

IHS Project Paper Series

**Project Paper No. UEM16
Promotion of Employment, Health and the
Environment, Lima**

César Zelo Fierro and Cecilia Castro Nureña

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Nureña**

**Promotion and Employment, Health and
the Environment, Lima**

*David J. Edelman Editor
Ed Frank, Project Manager*



**Institute for Housing and Urban Development Studies
Rotterdam, The Netherlands
February 1997**

Introduction to the Capacity Building for the Urban Environment Project

Focus and Outline of the Project

Capacity Building for the Urban Environment is a comparative research, training and experience exchange project that was launched in October 1994 with the support of the Dutch government. It provides an inventory and review of the experiences of relevant bilateral and multilateral organisations and of Best Practices in urban environmental management. For the countries of India, Peru and Bolivia, it identifies, communicates and extends the application of Best Practices in environmental management for cities. In May 1995, the project was expanded to include Senegal/West Africa with the support of the Swiss government.

The focus of the project is on learning from experiences in urban environmental management at the city level and on developing strategies for capacity building in order to replicate and scale up the best of these experiences elsewhere. The overall co-ordination of the project is the responsibility of the Institute for Housing and Urban Development Studies in Rotterdam, while co-ordination in the participating countries is the responsibility of the following partner organisations:

- Human Settlements Management Institute (HSMI), New Delhi, India;
- Instituto para la Democracia Local (IPADEL), Lima, Peru;
- Instituto de Desarrollo Urbano (CIUDAD), Lima, Peru (since January 1997);
- Centro de Servicios para el Desarrollo Urbano, (PROA), La Paz, Bolivia, and
- Institut Africain de Gestion Urbaine, (IAGU), Dakar, Senegal.

Project Activities

Support to cities in the form of applied research and development activities in the area of urban environmental management has been, and continues to be, provided by the co-ordinating partner organisations through the following set of activities:

Research

Within the applied research programme undertaken in the project, Best Practices in urban environmental management in Bolivia, India, Peru and, to some extent, Senegal were identified, and their lessons and experiences reviewed. An analysis and review of the identified Best Practices then took place involving a large number of individual research groups and professionals. In a process of on-going monitoring and review, guidance and support were provided by IHS and its partner organisations. The results of both the individual studies of Best Practices and their review are being published in several books and papers in both English and Spanish. These and their publication dates are listed in the *Introduction to the Project Papers*, which follows this note.

Networking

In identifying the research priorities of the project, during the conduct of the research studies, and throughout the review of research findings, a structure was developed and utilised to ensure the participation of all interested and concerned individuals and institutions through a consultative process. Expert group meetings and consultative seminars were organised for this purpose.

Capacity Building Strategies

After the Best Practices research, analysis and review were completed for all countries, outline capacity building strategies were developed for each based on what was learned from these local experiences and practices. These strategies were developed through a broad-based consultation process involving a large number of research institutions, individual professionals and academics, city representatives, NGOs and local representatives. They are currently being modified based on the outcome and findings of Habitat II, which was held in Istanbul in June 1996, and the emphasis has now shifted to applying a number of Best Practices to selected cities.

Best Practices Documentation

Concurrent to and co-ordinated with this project, IHS served as the secretariat of and contributed to the review of the Best Practices that were submitted to the United Nations Centre for Human Settlements (UNCHS) for the *Global Best Practice Initiative for Improving the Living Environment* in preparation for Habitat II. HSMI, PROA, IAGU and IPADEL were also involved and contributed to the national preparatory processes that took place in their own countries. An overview of the Best Practice submissions to UNCHS, as well as summaries of the additional case studies received by IHS, are being made available on the Internet through the IHS Home Page.

Databases

Two databases are also under preparation: an institutional database and a literature database. The institutional database is being developed in co-operation with the International Institute for Environment and Development (IIED) in London. It contains entries on relevant organisations, some of which are documented in extensive profiles, while others are included as shorter reference information entries. IHS is developing the second database, which provides references in the literature on experiences with urban environmental management.

Rotterdam Seminar

The Rotterdam Seminar, which took place in May 1996 during the two weeks preceding Habitat II, brought together all principal researchers, as well as city representatives and other professionals involved in the project for a period of intensive discussions. The seminar resulted in a document that provided a comparative analysis of practices and experiences in the field of urban environmental management. This analysis included the project process and network building, governance, job creation and poverty alleviation and gender. This was published as a book in February 1997 and is listed later in the *Introduction to the Project Papers*.

The Rotterdam seminar also discussed *city-level capacity building strategies* for the cities of Calcutta, India; Ilo, Peru; Santa Cruz, Bolivia and Dakar, Senegal. Experiences in *urban environmental management* were reviewed for the cities of Tilburg, The Netherlands and Nairobi, Kenya.

Habitat II

At Habitat II the project was presented in the Special Meeting on Implementing the Urban Environment, organised by UNEP and UNCHS, as well as in other fora.

Capacity Building Strategies for Peru, Bolivia, India and Senegal

The outline capacity building strategies which were developed in preparation for Habitat II (i.e., by CIUDAD, PROA, HSMI and IAGU with the support of IHS). They are being modified for implementation, which is expected to begin late in 1997.

Outline Training Program for Local Officials, CBO Workers, and other Partners for Peru, Bolivia and India

These training materials are to be developed over the next few months and will comprise curricula for short courses related to the most directly applicable Best Practices identified for each country in view of its national strategy for capacity building in urban environmental management.

The Development of a Medium-Term Capacity Building Strategy for Senegal and West Africa

This activity is in progress and addresses the building of individual and institutional capacities at the local level for urban environmental management in both Senegal and throughout West Africa.

Ed Frank, Project Manager
Rotterdam, February 1997

Introduction to the Capacity Building for the Urban Environment Project Papers

A number of publications have appeared under the Capacity Building for the Urban Environment project. These are listed below and can be ordered from IHS or its partner organisations respectively:

- *Capacity Building for the Urban Environment*, edited by David J. Edelman and Harry Mengers, summarises the research findings of the project and the conclusions of the Rotterdam Seminar. It was published by the Institute for Housing and Urban Development Studies (IHS) in Rotterdam in February 1997;
- *Urban Environmental Management: The Indian Experience*, edited by B.N. Singh, Shipa Maitra and Rajiv Sharma, reviews the Indian experience in urban environmental management and presents all the Indian Best Practice of the project in detail. It was published by the Human Settlements Management Institute (HSMI) and (IHS) in New Delhi in May 1996;
- *Problems and Issues in Urban Environmental Management: Experiences of Ten Best Practices*, also edited by B.N. Singh, Shipa Maitra and Rajiv Sharma reports on the Indian Best Practices of the project in an abridged form. It was published by HSMI and IHS in New Delhi in May 1996, and
- *Ciudades para la Vida: Experiences exitosas y propuestas para la accion*, edited by Liliana Miranda Sara, presents the Best Practices and outline capacity building strategies for Peru and Bolivia for a Spanish speaking audience. It was published as Volume 6 in the Urban Management Series of the joint UNCHS/UNDP/World Bank Urban Management Programme in Quito in May 1996.

