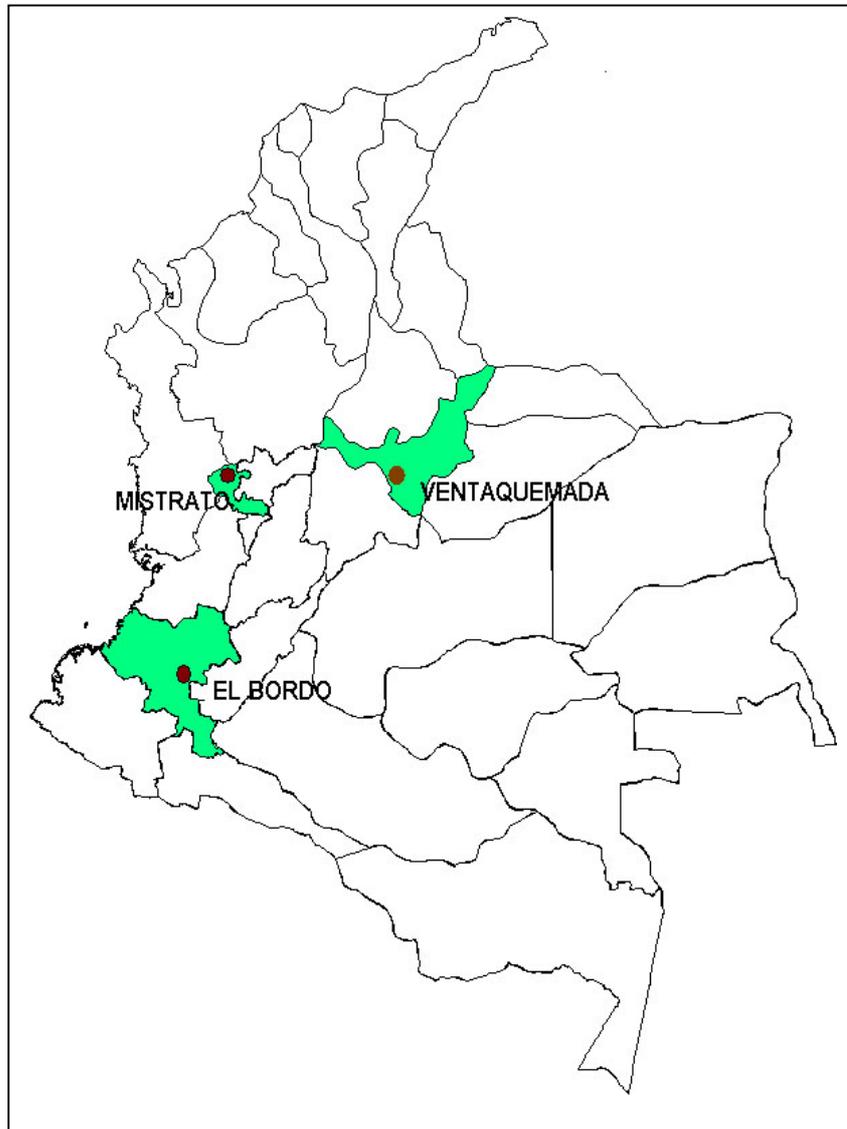


Figure 27 TLPs carried out in the National Programme for Sustainability of WSS Systems

Mistrató with a population of 6,140 inhabitants, is the urban centre of the municipality which has a total population of 13,000 inhabitants. Mistrató is located in the Risaralda Department on the Western mountain range. The principal economic activity is agriculture and

coffee is the main product. The average salary is around US\$ 100 per month. In the urban area, a public enterprise is in charge of water supply, sewerage and solid waste services.

