

*Capacity Building for the Urban Environment:
A Comparative Research, Training and Experience Exchange*

Project Paper No. 14

**Institutional and Development Framework for
Urban Environmental Management in Bolivia**

by

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***Capacity Building for the Urban Environment:
A Comparative Research, Training and Experience Exchange***

A project implemented by the

**Institute for Housing and Urban Development Studies (IHS),
Rotterdam**

In co-operation with the

**Instituto de Desarrollo Urbano (CIUDAD), Lima
Institut Africain de Gestion Urbaine (IAGU), Dakar
Instituto para la Democracia Local (IPADEL), Lima
Human Settlements Management Institute (HSMI), New Delhi
Centro de Servicios para el Desarrollo Urbano (PROA), La Paz**

Sponsored by

**Directorate General for International Co-operation (DGIS),
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**Swiss Development Co-operation, Federal Department of Foreign
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Introduction to the 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. HSML, 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 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: Experiencias exitosas y propuestas para la acción*, 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 chosen for this series. Finally, the first reference in the above list covers aspects of the research undertaken in all four countries of the project.

As a result, 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

**Institutional and Development Framework for Urban
Environmental Management in Bolivia**

by

**Gastón Mejía
PROA**

OVERVIEW

This document is the result of consensus reached in the formulation of strategic guidelines for the development of institutional capacities to respond to environmental issues (DICREI) in Bolivia. It was produced within the framework of the project "Capacity Building for Urban Environmental Management", implemented under the auspices of the Ministry for International Co-operation of the Netherlands in Peru and Bolivia. The implementing agencies for the project were the Centre for the Provision of Integrated Services in Urban Development (PROA) in Bolivia, and the Institute for Local Development (IPADEL) in Peru, with the technical assistance of the Institute for Housing and Urban Development Studies (IHS) of Rotterdam. The project formed part of the Dutch contribution to the HABITAT II. Conference held in Istanbul in June 1996.

This paper presents relevant information produced during a series of seminars and discussion groups that PROA organised with the active participation of municipal mayors, executive officers and community leaders, and with expert counselling from the public, non-governmental and private sectors. This series of events, which took place between late 1994 and February 1996, was especially designed to facilitate the discussion of urban environmental management issues, as well as to share the information collected in this regard.

This document forms part of the output of the project, which includes two research studies on urban environmental conditions in Bolivia; the systematic review and analysis of documents that spell out official environmental strategies in Bolivia; the preparation of a compendium of institutional experiences (success stories), and the listing of sectoral specialists and bibliography related to Urban Environmental Management; as well as two research studies in support of the Bi-National Forum, which was held in Lima, Peru, March 25-27 1996 to formulate the Action Plan 1996-2000.

Consequently, this paper is the result of collective reflections and discussions. Its formulation has been possible thanks to Ing. Marcelo Ballon, PROA's Project Co-ordinator; Lic. Carolina Stem, PROA's Associated Researcher; various participants in project activities who represent diverse public and private institutions in Bolivia and the technical assistance of Lic. Humberto Delgado, a well known Bolivian specialist in municipal development, who drafted this report.

MSc. Eng. Gaston Mejia
PROA's Executive Director
National Co-ordinator
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Introduction

To contribute to the formulation of a strategy for the development of an institutional capacity to respond to urban environmental issues in Bolivia is a major and highly complex task. This is especially so considering the low income levels in the country that generate very low revenues for covering a wide range of priority actions necessary to satisfy basic needs. Such a shortage of revenues works against the assignment of resources to the environment, cancelling out the apparent advantages of a low population density and a small number of highly populated cities.

The current efforts must, therefore, be analysed within this perspective. In addition, the propositions expressed here should be taken “with a grain of salt”, that is, within the framework of recently initiated policy reforms. Furthermore, most of the participants in the preliminary seminars have repeatedly alerted this author that their suggestions and the lessons learned during past years are only preliminary in nature; that their initial experiences are part of ground-breaking efforts that will hopefully contribute to the promulgation of an Environmental Protection Act, consistent with the policy reform processes that are affecting Bolivia.

Aiming in this document to make an effective contribution to the development of Institutional Capacity in Municipal Environmental Management in Bolivia through the generalisation of its main recommendations, the contributors have willingly excluded most theoretical discussion, and concentrated on useful and practical considerations. However, in the process of formulating strategic guidelines, some unavoidable conceptual references have been made.

The contents of this paper have been structured around the information needs expressed by the participants in the above mentioned seminars, as well as with regard to the information requirements made in the drafting of reference and support documents. The outline of the paper also responds to the characteristics of the different case studies, selected and discussed as part of the project, especially those that were selected for in depth discussion. The latter set of case studies constitutes a practical reference to that which is possible or doable under current conditions.

There are two main thrusts in this document. The first is the consideration that devising a strategy, starting from the analysis of the current situation, requires the preparation of reasonable prospective scenarios in the medium and long range to guarantee some degree of sustainable development. The second consideration is that the strategy should be aimed at results progressively reachable; in other words, a strategy should attain progressively more complex targets, based initially on the time frames, methodologies and technologies available, as well as developed in response to the human and financial resources within the country's control.

Establishing an urban environmental management system is well beyond the purpose and the means of this Project. Because of that, the recommendations of the current paper have been limited to the systematic collection of strategic action guidelines aimed at the strengthening of municipal environmental management capacity. Most of these guidelines are the result of extracting practical and theoretical propositions from the set of Best Practices reviewed.