The objective of this series of *Project Papers*, then, is to bring to an English speaking, audience the results of the project research in Peru and Bolivia appearing in the Miranda book. In addition, the Indian research, while documented in English in the second and fourth references listed above, has not appeared as complete, individual studies. Consequently, a selection of these will also be selected for this series. Finally, the first reference in the above list covers aspects of the research undertaken in all four countries of the project. Consequently the selection of work appearing in the *Project Papers* includes the following:

Bolivia

- 'Urban and Environmental Reality Workshops' by Zoila Acebey;
- 'Urban Agriculture in Community Gardens' by Julio Prudencio Böhr, and
- 'Institutional and Development Framework for Urban Environmental Management in Bolivia' edited by Gastón Mejía.

Peru

- 'Defence and Conservation of the Natural Swamp Area Pantanos de Villa, Lima' by Arnold Millet Luna, Eduardo Calvo, Elsie Guerrero Bedoya and Manuel Glave;
- 'Consultation in Urban Environmental Management: The Case of Ilo' by José Luis López Follegatti, Walter Melgar Paz and Doris Balvín Díaz;
- 'Promotion of Employment, Health and the Environment, Lima' by César Zela Fierro and Cecilia Castro Nureña

- ‘Environmental Sanitation and Infrastructure: The Case of the Marginal Urban Areas of the Southern Cone of Lima’ by Silvia Meléndez Kohatsu, Víctor Carrasco Cortez and Ana Granados Soldevilla, and
- ‘Inter-institutional Consultation and Urban Environmental Management in San Marcos Cajamarca’ by Marina Irigoyen and Russeles Machuca.

India

- ‘Power to the People: The Local Government Context’ by the Times Research Foundation;
- ‘Carrying Capacity Based Regional Planning’ by the National Institute of Urban Affairs;
- ‘NGOs/Civic Societies and Urban Environmental Advocacy’ by Development Associates;
- ‘Integrated Low-Cost Sanitation: Indian Experience’ by Sulabh International Institute of Technical Research and Training;
- ‘City-Wide “Best Practices” in Solid Waste Management in Collection, Transportation and Disposal’ by HSMI/WMC of UIFW;
- ‘Environmental and Health Improvement in Jajmau Area, Kanpur: Lessons and Experiences for Wider Replication’ by Ministry of Environment and Forests;
- ‘An Approach to Pollution Prevention in Electroplating Sector’ by Development Alternatives;
- ‘Integrated Study on Wetlands Conservation and Urban Growth: A Case of Calcutta's Wetlands’ by Institute of Wetlands Management and Ecological Design;
- ‘Sustainable Urban Development: A Case of Navi Mumbai (New Bombay)’ by City & Industrial Development Corporation;
- ‘Community Based Sanitation and Environmental Improvement Programme: Experiences of Indore, Baroda and Ahmedabad’ by Shri Himanshu Parikh, and
- ‘Institutional and Development Framework for Urban Environmental Management in India’ by HSMI.

It should be emphasised here that the nineteen *Project Papers* in this series reflect the views of their authors only and have been edited to varying degrees. Initial English language editing was done by, among others, B.N. Singh, S. Maitra and R. Sharma for India and by D.J. Edelman for Peru and Bolivia. In fairness to both the authors and the publishers, they should, therefore, be characterised as working papers rather than full academic papers.

David J. Edelman, Series Editor
Rotterdam, February 1997

**Promotion of Employment, Health and the
Environment, Lima**

**César Zela Fierro and Cecilia Castro
Nureña, Peru**

PROMOTING EMPLOYMENT HEALTH CARE AND THE ENVIRONMENT

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César Zela Fierro and Cecelia Castro Nureña

Lima, Peru

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1. Proesa Micro Enterprises and Urban Waste Removal

Introduction

The current research has as its objective understanding the results of the project "Promoting Employment, Health Care and the Environment (PROESA)," carried out by the Institute for the Advancement of Social Economy (IPES), to determine the impact on the quality of life of the population, particularly in urban marginal neighbourhoods, and analyse the possibilities of repeating them in other urban settings. In this regard, experiences were chosen to be developed in the Lima districts of Villa María del Triunfo, San Juan de Lurigancho, Ate Vitarte, Ventanilla and Miraflores (populated mainly by middle- and upper middle-class families). In addition, the evaluation of an experience reproduced by a private development organisation in the city of Puno is included.

The research was carried out with the participation of the principal subjects in the PROESA project: the local population, the authorities, local leaders and the workers and managers in micro enterprises, with whom the factors of success were analysed, as were the main problems and possibilities for sustainability and replication of a waste disposal system based on micro enterprises. The authors hope that the results of the research contribute to the reflection, debate and work of all those involved in the struggle to overcome poverty and build a sustainable world, particularly for those who confront the daily challenge of cleaning our cities.

1.1 Public waste removal in Lima

The city of Lima, Peru's capital, is home to 6,002,796 inhabitants, and it is where creativity and the ability of local organisations to come together to turn around the negative trends of poverty and alarming environmental destruction, which include the fact that: 11.7% of the population struggle to survive in housing that is physically adequate; 17.6% do not have potable water; 22% do not have access to sewers; and 39.7% do not have access to urban solid waste removal.

Urban solid waste removal is the responsibility of the municipalities, even though it is currently seriously lacking and inefficient. It is one of the most deeply felt problems of the population, particularly in the poorer communities -- 60% of the population -- because the wealthier are attended to in at least a partial manner.

Lima generates 3,535 tons of solid waste daily, and 2,131 tons are collected. Only 1,100 tons, however, are disposed of properly. That is, each day, 2,433 tons of waste accumulate on the streets, are tossed into the Rimac, Chillón or Lurín Rivers, or are dumped in the 14 informal landfills located in the poor districts. In these areas, the organic waste is "recuperated" and sold to clandestine pig farms, and the inorganic waste products with any resale value are sold through collection centres and eventually destined for recycling factories.

The recycling circuit for solid waste is very complex and structured in pyramid form. At the base of the pyramid are thousands of people who collect the waste products, who supply

hundreds of intermediaries (collection centres), who in turn sell to the recycling factories. The people who gather the inorganic waste products began working in a spontaneous fashion, in the social informal and marginal areas, as an answer to poverty and unemployment. Despite the fact that the recuperation of waste products is a self-employment strategy and generates income for approximately 5,000 people, the working conditions are basically sub-human, characterised by exploitation of the manual labour of the dispossessed, those who are socially marginalised and without any training.