6.3.1.2 Process

The activities carried out in the TLP are shown in Table 34. A list of participants is presented in Table 35. The participatory diagnosis revealed the following WSS problems in the locality:

- Poor water quality,
- Continuity problems,
- Deficiencies in the functioning of the water treatment plant,

Table 34 **Activities in the TLP in Mistrató**

STAGE	ACTIVITY
Diagnosis	• Participatory diagnosis
	• Establishment of local support groups
	• Identification and prioritisation of WSS problems
	• Identification of possible solutions
	• Participatory selection of water supply and wastewater options
Study to determine the willingness of the urban population to pay for the water and sewerage services	• Diagnosis of the WSS services administration
	• Planning the study
	• Presentation of the study pre-design
	• Adjustments
	• Implementation
Design	• Participatory definition of design criteria
	• Participatory pre-design
	• Seminar on design
	• Technical design
	• Presentation of the technical design
	• Adjustments
	• Handing over the project to the local and regional authorities
Evaluation	• Community evaluation
	• Institutional evaluation

Table 35 Participants in the TLP in Mistrató

GROUP	PARTICIPANT
Community	Support groups composed of members of local community organisations and WSS users
	Primary and secondary schools
Local authorities	Mayor
	Town Council
	Public Services Enterprise
	Environmental Sanitation, Section of the Health service
	Nurseries of the National Institution on Family Welfare (ICBF)
	Local office of CARDER
	Municipal Treasure
	Municipal Planning Secretary
	Catholic Priest
Regional Team	Departmental Health Secretary
	Departmental Coffee Committee
	Departmental Planning Secretary
	Environmental Authority in the Risaralda department (CARDER)
	Technological University of Pereira
	WSS enterprise of Pereira (Aguas y Aguas de Pereira)
	Departmental Association of Ecological NGOs
National Team	FINDETER
	FIU
	Ministry of Economic and Social Development
Facilitator	CINARA team

Source: CINARA *et al.* (1998c)

- Technical problems in most of the water system components,
- Low sewerage service coverage,
- Final wastewater disposal without treatment,
- Limited knowledge about the existing WSS systems,
- Administrative problems,
- High proportion of bad debtors,
- Water wastage,

- Low tariff that did not cover administration and O&M costs, and
- The urban water network received water from two community water supply systems, the quality of which were unknown.

The visits identified the high environmental risk in the area where the treatment plant was located. Part of the treatment plant was on the riverbed, and as a result, during the rainy season, flood damage resulted in frequent interruptions to the service delivery. The treatment plant relied on chemical products, which were not supplied regularly. The disinfection process was carried out manually by the caretaker and there was no method for controlling residual chlorine. In workshops, the community prioritised the problems to be included in the TLP. These were: watershed protection; functioning of the treatment plant; deficiencies in administration; lack of community knowledge; contamination by wastewater, and the fact that several households were not connected to the water and sewerage systems. Solutions were identified and an action plan prepared. Some of the solutions required local resource management. Some of the actions were undertaken by the institutions and organisations that were participating in the TLP. For instance, the Environmental Authority of Risaralda Department (CARDER) and the ecological NGOs began a plan for protecting the watershed. The TLP project itself focused on the WSS problems. A participatory diagnosis was carried out in collaboration with the municipal services enterprise and solutions which were to be implemented by its Director, were identified. A willingness-to-pay study was undertaken to define what the community wanted and was able to operate and maintain. A training plan for the community was drawn up. Some of the activities specified in the plan were carried out during the TLP. Others were to be carried out during the construction stage. The design of a wastewater treatment plant was developed as part of the TLP. Unconnected households were identified and the service enterprise together with the people came up with a way to pay the water fee. On-site sanitation systems were designed for some unconnected households, because it was technically impossible to connect these households to the sewerage system.

