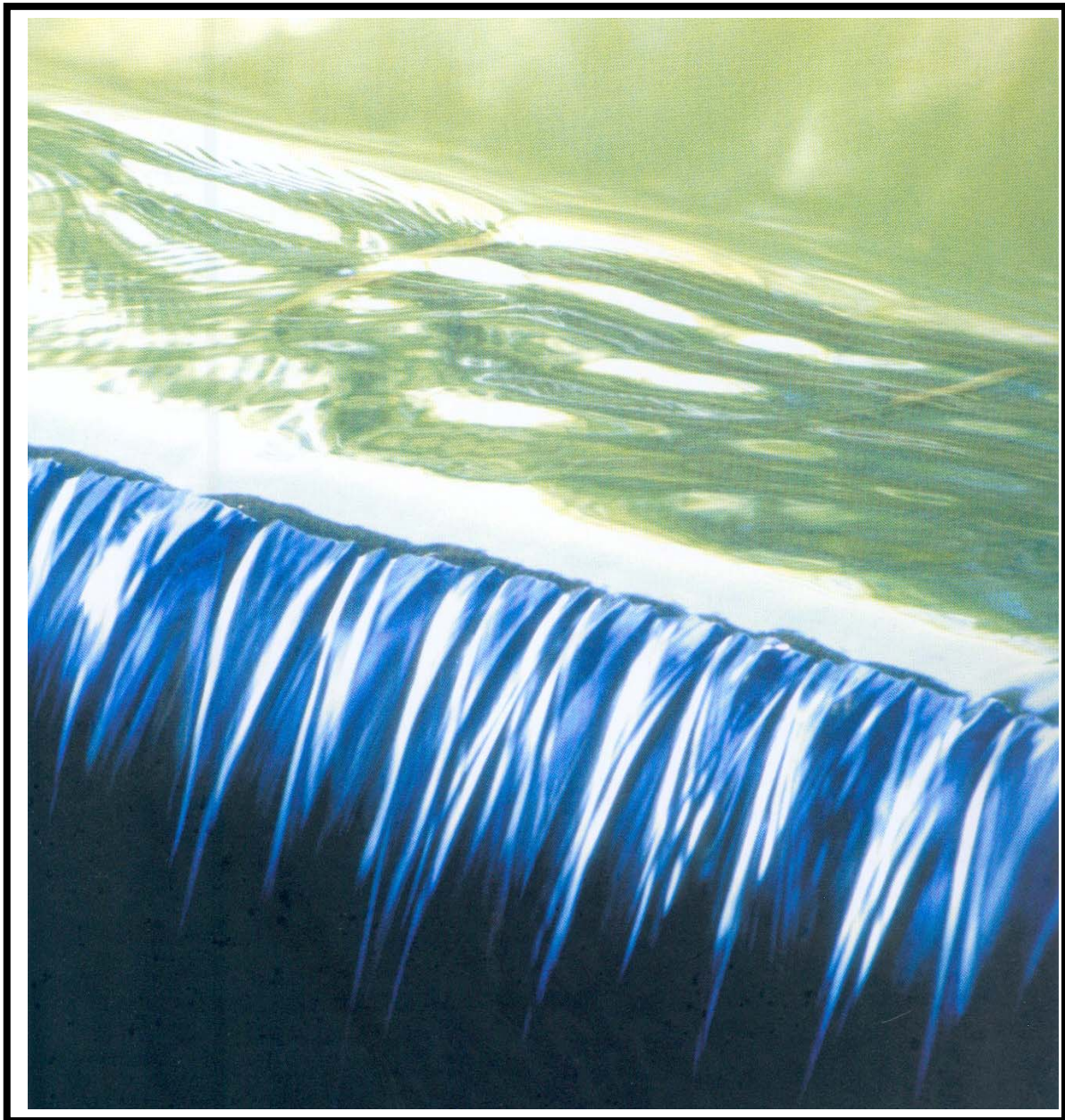


UNESCO-IHE INSTITUTE FOR WATER EDUCATION



Postgraduate capacities in the water and sanitation sector in Latin America and the Caribbean: What do we have? What do we need to achieve the MDGs?

Diego Fernando Mejia-Velez

MSc Thesis 04-020
September 2004

UNESCO-IHE
Institute for Water Education



Postgraduate capacities in the water and sanitation sector in Latin America and the Caribbean: What do we have? What do we need to achieve the MDGs?

Master of Science Thesis
by
Diego Fernando Mejia-Velez

Supervisors
Prof. Guy Alaerts MSc PhD (UNESCO-IHE, World Bank)

Examination committee
Prof. Guy Alaerts MSc PhD (UNESCO-IHE, World Bank), Chairman
Frank Guldenmund MSc (Delft University of Technology)
Ljiljana Rodić-Wiersma MSc PhD (UNESCO-IHE)

This research is done for the partial fulfilment of requirements for the Master of Science degree at the UNESCO-IHE Institute for Water Education, Delft, the Netherlands

Delft
September 2004

The findings, interpretations and conclusions expressed in this study do neither necessarily reflect the views of the UNESCO-IHE Institute for Water Education, nor of the individual members of the MSc committee, nor of their respective employers.