Among the principal causes of the problem of urban waste and the inadequate management of solid waste are the difficulty of municipalities to administer directly these services in an efficient and effective manner, the high costs for investment and operation of conventional systems in relation to the users' ability to pay for the services, and the uninformed attitude of the population in relation to the problem of urban waste.

To these problems can be added the outdated state of Peru's environmental legislation, the fact that municipal authorities have not paid sufficient attention to the problem, the lack of technical and professional support in the municipalities, the lack of adequate urban infrastructure for waste removal, and the climatic conditions of the city itself.

1.2 Institutional context

a) *The public sector.* The majority of municipalities deal with the problem of urban waste removal through processes of administrative decentralisation, i.e., delegating responsibility for waste removal to specialised services such as community service boards, the department of public works or technical services areas. In all of these cases, this means assigning economic resources to renew and maintain machinery and equipment, and contracting for more employees. It also means that the specialised units are kept at the bottom of the municipal hierarchy, completely removed from the decision-making echelon, and under the supervision of personnel with little professional training and no expertise in the field.

Few municipalities confront the problem of decentralising public services through the creation of municipal companies or privatising public sanitation services, with results that have proven more favourable, but which have not meant a definitive solution to the problem.

In addition, the central government has traditionally shown little interest in solving the problem of urban solid waste disposal. Nevertheless, as part of its policy to modernise the State, the current government has handed down laws that favour the participation of private capital in sanitation services, as well as in the construction, conservation and use of public service infrastructure. The government has also modified the criteria for setting the fees for services. For its part, the Ministry of Health, through decentralised agencies such as the General Environmental Health Board (DIGESA) and the National Environmental Protection Institute for Health Care (INAPMAS), has been (1) strengthening of the Peruvian Network for Environmental Control of Residues (REPREMAR) and (2) revising and updating legislation relating to urban waste.

b) *Civil society initiatives.* In the poor districts of Lima, there are a good number of social organisations that have been progressively developing initiatives and abilities in order "to heal" their barrios and make them sustainable. The opinion of these organisation is gaining force in terms of influencing local governments about sanitation programs, particularly in relation to potable water, sewage and urban waste.

In addition, there exist medium-sized, micro and small formal enterprises that specialise in urban waste removal, which are either contracted or simply authorised by district municipalities. For example, in the collection and transport of solid wastes, there exist medium-sized companies in middle- and upper middle-class neighbourhoods such as San Borja and La Molina. In the poor districts, there are micro enterprises formed, in the majority of cases, through a community's initiative to collect solid waste. This demonstrates the interest of the medium-sized companies to invest in areas where the residents have a higher standard of living and the generation of organic and inorganic waste is greater. Given the contribution of the medium-sized companies to solving the problem and the rationalisation with which they work, the authors can affirm that the results of this kind of privatisation have not been very satisfactory.

In addition, the "informals," made up mainly of people who own trucks, collectors using tricycle carts, and street pickers, concentrate mainly on recuperating solid wastes that can be re-sold so that they can make a living. These people act on their own and do not have the authorisation of the local government.

Finally, there are private organisations that offer technical support, such as the Pan-American Sanitary Engineering and Environmental Sciences Centre (CEPIS) and non-governmental organisations such as DESCO, the Environmental Consulting Office (OACA), and the Institute for the Advancement of Social Economy (IPES), all of which actively participate in the formulation and carrying out of programs to improve urban waste disposal in Lima.

1.3 PROESA environmental sanitation micro enterprises

Environmental sanitation micro enterprises are operating in 14 Lima districts with very promising results. They are located in higher income municipalities such as Jesús María and Miraflores, and in the poor districts of Villa El Salvador, Villa María del Triunfo, San Juan de Miraflores, San Juan de Lurigancho, Ate Vitarte (Huaycán), Santa Anita, San Luis, Lurín, and Ventanilla (Mi Perú), among others. These micro enterprises were formed, beginning in 1989, within the framework of the "Promoting Employment, Health Care and the Environment" (PROESA) project of IPES.

In Lima, PROESA supported the organisation of 140 micro enterprises dedicated to offering services for solid waste disposal. Of these, 47.9% are dedicated to collecting and transporting solid wastes, 20.7% to cleaning, sweeping and administering public rest rooms, 10% to maintaining green spaces, and the remaining 21.4% to separating and composting, as well as to maintenance and other related services.

PROESA's strategy is labelled "*Social Privatisation of Public Services*," in that it is a process of decentralising public services with the active participation of the municipality and the community's social organisations in order to transfer environmental management to specialised micro enterprises.

PROESA, together with the micro enterprises, carries out a citizen education program aimed at changing attitudes toward the environment and sanitation, improving waste management, and promoting recycling and a reduction in waste at its origin. These activities are carried out with the micro enterprises and principally benefit grassroots organisations (soup kitchens and Glass of Milk committees) and children and young people in the communities that benefit from the services.

2. Urban Waste Management Based on PROESA Micro Enterprises

2.1 Models for urban waste management

The PROESA micro enterprises in Lima use either of two alternative models, which are described in some detail in the next two sections. Both management models, moreover, are the results of municipalities and social organisations working together to decentralise public services through micro enterprises.

2.2 Alternative 1:

This alternative facilitates the organisation of collection services, transportation, dumping of solid wastes, street sweeping, maintenance of trash containers and maintenance of green areas. The municipality is the normative agent that contracts, supervises and pays the micro enterprises through the charges it passes along to the community that benefits from the service. The community participates in the supervision of the services and finances the cost of environmental services. This is the case in the districts of Miraflores, Villa María del Triunfo and Ventanilla.

In order for the model to function successfully, it requires an institutional framework that promotes the decentralisation of public services, an efficient system of collecting fees, and that the municipalities use the taxes exclusively to finance the cost of urban waste removal.

2.3 Alternative 2

This model allows for the organisation of the collection and transportation of solid wastes, administration of public rest room facilities and water supply. In this case, the community directly contracts and pays for the services of the micro enterprises. The municipality takes part as the normative agency and supervises the micro enterprises. This alternative operates in the districts of San Juan de Lurigancho and the Self-Managed Urban Community of Huaycán (Ate-Vitarte).

This alternative requires an institutional framework that promotes private investment in the field of environmental sanitation and allows for the transfer of the management of public services to social organisations in the community. The social organisations in the community need to function in a dynamic manner, and there needs to be an efficient way of collecting fees for the services.