Before the selection process was undertaken, a study on willingness to pay was carried out. This included a methodology to define costs and tariffs, different costs and tariff scenarios, and the design, presentation and development of the study. The results showed that 80% of the users were willing to pay US\$ 2 per month for the improved water supply

service. The suggested tariff was US\$ 1 when the study was carried out. This means that people were now willing to agree to a 100% tariff increase. Seventy percent of the increase was needed to cover increased administration and O&M costs; and 30% of the increase was required to recover the investment costs. The strategy adopted was to increase the tariff gradually to allow time for the municipal service enterprise could negotiate with those users who were not willing to pay for the services. Eighty-five percent of the users indicated that they were willing to pay US\$ 0.50 per month for the wastewater service. This tariff was sufficient to cover the administrative, O&M and replacement costs provided a low cost technology was chosen.

During the participatory selection of the water and wastewater treatment plants, the participants defined the essential characteristics the chosen technology would require. It must be flexibility enough to be able to cope with the variation in the water quality that exists in the watershed; have low initial investment costs; make maximum use of the existing infrastructure; make minimum use of chemical products; be easy to operate and maintain; be inexpensive to run; require few specialised skills or specially trained personnel to operate; have minimal requirements for equipment and laboratory facilities; and have a low environmental impact. In the case of the water treatment plant, three options were pre-selected. These all involved transforming the existing treatment plant into:

- a conventional treatment plant,
- direct filtration plus pre-treatment using a roughing filtration, and
- multi-stage filtration (MSF) plant.

The first choice was to transform the plant into a MSF plant. However, because there was not enough land available for slow sand filters, it was decided to change the plant into a direct filtration plant with pre-treatment instead.

There were several conditions, which restricted the wastewater treatment options. These included:

- The diagnosis identified that the people were not willing to pay very much for wastewater treatment,
- There was only one place to locate the treatment plant, and
- CARDER required a minimum removal of 60% BOD₅ and 60% TSS.

Four technological solutions were pre-selected. These included:

- Septic tanks and wetlands,
- Septic tanks, anaerobic filter, and wetlands,
- Primary sedimentation unit, trickling filter, and secondary sedimentation unit, and
- Septic tanks, upflow anaerobic sludge blanket (UASB) system, and wetlands.

The option selected was the septic tanks, anaerobic filter and wetlands. The design of the water and wastewater treatment plants was drawn up by the regional and local team during a seminar given by CINARA and attended by nine professionals and three community members. The seminar participants also design a socio-educational plan to be implemented during the construction phase. Regional and local institutions, community support groups, and the service enterprise worked together in the Department capital, Pereira, to complete the designs.

6.3.1.3 Results

The work carried out by the CINARA seminar participants and the groups working in Pereira resulted in a design for water supply and wastewater treatment plants, which were adapted to the local conditions. By working together at the local level, the groups also carried out a survey to assess people's willingness-to-pay; drew up an action plan to protect the watersheds; and put forward a proposal to improve administration and O&M. However, the main achievement was the knowledge that the institutions and community gained about WSS systems.

One of the things that had the biggest impact on us was knowing the status of the water treatment plant. We did not know that it did not function continuously nor according to our conditions. We did not know how the plant functioned.

We understood that it was very important to consume drinking water and to return the water very clean to the river. Also, we understood what sustainability is.

The plants were constructed as planned and are operational. As part of a programme to decrease water consumption, which was 1,600 litres per person per day, micro-measurement was introduced gradually with the agreement of the users. In the last week of August 2001, torrential floods affected the water treatment plant. However, the community and the service enterprise were able to restart the service. Because a severe rainy season was predicted for the current year, the community asked CINARA to evaluate the situation and to recommend ways to decrease the effects of flooding.

6.3.1.4 Lessons learnt

- ✓ One of the most important aspects in any transfer process is the personal commitment by the participants, especially the institutional staff. Personal commitment leads to institutional commitment, which facilitates the institutionalisation of findings produced by the TLPs.
- ✓ The responsibilities have to be clearly shared by all stakeholders. The function and mission of each institution and organisation have to be respected by the participants. The main conflicts arose when the boundaries between different functions and missions were not clearly established.
- ✓ It was not an easy task to integrate the different disciplines. It was difficult for professionals from engineering sciences to understand the role of those from other sciences. In addition, it was difficult for these professionals from the other sciences to understand their own role in a WSS project.