These Best Practices have demonstrated effectiveness and efficiency in the development of an urban environmental management capacity. Therefore, it is only reasonable to suggest that once they are duly systematised, they be able to be replicated under similar conditions. The Best Practices show that women's participation and commitment constitute a very valuable asset in coping with critical urban problems. These cases show that women are the single most effective and active group, and consequently the group with the greatest strategic value. Therefore, it is important to strengthen their participation and organisation, providing them with adequate and opportune information as well as valuing their contributions and roles.

An analysis of laws and regulations recently introduced in Bolivia, whose impacts are yet to be determined, suggests that in the next 10 years a series of fundamental transformations will occur in the country. Within these processes of change, municipal governments are emerging as the public instances par excellence for the changing of the urban reality. The strategy for the mobilisation of resources in response to community initiatives should be based on proven success stories, i.e., on Best Practices.

Within this framework, the action guidelines and strategic recommendations of the current paper stress the strengthening of local institutional capacities of municipal government in Bolivia. The municipal government *system* includes both urban and rural settlements, which are integrated by law with political and governance institutions, such as the territorially based organisations (OTBs) and their vigilance committees. The municipal government itself, on the other hand, is composed of a municipal council and the mayor (the *Ayuntamiento*), and it is the most important instance of local political power and public administration for improving the urban environment.

The contents of the present document were drafted based on the initial research of Carolina Stem, PROA's Research Associate. This First Chapter describes succinctly the urban environment conditions of the country in general, and the environmental conditions in the main urban centres in particular; the Second Chapter makes extensive use of documents produced by the Ministry of Sustainable Development and Environment, complemented by the contributions made by a series of seminars and workshops that PROA organised for this purpose, as well as by data collection conducted by Marcelo Ballon, Project Co-ordinator, and Carolina Stem in several urban centres throughout Bolivia. Finally, the Third Chapter was prepared based on the reflections and contributions made by different participants during the above mentioned workshops and seminars.

1. Chapter I

1.1 Environmental Management in Bolivia

Bolivia is a country of striking contrasts. Its territory is endowed with extensive natural resources; however, the conditions of life of its nearly 7 million inhabitants are reflected in the second lowest social and economic indicators in Latin America and the Caribbean. Only Haiti's population has poorer living conditions.

Bolivia has a low population density (5.84 inhabitants/km² in 1992, something positive in the prevention of environmental degradation), and a high fertility rate (4.8). The average national density is not representative of the spatial distribution of the population (74% of the population is concentrated in 35% of the territory), with large concentrations of people in the urban areas of El Alto, La Paz and Santa Cruz

El Alto is a growth-relief centre adjacent to the city of La Paz that, due to its rapid urban transformation over the past 30 years, has become the third largest and extensive city in the country. El Alto is currently growing at rate of 9.4% per year, mainly due to migration. In the city, only 63% of the population has access to potable water, 30% to sewerage and 40% to garbage collection services. El Alto is considered to be an ideal laboratory for the analysis of urban environmental problems.

The urban areas in Bolivia, if they continue to grow at the current urbanisation rates, which already exceed the capacity of the municipal governments to respond to urban demands, will experience a lower level of services provided through existing urban infrastructure that is already inadequate. The health services are also not growing to accommodate current population growth rates, especially in El Alto, so these services are deteriorating, thereby worsening the health status of the local population. The environmental ramifications of these deteriorating urban services will have serious environmental consequences.

1.2 Urban Environmental Conditions

Bolivia experiences many of the urban environmental problems associated with a developing country. The cities in Bolivia, generally, and more particularly the peri-urban areas (Zonas Marginales), lack any basic pattern of infrastructure that exists in industrialised countries. Water, garbage collection and basic sanitation are benefits generally not available to low income residents.

86% of the urbanites living in the capital cities of the nine Departments of Bolivia have access to some form of water service (including public taps). If water services are limited to household connections, however, the number of families served drops dramatically to 47% (see Table 1).

The quality of the water is generally too poor to guarantee safe levels, and the continuity of the service varies widely. The sanitation systems show even more depressing characteristics; including both public and private systems, only 37% of the urban residents are covered in these capital cities (See Table 2).

Intermediate cities provide potable water services to only 67% of the population. These cities also suffer quality and discontinuity problems just as frequently as the capital cities. In the intermediate cities, the sewage systems are completely inadequate, serving only 7% of the local population. Many households have latrines, which frequently are located near water wells, which contributes to the pollution of the water sources and the spread of disease.

Until 1994, the collection of solid waste and its final disposal were practically free of charge across the country (a fixed annual charge was established for the lot or the building). This criterion did not allow the local governments to offer satisfactory waste collection services. Consequently, people became used to depositing garbage in the streets. To remedy such a hazardous practice, the local governments of a handful of municipalities have established a charge for garbage disposal in the monthly billing for energy consumption; that is, a charge for garbage disposal is registered in the same invoice as that for electricity. This is not accompanied, however, by sanitary education aimed at overcoming the lack of conscience within the population. It is quite common to see people throwing paper away or tossing empty bottles through the windows of their cars or dumping garbage into the rivers. Others burn their garbage without any consideration of the type of materials being burned, the pollution they may create and the toxins that may be released into the air. Furthermore, there is no sorting of residues, nor pre-defined processes to deal with hazardous wastes. Once the garbage reaches the dumpsters, there are some scavengers that sort the garbage only in order to remove what can be sold. Such an activity reduces the level of solid wastes, generates some income and may improve the environment, but it endangers the health of the groups that do that type of sorting, because they operate without any type of safety norms and controls.