2.4 How are PROESA micro enterprises organised?

The PROESA micro enterprises are formed through the initiative of a community's social organisations and the municipality, with the support of a specialised technical organisation (OPD). Those involved sign a Co-operation Agreement in which they detail the commitment and responsibilities of each partner. Following are the steps involved:

- a) *Selecting candidates for the micro enterprise.* The social organisations select the candidates who will be member-workers in the future micro enterprise from among unemployed young people, men and women who demonstrate a high level of commitment to the community's development. The requirements include being healthy and physically capable, and preferably knowing how to read and write.

- b) *Training candidates.* The OPD organises a course to train the candidates in the environmental development of the community, how to set up and run an urban waste removal micro enterprise and on issues related to the technical-operational aspects of waste removal services.

- c) *Selecting the members of the micro enterprise.* The OPD applies a psychological and skills test to the candidates to evaluate their level of social skills and the disposition of the person to work on a team. The tests determine the level of knowledge gained from the training course.

- d) *Setting up the micro enterprise.* The OPD supports the formal constitution of the micro enterprise within the existing legal framework. The formation of a limited-liability company is recommended in order to facilitate a more democratic management of the micro enterprise.

- e) *Equipping the micro enterprise.* The OPD grants a loan directly to the micro enterprise or supports the micro enterprise in the process of applying for a loan from a financial institution in order to finance the purchase of equipment, uniforms, materials and, in some cases, to cover the capital needs in the first few months of operation.

- f) *Signing contracts for the micro enterprise.* After the micro enterprise is formally registered and equipment acquired, the municipality or social organisation signs a contract for services from the micro enterprise, through which the services to be offered, the cost of the services, the form of payment, the penalties for not complying with the services offered (penalty for the micro enterprise) and for late payment (penalty for default) are set.

- g) *Getting started and supervision of the micro enterprise.* Before beginning work, the micro enterprise uses flyers to alert the population that it will soon begin operations, what the characteristics of the work will be, the operating hours and to ask the population for support. The social organisation and municipality are responsible for supervising the services of the micro enterprise. The supervision is carried out by environmental inspectors and/or with the support of the community leaders.

h) *Supporting socio-business management for the micro enterprise.* In order to improve the service and management of a micro enterprise, the OPD offers assistance for six months, particularly for technical support in the field and training on issues such as micro enterprise management, organisation of technical and operational aspects, financial management of micro enterprises and commercialisation of services.

The OPD also offers legal assistance, and, in order to strengthen business operations, it sponsors the following workshops: (1) conflict resolution in micro enterprises; (2) self-esteem and assertiveness; (3) human relations within a micro enterprise; (4) gender and the micro enterprise, including sexual roles within the group; and (5) promotion of a business culture. The OPD also offers permanent support to the members of micro enterprises.

3. Results of the Research

3.1 Basic considerations for managing urban waste

Solving the problem of urban waste in Lima means solving the problems of urban development and governance in the city. This is especially complicated in a city like Lima which has 43 districts. This organisation hinders urban unity and acting in a unified manner on aspects of urban environmental management within the framework of a strategy that promotes a sustainable city.

The problem of urban waste is structural and affects most Lima's poorer districts. A definitive solution requires long-term integrated measures. But any initiative to be undertaken to solve the problem requires clear political will on the part of the central and local governments, committing all social and political forces to consensus. In addition, the clean-up of Lima demands a recognition of its urban diversity and, as such, the need to organise urban waste removal systems that combine conventional and appropriate technologies. The population using the services should cover the cost of waste removal and fees should be set according to cost effectiveness and, above all, a system for collecting fees should be designed that guarantees that the population pays on time for the services. Moreover, cleaning the city requires increased efficiency in the management of waste removal through the decentralisation of waste removal services and the participation of social organisations, but without freeing the municipalities of the responsibility of regulating, controlling and overseeing these services. Finally, it will only be possible to solve the environmental problems of Lima by raising the awareness of citizens and obtaining their active and permanent involvement in the city's environmental management.

3.2 PROESA micro enterprises

There are a number of different functions that are attended to by PROESA micro enterprises, and these different functional types are discussed in the following paragraphs.

a) *Micro enterprises that collect solid waste.* These micro enterprises offer services to collect and transport domestic and commercial waste in a given community. The workers operate in pairs and work six to eight micro routes daily, collecting waste "house to house" using 100-kilo "sacks" and a tricycle with a one cubic meter holding capacity. Once the tricycles are full, the waste is taken to a collection centre where, with the help of a truck or a tractor-driven cart, the garbage is then transported to a landfill for its final disposal. Forty-four percent of the vehicles used by the micro enterprises to transport the waste to the landfill belong to the micro enterprises; the remaining collection vehicles belong to the municipality. These micro enterprises function in Lima's poor districts, with an average of 11 to 14 workers and the capacity to move six to nine tons of waste daily.

The investment cost in these micro enterprises is US\$ 18,786. The average monthly operating cost varies between \$10 and \$15 per ton of waste collected and transported to its final destination. Considering that the micro enterprise operates 26 days each month, the monthly cost is no greater than \$3,510. This amount is less than the cost incurred by municipalities and private companies, which is more than \$26. per ton of waste.

b) *Street sweeping micro enterprises.* These micro enterprises manually sweep streets and collect waste found on the streets and avenues and in plazas. The waste is collected using a broom and shovel and is placed in 100 litre bags that are transported in a hand-pushed cart. Once the bag is full, it is collected by a tricycle and transported to the closest collection centre or container. These micro enterprises operate in poor districts and residential areas with 11 employees, 10 of whom sweep the streets and 1 who collects the waste with the tricycle. In one day, they can cover between 20 and 22 linear km of streets and avenues.

The investment cost in these micro enterprises is \$4,200, and the average monthly operating cost is \$5 per kilometre of road. Considering that the micro enterprises operate 26 days a month, the monthly cost is estimated to be \$2,860 (the cost incurred by municipalities and private companies is more than \$8 per km of road).

c) *Green area micro enterprises.* These micro enterprises offer maintenance services for parks, gardens, berms, planters and other public green areas. The work includes two phases. The first is preparing the soil, clearing away garbage, rocks and underbrush, and fertilising; while the second phase includes planting ornamental trees, fruit trees, flowers and grass, permanent watering, fumigation, pruning, periodic touch-ups, replanting and soil enrichment. These micro enterprises operate with 14 employees and have the ability to tend to between five and nine hectares, depending on the physical condition of each area.

