

5. STRENGTHENING THE LOCAL CAPACITIES TO DELIVER WSS SERVICES IN THE RURAL AND HILLY URBAN AREAS OF THE CALI MUNICIPALITY

The first part of the research discussed in this thesis was developed in connection with a programme commissioned by EMCALI and undertaken by UniValle/CINARA, between 1991 and 1999. When the programme began, the WSS services in the rural area of Cali were supported by the Municipality Health Secretary. As a result of the decentralisation process, the Health sector maintained the water quality surveillance, but the responsibility for guaranteeing WSS services was given to the Municipalities. In 1991, the Cali Mayor decided to hand over responsibility for rural WSS services to EMCALI, the municipal agency for public services. However, although EMCALI was in charge of WSS in the urban area, it knew nothing about these services in the rural area. Therefore, CINARA began a programme to strengthen the capacity for local communities and institutions to deliver WSS services in rural and hilly low-income urban areas. The programme was initiated with a project that identified the WSS conditions in the rural area and in the hilly low-income settlements in the urban area. More than 20 local and regional institutions, including some NGOs, went on to participate in that project. Additionally, an investment model at the local level was developed by the researcher as part of her MSc in Systems Engineering (Restrepo, 1995b) (Figure 21). The model applied the conceptual frameworks developed by CINARA about sustainability, learning processes and participation.

5.1. PHASE 1: INVENTORY AND PRE-DIAGNOSIS

5.1.1 Development

The inventory and pre-diagnosis of the WSS conditions in the rural and urban hilly settlements of the municipality were carried out over a two-year period (1991-1992). When compiling the inventory, initially information from local and regional institutions was recovered, systematised and compared. Missing and inconsistent information was identified. The information was analysed in a workshop with the institutions and the pre-diagnosis was programmed according to the institutions' priorities. Two teams comprising of institutions and CINARA staff (technical and social professionals) were established and each one visited a settlement for one day. The visits validated and complemented the information obtained in the

inventory. Sanitary inspections of the WSS systems, including the water basins, were carried out. The community-based organisations as well as formal and informal leaders were interviewed and households visits were carried out.

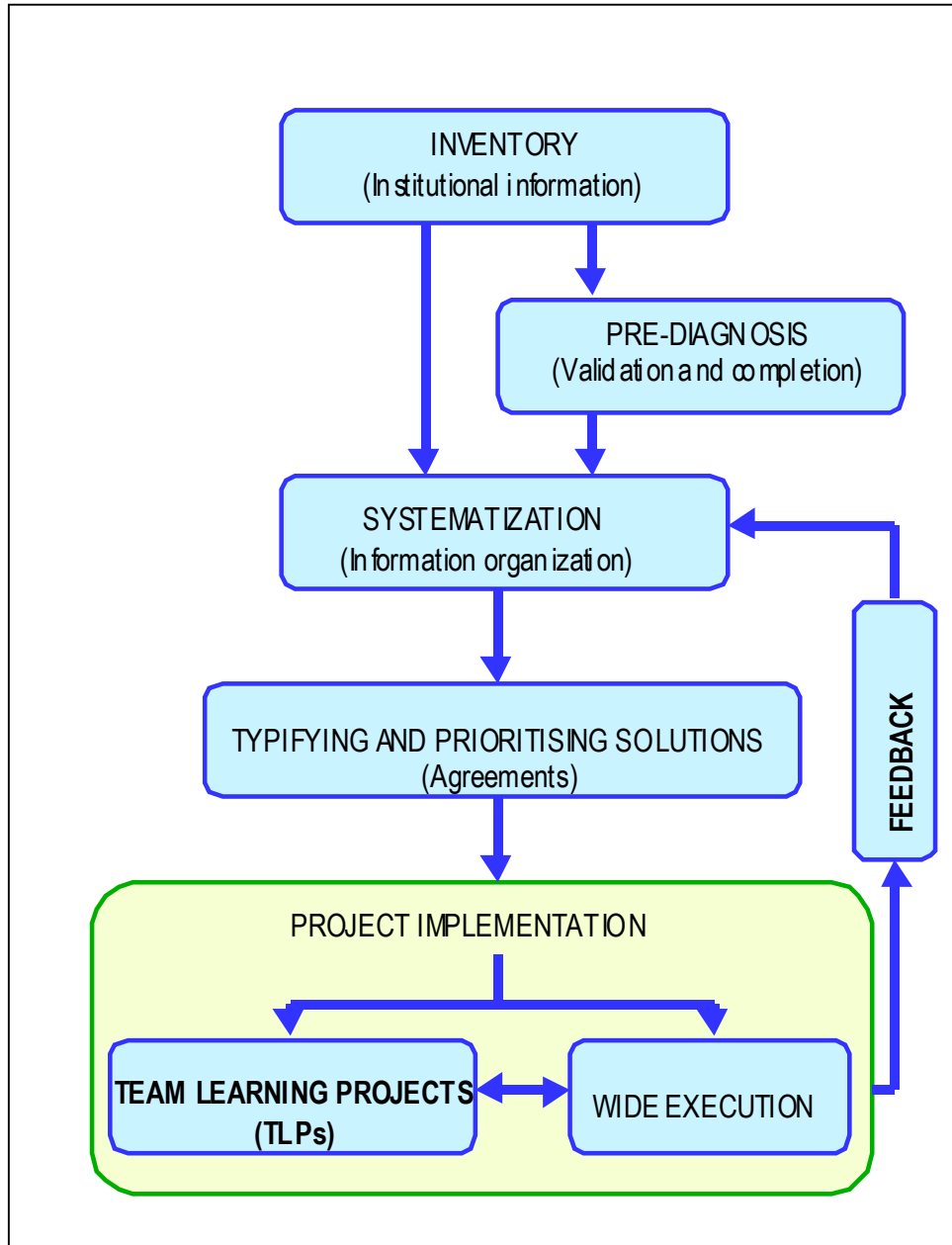


Figure 21 Model for planning WSS investments at the local level

Source: Restrepo (1995b)

The information was systematised and analysed by the institutions and by CINARA. The main problems were identified. Specific projects were identified by institutions. These projects were classified based on the municipality's existing experience and ability to solve the problems. Thus, long-term, medium-term and short-term projects were defined. Some of these projects, chosen on the basis of the priorities defined by the institutions, were included in the annual institutional budget. Additionally, joint projects were identified and institutional teams were organised to formulate them. The results were presented by the institutional team to the Mayor candidates during the election campaign and the elected Mayor, Dr Rodrigo Guerrero, took into account the results and supported the development of TLPs in the municipality (CINARA – EMCALI, 1992). The model was validated in the Andean urban centres of the Nariño Department, in a project financed by FINDETER; in the rural area of Buenaventura in the Pacific Coast with the Departmental Government; and in the central area of the Valle del Cauca Department with the NGO Plan International. In addition, as part of the decentralisation process, the WSS urban services agency, Aguas y Aguas de Pereira, located in Pereira, the capital of Risaralda Department began to support the municipal rural area. The agency applied the model to organise a Participatory Development Plan for the rural area, the first of this kind in the country. They carried out three TLPs.

5.1.2 Lessons learnt

Inter-institutional and inter-sectoral work was developed based on the model. Institutions shared information that allowed them to plan together on the basis of real conditions. Technical teams became useful tools for politicians to make better decisions. In addition, each institution and community took responsibility for its own area. A very important result was that institutions recognised the problems identified by communities, therefore began working together with the communities to prioritise projects. Because the investment is being made in projects which has been identified by both stakeholders, investment is planned and resources are better utilised right from the beginning.

5.2. PHASE 2: LEARNING PROJECTS

The model developed in the first project in the Cali programme proposed Team Learning Projects (TLPs) as a strategy for solving typical problems found in the study area. As

Table 16 Team Learning Projects in Cali (Valle)

Settlement	Location	Main aspect	Present condition (2001)
Altos de Menga	Peri-urban	Sanitation	Operating
La Sirena	Peri-urban	Sanitation	In construction
La Vorágine	Rural	Sanitation	Operating
El Hormiguero	Rural	Water supply	Operating
Pilas del Cabuyal	Rural	Micro-basin protection	Operating

Table 17 Stakeholders participating in the TLPs in Cali

	Altos de Menga	La Sirena	La Vorágine	Hormiguero	Pilas del Cabuyal
COMMUNITY					
Community-based Organisations			JAL	JAL	
	JAC	JAC	JAC	JAC	
		Water Committee	Water Committee Created: ASOVORAGINE (Sanitation service)	Water Committee (became User Association)	Water Committee (informal)
	Community Mothers Association	School Association	School Association	School Association	
	Comité Cívico Independiente de Colinas				
	Comité de Labor Social El Mirador				
People	Informal Leaders	Informal Leaders	Informal Leaders	Informal Leaders	Informal Leaders
	Formal Leaders	Formal Leaders	Formal Leaders	Formal Leaders	
	Women	Women	Women	Women	Women
	Children	Youth Group	Children and Youth	Children and Youth	Children
				Elder Group	
	Men	Men	Men	After the process: Men	Men
PUBLIC INSTITUTIONS					
Environment	DAGMA	DAGMA	CVC	CVC	CVC Ministry of Environment
WSS services	EMCALI	EMCALI	Health Secretary	Health Secretary	Health Secretary
				Sanitary Unit of Palmira (Valle)	
Solid waste management	EMSIRVA	EMSIRVA	EMSIRVA	EMSIRVA	EMSIRVA
Education and Research	UniValle/CINARA	UniValle/CINARA	UniValle/CINARA	UniValle/CINARA	UniValle/CINARA
	Education Secretary	Education Secretary	Education Secretary	Education Secretary	Education Secretary
			Secondary School	Primary School	

	Altos de Menga	La Sirena	La Vorágine	Hormiguero	Pilas del Cabuyal
Community Development	Community Development Secretary	Community Development Secretary	Community Development Secretary (became Economic and Competitiveness Development Secretary)	Community Development Secretary	Community Development Secretary
	Government Secretary (became Coexistence and Security Secretary)	Government Secretary (became Coexistence and Security Secretary)	Government Secretary (became Coexistence and Security Secretary)	Government Secretary	Government Secretary
Agriculture		Community Development Secretary (became Economic and Competitiveness Development Secretary)	Community Development Secretary (became Economic and Competitiveness Development Secretary)	Community Development Secretary. UMATA Department	Community Development Secretary. UMATA Department
Health	Health Secretary	Health Secretary	Health Secretary	Health Secretary	Health Secretary
People Defence	Municipality <i>Personería</i>	Municipality <i>Personería</i>	Municipality <i>Personería</i>	Municipality <i>Personería</i>	Municipality <i>Personería</i>
Public Resource Control	Municipality <i>Contraloría</i>	Municipality <i>Contraloría</i>	Municipality <i>Contraloría</i>	Municipality <i>Contraloría</i>	Municipality <i>Contraloría</i>
Family Defence	ICBF	ICBF	ICBF	ICBF	ICBF
Planning	Administrative Department of Municipality Planning	Administrative Department of Municipality Planning	Administrative Department of Municipality Planning	Administrative Department of Municipality Planning	Administrative Department of Municipality Planning
	Urbanising Order Secretary	Urbanising Order Secretary	Urbanising Order Secretary		
			Municipality <i>Catastro</i>	Municipality <i>Catastro</i>	Municipality <i>Catastro</i>
Recreation			Popular Recreation Corporation		
			Health Park		
NGOs					
People help	International Plan		International Plan	International Plan	
Environmental			Farallones Foundation		
			Environmental Group Green Life		
			PROCUENCAS	PROCUENCAS	PROCUENCAS
PRIVATE SECTOR					
				Corona Foundation	
			Club of Departmental Functionaries	Mr R. Curzat (Landlord)	
				Mr A. Naranjo (Landlord)	

The characteristics of the settlements are shown in Table 18. The project in La Sirena was extended only to the design stage because economic resources for construction were not available during the contract period. However, the community is still looking for resources to provide for the main sewers and is systematically building the unconventional sewers. On the other hand, EMCALI is now constructing the sanitation project in El Hormiguero after taking responsibility for WSS services in the rural area. It is expected that this project will finish in 2001. Although the programme activities finished at the end of 1999, contact with communities and institutions goes on through new projects.