*Not everything that can be counted counts,
and not everything that counts can be counted
(Albert Einstein)*

ABSTRACT

Lack of qualified personnel to carry out the projects of water and sanitation has been considered as one of the limiting factors observed in the field to restrict the successful achievement of universal coverage of water and sanitation provision in the developing world.

Regional prognoses have been made in order to figure out the requirements in work force to achieve the Millennium Development Goals at postgraduate level. In that sense, for Latin America and the Caribbean figures has been set in the order of 50% more postgraduates than the currently available are required to achieve the targets in water and sanitation by 2015.

As partial result of a preliminary research intended to estimate the needs of postgraduates in Asia, Africa, and Latin America and the Caribbean in order to achieve the MDGs in water and sanitation, this study comprises the results obtained from interviews made to forty local experts in five countries of Latin America and the Caribbean region. These experts in the water and sanitation sector in the region provided information regarding the performance of the institutions for education in the sector, the performance of the professionals, and the requirements by the sector in order to achieve the Millennium Development Goals, including the issue of Human Resources.

A definition of criteria was needed to select the countries and experts to interview. Subsequently, the selection of them took place and afterwards, interviews took place visiting the experts in their own premises, obtaining and analysing the results by them provided in accordance to the methodology defined. In that sense, needs assessment tools were used to elicit the information required, and expert opinion analysis was applied to reduce biases and analyse the results obtained.

Realities in the region can be hardly generalised. From huge urban centres to small villages, a wide range of situations can be observed. However, it is perceived in most of the cases, the number of professionals available in the countries can easily cope with the local realities. Although the performance of the sector is not sufficient to achieve the targets set by 2015, the slow development thereof does not encourage professionals to follow specialisation programmes in this field. Hence, other aspects that affect this development and limit the performance of the sector such as availability of financial resources, institutional capacities, and political will require more attention in order to boost the sector, and subsequently, analyse the specific needs in terms of human resources, including formation of technicians, operators, professionals, and postgraduates.

Study programmes appear to be obsolete and out of context to the current developments. A strong technical approach still deserves most of the importance in the education for professionals of the sector, and key aspects such as social, financial, and cultural are not dealt during the courses delivered. Then, education imparted does not correspond to the realities observed in the field, and requires revision in order to solve the problems of training from the root, both revising contents of the education delivered, and updating the knowledge available by the professors, lecturers, and instructors at all education

levels.

Considering the wide extent of this research, the isolated results of this study shall not be used as conclusive for any specific country. If applies, more detailed country specific studies are recommended to be carried out, using as baseline the conclusions drawn by this study. In that sense, conclusions included here serve as a basis to set assumptions that reduce the number of variables to define and design tools that allow the calculation of the specific needs in human resources with precision.

Keywords:

Millennium Development Goals, Water and Sanitation, Latin America and the Caribbean, Postgraduate education, Needs Assessment

ACKNOWLEDGEMENTS

In alphabetical order

Guy Alaerts, Sandro Alvarez Muñoz, Annamox®, Liesbeth Bastemeijer, Carlos Carvalho Jr., CINARA, the people of Colombia, Sunil Kumar Das, Pilar Engel, Benjamín Escobar, Richard Feynman, Caroline Figuères, Flying Dutchman, Gerardo Galvis, Frank Guldenmund, ISIC, Sir Richard Jolly, Jerson Kelman, Tanny van der Klis, Kobus Kuch, Peter Kolsky, Richard Krueger, Marcelita Labrada Velez, Ewen Leborgne, Ineke Melis, Mina Krusemanstraat, Plantsoen 9B, Edgar Quiroga, Carol Roa Engel¹, Carolina Rogelis, Ljiljana Rodić-Wiersma², Tomás Schwerdtfeger, Marielle Snel, Mariana Stravato, UNESCO Headquarters, UNESCO-IHE Department of Municipal Infrastructure, Nicolas Vélez, Teresa Vélez Balcázar, Emma Wiersma, Erik Wiersma.

From the deepest of my heart,

Thank you

Diego

¹ for your patient understanding, ongoing encouragement, limitless optimism and permanent support. The rest cannot be expressed in written, or even spoken words. Carolita muchas gracias por lo que haces y lo que deshaces, por lo que hablas y lo que callas, por lo que expresas y lo que inspiras.

² for your tireless support at the beginning, your wise guidance during this study, and your friendship and along this year. Thanks for becoming in a very positive character in my life. I hope this Kazakhstan gave crop.