- ✓ Participatory pre-design helped to enrich the technical design drawn up by professionals. People's knowledge about their region, social structure, and conflicts made a great contribution towards developing better technical and organisational options which were well adapted to the local conditions.

6.3.2 TLP in El Bordo

We feel that all of us gained because we have learnt that it is possible to work together, that we can respect each other although we do not agree with each other, that we can criticise constructively. However, although many things have to be done, the challenge is to demonstrate that this is sustainable.

CINARA et al. (1998d)

6.3.2.1 Description

The process followed in the TLP in El Bordo was that outlined in the final report by CINARA *et al.* (1998d). A regional team co-ordinated by the Departmental Water Unit was established. In order to determine where to carry out the TLP, which focused on community supervision during the construction stage, the regional team surveyed a number of localities. Four localities were pre-selected and finally, El Bordo was chosen.

El Bordo is the urban centre (9,019 inhabitants) of the El Patia municipality (26,136 inhabitants), located in the Cauca Department in the south of the country. Livestock is the main economic activity in this municipality. The region is deeply affected by the national conflicts. It is also one of the poorest Departments in the country and has low WSS coverage. A municipal public enterprise is in charge of the urban WSS services.

6.3.2.2 *Process*

The activities carried out in the TLP are shown in Table 36 and the participants are presented in Table 37. Although the TLP was focused on community supervision during the construction stage, the TLP began with a participatory diagnosis in the locality. The diagnosis revealed that the water system had had several problems since its construction some years earlier. Six of the 20 *barrios* were supplied for only 2 hours per week. The watershed had been diminished by deforestation and the water system components had been damaged. Most of the components were due to be repaired under a contract drawn up between FINDETER and a private contractor. The public WSS enterprise was also weak in administration and O&M issues. Community participation had never been considered and people felt that the local government was out of touch with the reality of their lives. The locality had twice received national resources to improve the water system, but these investments did not result in any significant improvements.

When the TLP began, 80% of the water network had been replaced. Thus, the construction process was focused on the improvement of the water system from the watershed to the treatment plant. In addition, some minor corrections were made to allow the equitable distribution of water throughout the network. The designs were reviewed by the CINARA team, who discovered many faults. It was evident that the community had not participated in the design project and the professionals' knowledge was not up-to-date. For example, some of the pipelines had been located in areas that the community had identified as high-risk areas during the diagnosis phase. Thus, the design of the improvements in the treatment plant was revised to include the recent advances in the water technology and the suggestions put forward by the community. The revised design was presented to the community and adjusted to take into account their observations. The design was explained to the community using the existing water supply system. Community support groups received specific training in technical aspects of the water system.

Table 36 **Activities in the TLP in El Bordo**

STAGE	ACTIVITY
Diagnosis	• Participatory diagnosis
	• Watershed inspection
	• Establishment of the local support groups
	• Review of water system designs
	• Adjustments
	• Re-design of the water treatment plant
	• Preparation of an Action Plan
Construction	• Training of local support groups in the technical aspects of the water system
	• Training of community and regional and local teams in community participation, focused on community supervision
	• Training of community support groups, Controller and constructor on community supervision
	• Agreements to incorporate community supervision in the construction stage
	• Involvement of students in activities regarding the control of water wastage
	• Accompaniment of the construction process
Evaluation	• Community evaluation
	• Institutional evaluation

Source: CINARA *et al.* (1998d)

During the construction there were no problems, and the community, the contractor, the Controller and the work teams participated actively. The professionals' commitment was such that they continued to work on the project during their vacations and on weekends. The work also inspired new projects, which were undertaken by the institutions in light of their social mission and functions. For instance, the Education Secretary started a programme with secondary school students to raise awareness of the problem of water wastage. The High School of Public Administration (ESAP) representatives trained the other professionals and community support groups in techniques to facilitate community participation in supervision of the State projects. In addition, the Environmental Authority of the Cauca Department (CRC) prepared a proposal for a community project to protect the watershed. Activities to strengthen the service enterprise in administration and O&M were carried out, and a plan for staff training was prepared, which was to be carried out by the Departmental Water Unit.