Table 18 Settlements' characteristics

Topic	Altos de Menga	La Sirena	La Vorágine	Hormiguero	Pilas del Cabuyal
Location	Peri-urban	Peri-urban	Rural	Rural	Rural
Population	2,800	4,200	220 + >2,500 tourists	3,500	150
Economic activity	Informal sector	Informal sector	Tourist services	Sand extraction	Informal sector (city)
Average income (US\$/month)	200	155	400	195 (Seasonal)	200
Community organisations	. Community Committee	. Community Committee . School Association . Youth group . Water supply association	. Community Committee . School association . Water supply committee	. Community Committee . School association . Elder group . Water supply committee	. Community Committee
External agents	. Public sector	. Public sector . International programmes . University/CINARA	. Public sector . NGOs	. Public sector . NGO . Private sector	None
Public services administered by CBO	None	Water supply	Water supply	Water supply	Water supply (informal)

CBO: Community-based organisation

Source: CINARA-EMCALI (1997a)

5.2.1 Altos de Menga

How can you be indifferent to that great river of bones, to that great river of dreams, to that great river of blood, to that great river? To that great river? Let's go and accompany me. Would you like that we open the door of the street?

*"The Street"
by Nicolás Guillén*

5.2.1.1 Description

The informal settlement Altos de Menga is located on the slopes of the city, which with two million inhabitants is the second most populous in Colombia. City growth has accelerated in the last 50 years as a result of immigration. A national census made in 1993 revealed that 44% of the population were immigrants from rural areas and towns. About 80% of the present formal city originated from illegal occupation processes. Immigrants settled in the plain and hilly areas that surround the city where the environmental conditions are precarious. In 1996, 214,000 people lived in informal settlements in the plain areas and 67,000 people lived in informal hilly settlements. These groups represented 15% of the population.

Altos de Menga was established at the beginning of the 1970s. Its population was 2,800 inhabitants, comprising 466 households with roughly six people per family (Photograph 4). Their income varied between US\$ 130 and US\$ 217 per month and people worked in the informal sector, usually in the city centre. The environment is precarious because the settlement was constructed on abandoned quarries used in building of the city and because, people covered the natural drainage systems and constructed their houses over them.

Because the settlement has not been recognised by the local authorities, people have usually solved their problems themselves, without institutional support. Thus, the settlement has been upgraded throughout the time and it continues growing with the arrival of new waves of immigrants. The leaders recognised the people's contribution and noted that:

Community committees really have helped to improve our living conditions. Our community has worked very hard in some important services such as the water supply system, the school and other important things that our Barrio has needed.

The settlement has had a very long tradition of community participation and its leaders have the management capacity that has guided the local development. They have negotiated projects, such as the opening of roads and building stairways, the Communal House and programmes to improve housing conditions. After several years of pressuring EMCALI to build an extension of the urban water network, a Mayor ordered its construction. However, EMCALI built the extension without taking into account the local conditions. For instance, water trucks delivered 40 litres of water per day to each person and the local people were constructing an independent water system themselves, taking water from a micro-basin in the rural area by gravity. The households relied on dry sanitation systems. EMCALI provided a new solution. It pumped water to a new elevated tank, providing 250 litres of water per person per day and built a house-connection pipe network. After that, the families began to replace the old sanitation systems; they bought conventional toilets, built showers and dish and clothes washing machines. The consequences were dramatic because the wastewater ran off the hills provoking landslides and accidents, which became serious during the rainy season.



Photograph 4 **Children in Altos de Menga**

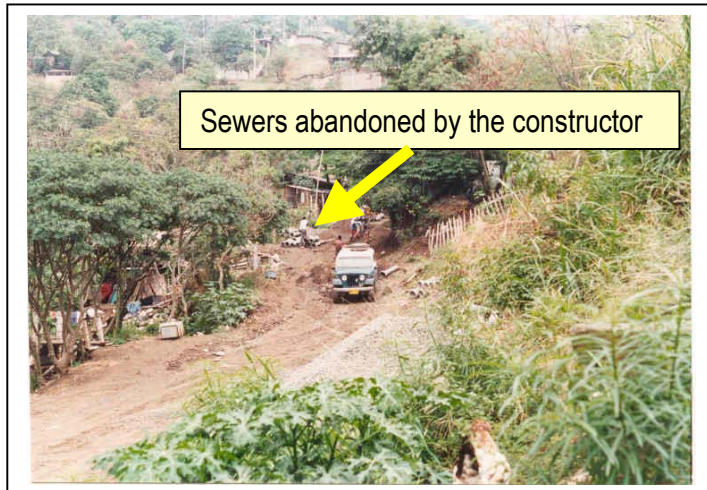
Source: CINARA – EMCALI (1997b)

5.2.1.2 *The TLP*

The project was inspired by a typical problem faced by EMCALI when it worked in hilly informal settlements. EMCALI extended the urban water network to these settlements as it did in the formal city, without taking into account the cost of the solution and the conditions that existed in the settlement. However, EMCALI could only partially solve the sanitation problem generated by the improvement in the water supply system. It was not possible to construct conventional sewerage systems, such as those built in the formal city, except in some of the wide roads of the informal settlements. This tended to result in a coverage of up to 60%, and a very high cost that had to be subsidised by the rest of the users in the city. In Altos de Menga EMCALI built a sewer in the main street (Photograph 5). This sewerage project was more expensive than others in the city because the soil consisted of blue stone. Although the construction team did not obey the construction regulations, the EMCALI Controller accepted the sewerage system. A few months later, infiltration from the sewer began to cause damage the roads. People put pressure on EMCALI to do something. However, its engineers did not know how to solve the wastewater problems.

The activities developed in the TLP are shown in Table 19. The TLP began with the institutional team training in participatory diagnosis, concepts and tools. During the training, the real diagnosis was prepared by the team. The diagnosis was carried out (Photograph 6); and the team met to analyse the results. Some essential points were identified:

- About 40% of the settlement lacked wastewater collection systems,
- There were high risk areas, especially those built on riverbeds,
- People had problems with rain water and solid waste, which could affect any wastewater solution,
- The water supply service was deficient, and was available for only 2 hours per day,
- There were conflicts between different sectors. New illegal settlements set up by immigrants located higher than the water tank were a particular source of conflict, and
- People were aware of the risks caused by the wastewater and wanted to participate in the solution.



Photograph 5 A
conventional sewerage system was constructed by EMCALI in this main road



Photograph 6 Community and institution members identifying the household WSS situation during the participatory diagnosis in Altos de Menga

Source: CINARA – EMCALI (1997b)

There was a very great resistance to change in some of the EMCALI departments, especially those in charge of operation and maintenance (O&M) and regulation. All government institutions were cautious because of the legal implications involved in working in illegal settlements. However, a lawyer working in the institution in charge of citizens co-existence drew attention to the legal resource to protect the institutions: the Article 365 of the National Constitution, that is the supreme mandate in Colombia. This states that:

Table 19 Activities in the TLP in Altos de Menga

PHASE	ACTIVITY	
PLANNING	<ul style="list-style-type: none"> • Participatory diagnosis, institutions training and development 	
	<ul style="list-style-type: none"> • Community and institutions training in sanitation options 	
	<ul style="list-style-type: none"> • Participatory technology selection 	
	<ul style="list-style-type: none"> • Women participation in the workshop on hygiene 	
DEVELOPMENT	DESIGN	
	<ul style="list-style-type: none"> • Organisation of community support committees 	
	<ul style="list-style-type: none"> • Study of high risk areas (identification, analysis and decisions) 	
	<ul style="list-style-type: none"> • Community training in selected option 	
	<ul style="list-style-type: none"> • Agreements on design criteria with EMCALI regulation and O&M departments 	
	<ul style="list-style-type: none"> • Participatory pre-design 	
	<ul style="list-style-type: none"> • Technical design 	
	<ul style="list-style-type: none"> • Design presentation and adjustments 	
	<ul style="list-style-type: none"> • Community agreements on passing the plots 	
	<ul style="list-style-type: none"> • Preparation and discussion with community of the Environmental Plan to the Administrative Department of Environmental Management (DAGMA) 	
	<ul style="list-style-type: none"> • Environmental Plan presentation to DAGMA 	
	<ul style="list-style-type: none"> • Design approval process in EMCALI 	
	LOOKING FOR RESOURCES	
	<ul style="list-style-type: none"> • Selection of qualified labour by community committees 	
	<ul style="list-style-type: none"> • Organisation to obtain community resources 	
	<ul style="list-style-type: none"> • Community process to obtain resources from AOISPEN Programme 	
	<ul style="list-style-type: none"> • Community presentation of the project to the NGO Plan International 	
	<ul style="list-style-type: none"> • Community presentation of the project to the National Training Institute (SENA) 	
	CONSTRUCTION	
	<ul style="list-style-type: none"> • Agreements between EMCALI and community 	
	<ul style="list-style-type: none"> • Training in construction issues to EMCALI engineers and community committees 	
	<ul style="list-style-type: none"> • Training in community supervision to institutional team and community committees 	
	<ul style="list-style-type: none"> • Organisation of community supervision team 	
	<ul style="list-style-type: none"> • Construction 	
	SERVICE MANAGEMENT	<ul style="list-style-type: none"> • Community agreements with EMCALI for O&M
		<ul style="list-style-type: none"> • Community definition of responsibilities on O&M
		<ul style="list-style-type: none"> • Training in O&M
MONITORING	<ul style="list-style-type: none"> • Community supervision of the construction process 	
	<ul style="list-style-type: none"> • Community monitoring of O&M 	
EVALUATION	<ul style="list-style-type: none"> • Community evaluation 	
	<ul style="list-style-type: none"> • Institutional evaluation 	
OTHERS	<ul style="list-style-type: none"> • Community training in alternate communication tools 	
	<ul style="list-style-type: none"> • Community committees participation in a workshop on leadership 	
	<ul style="list-style-type: none"> • Community participation in the University/CINARA events, AGUA 96, AGUA 98 and AGUA 2000 	

Source: CINARA – EMCALI (1997b)

Public services are inherent to the social purpose of the State. It is a State's duty to ensure their efficient delivery to all inhabitants of the national territory.

CINARA regained the experiences on conventional and unconventional sewerage systems in informal settlements in Latin America, thus fulfilling its function as a research and development institution. The Brazilian experience was especially valuable. The literature review was discussed within the inter-institutional team. A Brazilian engineer (Engineer José Almir Pereira) and a British Professor (Professor Duncan Mara) were invited to Cali under the UniValle/CINARA agreements. The team discussed the project and the way Brazil had included unconventional sewerage in the regulations and the problems that institutions had when implementing the solutions in informal settlements. Engineers were very surprised to learn that conventional sewerage was no longer used in the Brazilian capital. The O&M engineers were interested in the tools and skills needed in unconventional sewerage and the community participation in O&M. The tariff issue was widely discussed within the team, although there were no agreements.

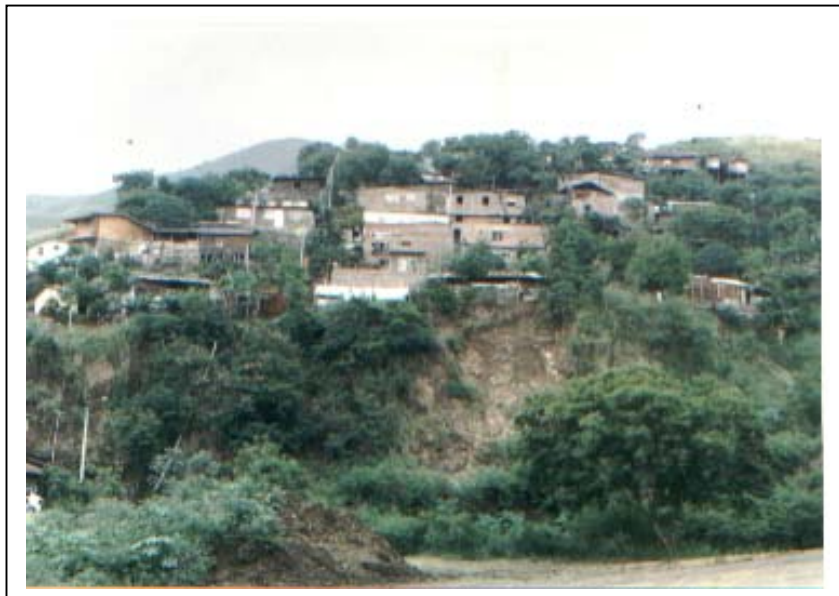
After discussing the available knowledge, the team was trained in community participation, concepts and tools as part of a workshop in which community and institutions met to plan the project as a practical problem. The workshop was organised by the institutional team with the guidance from CINARA, an organisation that has experience working with communities. Additionally, the team prepared the participatory technology-selection process in which technological options were discussed. In the technology-selection process, training was given to the community and institutional teams before they worked together to analyse the options. The community and institutions were sceptical about the unconventional options that were presented along with conventional options. The technical, environmental, social and economic aspects of each option were discussed and community committees and technical staff agreed upon the options. The participants agreed on the need to construct simplified and 'condominial' sewerage; improve the conventional sewerage built by EMCALI; organise training for community support committees and O&M staff; find ways to obtain the permission of householders to cross the plots; and to establish a community team in charge of O&M in each unconventional sewer. In return, households were to benefit from a credit in the form of construction materials provided by the programme for Self-construction of Sanitary Infrastructure (AOISPEN). Although the community had built on-plot sanitation

solutions before the water system was constructed, people did not accept this option. On-plot sanitation systems were very difficult to construct because of the nature of the soil, and when completed, they tended to be unused. In addition, sludge was disposed of in areas around the settlement causing inconvenience to the families. The major queries raised by the institutions and the community during the discussion of the options included the diameter and depth of the unconventional sewers.