TABLE OF CONTENTS

ABSTRACT	I
ACKNOWLEDGEMENTS	III
TABLE OF CONTENTS	IV
LIST OF TABLES.....	V
LIST OF FIGURES	VI
1 INTRODUCTION.....	7
1.1 Background.....	7
1.2 Aim, purpose, objectives and scope of the study.....	9
1.3 Research Questions.....	10
2 LITERATURE REVIEW.....	11
2.1 Millennium Development Goals.....	11
2.2 Capacity Building	12
2.3 Region of Latin America and the Caribbean.....	15
3 METHODOLOGY.....	30
3.1 Needs Assessment.....	31
3.2 Selection of sample.....	36
4 RESULTS AND DISCUSSION.....	42
4.1 State of the water and sanitation sector	44
4.2 MDGs in water and sanitation: Progress and limitations.....	54
4.3 Human capacities available at postgraduate level	63
4.4 Human capacities at postgraduate level required.....	68
4.5 The local universities and their role in the sector	72
4.6 Discussion of the methodology	76
5 CONCLUSIONS AND RECOMMENDATIONS	79
5.1 Conclusions.....	79
5.2 Recommendations.....	81
5.3 Topics for further development.....	85
6 REFERENCES.....	86
Capacity building in the water sector	86
Methodology applied.....	87
Millennium Development Goals and water and sanitation sector	88
Information about Latin America and the Caribbean	91
Useful websites.....	97
7 APPENDICES.....	102
Annex 1 Map of the region.....	102
Annex 2 Millennium Development Goals, Targets and Indicators	103
Annex 3 Total Population* of the Region between 1950-2015.....	106
Annex 4 Total Population - Drinking Water Supply (1998).....	107
Annex 5 Questionnaire applied	113
Annex 6 Invitation to Select Local Experts.....	130
Annex 7 Methodology to find out experts in Latin America and the Caribbean.....	139
Annex 8 Experts contacted	142
Annex 9 Experts identified and interviewed (*).....	145
Annex 10 Experts confirmed.....	146
Annex 11 Contact information of experts interviewed (in chronological order).....	149
Annex 12 Statistics of the countries under study.....	159
Annex 13 Water Related Postgraduate Courses	162

LIST OF TABLES

Table 1. Urbanization levels for selected major world regions, 1925-2025 (percentage).....	15
Table 2 Population in the region	16
Table 3 Evolution of coverage in drinking water and sanitation.....	22
Table 4. Gross enrolment ratios in tertiary education (GER), 1990 and 1998.....	25
Table 5. Private participation in tertiary education in selected countries, 1998.....	26
Table 6 Population of the Region by Groups of countries (1998)	37
Table 7 Coverage rates for water supply and sanitation in the Group IV	37
Table 8 No. of experts approached per country and region	40
Table 9 No. of experts approached per type of organisation.....	41
Table 10 No. of experts interviewed per region.....	42
Table 11 No. of experts interviewed per country.....	43
Table 12. No. of experts interviewed per type of organisation	43
Table 13 Evolution of coverage in drinking water and sanitation.....	45
Table 14 Population without water and sanitation in Latin America and the Caribbean.....	46
Table 15 Evolution of coverage in drinking water and sanitation in selected countries	47
Table 16 Evolution of coverage in drinking water and sanitation in selected countries	48
Table 17 Coverage of water and sanitation in Brazil by December 1998.....	49
Table 18 Coverage of water and sewerage in Mexico by December 1998	51
Table 19 Coverage of water and sanitation in Colombia by December 1998.....	52
Table 20 Coverage of water and sanitation in Peru by December 1998	53
Table 21 Coverage of water and sanitation in Argentina by December 1998.....	54
Table 22 Limiting factors to achieve the MDGs.....	55
Table 23 Will targets on water and sanitation be met?	56
Table 24 Goals of the National Commission of Water (2001-2006)	60
Table 25 Number of water related* postgraduate programs	64

LIST OF FIGURES

Figure 1 Levels of capacity within a systems context.....	13
Figure 2 Latin America and the Caribbean. Percentage of population of the groups 1998	37
Figure 3 Percentage of people without access to drinking water and sanitation and percentage of effluents without treatment. Progression between 1960-2000	46
Figure 4 Progress in Drinking Water (right) and Sanitation (left) Coverage 1990 - 2002.....	48

Lack of access to water supply and sanitation kills an estimated 2.1 to 3.5 million children per year (World Health Report, WHO, 2002).