The investment cost in these micro enterprises is \$7,500. The average monthly operating cost is \$800 per hectare, and the monthly cost of daily attention to seven hectares is \$5,600 (the costs incurred by municipalities and private companies is more than \$1,000 per hectare per month).

d) *Other PROESA micro enterprises.* The micro enterprises that maintain trash cans offer services such as collecting the garbage deposited in the cans and cleaning, washing and disinfecting the cans. The employees cover micro routes in pairs with the help of a tricycle and are able to clean a minimum of 30 cans per worker. They collect the garbage in 100 litre bags, clean, wash and disinfect the cans, and transport the waste to the nearest container or collection centre. Each micro enterprise has six workers, the investment cost is \$1,900 and the average monthly operating cost is \$1,623.

The micro enterprises that maintain public rest rooms set up public modules and administer them for the benefit of the community, setting them up in areas with heavy pedestrian traffic. Each module has two stalls, one for women and one for men that face each other and are separated by a hall where the person who charges for the service is located. These micro enterprises operate with four employees on rotating shifts. Each module has the capacity to tend to between 250 and 300 people per day. The investment cost is \$3,700 and the charge for using the service is \$0.09.

The four functional types of micro enterprises described above also face problems. The lack of an institutional framework that guarantees stability is the one of the principal problems of the micro enterprises, which depend in many ways on the political decisions of municipal authorities. One example is from the city of Puno, where municipal authorities decided to decentralise public sanitation services through micro enterprises but did not carry out the corresponding reorganisation of the public works department. As was expected, the municipal employees pressured municipal authorities to "close" the micro enterprises. After nine months and without receiving payment from the municipality for services, the micro enterprises were forced to cease operations.

In addition, some municipal authorities, once they contract the micro enterprises, disengage from the problem and do not offer adequate supervision or control, but expect the micro enterprises to solve the problem of public sanitation. In some cases, there has been no coordination between authorities and the micro enterprises, and the agreements are usually not respected (for example, they do not comply with the requirement of transporting the waste from the collection centres to the landfill).

In economic terms, the central problem is the permanent lag on the part of the municipalities in paying for the services offered by the micro enterprises given that the income generated from public sanitation is not designated exclusively to this end. This problem is aggravated by the municipalities' decision to change the fee collection structure that has generated ill feelings on the part of the employees and boards of the micro enterprises. In comparative terms, the problem is not as great in areas where the population pays directly for the services offered by micro enterprises. For their part, the micro enterprises have low return rates, and the point of equilibrium is low (low costs are equal to their income), limiting their possibilities for economic growth in the market. In addition, their earnings are almost always allocated to increasing the salaries of member-employees. Nevertheless, the 14 micro enterprises given close treatment in this study have complied with the requirement of paying back their loans, and four of them have paid back more than 50%. In addition, two collection micro enterprises, "Servicios La Unión" and "Amigos Unidos," which operate in Villa María del Triunfo, have generated a significant level of income. Both of these micro enterprises have purchased trucks valued at \$5,000 apiece.

3.3 Employees of the micro enterprises

Of the member-workers in the micro enterprises, 67.9% are women, and the percentage of all workers who are members rather than contract workers is 54.6% women and 45.4% men. Of the total number of workers, 59.4% are migrants from the highland provinces, and 87.4% live in urban marginal areas. The average age of women is 31 years, while it is 39 years for men; and 43.2% are heads of families, of which 56.8% are women. The average number of children per family is four; 89.0% live in their own home, which is constructed from solid materials. Of the employees, 94.1% have both domestic and street lighting, 63.9% percent have access to water, principally from water trucks, and 64.7% use latrines. After belonging to the micro enterprise, 40.5% have made improvements to their homes and 17.4% say they are thinking about making improvements.

Of the employees, 4.4% are illiterate, 31.0% have a grade school education, 56.5% have a high school education and 8.2% have some level of technical or higher education. Of the workers, 20.7% use part of their income to continue studying (particularly the young people) and 46.6% support the education of their relatives (especially children and siblings).

Before joining a micro enterprise, 37.1% of the employees had previous work experience as day labourers in the public sector, 6.9% in the private sector, and 40.5% as independent workers. Only 15.5% of employees lacked any work experience. The skills acquired before joining a micro enterprise were learned in the service and commercial sectors. The principal reasons for joining the micro enterprise were the salary (59.5%) and possibility of having something that belonged to them (28.5%). Before being incorporated into the micro enterprise, 83.7% of the workers received monthly incomes of less than 250 new soles. Today, 75% have incomes greater than 250 new soles. The average monthly income is 296.3 new soles (124% higher than the minimum wage established by law).

Of the workers, 43.6% had health problems during 1994. They said that these problems (31.8% affecting the kidneys and 30.2% the respiratory tract) were caused by permanent contact with garbage and dust. Only 9.5% of the illnesses were serious. Of the illnesses, 38.8% were treated by the Social Security Institute. The remaining cases were treated in health clinics, medical centres, hospitals or by self-remedies.

With regard to the work itself, the machines and tools the workers use are considered by them to be easy to operate. However, they say there are problems with the locations of the "collection centres" and, in some cases, too low a frequency of service. Nearly all of the micro enterprise employees (98.3%) consider the quality of their work to be good, because they are giving the best of themselves, and they have the recognition of the population. When asked about what they expected from their micro enterprises, they said that they hoped to continue working because they are assured earning a salary (50.9%) and that they are contributing to solving the problems of urban waste, protecting the environment or reducing health risks to the community (49.1%).

3.4 Participation of citizens and local leaders

The relationship between municipal governments and social organisations has facilitated a change in attitude among local leaders and the population in relation to environmental problems. All of the local leaders and 64.7% of the beneficiary population agreed that they think it is positive and important that the micro enterprises operate in their communities, because they contribute to the generation of employment in the community (32.6%), contribute to the protection of the environment (31.8%), improve waste removal and beautification (25.7%) and because private services are more efficient than public services (18.7%).

With respect to the quality of services offered by the micro enterprises, 92.5% of the population considers them to be regular or good, and only 7.1% to be poor. Compared to municipal services, 55.2% said the work of micro enterprises was better, 37.1% said it was the same, and 7.5% said it was worse. Along the same lines, 75.7% said the frequency of service was acceptable, and 24.3% said it was insufficient.

Of the population, 73.2% said the fees were acceptable or cheap and 26.5% said they were expensive. The treatment from the micro enterprise employees was considered good by 64.3% of the population, 30.3% said it was indifferent and 5.4% said the employees were rude. Of the population, 63.4% percent said the technology used by the micro enterprises was adequate and 30.2% said that it was not adequate.

For their part, local leaders demanded a greater participation in the management of the micro enterprises. They also said it was important to use non-conventional systems in the initial phase and demanded a progressive use of technology by the micro enterprises. They asked that operational abilities be improved, and they wanted increased specialisation in the management of waste, as well as want improved collection centres and better vehicles for transporting solid waste. In addition, they said that the future of micro enterprises will depend upon improving and modernising technology, the permanent improvement of operational systems, good relations with grassroots groups and good financial management.