Women played a very active role in the participatory pre-design phase. Maps were drawn, showing the location of each house and its sanitation unit. The community drew the sewers according to the topography and decided the location of house boxes (Photograph 7). In addition, they identified the specific places that had problems with rainwater and solid waste. The location of the sewers drawn on the maps were verified by engineers and community members on the ground. Problems caused by storm water runoff were discussed with the urban environmental authority, DAGMA, and short-term and long-term solutions were identified. The first ones were included in the TLP. As in any project, an Environmental Plan was presented to DAGMA. People signed legal documents allowing EMCALI to inspect the unconventional sewers. However, DAGMA did not permit the connection of 30 houses located in very high-risk areas to the sewerage system (Photograph 8). As a result, these families had to be re-located.

The community made a great effort to finance the construction. The EMCALI Programme, AOISPEN, gave credit to the families in the form of construction materials. The AOISPEN Programme required the community to collect money in cash to pay for the master masons because the AOISPEN Programme does not permit unpaid community participation in construction. As a result, the community had to collect the US\$ 157 per family needed to pay for the services of master masons. Although the support committees organised activities such as festivals, it was impossible to collect all the money required. There were a number of problems to overcome. Because the average income is only US\$ 180 per month, the families found it difficult to contribute their share in one payment. In addition, given the uncertainty about the legal situation, many families preferred to pay their share in labour rather than in cash. In light of these problems, the community committees presented the project to the NGO Plan Internacional, an organisation that helps people to improve their living conditions, in order to complete the resources needed. The resources obtained made it possible to start training engineers, master masons and community committees in the skills needed to handle the

team. However, if the EMCALI Controller felt that the complaints were not valid, he explained to the community members why he did not agree with them. The sewerage, which was financed by the resources provided by Plan International, included the house-connection and improvements in the sanitation unit.



Photograph 8 **Households settled in high-risk areas where landslides occur during the rainy season**

Source: CINARA – EMCALI (1997b)

5.2.1.3 Results

The final costs of the unconventional sewerage are presented in Table 20. The cost per metre was half of the estimated by EMCALI for conventional sewerage in the city (US\$ 66) and the cost per person was lower than the cost of simplified sewerage in Brazil (US\$ 80-150) (Bakalian *et al.*, 1994).

Table 20 Cost of unconventional sewerage in 1997

No families connected	143 (31% in 1997)
Total length	1,553 m
Item	Cost
Total cost	US\$ 52,040
Average cost of materials/ family	US\$ 207
Average cost of labour force/family	US\$ 157
Cost/family	US\$ 364
Cost/m	US\$ 34

Source: CINARA – EMCALI (1997b)

**Photograph 9 Community supervision made by women**

Source: CINARA – EMCALI (1997b)

Although the CINARA contract ended before all the Altos de Menga sectors had completed the construction, the community and EMCALI finished what was planned (Photograph 11). Now, the new informal settlements settled up Altos de Menga are struggling to obtain water supply and sanitation services. The engineers designed the unconventional sewers to take into account their possible future connection. The evaluation showed that community O&M and support committees knew the sewerage functioning and its construction aspects (Photograph 10). Thus, it is expected that it could be extended and well operated and

maintained. At the end of 2000, an evaluation carried out by undergraduate students as part of their degree project showed that the sewerage was functioning and the committees were working in O&M as was expected. Table 21 shows the sustainability indicators identified by community support groups in a workshop during the evaluation (García and Muñoz, 2001).

Table 21 Sustainability indicators identified by community support groups and results of their evaluation

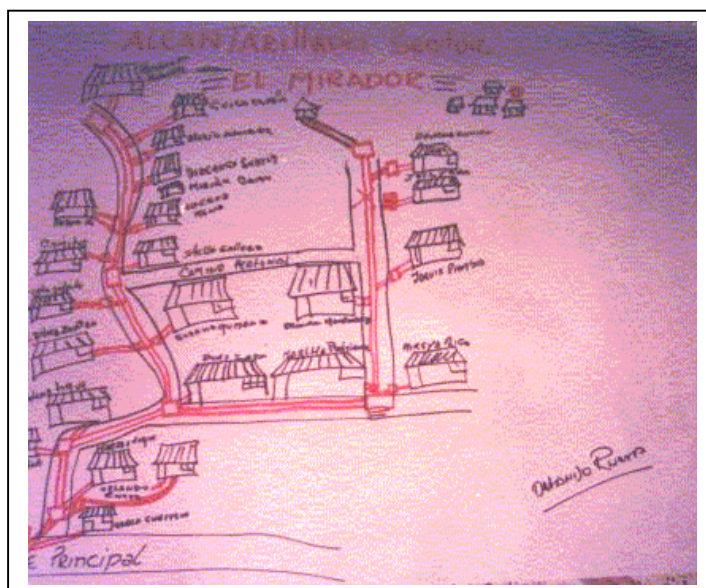
INDICADOR	CASES (No)
Presence of solid waste in the sewers or boxes	4
Smell	3
Households without connection	11
Box cover damaged	2
Sand in boxes	0
Incomplete connection	0
Existence of septic tanks	12
Construction over sewers	2

Source: García and Muñoz (2001)

Between 1998 and 2000, the community presented the project at the international AGUA 98 and AGUA 2000 events organised by UniValle/CINARA in Cali, and in the Andean Training Proposal workshop promoted by the UNICEF-UNDP/WB Programme in Lima (Peru). The community has also been visited by students undertaking courses as part of the undergraduate and post-graduate programmes in Civil and Sanitary Engineering, some of whom worked on degree projects related to subjects identified after the project finished. In addition, the community has also been visited by participants on short courses, as well as national and international visitors.

5.2.1.4 Lessons learnt

- ✓ The inter-disciplinary and inter-sectoral work helped in the development of an integrated project. In order to work together effectively, the team had to have a common knowledge about the settlement, problems and the technical options, as well as the social, economic and environmental issues. The social mission and functions of the institutions and organisations were identified and discussed and a consensus was reached which was respected by every one in the team.



Photograph 10 **Map made by community members in an evaluation in 2000**

Source: García and Muñoz (2001)

- ✓ Once the community were informed about all the technological options, including their advantages and disadvantages, and their costs and implications, they were able to discuss and select what they could afford and were able to operate and maintain. The community was happy to consider unconventional solutions once they understood what the options were and the implications of their choice.
- ✓ The sanitation problems were not isolated. The analysis had to be done integrally, taking into account water supply as well as excreta, sullage, solid waste, and stormwater disposal.
- ✓ The community's knowledge was valuable. When combined with the expertise of the institutions, the community's knowledge played an important role in helping to reach better solutions in an integrated way. An important factor in this success was acceptance of the idea that no institution or person had the complete knowledge to solve the WSS problems.



Photograph 11 Stormwater channel built after the TLP had finished

Source: García and Muñoz (2001)

- ✓ The process by which solutions were identified was an essential part of the project. The focus on the process, the technological option becomes a result of consensus amongst the stakeholders participating in the project. WSS projects are not merely engineering projects.

- ✓ The existing community organisations provided an entry point through which to approach the community. However, in a participatory project, new organisations with specific responsibilities are usually needed and new leaderships arise. The more community members participate and take on specific responsibilities, the greater the probabilities that the community will feel a strong sense of ownership. Encouraging participation in free labour force is not the only way to generate a sense of ownership among the users of the service.

- ✓ The illegal status of the informal city generated uncertainty both in the community and among institutions which affected the project process. However, working in interdisciplinary teams helped to make it possible to find unexpected solutions to the legal problems.
- ✓ The community decided to accept credit programmes to finance the settlement development because, by offering credit programmes, governmental institutions were acknowledging that the community was, in effect, an urban settlement. However, the programmes did not usually take into account the real conditions of the poor, especially conditions in households headed by women, which usually represent the poorest amongst the poor.

5.2.2 La Sirena

We need to better understand the non-project nature of people's lives, the complex livelihood interlinkages that make an impact in one area likely to be felt in others and the potential for unintended consequences arising from any intended intervention or act.

Cleaver (2001)

5.2.2.1 Description

The recreation ground called La Sirena located near the River Cañaveralejo began to be settled illegally by immigrants at the beginning of the 1970s (Photograph 12). Now it is a *barrio* recognised by the Municipal Planning Secretary, and classified as stratum 2 (low-income settlement). La Sirena has 4,200 inhabitants living in approximately 500 households. As in any settlement that originated in this way, the community has upgraded it. The community organisations achieved important goals. They built a Communal House where people can meet and negotiated the electricity service with EMCALI. In addition, the Municipal Health Secretary built the Health Post, which is functioning well; there is now a Basic School and community mothers manage six Community Nurseries (CAI) supported by the National Institute of Family Welfare (ICBF). The people who live in the settlement built the first water supply system. In 1987 they improved the water supply system and added a multi-stage filtration (MSF) plant. Now, the water supply system is managed by a community-based legally recognised organisation. This settlement serves as the first testing ground for CINARA's full-

scale research on MSF in a community. The project to improve the water supply system was selected as one of the examples among the 100 Best Practices at the Habitat II Conference held in Istanbul in 1996.



Photograph 12 **Precarious environmental conditions in La Sirena**

Source: CINARA – EMCALI (1997c)

However, in spite of this good start, the community contaminated the River Cañaveralejo because they did not have access to adequate wastewater disposal. When the community finished the water supply project, they initiated a self-construction project to build a sewerage system (Photograph 13). In 1996, EMCALI began the construction of a conventional sewerage system, parallel to the River Cañaveralejo by trying to collect the wastewater and transporting it to the city sewerage. People protested when EMCALI began to alter the sewerage system that they had built themselves, and EMCALI came to the conclusion that it was not possible to build a conventional sewerage system in most parts of the settlement. A TLP was proposed because there was a conflict between the community's sense of ownership of the sewerage system and the technical intervention proposed. In addition, the technical solution proposed by EMCALI was found to pose problems when it was applied to the settlement. In the EMCALI Programme to strengthen the community and institutional

capacities, the TLP in La Sirena was seen as an opportunity to apply what was learnt in the TLP in Altos de Menga and to go deeply into the social aspects of WSS.



Photograph 13 **Self-constructed sewerage**

Source: CINARA – EMCALI (1997c)

5.2.2.2 *The TLP*

The activities developed in La Sirena are shown in Table 22. Having been trained in the TLP in Altos de Menga, the institutional team prepared the participatory diagnosis in La Sirena. The diagnosis was carried out in co-operation with existing community support groups established by an International Water and Sanitation Centre (IRC) project dealing with the community management of WSS services that was being carried out at that time (Photograph 14). The activities were planned jointly by the institutions and community support groups. The pre-diagnosis demonstrated to the EMCALI staff the strengthening of the community's sense of ownership with respect to the self-constructed sewerage. From the community's viewpoint:

The sewerage system only needs new sewers where they do not already exist. The rest of the sewerage is functioning very well.



Photograph 14 **Participatory diagnosis was carried out by the institutional team**

Source: CINARA – EMCALI (1997c)

Although the diagnostic showed that the sewerage system was a symbol that represented the community's capacity to solve their own problems, the support committees recognised that the sewerage system could be improved. The community did not accept the idea of changing the system that they had built, but they did accept that improvements were needed. After the diagnosis, the community was trained in sanitation options, focusing on conventional and unconventional sewerage. Thus, when the physical inspection of the self-constructed sewerage system was carried out by the institutional team and the community support committees, the community members identified some problems that needed to be corrected. These included:

- Lack of inspection boxes in strategic points,
- The existing inspection boxes did not have wastewater channels,
- Several boxes were full of sand and rubbish,

- Several boxes were covered by pavements,
- Several sewers had leakage problems, and
- The storm water channels were obstructed by rubbish and plants.