1 INTRODUCTION

1.1 Background

In 1995, development ministers from the member countries of the OECD Development Assistance Committee (DAC) committed themselves to a year-long process of reviewing past experiences and planning policies into the next century. The resulting report, *Shaping the 21st Century: The Contribution of Development Co-operation*, published in May 1996, presented their vision for development progress into the next century (OECD, 1996). Emphasizing a partnership approach, they formulated a broad strategic framework aimed at realizing seven goals drawn from the resolutions of international conferences and summit meetings. (Devarajan *et al.*, 2002)

Subsequently, a series of expert group meetings jointly sponsored by the OECD, United Nations, and the World Bank, and including representatives of developing countries, NGOs, and United Nations funds and programs, helped to establish quantified targets for each goal and identified a set of 21 indicators for measuring progress. Collaborative efforts at monitoring and reporting on progress toward the goals culminated in the publication of *A Better World for All: Progress toward the International Development Goals* in June 2000 (Devarajan *et al.*, 2002).

The Millennium Development Goals (MDGs) represent a firm political commitment by all 189 United Nations member states (147 of them represented directly by their head of State or Government) to work together to eradicate global poverty. The MDGs are a set of goals and targets devised to help eradicate global poverty, aimed at accelerating global and national economic, social and environmental development. There are eight goals in total. For each goal, one or more specific targets have been set, most for 2015, using 1990 as a baseline.

Achieving the MDGs encompasses a whole range of activities and commitments at a global, national and regional level. Primarily, the MDGs need the support of genuine political will to translate rhetoric into actions on the ground. Additional conditions for achieving the MDGs include: effective collaboration between like minded multilateral organisations, government and donor agencies; readily available and sufficient funds from the industrialised nations to their southern counterparts; and a willingness on all sides to work for the common good and learn from past experience, whether this be positive or negative. A complete list of the Millennium Development Goals, with its targets and indicators is presented in the annexes.

Between 1990 and 2000, 900 million of additional people got access to water supply and sanitation services (Devarajan *et al.*, 2002). However, due to global population growth, the numbers lacking access remained roughly the same throughout this period, with an estimated 1.3 billion people in developing countries to be provided access to safe water and 1.8 billion people to be provided access to adequate sanitation in order to

meet the development goals (IMF, 2003)

Water supply and sanitation (referred as excreta disposal) coverage is an important poverty issue: when consulted, people affected by poverty consistently identify safe water as a high development priority. Furthermore, the range and extent of impacts from water and sanitation interventions point to its critical role in several areas such as poverty eradication; the environment; quality of life; child development and gender equity amongst others (WSSCC, 2004). Therefore, the goal number seven, which deals with ensuring environmental sustainability, relates directly to reducing the poverty levels. The targets defined to achieve this goal are:

- Target 9: Integrate the principles of sustainable development into country policies and programmes and reverse the loss of environmental resources
- Target 10: Halve, by 2015, the proportion of people without sustainable access to safe drinking water and basic sanitation
- Target 11: By 2020, to have achieved a significant improvement in the lives of at least 100 million slum dwellers (United Nations, 2000)

Developing countries still face the challenge of reducing the number of people without adequate access to water and sanitation services. Multilateral organisations, bilateral and national agencies have invested considerable financial resources in order to solve the problems of coverage in the water and sanitation sector during the last decades (WHO *et al.*, 2000). However, the financial resources invested have often not achieved the benefits expected (WHO, 1992). The reasons include: inadequate selection of technology applied, financial unsustainability of the installations and non-acceptance of the technologies implemented. This is caused mostly by the few involvement of the stakeholders, including lack of community participation, in addition to the inappropriate education delivered to the professionals in charge of planning and implementation in the field. The failures in its training is reflected in the lack of holistic vision based on the technically oriented education offered by traditional engineering schools (Cairncross, 1992; Kolsky and Cotton, 1996). Thus, one of the identified bottlenecks in the water and sanitation sector in the developing world is the lack of local capacities; since lack of skills, knowledge and power in local people affects the sustainability of the projects along the whole project cycle.

Capacity building in the water sector has been matter of interest during last two decades (Alaerts *et al.*, 1999; Alaerts *et al.*, 1991; van der Beken, 2002; IHP, 1999; Biswas *et al.*, 1996; Cunge and van der Beken, 2003; Galvis, 2001; Kolsky and Cotton, 1996), and although comprehensive studies have been carried out in order to establish the availability and needs of manpower in the water and sanitation sector in the developing countries in previous decades (Cairncross, 2003, Pardón, 2004), there is no information widely available in that regard. Although studies were conducted by the World Health Organisation, the referred documents were not found in the bibliographic sources consulted. Moreover, there are not studies regarding the current capacities at professional and postgraduate level available and required to increase the coverage levels of water and sanitation services in the developing world. The last efforts made in that sense, last from more than 30 years.

Accordingly, in order to assess the really available capacities of the water sector in the developing countries, there is need to evaluate the existence, or not, of sufficient local experts that ensure the availability of the skills required to support the planning,

implementation, operation, maintenance, and further evaluation of water and sanitation projects. Matching demand for human resources development with supply is an essential feature of such exercise. The assessment of these capacities will allow the planning of co-ordinated programmes, projects, and tasks that permit the achievement of the Millennium Development Goals for water and sanitation. In that sense, a study of this type may serve as a guide to direct the educational efforts of the sector and to inventorate the real capacities of the sector in the regions under study.