Sanitation and hygiene in market places and restaurants represent a serious threat to the public health of Bolivian citizens. Many of the market food vending stalls do not have a water connection, nor any device for the collection and disposal of garbage. The vendors do not follow any hygienic safety norms, mainly because they lack hygienic habits and because there are no municipal regulations in this regard. Garbage is accumulated near the vending stalls contributing to the presence of flies, other insects and all sorts of animals. Such conditions represent a danger to the environment and to the health of vendors and buyers in general.

Once every year, and for a relatively short time (June through September), the *chaqueo*, the slashing and burning of brush to make land usable for agricultural purposes, is practised by subsistence farmers in the valleys and lowlands of the country. This practice seriously impairs air quality all over the country. Small farmers have the idea that the burning of the bush will make the land more fertile, leaving rich organic materials similar to fertiliser. However, long term results show that this practice diminishes the overall productivity of the soil. Furthermore, the smoke liberated by the *chaqueo* into the atmosphere covers the entire country with smog that is an irritant to the eyes and aggravates environmental health problems, especially those related to the respiratory system. The Ministry of Sustainable Development and Environment has developed an educational campaign to stop these practices, but so far the results are only minimal.

Air pollution due to gases from engine combustion of the old and badly maintained vehicles that are common throughout the country is another important factor that contributes to environmental pollution. There are some controls in this regard; however their enforcement is not rigorous, and they are frequently circumvented. As of today, the country does not produce high octane gasoline, which, together with the inefficiency of old vehicles and the high level of dirt and residues present in the gasoline commonly used, makes the levels of air pollution dangerously high, especially in the highly populated urban centres. The national oil company, Yacimientos Petroliferos Fiscales de Bolivia (YPFB), produces gasoline with impurities that reach 2 mg/gallon, an impurity content that threatens the health of the Bolivian population with nervous disorders and a reduction in their learning capacity.

One of the main factors that prevents effective urban environmental management is the lack of co-ordination mechanisms among the diverse central government, municipal and private institutions that are in charge of urban development. During many interviews, specialists in these subjects expressed the view that there were no institutions working on these issues; however, after some research it was evident that there are many institutions involved in urban environmental issues. The main problem seems to be the lack of co-ordination and communication among them.

Local governments and institutions have ambitious and innovative plans for the improvement of the urban environment, but they see their efforts curtailed mainly because of the lack of financial resources and qualified personnel (e.g., in Cochabamba, a city of nearly 600,000 people, the municipal government has a little more than ten people to support its environmental activities). The Bolivian educational system is generally inadequate in helping students overcome different types of obstacles. Frequent public demonstrations, technical limitations, the lack of support of the municipal governments (which since 1995 are in charge of the educational infrastructure), and the very low salary levels of the teachers, all contribute to the very low quality of the Bolivian educational system.

The authorities declare that there are sufficient regulations; however, they also concur that there is no enforcement capacity. Furthermore, many private companies, institutions and citizens ignore their existence. Even worse, the contradictions and inconsistencies among them have created confusion and a lack of clarity in the regulatory framework.

The urban environment in Bolivia has been the subject of only marginal attention from environmental organisations and the donor community. Because the country has extensive territory covered with relatively untouched tropical forests, the environmental protection community has concentrated its resources and activities in the protection of these natural areas. While the environmental planning and protection of urban and rural areas is important, it is frequently easier to sell the protection of forests to environmental groups than to promote the construction of a sewage system to improve living conditions. It seems, however, that there are some changes in this view and the urban environment is gaining increased attention.

Table 1

Provision of Potable Water (Municipal And Private Systems). A)

	Total	Within the house. b)	Outside the house b)	Total	Public taps	No water service c)	% covered in house or public	% no service	% in the house	% outside the house	Total households served
Capitals	530,504	250,147	169,607	419,754	35,012	75,738	85.7	14.3	47.2	32.0	79.1
Sucre	29,770	15,553	10,532	26,065	826	2,879	90.3	9.7	52.2	35.4	87.6
La Paz	170,497	91,937	40,941	132,878	16,794	20,855	87.8	12.2	53.9	24.0	77.9
Cochabamba	87,703	41,140	19,937	61,077	2,417	24,209	72.4	27.6	46.9	22.7	69.6
Oruro	41,835	13,397	22,112	35,509	3,336	2,990	92.9	7.1	32.0	52.9	84.9
Potosi	25,103	7,777	11,986	19,763	3,091	2,249	91.0	9.0	31.0	47.7	78.7
Tarija	19,574	10,156	7,117	17,273	1,184	1,117	94.3	5.7	51.9	36.4	88.2
Santa Cruz	143,531	65,681	52,943	118,624	6,337	18,570	87.1	12.9	45.8	36.9	82.6
Trinidad	10,473	3,861	3,228	7,089	981	2,403	77.1	22.9	36.9	30.8	67.7
Cobija	2,018	665	811	1,476	76	466	76.9	23.1	33.0	40.2	73.1

Source: DINASBA

a) These figures are based on persons present in their homes during the day of the census in 1992.

b) Includes public and private systems

c) Includes all those who do not have water services as well as those who receive water through cistern trucks, fetch water from lakes, rivers or any other source of surface water.