Table 22 Activities in the TLP in La Sirena

PHASE	ACTIVITY
PLANNING	• Participatory pre-diagnosis
	• Community training in sanitation options
	• Participatory technology selection
DEVELOPMENT	DESIGN
	• Inspection of the self-constructed sewerage by community and institutions
	• Consensus on improvements in the self-constructed sewerage
	• Pre-design of new sewers
	• Technical design
	• Design presentation and adjustments
	• Community training in selected option
	• Tariff discussion and agreements
	• Incorporation of the sewerage service in the water supply (WS) community-based organisation
	• Preparation and discussion with community of the Environmental Plan to be presented to DAGMA
	• Presentation of the Environmental Plan to DAGMA
	• Approval process of the design in EMCALI
	LOOKING FOR RESOURCES
	• Inclusion of the construction project in the Projects Bank of the Municipality
EVALUATION	• Community evaluation
	• Institutional evaluation
OTHERS	• Community Committees Participation in a workshop on leadership
	• Community participation in AGUA 96, AGUA 98 and AGUA 2000 events organised by University/CINARA

Source: CINARA – EMCALI (1997b)

The EMCALI engineers specified the need for a conventional sewer in the main road which was designed to cover the expansion area included in the Municipality Development Plan up the settlement. The EMCALI engineers accepted the self-constructed sewers with the improvements identified. Although the community and EMCALI agreed that it was necessary to build conventional sewers needed along with implementing unconventional sewerage, the community did not like the idea of sewers being built to the rear of the plots. Instead, they wanted the sewers to be built along the stairways.

As in the TLP in Altos de Menga, a participatory pre-design was drawn up taking into account the improvements needed to the existing sewerage system (Photograph 15). Given that the settlement had an independent water supply system with a treatment plant managed by a community-based organisation, the community considered that the best option was an independent wastewater system managed by the same organisation. However, as part of the Development Plan for the city services, EMCALI will connect the conventional sewer to the urban sewerage. For this reason, it was impossible for the settlement to have an independent system. An application was made to the Municipality Projects Bank in order to obtain resources to develop the final project. In the meantime, the community began the self-construction of unconventional sewers with the support of EMCALI engineers. EMCALI also began constructing the conventional sewer system within the settlement. However, EMCALI did not have the necessary resources to build the main sewer parallel to the River Cañaveralejo. The sewerage system is still being constructed.

5.2.2.3 Lessons learnt

- ✓ The social aspects of the WSS project were complex and required an inter-disciplinary team. Engineers do not have the necessary background to address issues related to cultural identity, ownership and leadership, gender issues, conflict resolution, amongst others. On the other hand, social professionals need training in basic technical aspects of WSS in order to work with engineers and in social issues of technical projects such as WSS projects.
- ✓ The best way to begin with a WSS project that might cause conflict was to respect what the community considers to be its achievements. People in informal settlements have many achievements that must be recognised by institutions.



Photograph 15 **Participatory pre-design in the TLP in La Sirena**

Source: CINARA – EMCALI (1997c)

- ✓ One of the means of integrating local and institutional knowledge and improving the sanitation services at lower cost was to take advantage of existing technologies. Very often, in Latin America, engineers' education is generally directed towards conventional solutions. In addition, governmental statistics do not take into account what people have built by themselves.
- ✓ Conflict has been an inherent part of any participatory project. In WSS, conflict situations usually promote the community and institution participation. Always, when two people meet, conflicts may exist. Thus, the problem is not that conflicts exist, but that no mechanisms are provided to solve them.
- ✓ The sense of ownership was established by solving important problems together, with each partner contributing what they were able. It is not true that paying a tariff and participating in a free labour force are the only ways to generate a sense of ownership within a community.

- ✓ Techniques and tools are not valuable if they do not have a theoretical framework that supports them. Techniques and tools reflect the ideas about development that are implemented by external agents, such as international organisations or NGOs.

5.2.3 La Vorágine

We have a very clear case -that was completely unexpected- of a person who is supporting the settlement much more than any one else. I am talking about the WSS caretaker, he has emerged as one of the most important people in the settlement, and thanks to what he has done, the settlement flourishes again.

CINARA - EMCALI (1997d)

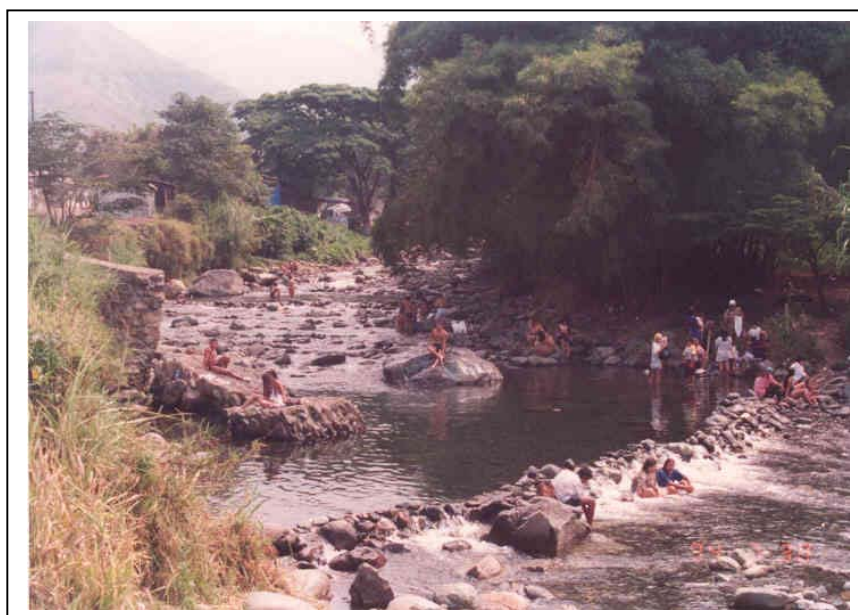
5.2.3.1 Description

Cali is called “the city of the seven rivers”, and the River Pance is the most popular recreation place for urban dwellers in the rural area. People swim, have lunch and dance in the Pance area. About 70,000 people visit the river during a typical summer weekend (Photograph 16). However, the river was contaminated by a small rural settlement called La Vorágine, which has 220 permanent inhabitants and where the economy was based on the recreational activities. The Valle del Cauca Department environmental authority, CVC, published a series of articles in the local newspaper with the results of the water quality evaluation along the river. The information provided by CVC lead to a decrease in the number of visitors to the river, and as a result the economy of the settlement was negatively affected. However, La Vorágine was not the only settlement located in recreation places near the rivers. This is a common problem in the hilly areas of the municipality on the Western mountain range. Therefore, a TLP was proposed in order to solve a problem in which many temporary inhabitants had to be taken into account.

5.2.3.2 The TLP

The project began training institutional staff because the institutions in the municipality have different departments and staff in charge of the rural area from those in charge of the urban area. The training was focused on WSS issues, social aspects of WSS projects and community participation concepts and tools. In the first meeting with community members who

were part of formal and informal community-based organisations, people were very sceptical about municipal projects and their own capacities. They did not believe in local government and they noted that it was very difficult for people in the settlement to work together. However, the project activities were jointly planned, and throughout the project an institutional team and formal and informal community organisations met once a week. The activities that took place as part of the TLP are shown in Table 23. The main points noted in the diagnosis workshop were:



Photograph 16 **The River Pance is the most popular recreation place in the city**

Source: CINARA – EMCALI (1997d)

- Community participation in institutional projects was in the form of a free labour force,
- Although the water system needed a treatment plant and some improvements in the pipe network, the community considered a priority to improve the wastewater management,
- Basic and secondary schools needed to improve the WSS conditions, and
- The administrative component of the water supply system needed to be improved.

Table 23 **Activities in the TLP in La Vorágine**

PHASE	ACTIVITY
PLANNING	<ul style="list-style-type: none"> • Participatory diagnosis, institutions training and development • Community and institutions training in sanitation options • Participatory technology selection • Female participation in the workshop on hygiene • Workshop on macro-basin protection
	DEVELOPMENT
	DESIGN
	<ul style="list-style-type: none"> • Community and institutions meetings with an expert (Jo Smet-IRC) • Participants agree on the location of wastewater and water supply treatment plants • Negotiations to buy the wastewater treatment plant plot • Participants work together on the pre-design of wastewater system • Technical design of wastewater system and water supply treatment plant • Design presentation and adjustments • Approval process of the wastewater system in CVC
	LOOKING FOR RESOURCES
<ul style="list-style-type: none"> • Project presentation in CVC, Health Secretary, National Coffee Federation and EMCALI • Approval process 	
CONSTRUCTION	
<ul style="list-style-type: none"> • Community training in technical aspects of the wastewater system • Construction • Training in administration, O&M • Starting up the wastewater system • Community workshop on hygiene and health 	
SERVICE MANAGEMENT	
<ul style="list-style-type: none"> • Preparation of a working plan on administration, O&M by the community organisation • Participatory diagnosis on administration (existing organisation) • Meeting with the community of Ceylán • Preparation of organisation rules • Community election of the Board • Users census • Community and institutions training in "estratificación" • Tariff definition by community • Legal procedures for the organisation to be recognised as Public Service Provider (ESP) • Legal process on contracts signed by users and the organisation • Training for secondary-school students on O&M • Preparation of O&M educational material by secondary-school students 	
MONITORING	
<ul style="list-style-type: none"> • Institutional and community training in community supervision • Agreements for community supervision of the construction • Community supervision of construction • Training in quality service monitoring • Community monitoring of the service quality 	
EVALUATION	
<ul style="list-style-type: none"> • Community evaluation • Institutional evaluation 	
OTHERS	
<ul style="list-style-type: none"> • Celebration of the Water Day • Community Committees participate in a workshop on leadership • The experience gained is presented in a EMCALI workshop • The experience gained is presented in the Foro por Colombia event • The community participates in the AGUA 96, AGUA 98 and AGUA 2000 events 	

An international expert participated in the discussion and training events during the technology selection process and design. The main discussion point was the design criteria. A particular difficulty was to establish the numbers to include in the final population. A number of people using the area varied greatly because many tourists come to the Pance area at weekends. However, the settlement is located near the border of the Los Farallones National Park, which represents a restriction to the population growth. Several meetings were necessary to reach a consensus regarding the technological options. The on-plot solutions were technically impossible because people lived on the riverbank and therefore the households did not have land available on their plots. They also had conventional toilets that nobody wanted to change. In addition, infiltration water from on-plot sanitation options could potentially contaminate the river. As well as the high cost and the tariff implications, there were technical problems associated with the implementation of conventional sewerage. Additionally, any collective solution would require wastewater treatment and there were limitations on the land availability. When collective options were discussed, the main concern was the small diameter of the unconventional sewer pipes. Two sewers were needed for unconventional sewerage systems. However, a community member who had experience in construction explained to the community how an unconventional system could be similar to the city sewerage. Although the project engineers had provided a technical explanation, this was the explanation accepted by the community:

In the city, the sewer is eight inches in diameter; of course we can have two four-inch sewers, one on each side of the road.

The technology selected was simplified sewerage with a treatment plant consisting of septic tanks, anaerobic filters and wetlands. With respect to the drinking-water treatment plant, a multi-stage filtration (MSF) plant was selected. The community negotiated the plot needed for the wastewater treatment plant, which was located in a private recreational club owned by the Department officials. The negotiation was very difficult because the club manager did not want to have that kind of plant on site because it could cause inconvenience to the club members, especially because of the smell. Although the drinking-water plant was located on private land, there were no problems in negotiating a site. The community members discussed the technical aspects –in particular the functioning of small diameter sewers- with international experts who visited CINARA at that time. These included Professor Duncan Mara from England, and Engineers José Almir Pereira and Sergio Rolim Mendonça from Brazil. The

household sanitation units were included in a participatory pre-design process. The manager of the private club participated in the design and construction processes.