1.2 Aim, purpose, objectives and scope of the study

This study aims to assess the needs for professional work force, at postgraduate level, to achieve the Millennium Development Goal number 7 on water and sanitation, targets 10 and 11.

The purpose is to provide reliable information regarding the availability and needs of personnel qualified at higher education level in matters related to water and sanitation issues in Latin America and the Caribbean, and estimate the number of professionals at postgraduate level required to meet by 2015 the targets in water and sanitation set by the Millennium Development Goals.

Having as horizon line the accomplishment of the Millennium Development Goals and, more specifically, the achievement of the targets 10 and 11 of the Millennium Declaration, related to the increase by 50% in the levels of coverage in water and sanitation services, this study, presents the current state of the education in water and sanitation issues, at postgraduate level, in the region of Latin America and the Caribbean. At the same time, it intends to serve as a basis to support further studies in this sense and to contribute in setting of policies that help to the strengthening of water related education in Latin America and the Caribbean.

To fulfil the aim, the following objectives have been defined:

- To assess the current state of water and sanitation provision throughout the region,
- To identify the activities planned and undertaken in order to achieve the Millennium Development Goals in selected countries of the region,
- To identify the main limiting factors observed to achieve the goals,
- To evaluate the performance of the institutions for higher education and its role within the water and sanitation sector
 - To estimate the number of masters available in the water and sanitation sector and the requirements of masters to meet the targets,
 - To identify strengths and weaknesses in the education of local professionals for the water and sanitation sector,
 - To quantify the offer of masters programmes in water and sanitation related issues throughout the region,
 - To evaluate the appropriateness of the higher education imparted in water and sanitation related issues, and
 - To assess the role of institutions for higher education in activities related to the development of the water and sanitation sector.

In order to achieve the aim, purpose and objectives, an analysis is required to select the more suitable tools and methodologies to apply in this research.

1.3 Research Questions

In principle, the main question that arises is “How many professionals in the water and sanitation sector must be educated at postgraduate level in order to achieve the targets 10 and 11 of the Millennium Development Goals?”

However, special conditions must be specified in order to give validity to a figure as such. Then, complementary information should be given in order to generate a context in which the results obtained apply. Therefore, finding out a figure exclusively may ignore many other important issues that should be included in order to justify, explain, and give context. The list of questions including those issues is the following:

- Are Latin American and Caribbean countries progressing according to the expectations to achieve the targets 10 and 11?
- Which are the relevant factors that restrict the achievement of the goals?
- Which strengths and weaknesses local professionals have?
- Which institutions in the water and sanitation sector lack most the development of more capacities?
- How the institutions for higher education in the water and sanitation sector fulfil their role?
- Do institutions for higher education deliver the appropriate curricula for the local practitioners?
- Are there sufficient local experts to build the required capacities in their local contexts?

Answers to these questions will provide a perspective about the performance of the education institutions in relation to the water and sanitation sector activities, involving teaching, research and extension, the three core activities of the universities and other institutions for higher education. Hence, the needs of education in the sector will be studied not only regarding the needs in quantity of postgraduates, but also in quality required, including contents and methods of education.

2 LITERATURE REVIEW

In order to build up a complete vision that allows the recognition of the main issues related to the questions under study, there is need to analyse the problem from different perspectives. Firstly, the MDGs, its targets and indicators set as well as the rationale behind them must be understood, in order to select an appropriate strategy to address the problem. Secondly, the theoretical basis for the methodology to be utilised and the concepts related to capacity building and its applications within the water sector. Thirdly, It is crucial to identify and understand the local conditions of the countries where the study is carried out, identifying performances of both the water and sanitation sector and the institutions for higher education.

2.1 Millennium Development Goals

The Millennium Development Goals (MDGs) constitute a set of agreed and measurable targets. As expressed in the United Nations Millennium Declaration (adopted in September 2000 by 189 countries including 174 heads of state and government at the Millennium Summit), they provide an unprecedented basis for building a partnership between developed and developing countries to achieve poverty reduction and sustainable development with equity.

The Millennium Development Goals, mainly targeted for 2015, seek to halve the numbers of those suffering extreme poverty and hunger; to achieve universal primary education and gender equality; to reduce by two thirds the mortality rate among children under five; to reduce by three quarters the maternal mortality ratio; to halt the spread of HIV/AIDS and malaria; to guarantee environmental sustainability; and to promote a global partnership for development with specific goals for foreign aid, debt relief, trade expansion and technology transfer (ECLAC *et al.*, 2003).