Table 2
Sewage Services A)

	Total	Modern private services b)	Basic private services c)	Modern public services b)	Basic public service c)	Without service	% with service	% without service	% with modern private service	% with modern or basic private service
Capitals	530,504	162,529	68,325	58,661	80,449	160,540	69.7%	30.3%	28.4%	37.4%
Sucre	29,770	9,832	2,647	5,795	4,434	7,062	76.3%	23.7%	39.9%	42.2%
La Paz	170,497	55,186	13,072	16,590	2,305	62,593	63.3%	36.7%	37.0%	39.4%
Cochabamba	87,703	27,893	15,359	7,461	16,888	20,102	77.1%	22.9%	36.0%	42.7%
Oruro	41,835	6,216	2,934	2,530	3,694	26,461	36.7%	63.3%	17.1%	20.3%
Potosi	25,103	4,117	3,213	1,749	6,906	9,118	63.7%	36.3%	28.25	28.8%
Tarija	19,574	7,249	1,419	3,666	1,521	5,719	70.8%	29.2%	39.5%	42.3%
Santa Cruz	143,531	49,597	25,684	20,185	21,174	26,891	81.3%	18.75	15.2%	37.6%
Trinidad	10,473	1,973	3,145	519	2,489	2,347	77.6%	22.4%	0.9%	25.7%
Cobija	2,018	466	852	166	287	247	87.8%	12.2%	3.3%	28.5%

Source: DINASBA

a) These figures are based on the number of people present at their homes during the 1992 Census.

b) The term "modern" is used to denote water sealed toilets connected to sewage systems or septic tanks.

c) The term "basic" include simple toilets and latrines.

2. Environmental Conditions in Cities

Most urban centres in Bolivia have similar environmental problems. However, each city has a set of specific problems of its own due to the number and type of industries located in it, the regional economy, weather, topography, roads, infrastructure, etc. The following paragraphs present a summary of different environmental assessments conducted by diverse institutions in the main Bolivian urban centres. The cases outlined are just a sample of the activities conducted in each place.

2.1 Environmental Conditions in El Alto

With a current population of nearly 500,000 people, a rate of annual growth of 9.4%, and an urban infrastructure by all means inadequate, this city is quite separate from the city of La Paz. It is located at 4,100 meters above sea level. As such, it has a critical environmental situation. The urban services, already worse than those in any other city in Bolivia, are unable to keep pace with the high annual population growth rate, which is the highest of all Latin American cities.

The city dwellers, to a great extent migrants from the Andean rural areas, are asking for better living conditions; they lack, however, the necessary financial resources. This fact defines the social characteristics of the city: severe levels of poverty, low educational levels and high mortality and morbidity rates.

The city of El Alto, with a 20% share of national production (1995), is an industrial centre (metals, food production, textiles and chemicals) for the city of La Paz. Deprived of the direct benefits that these activities create, El Alto is nonetheless the recipient of the environmental impacts that these activities generate. Furthermore, because of their lack of economic capacity and social responsibility, the industries in El Alto do not adopt prevention measures to control the pollution that their activities generate.

The absence of human and financial resources, coupled with the lack of infrastructure and weak institutional co-ordination, have turned El Alto City Hall into an office incapable of pursuing and implementing an effective environmental action plan for environmental management.

The United Nations Development Programme has promoted environmental studies through local organisations (INSO 1991, PROA 1993). As a result of these studies, several forms of environmental pollution have been identified, such as: heavy metal pollution in some neighbourhoods near Rio Seco. This river flows across the city and its waters are used for drinking purposes by many people, in addition to its being used for the laundering of clothes and washing vehicles. Most activities in El Alto generate chemical and biological pollution, air pollution produced by gases and industrial fumes, and a high level of biological pollution in the streets (60% of the population uses the streets and empty lots as sanitary facilities). Other types of environmental pollution include underground water pollution with carbon residues, sulphuric acid, lead and other residues produced at artisan shops; the acoustic pollution of the airport facilities that serve La Paz and El Alto, as well as of the main thoroughfares (roads to Oruro, Viacha and Copacabana); and the large volumes of waste deposited daily in the streets and empty lots (only 60% of the garbage is collected; the level of garbage production is 400 grams/person/per day).

The coverage levels in water and sanitation are among the lowest of the main urban centres in Bolivia. Not only are these services inadequate, but the ones that are available are also inadequately used (140 kms of sewage mains are not used; only 10% of the bathrooms along these mains are connected).

TABLE 3

WATER AND SEWAGE SERVICES IN EL ALTO

TOTAL POPULATION (1992)	405,492
<u>Water Services</u>	
With connections inside the house	133,335
With connections outside the house	213,796
Total population with water services	347,151
Without water services	58,341
% with connections inside the house	32.9%
% with connections outside the house	52.7%
% without water connections	14.4%
<u>Sewage Services</u>	
Connected to a sewage system	82,516
Septic tanks	17,681
Latrines	33,945
Without services	271,351
% with sewage system	20.3%
% septic tanks	4.4%
% latrines	8.4%
% without services	66.9%

Source: DINASBA

Food production at an artisan and micro entrepreneurial level lacks basic technology, not only in producing, but also in marketing (only 3% of the commercial retailers have adequate food storage), as well as in handling (e.g., street vending, on the floor vending, preparation of food at the family level, etc.). These limitations constitute an important source of disease and a serious risk to the health of the citizens of El Alto. Food sold at the market places and in the streets is exposed to insects and burning, as well as to chemical and biological pollutants.

Due to its high altitude location, the residents of El Alto are exposed to high levels of ultraviolet (UV) radiation (the intensity of UV is 40% greater than at sea level). This radiation causes skin cancer, eye cataracts and genetic mutations and hypoxies, especially during periods of sleep, with hematic effects and cardiac complications.