Table 37 Participants in the TLP in El Bordo

GROUP	PARTICIPANT
Community	Support groups composed of members of local community organisations and WSS users
	Secondary schools
	Police
Local authorities	Mayor
	Town Council
	Public services enterprise (EMPATIA)
	Municipal Public Works Secretary
	Municipal Internal Control Secretary
	Municipal Planning Secretary
	Agriculture Unit
	Municipal Education Secretary
	Local Hospital
	Local Coffee Committee
Regional Team	Departmental Water Unit
	Departmental Education Secretary
	Departmental <i>Contraloría</i>
	Public Administration School (ESAP)
	Environmental Authority of Cauca Department (CRC)
National Team	FINDETER
	FIU
	Ministry of Economic and Social Development
Facilitator	CINARA team

Source: CINARA *et al.* (1998d)

6.3.2.3 Results

The water system has been functioning for the last two years without problems and all the *barrios* receive water.

If you looked at the people when the water service functioned the first time, they were like children playing with water; they were very happy.

New projects have been carried out by the regional team using the tools of community participation and supervision. The Departmental government gave support to this group when a member of the institution that participated in the project became Governor of the Cauca Department.

Four variables were identified as fundamental in the construction stage:

- ☛ Design quality. The design has to make use of up-to-date knowledge and be drawn up in collaboration with the community,
- ☛ Contracting process. This process is usually affected by non-ethical practices which result in the use of more resources than necessary for the job,
- ☛ Quality control. The Controller is a defender of the interest of the people and the institutions. The primary interest of the Controller should be to ensure the quality of the work. The local organisations cannot administer and O&M, a service that was poorly constructed, and
- ☛ Community supervision. This is a support for the Controller. The community is the ultimate beneficiary of the works and has the right to supervise the State projects.

6.3.2.4 Lessons learnt

- ✓ Choosing the right technology is not enough. Good quality construction is also essential. Community supervision is a useful tool in the construction process to help the institution Controller for making better decisions.
- ✓ Community supervision helped to encourage a sense of ownership amongst the users. The training attended by community support groups helped people to become familiar with their water system. The increased awareness of water issues led to new projects to improve the WSS conditions. These included projects to protect the water resources.
- ✓ Support at the departmental level was essential to strengthen local capacity. Support from the national government is needed to encourage the departmental government support for regional water units at the departmental level.

6.3.3 TLP in Ventaquemada

Now I know that we drink safe water, I was invited to become familiar with our water system, to visit our watershed and of course, this is valuable knowledge.

CINARA et al. (1998e)

6.3.3.1 Description

The process followed in the TLP in Ventaquemada was drawn from the final report by CINARA *et al.* (1998e). The Boyacá Rural Water Supply Secretary established and coordinated a regional team. The team carried out an inventory of the water systems in the Boyacá Department. Four localities were pre-selected. In the end, Ventaquemada was chosen as a TLP for the service management stage because although it had a functioning water system, there was no effective organisation in charge of the WSS services.

Ventaquemada is the urban centre (1,369 inhabitants) of the municipality (12,334 inhabitants), located in the Eastern mountain range in the Boyacá Department. Agriculture is the principal economic activity and potatoes are the main product. The locality had a water system, including a MSF plant and a sewerage system, but there was not a wastewater treatment plant. The services were managed precariously by the Mayor's office. The water treatment plant was constructed in 1992, as part of a departmental programme to build 20 slow-sand-filtration treatment plants. The Departmental Rural Water Secretary and CINARA prepared a contingency plan in 1993, when an evaluation revealed that most of the plants were not functioning at all. The Ventaquemada treatment plant was included in this plan, and was due to be converted from a conventional to an MSF plant. The plan was not completed due to the lack of economic resources.