Because the wastewater system was the priority defined by the community, the initial effort was concentrated on obtaining the resources for construction. The environmental authority in the rural area, CVC, financed the wastewater system, and the National Coffee Federation promised to finance the drinking-water plant and some of the improvements needed in the water pipe network. The community organised the supervision of the construction and the support groups were trained on the technical aspects of the infrastructure. A private construction company was contracted by CVC and a CVC Controller was designated by this institution. Colombia has a legal framework for the community supervision, Act 134/1994, Art 100, which states that:

Civil organisations can constitute “veedurias ciudadanas” or surveillance committees at the national level and any other territorial division, in order to control the public management, its results and public service delivery. The surveillance can be done in any aspect and level where all or a majority of the resources are public resources, as defined in the Political Constitution and the law that regulates the Art. 270 of the Political Constitution.

A workshop was held to establish agreement about the supervision. It was agreed that community support groups would visit the works every day, write down their comments in the “bitácora” book and the CVC Controller would make the decisions about what had to be done. The construction process was controversial because no one had experience in community participation in construction supervision. On many occasions, the CVC Controller did not take into account the community’s observations, and the private contractor did not like to have community members visiting the works every day. In the end, the community did not accept the wastewater system because it did not fulfil the technical requirements that they learnt about when they were trained (Photograph 17). As a result, CVC had to allocate resources to correct the mistakes made by the contractor which were accepted by its Controller. The local organisation in charge of the WSS services accepted the works only when the community supervision groups accepted the wastewater system. The Department of the Chemical Processes of the UniValle participated as advisor in technology commissioning

and training in O&M. Educational material was produced by secondary school students (Photograph 18).



Photograph 17 **The filtration material was dirty when the CVC Controller accepted the works**

Source: CINARA – EMCALI (1997d)

5.2.3.3 Results

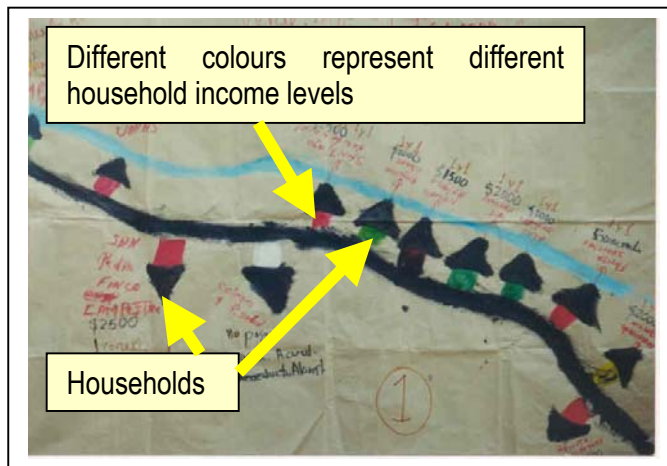
The total cost of the wastewater system was US\$ 168,000, including the sewers, treatment plant, and household connections with grease traps. This equates to a per capita cost of US\$ 62 for a population which includes 220 permanent residents and 2,500 tourists at weekend. This is lower than the US\$ 130 per capita costs estimated by the National Planning Institution (DNP, 1991b).

A legal Public Service Provider (ESP) organisation, called Users Association of La Vorágine (ASOVORAGINE), was established and the Secretary for Economic Development and Competitiveness helped the organisation to arrange the signing of contracts with each user. In a General Assembly, the users defined the tariff on the basis of cost analysis carried

out as part of the technology selection process. The users identified the paying capacity of each household based on their own indicators of wealth (Photograph 19).



Photograph 18
Secondary school students
preparing an O&M manual



Photograph 19 **Social**
mapping applied by the
community as one of the tools
to define tariffs

Source: CINARA – EMCALI (1997d)

In the beginning, there were problems during the rainy season when the plant overflowed. The problems were solved and the wastewater system has functioned without problems for five years. Community support groups and ASOVORAGINE have improved some of the components of the system. For instance, the box covers were built in concrete and were too heavy to be picked up by the caretaker. ASOVORAGINE changed them to metal covers. Holes allowed mosquitoes to enter the tanks and breed causing a risk of dengue, so the community covered the holes with mesh. At present, the wastewater system is functioning as was expected. It is being monitored by the caretaker, who is considered by the community to be one of the most important people in the settlement. The performance of the wastewater

system is indicated in Table 24. The plant satisfies National Act 1594/84, which regulates wastewater treatment. The service organisation was contracted by CVC to implement a project on water resources protection in the area. The Secretary of Economic Development and Competitiveness went on to contract ASOVORAGINE to protect the springs in the Pance watershed. At present, ASOVORAGINE is investing on improvements in the water and sewerage systems. People are proud of what they have achieved. Publication of the project results in local newspapers has had a positive impact on the recreational activities, which are now back to normal. The water treatment plant has not been constructed yet because of the economic situation in the country which has affected the National Coffee Federation. This organisation was interested in funding the plant. Recently, conflicts in Colombia began to affect the settlement because guerrillas, army and paramilitaries are now active in the surrounding areas.

Table 24 Efficiency of the wastewater treatment plant in La Voráquine

Parameter	Removal
BOD ₅	92%
TSS	93%
Faecal coliforms	3 log
N and P	30 – 40%

Source: Rivera (1998)

5.2.3.4 Lessons learnt

- ✓ Community supervision of construction helped to generate a sense of ownership amongst the users. Because they built it themselves, the users knew everything about their WSS systems and they felt they were the owners. Users made decisions about the WSS systems in the same way as they did in their own homes.
- ✓ Gradually, institutional staff learnt to work with the community. The staff appropriated tools and methodologies and questioned the top-down work that they themselves usually had had in WSS projects.

- ✓ The community adapted the technical language in order to understand technical issues. By incorporating technical knowledge in their daily lives, community members were able to adapt new technical components to arrive at improved solutions.

5.2.4 El Hormiguero

Life is paradoxical; look, we have the second river in importance in the country and we do not have drinking water.

Nelly Guapacha, community leader (1993)

5.2.4.1 Description

El Hormiguero is a black ethnic community located on the bank of the second major river in Colombia, the River Cauca. It is also one of the most contaminated rivers in the country. The settlement was established more than a century ago. Because nobody knew that they had to establish the legal ownership of the land and property, people have no tenure rights now. Wealthy landlords occupied the surrounding areas, although the land was the property of the State. However, some landlords legalised their occupation. A few years ago, the local government began a lawsuit against those landlords to try to recover the land.

In El Hormiguero, men work extracting sand from the river, which they sell to construction firms (Photograph 20). During the rainy season, when it is impossible to extract sand, men work in the sugar cane plantations. Women play a central role in family life and also serve as community leaders. Women also used to work in the agricultural plantations until the landlords began to plant sugar cane. In 1991, the cholera outbreak in Cali began in El Hormiguero and 90 cases occurred; a child died as result. This causes great scandal. However, as often happens in developing countries, tragedies provide an opportunity for community development. In this case, the local government declared a sanitary emergency and additional resources were allocated to solve the problems that caused the outbreak. The Health Secretary built pour-flush latrines in almost every household. EMCALI sent water trucks (Photograph 21). The Community Secretary provided big water storage tanks, which were located along the road, so they could be filled by the water trucks. However, when the water trucks did not arrive, people took water from the river as they had always done because they did not like the water supplied by their water system. As a result, the cholera did not

disappear in spite of the resources spent; on the contrary, it spread into other settlements in the plains. Institutions did not know how to solve the problem and El Hormiguero was selected as a TLP, because the project was designated as a priority by the municipality.



Photograph 20 **Men work extracting sand from the riverbed**

Source: CINARA – EMCALI (1997e)

5.2.4.2 *The TLP*

The activities carried out in the TLP are presented in Table 25. The diagnosis and the analysis of its results with the community revealed the following points (Photograph 22):

- The water system supplied three settlements: El Hormiguero, Cauca Viejo and Pízos and all of them should be included in the TLP. Cauca Viejo did not have service in spite of the cholera outbreak because the tractors in a sugar cane plantation had damaged the main pipeline many months before and the landlord did not want to repair it. In Pízos, the pressure in the pipeline was so low that people opened cavities to get water (Photograph 23),



Photograph 21 Water trucks sent by EMCALI when the cholera outbreak began

Source: CINARA – EMCALI (1997e)



Photograph 22 Community and institutions analysed jointly the results of the diagnosis

Source: CINARA – EMCALI (1997e)



Photograph 23 **Cavities to get water from the water network in Pizamos**

Source: CINARA – EMCALI (1997e)

- The well had been constructed around 15 years earlier and had always supplied poor quality water. There were very high levels of turbidity and colour as well as continuous reports of faecal contamination. Iron and manganese (Fe and Mn) concentrations were also very high,
- The water pump was frequently damaged by the power changes and it remained unrepaired for up to six months,
- Around 80% of the users were bad debtors. The service provided was poor and the tariff charged (US\$ 0.2) was too low to cover payment to the caretaker and to improve the service,
- The water network was obstructed and the house connections were precariously repaired when damage occurred,
- People took the drinking water from the River Cauca and used the water supplied by the system to damp down the dusty road,

Table 25 Activities carried out in the TLP in El Hormiguero

PHASE	ACTIVITY
PLANNING	<ul style="list-style-type: none"> • Institutional seminar on participatory diagnosis • Participatory diagnosis • Joint community and institutions workshop to analyse the results of the participatory diagnosis • Technology selection process • Community training in projects formulation • Workshop on hygiene and health
	DEVELOPMENT
	DESIGN
	<ul style="list-style-type: none"> • Institutional seminar on participatory design • Joint community and institutions workshop on WSS technology • Community visits to other communities • Re-design of the water pipe network • Workshop on groundwater • Participatory location of the deep well • Plot negotiation • Wastewater technology selection • Participatory pre-design of the wastewater system
	LOOKING FOR RESOURCES
	<ul style="list-style-type: none"> • Community presentation of the project to the NGO Plan Internacional, EMCALI and other local and regional institutions • Approval process
	CONSTRUCTION
	<ul style="list-style-type: none"> • Drilling the deep well (Health Secretary and the private firm COLPOZOS) • Buying materials to replace the water supply network (Community –Plan Internacional) • Installation of the new water pump (Health Secretary) • Construction of complementary works (Health Secretary) • Cleaning and disinfecting of the water supply system (EMCALI) • Commissioning the water system • Training in Administration, O&M
SERVICE MANAGEMENT	<ul style="list-style-type: none"> • Board election • Drawing up the rules for the organisation • Workshops on tariff definition
MONITORING	<ul style="list-style-type: none"> • Institutional and community training in community supervision • Community supervision of the construction • Training in monitoring the service quality • Community monitoring of the service quality • Institutional monitoring of the water quality
	EVALUATION
	<ul style="list-style-type: none"> • Community evaluation • Institutional evaluation
	OTHERS
	<ul style="list-style-type: none"> • Workshop on leadership • Community and institutional seminars on legal framework for community participation in government projects • Community participation in AGUA 98 and AGUA 2000 events • Participation in the National workshop Integrated Management of Water Resources

Source: CINARA – EMCALI (1997e)

- Many sanitation systems did not function and many others were incorrectly installed,
- Solid waste was disposed of in the stormwater channels and in the backyards,
- People trusted the treasurer, and
- People considered the water problem the priority.

Because of the cholera outbreak, community and institutional participation was very good. The most familiar institution was the NGO Plan Internacional that had worked for a very long time in the settlement. However, this NGO supported only those families that subscribed to its programmes. Women participated actively and made the decisions. It was very hard to get men to go to the meetings because they believed that things related to improving living conditions were women's matters (Photograph 24 and Photograph 25). Although the community believed in the project, they distrusted their own capacity to work together. There were two extremes of opinion concerning the several alternatives available for improving the water supply system. The community wanted a water treatment plant similar to the one in the urban area. This plant had been promised by the Mayor in a community meeting after his election when he signed a letter approving the use of municipal resources for the construction of the plant. The community wanted to use the letter as a basis for to a suit against the mayor if he did not fulfil the promise to construct a new water treatment plant. On the other hand, the Health Secretary and EMCALI preferred the option of improving the old well. This option was not accepted by the community. During the selection process, the community visited the main urban treatment plant that utilised a pumped system. They also visited the communities in Aguablanca District who had been provided with a deep well. CVC, the institution in charge of the groundwater concessions, trained community members and institutions on groundwater issues in the Cauca Valley. In the end, the community and institutions agreed to construct a new, deeper well in a different place which was defined by the community and CVC. The Health Secretary, EMCALI, CVC and the NGO Plan Internacional allocated the resources. However, a common fund was not set up and each institution managed its own resources and they co-ordinated their own share of the work. As a result, the Health Secretary built the well, CVC and community supervised the contractor, the NGO Plan Internacional and the community replaced the damaged water network, EMCALI guided the replacements and, finally, EMCALI disinfected the water system.