2.1.1 Projects and Progress

The Best Practices in urban environmental management found in the city of El Alto are mainly related to the collection and treatment of solid waste. One of these experiences is that of the Association of Micro Entrepreneurs for the Collection of the Solid Wastes of El Alto (AMERSEA). This association constitutes a sound private system for garbage collection within the city, and it is an initiative of the Centre for Integrated Services for Urban Development (PROA). AMERSEA, at the present time, is composed of eight private micro enterprises. The association was under contract with El Alto City Hall to provide urban cleaning services from 1989 through 1995; a period of time in which the association collected 60% of the garbage produced, covering 53% of the urban area. Currently, AMERSEA and the private enterprise CLISA are conducting similar activities in the city.

Another Best Practice is one conducted directly by PROA, which is a private institution that plays an important role in community organisation and training (meetings, workshops, etc.) in the areas of health, hygiene, basic sanitation and the environment. At present, it provides formal training to school students through an international programme for environmental education, a programme that actively involves students in the control of the environment through the use of computers for the processing and analysis of environmental data. In 1995, PROA assumed the role of co-ordinating agency for national environmental improvement in El Alto (Campaña por la Calidad de Vida en Bolivia). This campaign was aimed at the reduction and recycling of garbage, bartering garbage for food and school supplies, as well as public education on these issues.

PROA also plays a dynamic role in institutional organisation and in community mobilisation in urban forestry. Forestry is of vital importance in El Alto, a city with a dry climate (20% relative humidity), low temperatures, (10 centigrade as the mean daily temperature) and strong winds during the winter months.

Another Best Practice is one of the non-governmental organisation (NGO) ENDA Bolivia. It started a garbage recycling project in 1990 with the objective of training abandoned children and children who work on the streets in the processing and transformation of solid waste. The goal of this programme was to reintegrate these children into society through job opportunities. ENDA Bolivia was able to disseminate its activities and to create consciousness among other children, organising similar activities in schools for students who were trained in recycling and environmental protection.

Another successful environmental activity developed in El Alto was the construction of greenhouses for the commercial production of vegetables and decorative plants.

2.2 The Environmental Situation of the City of La Paz

La Paz is the city where the Bolivian central government is located. It is an urban centre in a fertile valley adjacent to the Altiplano (high plateau) and the eastern part of the Andean mountains. La Paz is at the foot of El Alto, with a mean altitude of 3,600 meters above sea level. La Paz has nearly 800,000 and is the second largest city in Bolivia. While the city enjoys a relatively unpolluted atmosphere, these relatively unpolluted conditions should not serve as an excuse for the neglect of other serious environmental problems, although they are less severe than in other urban centres.

Water pollution is one of the most serious environmental threats for La Paz (the volume of surface water contamination, produced by industry is 50% greater than the volume produced by all domestic refuse). Some of the waterways that traverse the city start their downward course in El Alto and are already polluted at the origin due to the industrial and domestic residues generated in that city.

The Choqueyapu River is the main river in La Paz, and it collects sewage discharges, solid wastes, industrial refuse, dead animals and all sorts of other waste. The river flows south of the city, where its waters are used for the irrigation of agricultural fields. The vegetables which are produced are then sold in La Paz's open markets (30% of all the vegetables that reach La Paz come from this zone). Another river in the city of La Paz is the Orkojahuirá, a river that flows through the eastern part of the city and collects the discharges of the large hospitals located along its course.

Potable water is distributed by SAMAPA (Empresa Municipal de Agua Potable y Alcantarillado). This water is not suitable for human consumption unless it receives additional treatment. In addition to microbiotic pollution, this water contains high levels of magnesium. In order to compensate for this situation, SAMAPA treats this water with chemical compounds that produce a pH that exceeds international norms. La Paz does not experience excessive levels of atmospheric pollution, although in recent years it has registered increasing levels of air pollution, mainly due to particles of carbon, lead and nitrogen oxides produced by the combustion engines of the 110,000 vehicles that circulate in the city, and by the industries that are located in La Paz. Most of them are related to the production of detergents, chemicals, textiles, beer and paper.

La Paz has a dry climate (20% relative humidity), a striking and difficult geology and high levels of deforestation, which is the origin of other environmental problems. The most important of these problems are land instability and erosion because of rain, construction work, clandestine graveyards and the lack of basic services. In the southern part of the city (residential areas), land rehabilitation has led to the deliberate changes of river courses, a practice that has serious consequences for the national environment.

2.2.1 Projects and Progress

Private and municipal enterprises in La Paz have developed creative and sustainable ways to control environmental pollution. For example, INDUPEL, the local paper company, operates a recycling programme in which it exchanges sanitary paper for ordinary paper that will later be recycled by the Municipal Cleaning Enterprises, EMA, to recover costs in the final disposal of waste and to guarantee consistent coverage. A private enterprise STARCO, has reached an agreement with the local electricity company to include the monthly charges for street cleaning in the electric bills. EMA has also recognised the efficiency of micro enterprises and is delegating some of its services to them with the aim of improving the delivery of that service.

In La Paz, there are several isolated efforts in the construction of greenhouses for the production and commercialisation of vegetables in safe conditions. The main participants in these efforts are a local supermarket (ZATT), a private agricultural group (VENTILLA) and a non-governmental organisation (CIPCA).