6.3.3.2 Process

The activities carried out in the TLP are shown in Table 38. The participants are listed in Table 39. As any TLP, the project began with a diagnosis that included administrative, technical, social, economic, and environmental aspects of the services. The diagnosis

showed that the water and sewerage systems were inadequately administered. The main problems included:

Table 38 Activities in the TLP in Ventaquemada

STAGE	ACTIVITY
Diagnosis	<ul style="list-style-type: none"> • Participatory diagnosis
	<ul style="list-style-type: none"> • Inspection of the WSS systems, including the watersheds
	<ul style="list-style-type: none"> • Household visits
	<ul style="list-style-type: none"> • Identification and prioritisation of problems
	<ul style="list-style-type: none"> • Preparation of an action plan
	<ul style="list-style-type: none"> • Establishment of community support groups
Service management	<ul style="list-style-type: none"> • Consideration of alternatives for managing the service
	<ul style="list-style-type: none"> • Establishment of the Social Control Committee, according to the Act 194/94
<ul style="list-style-type: none"> • Training of the support groups and Social Control Committee 	
<ul style="list-style-type: none"> • Constitution of the Municipal Services Unit 	
	<ul style="list-style-type: none"> • Technical improvements which included: <ul style="list-style-type: none"> ➤ Evaluation of the treatment plant ➤ Improvement of the pre-filters ➤ Training in design of water systems ➤ Training in O&M ➤ Water network registry ➤ Review of the hydraulics of the water network
	<ul style="list-style-type: none"> • Activities required to strengthen the Municipal Services Unit which included: <ul style="list-style-type: none"> ➤ Recovering and systematisation of the economic information ➤ Census of users ➤ Selection of a manager ➤ Improvements to the water network and treatment plant ➤ Study to determine the willingness of users to pay for the WSS services ➤ Defining the level of tariffs ➤ Design and implementation of administrative instruments and tools ➤ Manager training ➤ Visits to other TLPs
Evaluation	<ul style="list-style-type: none"> • Community evaluation
	<ul style="list-style-type: none"> • Institutional evaluation

Source: CINARA *et al.* (1998e)

- Water bills were paid into the municipal treasury, and in this way contributed to the common funds of the municipality, which were used to support other tasks different from the WSS services in the municipality,
- There was no specific accounting for WSS services,
- The caretaker reported directly to the Mayor. The caretaker was the only employee who worked directly with WSS systems,
- The community had never previously participated in any aspect of the WSS services,
- The people did not pay for the sewerage service, and
- There were technical problems in the water system.

Table 39 Participants in the TLP in Ventaquemada

GROUP	PARTICIPANT
Community	Support groups composed of members of local community organisations and users
	Social Control Committee
Local authorities	Mayor
	Town Council
	Municipal Planning Secretary
	Municipal Treasury
	Municipal Services Unit
	Municipal Health Secretary
	Municipal <i>Personería</i>
Regional Team	Departmental Rural Water Secretary
	Departmental Health Secretary
	Santo Tomas University
	CorpoChivor
National Team	FINDETER
	FIU
	Ministry of Economic and Social Development
Facilitator	CINARA team

Source: CINARA *et al.* (1998e)