The eight MDGs are:

1. Eradicate extreme poverty and hunger
2. Achieve universal primary education
3. Promote gender equality and empower women
4. Reduce child mortality
5. Improve maternal health
6. Combat HIV/AIDS, malaria, and other diseases
7. Ensure environmental sustainability
8. Develop a global partnership for development

Originally, in several international conferences and summits held in the 1990s, many of the MDGs were set. However, only in September 2000, during a meeting in New York (the Millennium Summit) all of the 191 United Nations member states adopted the Millennium Declaration – a declaration of political commitment to work together to combat poverty, hunger, disease, illiteracy, environmental degradation and discrimination against women (UN, 2000).

The MDGs Related to Water and Sanitation

In 2000, the UN Millennium Summit set a target as follows: ‘by 2015, reduce by half the proportion of people without access to safe drinking water’. Two years later, in Johannesburg during the World Summit on Sustainable Development, in the Plan of Implementation, agreed to “Launch a programme of actions, with financial and technical assistance, to achieve the Millennium development goal on safe drinking water. In this respect, we agree to halve, by the year 2015, the proportion of people who are unable to reach or to afford safe drinking water, as outlined in the Millennium Declaration, and the proportion of people without access to basic sanitation” (UN, 2000).

Definitions

In this context, safe drinking water refers to *sustainable access to an improved water source, urban and rural*, including piped water, public tap, borehole or pump, protected well, protected spring or rainwater. Improved water sources do not include vendor-provided waters, bottled water, tanker trucks or unprotected wells and springs (Water Supply and Sanitation Collaborative Council, 2004).

Basic sanitation refers to access to facilities that provide hygienic separation of human excreta from contact with humans, animals and insects. Adequate facilities are sewers or septic tanks, pour-flush latrines and simple pit or ventilated improved pit latrines (WSSCC, 2004).

According to the mentioned targets, the number of people with access to drinking water has to increase by about 250,000 people per day to meet the MDG for water supply. This is higher than the performance levels of the 1990s. It is lower than the levels of the 1980s, but many of those connections did not provide sustainable access to safe water. As for the sanitation target, providing access for more than 350,000 additional people per day will require a doubling of the efforts made in the past (IMF, 2003).

2.2 Capacity Building

Definition

Capacity is the ability of individuals and organisations or organisational units to perform functions effectively, efficiently and sustainably. This implies that capacity is not a passive state but part of a continuing process and human resources are central to capacity development. (UNDP, 1998)

Capacity building consists of three basic elements (Alaerts *et al*, 1991):

- Creation of an enabling environment with appropriate policy and legal frameworks;
- Institutional development, including community participation; and
- Human resources development and strengthening of managerial systems.

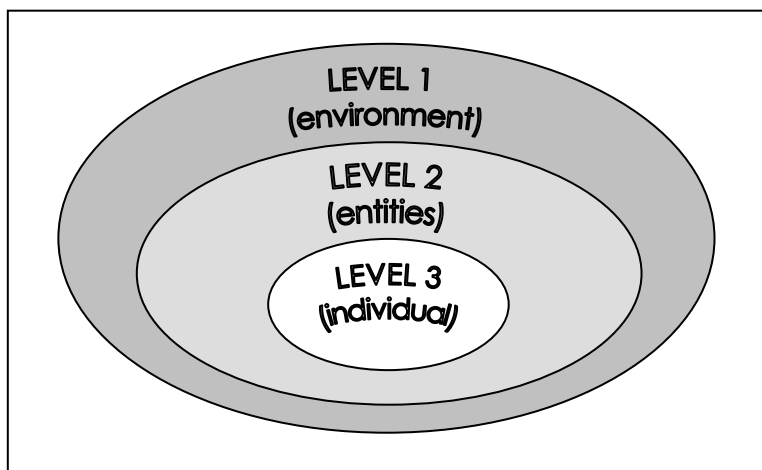
Capacity Assessment

An essential step in planning programmes is to diagnose the requirements—assessing capacity requirements, as well as identifying the most suitable change strategy, considering the enabling environment (UNDP, 1997).

Capacity assessment is a structured and analytical process whereby the various dimensions of capacity are assessed within the broader systems context, as well as evaluated for specific entities and individuals within the system (UNDP, 1998).

The Figure 1 graphically illustrates that capacity issues can be analysed at three levels. Often, capacity issues are first addressed at the individual level, then at the organisational or entity level. However, as noted above, capacity must be understood at the systems level as well. By definition, a system is a regularly interacting or interdependent group of items forming a unified whole.