Photograph 24 Women were the leaders

Source: CINARA – EMCALI (1997e)



Photograph 25 Men did not participate in community projects

Source: CINARA – EMCALI (1997e)

At the same time, the wastewater system was defined. Training in sanitation options was given to the community and the institutional team. A participatory selection process was

carried out during which the community visited places to examine the different options. The household unit was designed in a community workshop. Because of the linear urbanisation along the roads and the existence of septic tanks, the ASAS system (settled sewerage), which involved locating sewers along the backyards was selected. However, in 1999, community changed its mind and opted instead for 'condominial' sewerage. A new design was drawn up by a private contractor financed by EMCALI. This sewerage is now being constructed, following delays because the negotiations with landlords for the wastewater-treatment-plant plot were difficult. The landlords did not have the legal documents to prove that they were landowners, and so could not provide the community with any legal documents regarding the plots. The selection process enriched the experience both of the community and the institutions.

A user noted: 'we believed that we did not know and we discovered that we know. We decided what the best option was'. Dr Pereira of Personería declared: 'it is very interesting that people know what they want. We thought that people did not know what water quality was and look, this is an example of what the communities can do.'

However, when it came to look for resources, the level of community participation decreased because both the institutions and the community were very pessimistic. During this time, some action was taken to improve the electricity service because the old pump system was damaged several times due to voltage variations. It was hard to re-initiate the participation process once the resources were allocated because several months had passed since the design had been drawn up. Four community support groups were set up, and was assigned a specific area of responsibility. These included: managing the NGO resources; buying and distribution of materials; supervision of the work; and co-ordination of the labour force responsible for changing the water network. The NGO Plan Internacional insisted on the availability of a free force labour as one of its conditions for support. When the work was carried out, there was a festival atmosphere in the settlement. Children carried the pipes along the excavation made by the men, and the women gave juice and lunch to all of them. Also, where they could, women helped with the excavation. The engineers also worked to excavate and fix pipes. About 1.5 km of pipeline was cleaned (Photograph 26) and 1.8 km was replaced (Photograph 27). The well was an artesian well. It produced a five-metre jet of clean water, which made people very happy.

The treasurer said: 'this is the first time that I can have a bath without taking water in a bucket.'



Photograph 26 Part of the water network was cleaned

Source: CINARA – EMCALI (1997e)

The existing Water Committee was strengthened by access to additional training and tools to communicate with the users. Thanks to the Household Public Services Act, the organisation was helped to become a Public Services Provider (ESP) organisation with rules and regulations in 1994. The new ESP is known as Users Association of El Hormiguero (ASOHORMIGUERO). The Board is changed every two years in a User's General Assembly. At present, it has been changed twice without any problem. The first caretaker existing in the old water system is now the President of the Board and new leaders have emerged in the settlement.

During the evaluation, María Elena Cortéz said: 'I was so pleased that we realised that everyone has the potential to be a leader. It is not necessary to be well spoken. What is important is to do every thing in a proper manner.'

Photograph 27 The community replaced the damaged part of the water network

Source: CINARA – EMCALI (1997e)

5.2.4.3 Results

The water supply system has been functioning for the last five years. The present conditions are shown in Table 26. ASOHORMIGUERO is negotiating with the immigrant leaders to solve the water supply problems in a new illegal neighbourhood because the storage capacity is not sufficient to supply that illegal settlement with house connections. ASOHORMIGUERO is also negotiating with the existing illegal users. These are mainly relatives of legal users who have built new houses in the same plot. The General Assembly raised the tariff from US\$ 0.2 to US\$ 1.7 to cover the O&M cost, including the caretaker's salary (Box 8). However, the national government ordered an end to the subsidy given to community water-pump stations. As a result, the community is discussing whether to increase the tariff or reduce the pumping time. The administrative flexibility that ASOHORMIGUERO is able to offer is remarkable. For instance, when river level rises during the rainy season, it suspends payment of the tariff for those families that depend on the sand extraction for their income until sand extraction activity can return to normal. This degree of flexibility is possible because of the cultural characteristics of the black communities such as solidarity ties, which are very strong (CINARA, 2001). After the successful completion of the TLP, new projects were negotiated by the community. These included, for example, the provision of public telephones with support from EMCALI. In addition, the municipality paved the roads and public transport is now available. Women organised a micro-enterprise and men organised a Sand Extractor Co-operative. EMCALI is constructing a simplified sewerage system with a wastewater treatment plant. The system will be managed by ASOHORMIGUERO ESP. People are very proud of the change that their living conditions have brought about (CINARA, 2001):

We feel that it is not only the house front that has changed over these five years. We too have changed. We do not fight as we did. Now, we talk and problems are solved peacefully. Now, we organise ourselves, even when it comes to small jobs such as replacing a pipe. We are aware that without organisation nothing can be achieved, this is like sowing seeds in the desert.

The Health Secretary is the institution responsible for monitoring water quality. The water analyses are sent to ASOHORMIGUERO which posts them on the wall in the Administration Office where users pay the tariff. Community support groups and ASOHORMIGUERO were trained in monitoring the service quality. However, monitoring is not yet carried out systematically.

Box 8 Water supply in El Hormiguero (Cali)

Every one who knew the water supply system in El Hormiguero says 'I cannot believe this!'. Because for the first time in 20 years, the community-based organisation, which administers the system, had a surplus of more than US\$1.000. Now, they pay salary for the caretaker and users pay for tariffs without problems. Before the TLP was developed, the bad debtors were about 80% due to the bad service and tariffs were too low to pay for the caretaker who had to work in other activities and his spare time was dedicated to the water system. The users say 'The water system is ours, we are going to bring it up.'

CINARA - FMCAI I (1997e)

Table 26 Present conditions of the water supply system in El Hormiguero (2001)

INDICATOR	VALUE
Total households	405 + a new illegal settlement (90)
Coverage	Total users: 405 (100%) Potential new users: 90 (new illegal settlement) Legal users: 83%
Water quality	0 faecal coliforms Colour < 5 Turbidity < 5
Continuity	14 hours/day (5 am – 7 pm)
Tariffs	Fees: US\$ 75 Re-connection: US\$ 25 Stratum 0: US\$ 1/month Stratum 1: US\$ 2/month Stratum 2: US\$ 5/month
Revenues/expenses	1.02
Bad debtors	3%
Women participation in the Board	50%
Board rotation	Every two years
Board meetings	One a week
Legal recognition	ASOHORMIGUERO is an ESP

Source: CINARA (2001)

5.2.4.4 Lessons learnt

- ✓ Conflict offers the potential to bring people together around a common objective. As Abbott (1996) pointed out, the challenge is how to maintain community participation once the problems have been solved.
- ✓ The WSS projects can act as an open door for community development if they are conceived of as more than just a technical solution.
- ✓ The cultural component is a basis to plan the WSS projects. Culture determines most of the community's behaviour concerning leadership, solidarity and friendship ties between community members.
- ✓ Black ethnic communities have their own time rhythm, which should be understood and respected by the outsiders.
- ✓ Gender issues can relate not only to the involvement of women, but to the involvement of men in community development. Considering the role of men in this context does not imply that women should be prevented from playing a key role in decision making process.
- ✓ The community has proved that is able to define the best option in light of their circumstances; define tariffs; and manage and administer the WSS services.
- ✓ Project sustainability is heavily dependent on the process by which a project is carried out.
- ✓ WSS improvements can continue over time as the communities circumstances change.
- ✓ Strengthening governmental institutions is a way to strengthen municipality development. The reality is that only the community and the local government are permanent at the local level, whereas the NGOs and external agents move through settlements according to their own interests.

5.2.5 Pilas del Cabuyal

Water is a subject in which everyone is a stakeholder. Real participation only takes place when stakeholders are part of the decision-making process. This can occur directly when local communities come together to make water supply, management and use choices.



GWP (2000)

5.2.5.1 Description

Pilas del Cabuyal is a small rural settlement located at the urban border, 10 minutes up from the water intake of the second water-treatment plant in the city. This plant supplies water to 20% of the city population. The micro-basin, El Cabuyal, part of the River Cali basin, was burned every year during the summer, decreasing the basin's capacity to regulate water. Thus, during the rainy season, this basin flooded along the River Cali, parallel to one of the main avenues in the city centre. Additionally, the river was contaminated with wastewater produced by the settlement. When the occurrence of a new "El Niño" phenomenon was announced by the Institute of Meteorology, Hydrology and Environmental Studies (IDEAM), the municipality recognised that protecting the basin, which was been sown with trees after the last fire in the summer, was a priority. EMCALI selected the settlement to develop a TLP because protecting the water basins that supplied the urban plants was a priority and a Department had been recently created to take charge of this task.

Photograph 28 Pilas del Cabuyal drawn by its people

Source: CINARA – EMCALI (1997f)

5.2.5.2 The TLP

Pilas del Cabuyal is located on the left-hand side of the River El Cabuyal (Photograph



28). The settlement includes 30 households, comprised mainly of people originating from one family which settled in the area about 50 years ago. People obtained water from the stream, El Venado, in the same basin but on the other side of the river. The El Venado micro-basin was regularly affected by the fires in summer. However, people could do nothing to prevent fire damage because they did not have telephones to alert the firemen and they did not have tools to extinguish the fire themselves. Although the TLP included water supply and sanitation, it focused on water resources protection.

The activities carried out in the TLP are shown in Table 27. The institutional team included the firemen in charge of the fire management in the Western mountain range. The diagnosis included the recognition of the water basin and the WSS systems (Photograph 29). It was carried out by the institutional team and pointed out that:

Photograph 29 Community and institutional inspection of the El Venado micro-basin

Source: CINARA – EMCALI (1997f)

- Community organisation though informal, was very strong because of the family ties,
- The community had solved their problems without institutional support over the years,
- People worked in the city, in the informal sector,
- This was the first time that institutions had a project in the settlement,
- The community considered the protection of their water source, the stream El Venado, to be a priority,
- The water system was constructed by the people based on their own knowledge, and
- Most of the households did not have any sanitation system.

A management plan was prepared jointly by the institutions and the community (Photograph 30). Areas with problems such as summer fires, deforestation, intensive livestock populations and contamination were identified. Solutions were identified for each problem. As a part of the solution, the community was trained in fire management and provided with the necessary tools to extinguish fires when they started. A contract was signed between the community organisation and EMCALI to replant the basin with trees, and workshops on solid waste management were offered by EMSIRVA, the municipal institutions in charge of solid waste management (Photograph 31). At the same time, the WSS problems were discussed. Pre-filters were designed to improve water quality. Training in sanitation options was given to the community prior to the participatory technology selection. Because of the scattered nature of the households, on-plot sanitation options were selected. People preferred low-consumption toilets with a septic tank, anaerobic filter and wetlands. The people constructed the pre-filters under the guidance of EMCALI and CINARA engineers. The Health Secretary set up a contract for the construction of the sanitation solutions, a process which was supervised by a Health Secretary engineer and the community support group. The resources were provided by the national fund Urban Infrastructure Fund (FIU) and the regional Government.