About 50% of the 258 users participated in the general assemblies held to determine the way the WSS systems should be managed. The final assembly decided that the water and sewerage services should be managed by a Municipal Services Unit. The Board of the Municipal Services Unit included two *Vocales de Control* from the Social Control Committee and representatives from the Planning and Education Secretaries. The Mayor was appointed President of the Board. The Unit was to be managed by an administrator, who would serve as its legal representative. The Town Council passed a municipal Act to provide a legal status for this organisational structure. The Ministry of Economic and Social Development provided training in Ventaquemada in accounting for costs and administering tariffs. The training drew on specific examples. In addition, the Social Control Committee with help from secondary school students and support from the regional team carried out a study to assess people's willingness to pay for the WSS services. This study revealed that only 37% of the users were willing to pay the US\$ 1.5 needed to cover the administrative and O&M costs, because they felt that the service delivery was not satisfactory. Therefore, the decision was made to carry out a detailed evaluation of the technical aspects in order to optimise the water service. Following the optimisation of the service, a new study to assess willingness to pay was planned. US\$ 9,000 was allocated by the Town Council as a seed fund to begin technical improvements. The caretaker, the Services Unit, the Social Control Committees and the community support groups were trained in O&M. In addition, specific training in administrative issues was offered by the Departmental Rural Water Secretary. The representatives of the groups participating also went on a study visit to investigate other TLPs developed in the Departments of Valle and Cauca.

6.3.3.3 Results

Manuals dealing with the establishment of municipal water and sewerage units were produced along with manuals on administration and O&M. These manuals formed the basis of the educational material published by the Ministry of Economic and Social Development.

The immediate results were unexpected. For instance, the users' general assembly asked for the installation of micro-measurement to control water wastage, and 40% of the outstanding arrears was paid by the users. New projects were initiated. Among these was a project to protect the watershed carried out by the secondary school students. In addition,

CorpoChivor, the private company in charge of the Chivor dam, and FINDETER allocated US\$ 20,000 for watershed protection. The Municipal Water Management Unit is functioning and has presented its experience at several events. The project is also being used as a demonstration project for other municipalities in the Boyacá Department and as a training place for people from the central region of the country.

6.3.3.4 Lessons learnt

- ✓ The first requirement for improving administration and O&M is to improve the existing technical problems in the WSS systems. It is not possible for communities or municipalities to administer, operate and maintain WSS systems which are handed over to them with serious technical deficiencies which are usually the result of failures in design and construction.
- ✓ Most effort is required to implement a TLP during the service management phase, which forms the final stage of a WSS project. This is because it is more difficult to solve problems that have accumulated during the early phases of the project if the municipality and the community have not been involved in the earlier stages.
- ✓ The participatory projects contribute to the building of a social fabric within the communities and they strengthen the social ties between communities and their local institutions.
- ✓ Holistic analysis of the WSS systems helps to improve service delivery because the function of each of the components can be understood in the context of its contribution to the overall service quality.
- ✓ WSS projects have to develop the aspects of legality and legitimacy of the organisations created to manage the services. Usually, institutions are focused on the legal aspects of the service organisation. However, the legitimacy of the WSS organisations is more important in the quality of service delivery because an WSS organisation recognised and supported by the users can easily work with them in order to improve the WSS conditions in the locality.

6.4. CONCLUSIONS

The Programme for Sustainability of the WSS systems revealed weaknesses in the institutional project cycle. Generally, the institutional project cycle did not involve community participation, especially in the stages essential for ensuring sustainability such as problem identification, design, construction, and organisation of the service management. Furthermore, the institutional project cycle is 'supply-driven'. Although Colombian law supports community participation in monitoring the in-house public services, the institutional project cycle did not include any monitoring. It seems that most of the concepts promoted in the WSS projects at the international level are not considered in the WSS projects in Colombia. No action is taken to promote integration between water supply, wastewater management, and hygiene education. Furthermore, gender issues are not taken into account. The concept of sustainability is unknown; water resources are not considered part of the WSS systems; and the households, according to Colombian law, are not considered part of the WSS systems and therefore households do not play any role in WSS systems. When the institutional project cycle is analysed, it is possible to understand what has been happened in the WSS sector and the reasons for the enormous waste of resources. WSS conditions will not improve unless the institutional project cycle changes to take into account the concepts such as participation, learning and sustainability promoted to improve the WSS situation in developing countries. In addition to the changes in the project cycle, it is necessary to develop tools and instruments to make it possible to incorporate these concepts into the all projects regularly carried out by institutions.