The technical advisory programme for the urban development of the municipality of La Paz (PADUM), funded by the United Nations and the World Bank, constitutes a Best Practice in long term municipal planning. The project has placed emphasis on the need to decentralise services and on the delegation of authority to the district level. Among its activities, it is considering the restructuring of existing municipal enterprises, and it is implementing the computerisation of accounting systems, as well as the creation of information banks for planning purposes and for the monitoring of natural disasters. The project also includes the preparation of a land use plan.

Another important effort is being developed by the voluntary organisation SIEMBRA. This private institution is committed to reforestation and the recovery of eroded areas through the active participation of urban youth groups. These children and young adults assume the responsibility of taking care of recently planted trees for a period of at least one year. This initiative is very important and contributes to creating environmental consciousness early in the lives of the citizens and actively involves community groups in the maintenance of the environment.

2.3 The Environmental Situation of the City of Santa Cruz

Santa Cruz is the biggest and most modern city in Bolivia, with a population of a little more than 800,000 people. It is located in the eastern Department of Santa Cruz. This flat and extended city is at an altitude of 400 meters above sea level, and it experiences temperatures that average 30 degrees centigrade. It is situated in a transition zone between the high Andean mountains and the low Amazon plains, and it is subject to variable and unpredictable weather.

One of the most critical environmental problems that faces Santa Cruz is the access to and the quality of water. Water is notoriously limited, especially in those areas of the city that have been settled in recent years. The pollution of the rivers that run across the city with industrial refuse, garbage and organic residues is of major concern. Some of the urban areas also lack drainage and have large accumulations of mud and water during the rainy season. These areas are breeding grounds for mosquitoes and other insects.

Another problem stressed by a research study of the United Nations Food and Agricultural Organisation (FAO) and the Centre for Tropical Agricultural Research (CIAT) reveals that some of the cereals produced in Santa Cruz have a high level of toxic substances due to the overuse of pesticides.

The air pollution in Santa Cruz has as its principle pollutants carbon monoxide from the combustion of diesel oil (used in most agricultural machinery) and gasoline, as well as from the slash and burn practices of the farmers during the dry season (June to September). The local brick factories create water pollution problems, mainly because of the dust produced by this type of activity and by the carbon monoxide produced in the baking process of these ceramic products.

Santa Cruz, however, has the good fortune that its territory is subject to strong and frequent winds that prevent the concentration of these pollutants. Unfortunately, the winds simply serve to transport those pollutants to other areas of the region.

Finally, urban environmental problems in Santa Cruz include degradation of the land due to the lack of planning in the location of industries, which has led to them being located within densely populated. These areas lack of specific norms to control emissions of toxic wastes and noise pollution.

The demographic explosion has also brought its share of problems to the city of Santa Cruz. These include the inability of the municipal government to provide public services to around 300,000 people; the constant reduction of the green belt that surrounds the city, with the concurrent increase of dust, wind and other air pollutants in suspension; illegal settlements; and an increase in the uncontrolled dumping of domestic wastes into streets and lots.

2.3.1 Projects and Progress

One successful NGO, La Casa de la Mujer, works mainly in the training and education of women. It has programs linked to the protection of the environment and the protection of health. It places emphasis on economic opportunities associated with environmental protection and improvement. This relatively small organisation plays an important role in urban environmental management, and it is well known and respected by all the environmental groups in Santa Cruz. It has also produced books and audio-visual materials with regard to water, garbage, food, and the use of detergents.

The Ecological Association of the East (ASEO) is another important organisation which has expanded its range of action into urban environmental management. Through diverse contracts, ASEO has completed a diagnosis of the urban problems in Santa Cruz; a research study to measure the indexes of health, education and poverty and their relationships with the urban environment; and a compendium of the local resolutions and regulations referring to the environment (1990 to the present). In addition, ASEO participates in environmental protection activities, trying to convince the local government to promote the separation of organic and inorganic waste. Its future plans include the development of an environmental protection programme for urban schools; the programme will involve the students in the measurement of diverse environmental variables.

The City Hall has played up to now a relatively insignificant role in the planning and management of the urban environment, but it has the intention to become more involved in the future. At present, it is preparing a survey to determine environmental norms.

The Centre for Forestry Development (CDF) is committed to the urban environment from the point of view of reforestation. It has organised a campaign for reforestation and environmental education (the Green Telephone), with limited results due to the lack of interest and participation of the local community. Its goal for the future is a redefinition of the city limits and the establishment of a green belt around the city.

2.4 The Environmental Situation of the City of Oruro

Oruro is an Altiplano city situated 250 kilometres south of the city of El Alto, and it faces similar environmental concerns. A high rate of rural - urban migration, together with a weak economic base that cannot absorb such a massive influx of people, have created tough living conditions for all the residents of Oruro. This city has a population of around 200,000, and a high percentage of its population (81%) is considered to be poor. Historically, it has been a mining town. As of today, Oruro continues to be a centre of mining activities and, secondarily, a centre of industrial activities. The declining price of its main mineral resource, tin, has created a crisis in the mining activities of Oruro.

Urban planning in Oruro did not exist until 1976, the year in which the Ministry of Urban Affairs developed a master plan for the city. The coverage rates of water and sewage are the lowest of all capital cities in Bolivia. More than 63% of the population does not have access to any type of sewage system, basic or modern (See Tables 1 and 2).

The environmental pollution and degradation that Oruro suffers are the results of mining activities, of processes that indiscriminately use chemical products and obsolete technologies. The industries dump the residues into the urban environment with large environmental impacts, especially in the pollution of waters near the mining sites. One of the mining companies located on the outskirts of the city has created a large number of environmental problems mainly due to the deposit of mining tailings, which now form hills, on top of which people have built some houses. Furthermore, when the mines are in operation, they produce acid fumes at an average rate of 15 litres per second, 24 hours a day.