The direct relationship between the micro enterprises and the beneficiaries has allowed them to continue operating in areas where the municipality has had problems paying the micro enterprise on time, but which has been able to survive by using the resources the population itself could pay. This is what happened in Villa María del Triunfo, where the municipality recognised its limitations for offering services and its lack of funds to pay the micro enterprises for eight months. The municipality decided to give the concession directly to the micro enterprise, authorising it to negotiate with the population (in the barrios of José Gálvez, Tablada Antigua and Tablada Nueva) fees that guaranteed continued waste removal services in these zones.

3.5 Education for the population

Recognition of the micro enterprises as units economically independent of the municipality that contribute to the reduction of sources of infection in order to improve the health of the community was achieved through educational workshops, clean-up campaigns organised with the population and the recuperation of solid waste with schools in the urban-marginal zones. Through solid waste campaigns such as "Paper Week," "Plastic Week," and "Glass Week," students learned how to separate and differentiate between organic and inorganic waste. The waste collected was sold and the money earned given the school boards.

To this end, 134 Environment Health Workshops and seven clean-up campaigns were carried out with 55 grassroots groups (soup kitchens, Glass of Milk committees, mothers' clubs). In addition, 79 environmental health workshops and eight waste recuperation campaigns were held in eight schools, with the participation of 8,000 students, 400 teachers and 2,000 parents.

4. PROESA women

4.1 Gender focus of the project

The PROESA experience has been developed principally in urban marginal zones (82.4%), where the economic crisis has affected the population with greatest intensity and where women are at a disadvantage in relation to men in different aspects of social and political life, mainly in relation to access to employment and economic resources. This situation helped to determine that the project would place emphasis on poor and unemployed women in the areas of intervention. Time has shown that while women remain working in the micro enterprises, men consider this to be only a temporary job and leave the micro enterprises as soon as they find another job or a different profession that has a higher social status than collecting garbage. For women, work in the micro enterprises is their only source of income, and they take on the work with more responsibility and continuity.

The property and management of the micro enterprises are in the hands mainly of women, 67.9% of whom are member-workers, and 47.8% of whom are leaders (managers) and make the same wages as men in all of the micro enterprises. In addition, they feel as capable as their male counterparts in doing their daily jobs.

The female managers of PROESA have taken on greater responsibility and commitment to leading and organising the environmental sanitation micro enterprises and have shown an adequate level of management skills despite having no previous experience and even literacy limitations. For example, the female manager of the "Servicios La Union de Tablada de Lurín" micro enterprise has managed to expand services to the districts of Villa María del Triunfo and Pachacámac. The women business managers have gained space and recognition among local leaders and the beneficiary population because of the ties they establish with them and the importance they given to keeping their neighbourhoods clean and reducing the number of sources of infection as a way of preserving the health of the families in their community.

4.2 Development of female business leaders

Of the women who participate in micro enterprises, 59.4% come from poor families that have migrated from the highlands. Poverty has determined the manner in which they relate to their environment. From childhood they have contributed to the management of the household economy. The majority were not able to finish grade school, secondary school and much less go on to higher learning, which limited their intellectual development and placed them at a disadvantage compared to other women and men of their same socio-economic level. With the passage of time, their responsibilities increased given the economic pressure on the family. They got engaged, married or moved in with their partner and, in many cases, took on the household responsibility alone (56.8% are heads of families). Many entered the work force in jobs that did not demand high levels of training or knowledge and which were generally an extension of their domestic chores.

The desire to get ahead and the economic demands of their families led them to take on the challenge with other men and women of forming environmental sanitation micro enterprises to confront the need to acquire new forms of knowledge and skills for work. The membership in the micro enterprises has produced changes in their family relationships (reactions of their children and partners whether it is for the hours they are away from the home, the physical activity they engage in or the new way in which they see their personal and social reality), and their incomes are seen as an important sources of resources in their homes.

4.3 Gender roles and identities of PROESA women

Many of the women have participated in the organisation and management of their communities. By forming part of the micro enterprises and taking on independent and paid work, they have changed their traditional roles and have developed a gender identity that allows them to change their position in society, thereby breaking a series of stereotypes. For them, for example, it is not true "that men are stronger than women." It is common to find them doing the same tasks as their male counterparts, such as changing tires, adjusting bolts, carrying bags full of garbage, fixing mechanical problems with transportation, carrying waste to its final destination and even spending the night in a landfill because of a flat tire. They consider themselves to be stronger emotionally and more dedicated to confronting the problems and challenges in the home.

The majority of the women say they have taken on new roles at home. They divide their domestic chores with their children and, in some cases, with their partners, in this way beginning a process of developing more democratic practices within the home. In many cases this has left them open to domestic violence (psychological and physical) and has led to temporary separations and even the divorce of some couples. The women are in the process of changing attitudes and answers, and have discovered that they are capable to getting ahead through their own efforts and achieving a new level of personal development, which is as important as the economic resources they bring home.

Their participation in different areas of local public life has also allowed them to experiment with other kinds of relationship in the outside world and develop a new vision of themselves. For example, they are no longer afraid to fill out the paper work necessary to demand payment for services from municipal authorities and participate in running the PROESA Association of Micro Enterprises, where their demands are channelled and the organisation strengthened.

4.4 Perception of and commitment to the environment problem

The women recognise the value and importance of the work they do and for this have developed a special sense in relation to the problem of urban waste and the environment, particularly in their own communities. They identify with their work, because they can translate their work of cleaning the home to the public sphere. By sweeping the streets and collecting solid waste, they are carrying out educational tasks and showing the commitment of the community. While it is important for them to earn a living from the work they do, it is also important to them to help in solving the environmental problems in their neighbourhoods. In this way, they demonstrate a more integrated vision of the problem. They are more willing to organise and participate in clean-up campaigns, as well as in hygiene and other sanitation activities, because they are aware of the environmental problem.

5. ANALYSIS OF THE RESULTS OF THE RESEARCH

5.1 Social Privatisation of Public Sanitation Services

The struggle for development, understood as the process of substantive improvement of the quality of life of people, will be successful and sustainable if it is incorporated into the lives of the beneficiary population. As such, it will only be possible to reverse the negative tendencies of poverty and environmental deterioration in the cities through programs and strategies that are based on bringing people together and strengthening the institutional abilities of public and private local organisations. In this sense, the *Social Privatisation of Public Services* as a method of decentralisation is an alternative solution to the serious problem of urban waste removal in our cities.