5.2.5.3 Results

A model designed to involve the community in water resources protection was developed and applied in other settlements in the rural area of the Buenaventura Municipality, in the Pacific Coast and in La Elvira in Cali. The latter project won a research prize for its contribution to the development of methodologies for involving children in water resource protection. These methodologies are discussed in Chapter 8. In light of the successful application of the training given by the Community Development Secretary on administration issues, the water committee trained other community committees in the rural area. Thus far, fires have not occurred in this basin. However, it is necessary to wait until the end of this summer (August 2001) to judge the success of the training because it has been one of the hottest summers in the last 10 years. In the beginning, two of the sanitation systems had odour problems. They were solved jointly by the Health Secretary and CINARA with the users. In the evaluation, people expressed their satisfaction:

Table 27 Activities in the TLP in Pilas del Cabuyal

PHASE	ACTIVITY	
PLANNING	• Participatory diagnosis	
	• Sanitary inspection of the El Cabuyal basin and the El Venado micro-basin	
	• Identification and prioritisation of the environmental problems	
	• Preparation of a micro-basin management plan by institutions and the community	
	• Women participate in a workshop on hygiene and health	
DEVELOPMENT	DESIGN	
	• Community training in fire management	
	• Organisation of community groups for fire protection	
	• Workshop on solid waste management held for children by EMSIRVA	
	• Community agree a contract with EMCALI to reforest the El Cabuyal basin	
	• Community workshop on solid waste management	
	• Training in community participation in water resource protection	
	• Analysis of the legal framework for environmental protection in the Reservation Area of the municipality carried out by the institutional team	
	• Participatory re-design of the water supply system	
	• Training in sanitation options	
	• Sanitation technology selection	
	• Participatory pre-design of sanitation solutions	
	• Technical design of WSS systems	
	• Community adjustments	
	CONSTRUCTION	
	• Water system construction by community	
	• Sanitation systems constructed by the Health Secretary	
	• Starting up of the sanitation systems	
	• Training in O&M	
	SERVICE MANAGEMENT	• Training in administration, O&M
		• Training in conflict resolution

MONITORING	<ul style="list-style-type: none"> • Training in community supervision • Community supervision of construction
EVALUATION	<ul style="list-style-type: none"> • Institutional evaluation • Community evaluation
OTHERS	<ul style="list-style-type: none"> • Community participation in a workshop on leadership • Visits to the communities of Ceylán and El Hormiguero • Community participation in AGUA 98 and AGUA 2000 events

Source: CINARA – EMCALI (1997f)

Photograph 30 An action plan was prepared jointly by the community and the institutions

Source: CINARA – EMCALI (1997f)

Photograph 31 Workshop on solid waste management with children

Source: CINARA – EMCALI (1997f)

We can live with nature in harmony. There is no contamination any more. We value our settlement. We value our work. The project allowed us to establish horizontal relationships with the institutions. Furthermore, it gave employment to our unemployed people. Now, the possibility exists for setting up new contracts through the community organisation.

5.2.5.4 Lessons learnt

- ✓ The community has improved its living conditions in spite of failures on the part of institutions.
- ✓ Although much has been said about water resource protection, methodologies to involve



communities at the local level in that action have not been completely developed.

- ✓ Although environmental sustainability is normally taken to imply nature without human beings, it is possible to reconcile human development and environment conservation.

5.3. PHASE 3: INSTITUTIONALISATION

Go towards people, live with them, learn from them; love people, begin with what they know, build with what they have. Nevertheless, the best reward for a leader comes when the task is finished and the work has been done, and people say: we have done this ourselves.

Tao To Loa (700 BC)

The final part of the Cali programme incorporated the findings of the TLP into the EMCALI institutional project cycle so that the last step of the investment model (Figure 21) was completed. In fact, the projects in this last phase of the programme were called 'institutionalisation projects'. These projects were developed between the end of 1998 and 1999. In these projects, CINARA acted as a social mediator, lending support to EMCALI in the different phases of some of its projects developed in the rural area. Some projects were selected due to they were in the planning phase. Others were selected due to they were in the development phase. All projects included specific objective for CINARA to strengthen of the community-based organisation in charge of the WSS services (Table 28) (CINARA – EMCALI, 1999).

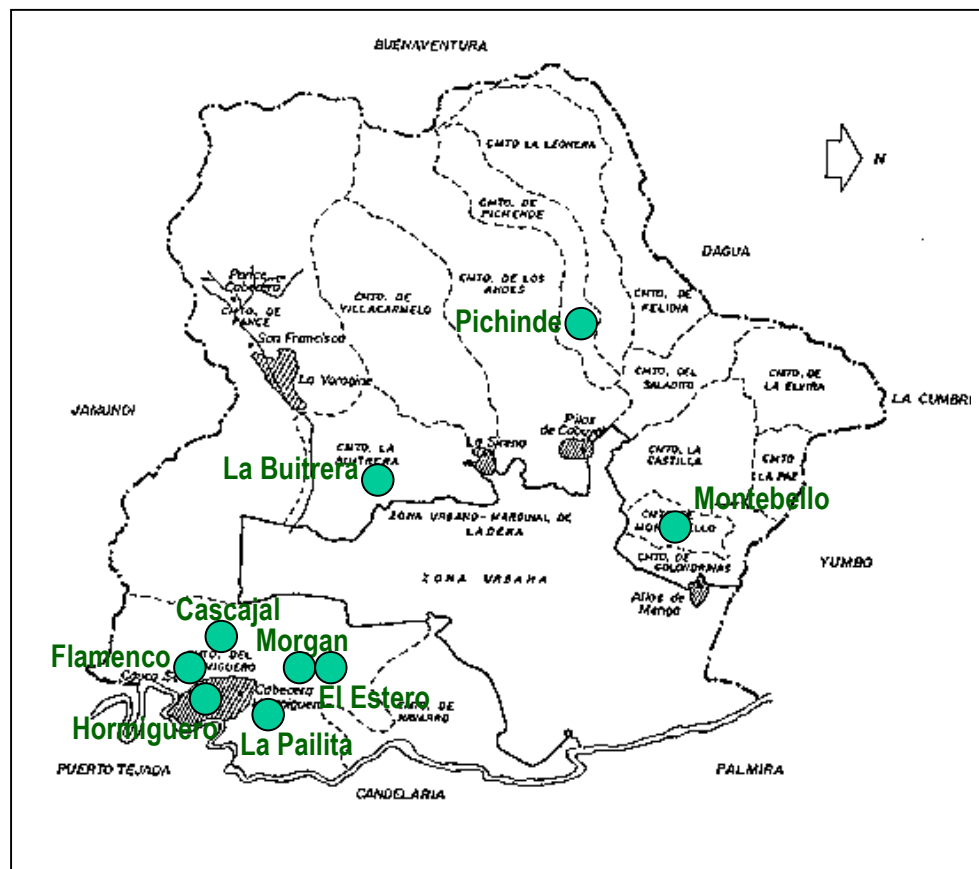


Figure 23 Localisation of the institutionalisation projects

Source: CINARA - EMCALI (1998f)

EMCALI did not include community supervision in its projects. Furthermore, almost all of the designs were contracted out to local consultants and construction had been always contracted to private construction firms. Additionally, the engineers in different departments had no experience in WSS in rural areas. Although most of the engineers considered the EMCALI urban projects as participatory ones, community participation took the form of merely informing the community that a project was to be carried out in the *barrio*. Therefore, the main objectives of the institutionalisation projects were to support EMCALI engineers and the new sociologist contracted to work in the rural department, and to incorporate the findings of the TLPs in the EMCALI project cycle, especially with regard to community supervision. One of the general results of the TLPs was that EMCALI incorporated community participation in the legal framework of its projects. EMCALI included a clause in the contracts with private

consultants and contractors to require community participation in the project. However, neither the EMCALI Controllers nor the consultants and contractors knew how to involve the community in the project. The specific works contracted by EMCALI are shown in Table 29.

Table 28 EMCALI projects included in the institutionalisation phase

PHASE AND STAGE	ASPECT	SETTLEMENT	LOCATION
PLANINNING	Water supply	El Estero	Plain zone
DEVELOPMENT			
Design	Wastewater	El Hormiguero	Plain zone
	Sanitation	La Pailita	Plain zone
	Wastewater	Pichinde	Western mountain range
	Wastewater	Montebello	Western mountain range
Construction	WSS	Morgan	Plain zone
	Water supply	El Hormiguero	Plain zone
	Water supply	La Pailita	Plain zone
	Water supply	Cascajal	Plain zone
	Water supply	Flamenco	Plain zone
	WSS	El Estero	Plain zone
	Water supply	Montebello	Western mountain range
	Water supply	La Buitrera	Western mountain range
SERVICE MANAGEMENT	Organisation, administration, O&M	Montebello	Western mountain range

The project began with a workshop with the contractors. This workshop explained to them the way in which EMCALI wanted to develop the projects. During the workshop, the contractors presented what they had planned in view of the fact that community participation was specified in the contract that they had signed. Not one of them knew anything about community supervision and the legal framework that supported this activity. Although they were familiar with the concept of community participation in the conventional sense -that is informing communities about the project-, they knew nothing about participatory pre-design and construction supervision. There were concerns about the time that community participation activities would require. The main concern was about the additional time a participatory project would require in light of the time allowed by the contract. However, they agreed to include those activities in light of the fact that CINARA agreed to act as an intermediary and to provide training prior to the participatory activities being carried out.

CINARA included the participatory activities within the time framework planned by the contractors. All of the engineers felt threatened by community participation in technical aspects of the projects because they thought that the community had no contributions to technology selection, design, and construction supervision processes.

Table 29 Contracts made by EMCALI with the private sector (consultants and constructors)

SETTLEMENT	CONTRACT
Morgan	Construction of a new well, aeration system and installation of a new pump and a disinfection system
	Construction of on-site sanitation systems
El Estero	Construction of the aeration system, replacement of the households connections
	Construction of on-site sanitation systems
El Hormiguero	Replacement of the aeration system, pump control system and installation of a disinfection system
	Design of the sewerage system, including treatment plant
Cascajal	Replacement of the aeration system and installation of a disinfection system
La Pailita	Replacement of the aeration system and installation of a disinfection system
	Design of on-site sanitation systems
Flamenco	Replacement of the aeration system and installation of a disinfection system
La Buitrera	Construction of La Soledad and El Carbonero drinking-water treatment plants
	Construction of storage tank and completion of the water network
Montebello	Construction of the drinking-water treatment plant
	Design of the sewerage and wastewater treatment plant
Pichindé	Design of the sewerage system, including treatment plant

The following activities were incorporated into the contractors' project plan: participatory diagnosis (one day); community training in WSS options (carried out by CINARA); participatory pre-design (one day); community training in construction supervision (carried out by CINARA); a meeting to co-ordinate community supervision; Controller activity and the construction plans (one day); and community supervision throughout the contract period. All the workshops held in the communities were guided by CINARA and the EMCALI sociologist. EMCALI had decided what to do in the settlements based on visits made by its engineers. However, these visits to the settlements were made without making contact with the communities. The diagnosis revealed that some of the work contracted had already been carried out by the WSS community-based organisations and that these organisations had other priorities and needs. EMCALI and the contractors accepted that they should alter some of the work specified in the contracts. This action required the intervention of the legal

department. The contractors were very receptive to the ideas presented in the community-based workshops and all participated actively. The EMCALI engineers and contractors also participated actively in the training events, which were mainly focused on sanitation aspects.

5.3.1 Planning projects

Although some improvement work in El Estero was contracted by EMCALI, EMCALI did not have the resources available to carry out all the required alterations to the water system. In order to obtain the necessary resources the community registered projects with the Municipal Projects Bank so that municipal resources could be allocated in the municipal budget plan for the following year. Community members were trained in project formulation, using their own projects as case studies. CINARA staff helped them set out the details of the formulated project as required by the official application form provided by the Planning Secretary.

5.3.2 Design projects

This section describes the design projects carried out in La Pailita, Pichindé and Montebello (See Figure 23).

5.3.2.1 La Pailita

The La Pailita community knew of the process followed by El Hormiguero and wanted to participate in a similar process. The participatory diagnosis revealed the community's expectations regarding sanitation solutions. Because the houses were scattered along the roads, on-site sanitation options offered possible solutions. However, because they had in-house water connections, the people wanted on-site sanitation options that incorporated pour-flush toilets. EMCALI agreed, but the available resources only covered pour-flush toilets without cisterns. A negotiation process was carried out and the final agreement was that families made contributions to top up the funds needed to buy the toilets. After reaching the agreement, a participatory pre-design was carried out. The community drew the sanitation unit they wanted and the consultant explained to them the possible disposal options including their costs and O&M requirements. Because the people used the groundwater in the area, no one

was in favour of infiltration options such as soakaways or infiltration fields. Therefore, the treatment option chosen was to use septic tanks plus anaerobic filters, with final disposal in natural drainage channels. The people agreed to contribute sand that they extracted from the River Cauca. They also wanted to work in the construction and asked EMCALI to force the contractor to include them as paid labour. The EMCALI Controller, consultant and the community participated actively in the process. Together, they made household visits before the participatory diagnosis and analysed the materials used in the settlement and the existing sanitation options. The schedule agreed at the beginning of the institutionalisation projects was respected and the consultant did not have problems in presenting the final design within the time framework stipulated in the contract.