The city's industries are an environmental threat of lesser proportion in comparison to mining activities; nevertheless, industries are also an important source of urban environmental pollution. Oruro is the domicile of several chemical factories that use materials such as diverse acids, polyurethane and other potentially hazardous substances.

The lack of both technological innovation and upgrading has caused mines and industries to contaminate ground and surface water, as well as land, not to mention the noise pollution the high occupational risks. One recent research study found that the effluents produced by the industries are frequently above the maximum permissible levels. For instance, chromium measurements show levels of 3,000 mg/l, compared to a maximum permissible level of 5 mg/l.

Waste water has as its final destination an oxidation pond, which each day is closer to the city limits, because of the urban expansion of Oruro. In addition, the oxidation pond is close to the Uru Uru Lake, constituting a threat to the region and the natural ecosystem.

With the collection of only 38 metric tons of the 108 metric tons of solid waste produced daily in the city of Oruro, the ground pollution in Oruro is also very high.

Air pollution is not one of the main environmental problems in Oruro, although the emissions of nitrogen, sulphuric oxide and sulfanic dioxide have irritant effects on the respiratory system. The high winds that traverse Oruro help to dilute the pollution, while, at the same time, they create other problems, such as high dust and other particle concentrations.

2.4.1 Projects and Progress

One successful experience is that the School of Agriculture of Oruro. It conducted extensive research on the native aquatic flora that can be used in the purification of water contaminated by industrial residue. Different from conventional physical and chemical treatment, this method uses aquatic plants that retain the metallic elements and purify the water from these toxic elements. The chemical research programme of this university is also washing with the biological purification of domestic residue, using the conventional process of activated mud. The very same project has experimented too with oxidation ponds for the treatment of water with a high organic content.

With greater emphasis on the community than on engineering aspects, the Centre for Graduate Studies (UTO) has developed an academic model for community development. Its main goal is to identify alternative solutions to the principal problems that the region and the country in general experience.

The programme for small farmers self development (PAC), which started as an emergency programme, has been transformed into a programme of development and consolidation. The programme has made some progress in the areas of basic infrastructure, productivity, the improvement of local capacities in agricultural technologies, and the strengthening and transformation of community organisational skills. PAC has played an instrumental role in the process of popular participation, disseminating the use of participate planning methods for the development of community activities.

2.5 The Environmental Situation of the City of Cochabamba

Cochabamba is a city of around 600,000 people, situated in a valley at an altitude of 2,750 meters above sea level. It enjoys mild weather, but it has a topography that retains pollution from vehicles, aeroplanes and dust, because the local winds make them circulate in the same place.

Industrial pollution of air, water and land complicates even further the local situation. For example, the oil refinery in Valle Hermoso has not conducted a single study on environmental impacts. The bricks produced in local factories also contribute to industrial pollution producing residues that include chromium VI.

The environmental problems in Cochabamba are also linked to its rapid urban expansion. The city is undergoing a chaotic urbanisation process, where land speculation is out of control. The urban expansion covers areas that are not best suited to urban uses, leading to the loss of vegetation and natural resources, the loss of agricultural land in the peri-urban areas, the pollution of land, air and water, the falling of trees, as well as climate change, erosion, and the loss of humidity and biodiversity. The expansion has also produced an increase in noise pollution. Traffic congestion within the city combined with air traffic at the airport, which is located within the urban limits, has created high levels of noise that are threatening the health of the residents and constitute a permanent nuisance.

2.5.1 Projects and Progress

The Centre for Research, Promotion and Development of the City (CIPRODEC) plays an integral role in environmental management for Cochabamba. In the peri-urban neighbourhood of Valle Hermoso, this organisation helps the residents to understand their urban reality and the problems that affect them, using participate methods that establish basic principles for the development of small projects, as well as guidelines for policy on urban environmental management.

Another project, designed to compensate for the lack of municipal capacity to meet the urban needs of garbage collection in the neighbourhood of Villa Sebastian Pagador, has, of today, satisfied 100 % of the demand for this type of service in that area of the city. To do this, CIPRODEC established a self-financing micro enterprise for the collection of solid waste.

Applying a methodology that uses Quechua, a local language, the Centre for Research and Popular Education (CINEP) conducts a series of efforts in urban environmental management. With emphasis on working with women, this projects aims at preparing local communities to improve their quality of life and to strengthen their relationships with local governments and other organisations, to improve health and education services, to reduce discrimination and other obstacles that prevent the access of women to the benefits of development and to create and strengthen new educational concepts for formal and informal education systems.

The University Centre for Ecology, Environment and Development (CUEMAD) recently introduced urban education as one of its environmental activities. Through informational exhibits and expositions, seminars and workshops within local neighbourhoods and markets, CUEMAD disseminates information about urban and rural development planning, reforestation and environmental quality.

Cochabamba City Hall is preparing a Master Plan for land uses in the Tunari National Park aiming at providing better living conditions to the population that has settled in those areas, including the provision of water, sewage and electricity services. It also aims at mobilising private enterprises for the development of recreational areas within the park.