The social privatisation of public services facilitates the participation of community organisations in an effective system of environmental management, allowing them to improve by transferring the corresponding services to micro enterprises that specialise in collection, transport and disposal of solid wastes, separation and recycling, as well as the maintenance of green areas, public rest rooms and others areas. It also promotes the participation of private investment in the solution of environmental problems in the community and contributes to a transparent management of these issues at the local government level. Finally, social privatisation allows unemployment to be addressed, improves the role of women in the community and promotes a solid, democratic and efficient micro enterprise sector.

5.2 Contribution of micro enterprises to solving the problem

Micro enterprises represent a valid strategy for managing urban waste disposal in Peru's cities, because they are a definitive solution where conventional systems cannot function or function with difficulties (Villa María del Triunfo and Ate-Vitarte), and they are an efficient complement to conventional systems because of their flexible technology, operational capacity and their advantages for reducing costs (Miraflores, San Juan de Lurigancho and Ventanilla).

Environmental sanitation micro enterprises tend to the demands of the basic environmental services of the population. Of the micro enterprises studied in this research, 43.5% collect and transport solid waste, 39.1% clean, sweep, maintain trash cans and run public rest rooms, 13.0% maintain green areas and 4.4% percent supply water.

Micro enterprises mean low investment costs and, above all, carry out environmental services by using simple technologies and labour intensive work. Thus, micro enterprises generate employment in the communities where they operate. The micro enterprises in this research have created 273 jobs (among member-workers and contract workers), of which 45.4% are filled by men and 54.6% by women. The micro enterprises have improved the living conditions of young men and women in Lima's urban marginal zones who now have steady jobs and income, which allows them to improve the conditions of their homes, offer their children education or finish their own technical and superior education.

The micro enterprises contribute to the personal development of women, giving them more autonomy, confidence in themselves, opportunities to develop leadership skills, a space to develop their business skills and strengthen their solidarity to their community. It is important to note that the property of the micro enterprises is concentrated mainly in the hands of women (67.9%).

The urban waste removal micro enterprises offer a possibility for a solid, democratic and efficient business sector given their origins, the work they do, and their administrative structure. Moreover, property is owned by all members, leadership positions rotate and there is no division of labour.

5.3 Citizen participation and joint action

The environmental sanitation micro enterprises that operate in Lima's poor districts are the result of the relationship between the municipality and local organisations. The organisations, particularly their leaders, participated in the formation of the micro enterprises, authorising their operation, co-ordinating the fees with the managers of the micro enterprises and, finally, supervising the quality of service. In addition, the municipalities, through prior agreement with the social organisations, formally contract the micro enterprises or authorise their operation in the selected communities, and also take on the role of overseeing the micro enterprises and controlling fees.

In the districts with higher income levels, such as Miraflores, the population participates in supervising the services through the Office of Community Services, which are in charge of receiving and channelling citizen complaints.

5.4 Education and changing attitudes in the population

In the poor districts where they operate, the micro enterprises have raised the awareness of the population with regard to the environmental problem. The member-employees of the micro enterprises, within the framework of the PROESA project and with the objective of building co-operation with their neighbours in community waste disposal, have carried out educational activities with grassroots organisations and schools in their areas (Villa María del Triunfo, Huaycán and Ventanilla), where they have started to change the attitudes of the community in this regard.

5.5 Principal problems of the micro enterprises

The micro enterprises are based on laws that promote private investment in the environmental sanitation field. Nevertheless, the lack of a metropolitan environmental agency and regulations to guarantee greater stability are evident. Such an environmental authority would be in charge of planning, regulating, controlling and resolving conflicts between municipalities, social organisations and the micro enterprises that offer services, would regulate the laws promoting private investment and would define the necessary rules for free competition of the micro enterprises in the urban waste removal market. On the other hand, the perspectives for an authority in the future are favourable in that a majority of local leaders and politicians are convinced of the advantages of decentralising urban solid waste removal. As an example, there is the mayor of Lima, who has proposed as part of his urban waste removal strategy the creation of 40 specialised micro enterprises.

In relation to economic problems, the authors want to highlight the need to overcome the difficult micro enterprise-municipality relationship, particularly the delays in payment to the micro enterprises, which could be done through the organisation of an effective system of fee collection and improving the municipalities' management of income, using the money collected for trash removal only for that purpose. The problem is not as evident where the population pays directly to the micro enterprise.

In the same way, it is important for the micro enterprises to develop initiatives that allow them to increase their income in order to improve their profits and build up their financial bases. For this, it would be useful to promote the option of the micro enterprises carrying out related activities tied to the solid waste collection, such as recycling solid waste. This is a strategy that would permit them to diversify their services, increase their earnings and guarantee their sustainability.

In relation to the problems of occupational health given the number of workers with kidney and respiratory illnesses, it is necessary to develop an occupational health program for the micro enterprises, increasing the use of protective equipment, improving working conditions and organising low-cost health coverage for micro enterprise employees.

In spite of the existing problems, the micro enterprises continue to carry out sanitation services in an alliance with the population, demonstrating that they can sustain themselves and grow at the metropolitan level into an important sector of service to the population.

6. CONCLUSIONS

6.1 Sustainability of micro enterprises

The evaluation of the micro enterprises in this research has allowed basic criteria to guarantee their sustainability and the necessary conditions for their replication. The criteria considered are technical, economic, social and environmental. Thus, the micro enterprises are *technologically* viable because they use technology adapted to their needs and the possibilities of the population. In addition, they are flexible and can be complemented with other technologies. They are also *economically* viable because of their low cost and because they can stay afloat with the population paying the cost of the services. They are *socially* sustainable as a result of the agreement between the local government and social organisations to meet the explicit needs of the population, and they use a model of urban waste management that is easy to replicate. Finally, they are *environmentally* sustainable because they contribute directly to the conservation of the environment in that they carry out services that are clearly in favour of protecting the environment.

Nevertheless, the micro enterprises must overcome their problems within the institutional framework of urban waste removal. The norms governing the decentralisation of the public services must guarantee a greater stability for the micro enterprises. Municipal authorities need to change their attitudes in relation to their responsibility for local development and the role they play in carrying out a system of urban waste removal management based on the work of specialised micro enterprises. If the current situation continues, the sustainability of the micro enterprises will depend on their ability to unite directly with the beneficiary population so that, as a consequence, they can operate with the resources obtained through consumer fees. The community needs an effective fee collection service. For example, payment for waste removal can be collected together with payments for water and electricity.

On a different level, the sustainability of the micro enterprises will depend on their ability to become a negotiating force. In this respect, they have taken the initiative by forming the National Association of Environmental Sanitation Micro Enterprises, in February 1996.