Figure 1 Levels of capacity within a systems context



Source: UNDP (1997). Capacity Assessment

It is clear that there exists a diverse range of analytical techniques and methodologies that can be applied to assess capacities of the various dimensions at each of the three levels, and there simply cannot be a “one - size - fits - all” set of guidelines to cover the extremely diverse range of possibilities. Accordingly, partnerships with stakeholders and beneficiaries carry out the assessment. Key stakeholders include national experts, resource suppliers, service users, consultants, and others with a direct interest in the outcomes. In that sense, a *stakeholder analysis* could be carried out to determine precisely who should be involved, the nature of their involvement (role, responsibilities, accountabilities; direct or indirect involvement), and magnitude of involvement (e.g., full or part-time, specific activities only) (UNDP, 1998).

Before initiating an assessment, it is important to define the parameters of the programme, mostly based on the political will and resources. In summary, this capacity assessment approach involves four activities (UNDP, 1997):

1. Set the starting point or baseline of the programme
2. Establish clear objectives to achieve
3. Determine a strategy (methodology) to meet the objectives
4. Estimate the capacities needed to implement the strategy and achieve the objectives

The result of the first three steps comprises a list of interrelated objectives that address the overall environment, entities and individuals—as well as strategies to reach these objectives. After that, the fourth step is to identify capacity requirements for each level:

1. Environment: capacity development requirements at the highest level address the needs of the larger systems— themes, sectors, institutions and geographic boundaries. The requirements at this level include policies, strategies, legislation;

and capabilities to coordinate, manage changes and implement programmes.

2. Organisation level: capacity requirements include: vision and mission, strategy, policies and values, competencies and functions, processes (internal and external), human resources and financial information and physical resources.
3. Individual core capacity development takes place at the individual level. The emphasis is on continuous and incremental learning, formal and informal training, skills development, improved human resource policies, incentives and improved information and accountability systems (UNDP, 1998).

By assessing the capacity requirements of each level, hierarchies of interrelated objectives are defined—starting with those for policy and management, moving to the organizational and group requirements and, finally, the individual objectives. Each level of objectives relates to complementary inputs, activities, and outputs. Outputs will reflect capacities achieved; activities will describe the actual acquisition and development of capacities and the related changes needed in policies, structures, systems and competencies; while inputs will include the contributions of all the stakeholders involved in the process (UNDP, 1997).

Capacity Building in the Water Sector

The Long-Term Vision for Water, Life and the Environment, most commonly known as The World Water Vision, underlined the importance of the water resources. After that, management of water resources infiltrated through the entire society involving different organisations, stakeholder groups, social classes, urban and rural populations, generations and gender (IHP, 1999; Cosgrove, 2000).

Water related education concerns the knowledge of the hydrological cycle, including resources assessment, monitoring, and management. The capacity building strategy for the water sector reflects the whole range of education, including pre-school, primary and secondary educational levels, vocational training, university and professional education at undergraduate and postgraduate levels, lifelong continuing education and training, as well as the informal and innovative ways of knowledge and information transfer (IHP, 1999).

Within this framework, universities and other institutions for higher and continuing professional education have to innovate in both content and methodology of education. Higher education includes the preparation of teachers and trainers to their tasks to educate the young generation at schools, institutes and universities. In this context, the essential role of research in education and training cannot be overemphasized (IHP, 1999).

In order to translate the strategy formulated, in the World Water Vision, into action, an approach was proposed to meet the needs for water related education and training in the formative years, vocational training, university education, continuous learning and research capacity strengthening (Van der Beken, 2002, IHP, 1999).

Postgraduate education, including water disciplines such as engineering, hydrology, economics, environmental sciences, water resources management and environmental law, will produce the water professionals of the future. In order to tackle complex water

related problems they need to have the ability to interact with each other on water quantity and quality issues, particular from the points of view of hydropower engineers, irrigation engineers, water and sanitation engineers, hydrologists, environmentalists, economists, lawyers and other specialists (Cunge and van der Beken, 2003, Van der Beken, 2002, IHP, 1999).

Regarding the water and sanitation sector, the requirements for a given level of service will determine the capacities required in those responsible for ensuring sustainability at the local level. Although the factors required for sustainability will vary depending on the level of service, all systems will need capacity in certain general categories including skills and abilities, public awareness, and economic factors to support the investments in infrastructure. Moreover, the amount capacity building required for a given category will depend both in the capacity already available within the community, and the level of service and the technology chosen (Abrams, 1996).

2.3 Region of Latin America and the Caribbean

Profile of the region

The Latin America and Caribbean Region includes Antigua and Barbuda, Argentina, Belize, Bolivia, Brazil, Chile, Colombia, Costa Rica, Dominica, Dominican Republic, Ecuador, El Salvador, Grenada, Guatemala, Guyana, Haiti, Honduras, Jamaica, Mexico, Nicaragua, Panama, Paraguay, Peru, St. Kitts and Nevis, St. Lucia, St. Vincent and the Grenadines, Suriname, Trinidad and Tobago, Uruguay, and Venezuela.