5.3.2.2 *El Hormiguero*

Designing the new wastewater system in El Hormiguero presented no problems because people had participated in the design carried out during the TLP in the settlement (See item 5.2.4). Rather than opting for settled sewerage –the option chosen during the TLP in the settlement–, the people now chose ‘condominial’ sewerage. Some of the work carried out during the first TLP was retained and proved useful in the new design. For instance, the sanitation unit remained as it was designed. It is remarkable that no records of the original design drawn up for the TLP could be found in the EMCALI archives. Except in Pizamos (one of the settlements supplied by the water system in El Hormiguero) where a conventional small sewerage system was proposed, the final design presented by the consultant comprised of sewers in backyards, and three pump stations. However, although the EMCALI Controller supported the use of pump stations, these were considered unsustainable by the CINARA team, who pointed out that the people were unlikely to be able to pay for the electricity needed to run them. The design could not be reviewed in detail by CINARA and its opinion was not taken into account by the Controller. However, when the contract for construction was signed, after all these institutionalisation projects had finished, the EMCALI WSS services Director asked CINARA for their opinion about the design. He thought that the design was unsustainable and CINARA agreed. The Director authorised the construction of the first part of the proposed design in Pizamos where conventional sewerage had been designed without a pumping system. The construction of this independent sewerage system, which included a treatment plant, was completed. However, the system is currently not functioning because of the economic crisis. People do not have sufficient resources to connect their households to

the sewers. The Director stopped the remaining construction work and no new solution has been considered.

5.3.2.3 Pichindé

In Pichindé, the community, the contractor, and the Controller participated actively in the design process. The first problem occurred when EMCALI presented the project to the community. EMCALI had selected the location for the wastewater treatment plant without taking into account the wishes of the landowner. Also, the treatment option chosen by EMCALI required electricity and mechanical parts which the community did not feel they could maintain and pay for. The Controller had agreed the wastewater treatment technology with a private foreign company prior the beginning of this participatory project, and he was confident that community participation could be limited only to the selection of the sewerage option. As a result, the consultant was under pressure to accept the treatment technology chosen by EMCALI, and during the technology selection process, it was clear to the community that the consultant would not be taking their opinions into account. This led to conflict. In the end, pressure from the community prevailed and the Controller accepted the need for a complete participatory process for technology selection and design. Another important conflict emerged when the integrated concept was applied because the settlement consisted of a concentrated core of buildings surrounded by scattered houses. The consultant argued that the design should concentrate on the core part of the settlement. The consultant only agreed to include the whole settlement after many meetings with the participation of the Controller and EMCALI legal department.

When suggesting the types of sanitation systems to consider, the CINARA team was able to draw on the previous experience of a Dutch NGO. Many years before, the Dutch NGO, working with the local community, built a complete sewerage system in a *barrio* in Pichindé. The wastewater treatment plant used included septic tanks with anaerobic filters that incorporated *guadua* (the local bamboo) as the filter medium. The final design of the wastewater system in Pichindé included on-site sanitation options for scattered households, simplified sewerage under the sidewalks, a septic tank with an anaerobic filter (using *guadua* as the filter medium), and aeration system. The River Pichindé was the final recipient. This river joins with the River Cali, which supplies 20% of the urban dwellers.

The EMCALI Controller, who was at the same time the Head of the Rural Department, was very dissatisfied with the community participation in the design process and supervision in Pichindé. However, the community was very satisfied with their role as participants and supervisors, helping the Controller to make better decisions. The consultant was surprised by the community's capacity to understand the technology and analyse it in light of their own lifestyle and experience. The community considered issues such as:

If bio-filters need electricity, what will we do when power goes down for one or more weeks as it happens very often here? Would the small organisms die? Will EMCALI pay for the electricity needed by the system that it chooses?

5.3.2.4 Montebello

Montebello, which has 10,000 inhabitants, is the largest rural settlement in the municipality. The design process in Montebello was not carried out as part of the CINARA contract because it had been agreed that longer-term activities needed to be developed by the consultant. These activities were identified in the participatory diagnosis developed in collaboration with the community-based organisation in charge of WSS services. The participation of the community-based organisation was very important because it was familiar with the local conditions and the history of WSS in the area. This included, for instance, the fact that people had built provisional sewers and nobody knew about them exactly. Also, there were many springs within the settlement which had to be identified. In addition, the high-risk areas also needed to be characterised. Water continuity and quantity had been a great problem for many years and affected the existing sanitation systems (Photograph 2). The water source did not supply enough water to satisfy the settlement's needs in light of the existing consumption patterns. It was therefore necessary to discuss with the community the need to change from conventional toilets and in-house devices to low-water consumption toilets and devices. This discussion would make it possible for resources needed to be allocated by the community and for a plan to make the changes to be agreed with the services organisation.

5.3.3 Construction projects

5.3.3.1 Plain zone

On-site sanitation options had been designed for El Estero and Morgan. The systems were comprised of pre-fabricated septic tanks and grease traps, anaerobic filters and infiltration fields. While the community participation process began, the constructor started replacing the wastewater system in the school. The diagnosis showed that the design had not taken into account the local conditions. A consultant visited the settlement, but she did not talk to any community members. There were several problems identified in that design. For example, a part of the settlement had been excluded because information on which the design was based was incomplete. The design did not take into account recent immigration because the immigrants were settled in illegal areas. However, during the first part of the construction project the households excluded proved that they had had legal land tenure for 50 years. An illegal settlement actually existed within El Estero but it was wrongly located by the consultant responsible for the design. The omission of the illegal area cause particular problems because most were headed by women with four or more children, and lack of adequate WSS services posed serious health implications for the children. To overcome these problems there were meetings with the Planning Secretary. The criterion applied in the TLP in Altos de Menga was applied (See item 5.2.1) and the families in the illegal settlements were included. The community was trained in the construction and function of the sanitation solutions, using the project in the school as practical case study. Community support groups were established to supervise the construction. The agreement was that the construction firm would employ the community labour force to excavate trenches, but would employ its own team for the actual construction. New conflicts emerged when the construction firm employed its own construction team to carry out all the work. Several problems arose during the construction phase:

- The prefabricated covers of the septic tanks were damaged because of the weight of the soil when the tanks were covered,
- The construction firm asked people not to use land over and near the tank. This condition was not discussed when the technology was originally presented. As a result, people agreed on the location of the system without knowing that the land used would be completely lost,

- During the construction, when the rainy season began, the tanks floated,
- The construction firm used less gravel than that specified in the design, and
- The construction firm did not construct the slope specified in the design for the infiltration fields.

Local materials were used to solve the problem of strength in the tank covers. The EMCALI Controller ordered the re-construction of many pipelines in the infiltration fields. In addition, carefully supervision by the community was needed because the construction firm wanted to reduce the amounts and quality of the material used to reduce their costs, thus decreasing the quality of the construction. Although most of the problems were solved, people still lost the land used in the systems. All systems were constructed and are functioning without problems.

The work done to improve the water systems in the plain zone (See Table 28) was disastrous. Frequently, the opinions expressed regarding designs, materials, and costs, amongst others by the CINARA team before the construction began were not taken into account. EMCALI had accepted the use of materials that were not able to resist the water pressure. For instance, the aeration systems were damaged when they received the water pumped up to them. The disinfection pumps were damaged once they were operated. The community support groups carrying out the community supervision protested. Several meetings were held, including some with the EMCALI WSS services Director. Because the community's demands were not accepted by the EMCALI Controller, the community decided to present their complaints to the control institutions in the municipality (*Defensoría del Pueblo, Personería, Contraloría and Procuraduría*). These institutions investigated the contracts and concluded that it was EMCALI's responsibility to solve the problems caused by its contractors. The problems were solved, although at a high cost for EMCALI. The communities were very dissatisfied with the support provided by EMCALI for WSS in the rural areas and the EMCALI Controllers were very dissatisfied with community participation in WSS projects.

5.3.3.2 *Western mountain range*

Only one of the treatment plants in La Buitrera was constructed. However, the commissioning process was not carried out because the water network received water from two sources. The construction of the other treatment plant was postponed because the landowner decided not to sell the plot. The EMCALI legal department was negotiating the new conditions imposed by the landowner. The community participated in the construction supervision as was expected because they had participated in the design process. The relationship established between the community support groups, the contractor and the EMCALI Controller were good. A new project was identified during the course of an investigation carried out to discover why it was not possible to connect the community where one of the treatment plants was located to the system. Contractors, EMCALI engineers, and the community were trained throughout the institutionalisation project. Specific activities carried out to strengthen the community organisations in administration, O&M and the CINARA team helped some of organisations to become Public Service Provider (EPS) organisations.

5.3.4 Results

- The communities met several times to exchange their experiences, problems and solutions. After the institutionalisation phase of the Cali programme finished, the idea of setting up an association was conceived. The idea was put into practice in 2000. At present, the association of WSS community-based organisations is working to agree on its functions, rules and regulations.
- A training programme was designed for EMCALI staff by CINARA. This programme was carried out between 1999 and 2000. The subjects were agreed by both CINARA and EMCALI, to take into account both the conditions in the municipality and EMCALI's priorities. However, the changes in the structure of EMCALI that resulted from economic problems both in EMCALI and in the municipality, have resulted in the dismissal of many professionals who had participated throughout the entire programme.

- Although the EMCALI engineers did not like community participation in the WSS projects in the rural areas, the communities are demanding the right to participate. This right has a recognised legal basis.
- The methodology developed in each phase of the project cycle was validated in the National Programme for the Sustainability of WSS systems in Colombia.

5.4. CONCLUSIONS

The science of learning emphasises “learning with understanding”. This means that it is not enough for people to receive knowledge, but they must also understand the meaning of the knowledge they receive. Several researchers have concluded that people acquire new knowledge and understanding on the basis of their pre-existing knowledge and beliefs (Bransford *et al.*, 2000). The projects discussed here followed a model of technology transfer that differs from the traditional models used in industrialised countries to strengthen local capacity in the WSS sector. In the model discussed here, the technology was developed through a participatory process in which learning was people-centred and began with what the participants already knew. The model also placed equal importance on the views of the communities and institutions. The programme carried out in Cali municipality based on this alternative model revealed that communities were more receptive to new ideas than professionals were. Communities were open-minded to changes that they perceived as beneficial to their welfare. However, the professionals had pre-conceived ideas about community participation. Usually, their own interests were contrary to the results expected in any WSS project. The professionals participated actively in the TLPs because they perceived the benefits of gaining knowledge of the conditions that exist in enabling environments such as those promoted by this programme in the municipality. In the enabling environment promoted by the TLPs, they felt reinforced and protected by an inter-institutional team that had not existed in the municipality. However, although political support for whole programme was strong in the municipality, the professionals were highly resistant to changing the traditional practices followed in the common projects carried out in their regular professional life such as the ‘institutionalisation projects’ developed in the last phase of the Cali programme.

The role played by the private consultants and construction firms throughout the programme was remarkable. Although the private sector in Colombia tends to be characterised by a strong interest in profits, most of consultants and construction firms accepted all the activities proposed to facilitate community participation. In the TLPs, they accepted the community participation in their activities and were flexible about modifying the schedules as needed because of the enabling environment that surrounds the TLPs. In the institutionalisation projects, contractors were cautious about community participation because of the pre-conceived ideas that participation is synonymous with delays. However, when a limit on the amount of time spent within the projects on community activities was clearly set out and guaranteed by an intermediary, consultants and constructors were completely active and open-minded carrying out the projects. The major problems that occurred were related to the conflicts between their interest in profit and ethics when providing infrastructure. It was unfortunate that the contracts were too restricted to allow easy changes in response to new conditions. The need for changes was usually the result of a lack of community participation from the very beginning.

One of the main results of the programme was the new attitude assumed by all the communities who participated in it. Within a very short time, they developed new participatory projects to solve problems in areas other than WSS. This confirmed the findings of the learning sciences, which stated that “to develop competence ..., learners must (Bransford *et al.*, 2000):

- a) have a deep foundation of factual knowledge;
- b) understand facts and ideas in the context of a conceptual framework; and
- c) organise knowledge in ways that facilitate retrieval and application”.

In spite of the enormous difficulties that the country faces, the WSS community-based organisations are managing the services taking into account social, environmental and economic criteria. This demonstrates how deeply they have assimilated the knowledge about WSS sustainability built up throughout the process in the Cali programme to improve WSS services. In this way, WSS projects have become one of the starting points for community development, and brought about an understanding of community development as a common

dream which people are willing to build in spite of their own interests. Given the changing conditions at the local level, sustainability is never reached forever without continuous monitoring of the sustainability indicators. These communities have shown that WSS services can be sustainable even after the external agent finishes its intervention if technology is properly transferred to the communities and local institutions. However, the challenge is how to incorporate the findings of the TLPs in the regular work of governmental and non-governmental institutions, which support community development. The programme showed that political and community commitment alone is not sufficient to change traditional practices, especially when the changes affect the non-ethical practices followed by professionals.