6.2 Possibilities for repeating the experience

With respect to the replication of the micro enterprise experience *in Peru*, the following can be stated:

- The micro enterprises that collect, transport and dispose of solid waste can be technically reproduced in areas where the population is no greater than 220 inhabitants per square block. The micro enterprises involved in separation and recycling, street cleaning, maintenance of green areas, maintenance of trash cans and maintenance of public rest rooms, can be technically reproduced in areas with a higher population density.

- In economic terms, the micro enterprises can be reproduced in areas where, first, medium- and large capital interests are not willing to invest in public sanitation and, second, where the population has the ability to pay for the services, even if this ability is limited, and it is willing to cover the costs of public sanitation.
- The micro enterprises can be reproduced socially if the population and its social organisations are aware of the role of public sanitation and are willing to participate, if the municipality is willing to decentralise public sanitation services through micro enterprises and assume the risks that this may involve, and important experiences with micro enterprise intervention have already occurred in the area.
- Environmentally, the micro enterprises are viable in areas where the need for urban waste removal is not met (even partially) or the need is attended to in a very weak manner.

Based on the experiences in Lima reported on here, it is recommended that a management model for urban solid waste removal be based on the decentralisation of public services; that a District Environmental Authority made up of municipal representatives and the leaders of social organisations that would be responsible for planning and managing environmental protection services be created; and that urban waste services, including street sweeping; collection, transportation and disposal of waste; separation and recycling of waste; maintenance of green areas; and administration of public rest rooms, be implemented. In addition, the Environmental Authority should co-ordinate an administrative team made up of a manager, sanitary engineer, an accountant, and a team of environmental supervisors. Finally, the Environmental Authority would be in charge of contracting the services of specialised companies and would be in charge of collecting the fees for public sanitation.

Only in this way, by involving the public, and by strengthening the ability of their public and private organisations, can the cycle of poverty be reversed and sustainable cities be built.

7. Annex: Methodology Used in The Research

7.1 Methodological Aspects

The research involved the principal participants in PORES: municipal authorities, leaders in the major community social organisations, the beneficiary population and the micro enterprise employees. The districts and zones were chosen given the models of urban waste removal management, the urban characteristics of the communities where the micro enterprises operate and the number in the community, and the team that collected the information was formed by members of the "PROESA Socio-Business Support for Micro Enterprises" project that maintained a direct relationship with the members and employees of the grassroots micro enterprises in the zones.

The research was carried out in the following phases:

- a) Information gathering,
- b) Information processing,
- c) Preparation of report on results and
- d) Preparation of final report.

7.2 Instruments Used to Gather Information

- a) Surveys of the beneficiary population to gather its opinion on the work of the micro enterprises, the quality of the service, the reduction in sources of infection, relationship to the micro enterprise, technology used, level of participation, and employment generation.
- b) Open interviews with municipal authorities and the leaders of the community organisations involved in the experience to gather their opinions on the work of the micro enterprises, the technology used, quality and cost of services, relation with workers and their organisations, and the future of micro enterprises.
- c) Technical cards on the micro enterprises as a way of gathering information to understand their market, services, socio-economic situation, organisation of management, the working situation of employees, and income indicators.
- d) Surveys of employees to understand improvements in their quality of life, opinions about their work, the technology used and the problems with the population.

- e) The conclusions and testimony of the female leaders of PROESA from the gender workshop, "Women, Micro Enterprise and the Environment," held to identify the kinds of human relations of the women in the home, work place and with members of the community.
- f) Conclusions from the workshop, "Decentralisation of Public Services through PROESA Micro Enterprises," which was held with the objective of evaluating the impact of PROESA's micro enterprises and identifying the conditions for sustainability and replication.
- g) Reports and technical expertise on the implementation of urban waste removal systems with non-conventional systems prepared during the PROESA project.

7.3 Methodological Process

- a) Elaboration of work instruments. Surveys were designed and formulated for the population and the employees of the micro enterprises, as were the question guidelines for the interviewers with local leaders and municipal authorities, and technical cards to obtain socio-economic information from the micro enterprises.
- b) Population surveys. The size of the population sample (number of surveys to be applied) was determined using the following statistical formula:

$$N = \frac{N_p}{(N_p - 1)k^2 + 1}$$

in which:

- N_p = Estimated total population (The total number of families serviced by the micro enterprises is 87,717)
- k = Acceptable rate of error in estimating the total sample (assuming that the rate of error is 5% and the acceptable level is 95%). The homes surveyed were chosen at random.

- c) Completing the technical cards on the PROESA micro enterprises involved in this research was done through direct meetings with the boards of each micro enterprise.
- d) Surveys of the micro enterprise employees. Surveys were conducted with 85% of the employees in the micro enterprises included in this research. Surveys were conducted with 221 people, of whom 98 were men and 123 were women. The surveys were carried out in meetings convened by the micro enterprises with the board members present.

e) Interviews with local leaders and municipal authorities. Local leaders were interviewed from the selected areas and included a debate organised by the official daily newspaper "El Peruano," May 12, 1995, that included the participation of Walter Paredes (operations manager of ESMMLL) Alberto Andrade (who was then the mayor of Miraflores), Jorge Villena (director of DIGESA), Patricia Iturregui (Peruvian Society for Environmental Law) and the researchers from PROESA.

f) Revision of institutional information referring to the research project: original PROESA project, weekly evaluation reports, final project report and technical expertise from the micro enterprises involved in the research. These documents served as a point of reference for analysis of the theoretical base of PROESA, environmental impact appraisal, and the socio-economic results achieved by the micro enterprises. In addition, IPES' diverse technical reports and publications related to environmental improvement in the city of Lima were reviewed.

g) Workshop: "Women, Micro Enterprises and the Environment." The workshop made it possible to understand better the personal processes of PROESA's businesswomen in order to identify the changes in their roles in the home, the identities they developed in their work and the commitment to the environment in their community through their participation in the micro enterprises. Eighteen female leaders from the micro enterprises involved in the research participated in the workshop.

h) Workshop: "Decentralisation of Public Services through PROESA Micro Enterprises," in which the environmental management system based on micro enterprises was evaluated. This included assessing: (1) the impact and contribution of micro enterprises in solving environmental sanitation problems, particularly in Lima's urban marginalised areas; (2) the identification of conditions for the sustainability and replication of micro enterprises. Thirty-two people participated, including three municipal authorities; four employees of two municipal public sanitation companies; four local leaders; four employees of government agencies involved in issues of health and the environment; three candidates for mayor in Lima districts; eight specialists on urban environmental management; one representative of the environmental police; one representative of the Peruvian Society for Environmental Law; two representatives of the PROESA Association of Sanitation Micro Enterprises; and two members of the press.

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