2.6 The Environmental Situation in Tarija

Tarija is a city located in an agricultural valley in the southern part of Bolivia at an altitude of 1900 meters above sea level. The city is well known because of its warm climate, its friendly residents and its tranquil atmosphere. It is also famous because of the severe erosion and degradation of its soil due to diverse causes, among them the urban expansion into rural and forest areas, the cutting of trees for fuel, the grazing of cattle, the introduction of eucalyptus trees that exhaust soil nutrients and the destruction of forested areas. All these activities have led to high levels of soil erosion in all sectors of the central valley, as well as to the pollution of rivers with the sliding of eroded lands.

The Guadalquivir River that flows through the city of Tarija has high pollution levels due to the discharges of the sewage system, reducing consequently the sources of potable water for the local residents, and representing a source of contamination for the residents who use its waters for personal hygiene. Furthermore, the oxidation ponds for the treatment of waste water are located in improper places for that function.

With regard to urban services, Tarija has the best national indexes; 42% of its residents have access to modern sewage systems or systems for hygienic disposition; and 88% of the population have direct access to potable water within their houses. Even though these percentages exceed the national averages, they are still low if compared to developed countries.

2.6.1 Projects and Progress

CARITAS, an international organisation dedicated to research, education, financing and project implementation, is working in peri-urban neighbourhoods of Tarija, where it has developed a reforestation programme to reclaim heavily eroded lands in urbanised areas and in 31 rural communities. This project orients these activities to the concept of sustainable development rather than exclusively to soil conservation.

An important Best Practice in Tarija has been instituted by the city itself. Tarija's City Hall has adopted a creative way for improving the urban environment without using its scarce financial resources. Instead of assuming the direct responsibility for parks and plazas, City Hall has delegated this authority to professional teams, each of which has specific responsibilities. These teams are financed with the revenues from the sale of refreshments and snacks in stands within the parks under their jurisdiction. With this improvement in the maintenance of parks, the citizens have started to develop environmental consciousness, placing their garbage in bins instead of throwing it onto the ground. Additionally, the neighbourhood organisations have assumed an active role in the improvement and maintenance of those parks.

PROMETA, Pro Environment of Tarija, is an organisation that is playing an ever more important role in environmental issues in Tarija. It has entered into the second phase of its project "Women and Environment" in the neighbourhood Luis Espinal, for which PROMETA has obtained the support of the Embassy of the Netherlands to irrigate gardens and common lands. The beneficiaries of this project have decided to purchase two additional hectares of land in order to build an ecological neighbourhood. In addition to connecting women with the environment and giving them renewable resources as means of income, PROMETA has also organised educational activities centred on the environment and is aiming at generating and promoting environmental consciousness; normalising and validating methodologies, contents and materials for environmental education; informing communities with regard to the environment and its degradation; and supporting and strengthening the initiatives of individuals and interested groups in environmental conservation. This programme includes an urban component that allows PROMETA to reach schools and local neighbourhoods with environmental messages.

2.7 The Environmental Situation of the City of Potosi

Potosi is located at 4,000 meters above sea level at the head of a hydrological basin. It is a city with a tragic history of slavery and exploitation, that for centuries has provided the world with mineral wealth, but which has never harvested the economic benefits associated with these mining activities. In its place, the exploitation of the mining areas has left its residents poorer, sicker and with a highly deteriorated environment. The activities related to the mining operations in the present as well as in the past continue to discharge leachates in the region.

The mining activities are the cause of soil and air pollution. The gases that emerge from the mining and metallurgic activities contaminate the air, while the mining residues drain through the ground and are transported to distant lands through rain and wind.

The coverage of water and sanitation systems is limited in Potosi. The potable water system is insufficient and irregular, and only 31% of the population has a private connection to the sewage system. Water is frequently contaminated with minerals and the oxidation of the pipes which are in poor condition. Furthermore, the sewage system of the oldest part of the city, due to urban growth and bad urban planning, runs across recent settlements, constituting a threat to public health.

With regard to cultural aspects, Potosi is witnessing the constant deterioration of its historical urban centre. It lacks parks and green areas. This is due, in part, to its cold and dry weather, but it is also the result of the lack of serious reforestation plans.

The aesthetics of the city are also threatened by the indiscriminate disposal of garbage in areas near to the city. CLISA, an enterprise in charge of collection and disposition of garbage, has recently started activities in Potosi.

2.8 The Environmental Situation in the City of Sucre

Sucre is one of the cleanest and most picturesque cities in Bolivia, with all its buildings painted white. This city is located in a valley 2700 meters above sea level. In the low lying neighbourhoods of the city, the streets are well kept and appear to be without most of the environmental problems that are present in the rest of the country. However, Sucre presents some difficulties of its own related to the urban environment.

One of the most serious environmental threats for Sucre and its surrounding areas is the pollution with organic refuse of the Quirpinchaca River, a tributary of the Pilcomayo River. In the past, the collectors of garbage in each neighbourhood simply dumped all the garbage that they collected into the river, without any consideration of the consequences of these actions for public health. The Quirpinchaca River is one of the most important rivers in the southern part of Bolivia. Its importance is related to fishing, irrigation, hydro electrical potential, and the provision of water for human consumption. Obviously, its pollution represents a danger to regional productivity and to the health of the area's inhabitants.

The emission of fumes from vehicles and from the cement factory FANCESA are responsible for a large percentage of the air pollution in the city of Sucre. However, air quality in Sucre, at the present time, is something not to worry about.

In the nearby rural areas, the burning of wood for cooking purposes represents a loss of forest area. Local families use an average of approximately 7 kilograms of wood per day. Despite some efforts at reforestation, results are not guaranteed. The implementors of these programmes are using inappropriate species, such as eucalyptus trees, for the restoration of degraded land.