Latin America and the Caribbean is a region of staggering diversity, with 525 million people who speak Spanish, Portuguese, English, French and some 400 indigenous languages. Its topography and ecosystems range from those of tropical islands to high mountains and plateaux, rainforests, deserts and extensive plains. It includes the entire continent of South America, the Central American isthmus, the large and small islands of the Caribbean Sea, and Mexico, which is part of North America. Latin America and the Caribbean is one of the most urbanised regions in the developing world, with three-quarters of its people living in and around cities. A comparison among the level of urbanisation in the major regions of the world is observed in the Table 1.

Table 1. Urbanization levels for selected major world regions, 1925-2025 (percentage)

<i>Region*</i>	<i>Year</i>				
	<i>1925</i>	<i>1950</i>	<i>1975</i>	<i>2000</i>	<i>2025</i>
World	20.5	29.7	37.9	47.0	58.0
More developed regions	40.1	54.9	70.0	76.0	82.3
Less developed regions	9.3	17.8	26.8	39.9	53.3
United States and Canada	53.8	63.9	73.8	77.2	83.3
Latin America	25.0	41.4	61.2	75.3	82.2
Europe	37.9	52.4	67.3	74.8	81.3
Oceania	48.5	61.6	71.8	70.2	73.3
Africa	8.0	14.7	25.2	37.9	51.8
Asia	9.5	17.4	24.7	36.7	50.6

* Regions are ordered by level urbanization in 2000.

Source: Lattes, Rodriguez and Villa (2002).

However, natural resources and agriculture are important to many of its economies,

which include some of the developing world's largest, such as Brazil and Mexico, and some of the smallest such as Saint Vincent and the Grenadines, Grenada and Dominica. It means that a general overview of the region would hide realities going on, especially in those small countries where, due to its low population and special characteristics (most of them are islands) are not representative for the complete set of countries in the region. Despite immense resources and dynamic societies, deep inequalities of wealth persist in most Latin American and the Caribbean countries, with around one-third of the region's people living in poverty.

Population

The Region of Latin America and the Caribbean has experienced considerable population growth, tripling in the second half of the 20th Century, going from less than 170 million inhabitants in 1950 to 500 million at the end of 2000, and expecting to achieve more than 630 million inhabitants by 2015 (ECLAC, 1999; Brea, 2003). See annexes.

An important characteristic of the regional demography is the continuous migration of the rural population toward the cities, which at the end of the 1990s resulted in the predominance of urban population over the rural in the region as can be observed in the Table 2.

Table 2 Population in the region

Country/Territory*	Urban Pop.**	%Urban	Rural Pop.**	% Rural	Total Population**
Brazil	126.77	78	35.02	21.64	161.79
Mexico	70.46	73	25.34	26.45	95.8
Colombia	28.72	70	12.05	29.56	40.77
Argentina	32.48	88	4.1	11.2	36.58
Peru	16.97	68	7.83	31.58	24.8
Venezuela	18.89	89	2.21	10.49	21.1
Chile	12.72	85	2.2	14.73	14.92
Ecuador	7.64	62	4.54	37.29	12.18
Cuba	8.38	75	2.76	24.8	11.14
Guatemala	3.88	34	7.21	65.02	11.09
Dominican Republic	5.26	64	2.96	35.99	8.22
Bolivia	4.77	60	3.18	40	7.95
Haiti	2.62	33	5.12	66.19	7.74
El Salvador	3.13	50	3.03	49.25	6.16
Honduras	2.79	46	3.2	53.45	5.99
Paraguay	2.91	53	2.5	46.26	5.41
Nicaragua	2.51	53	2.18	46.38	4.69
Costa Rica	1.44	43	1.9	56.89	3.34
Uruguay	2.92	90	0.3	9.2	3.22
Panama	1.53	55	1.24	44.79	2.77
Jamaica	1.27	49	1.29	50.39	2.56
Trinidad and Tobago	1.25	100	0	0	1.25
Guyana	0.18	24	0.57	76	0.75
Suriname	0.3	69	0.13	30.52	0.43
Bahamas	0.25	83	0.05	16.78	0.3
Barbados	0.27	100	0	0	0.27
Belize	0.12	50	0.12	49.64	0.24
Saint Lucia	0.15	100	0	0	0.15
Saint Vincent and the Grenadines	0.06	54	0.05	45.2	0.11
Antigua and Barbuda	0.04	60	0.03	40	0.07

* Countries ordered by population in December 1998.

** (Population in million)

Source: Rangel (Ed.) (2001)

Unemployment, low income, violence and local conflicts motivate both displacement and emigration of the population from rural areas to the cities in the region. Moreover,

the application of more developed technologies in agricultural activities diminished the demand for rural labour (Cerrutti, 2003). The complete relation of rural and urban population per country is shown in the annexes.

During the second half of the 20th Century, peri-urban areas developed as a big problem in large and many medium cities of Latin America. These marginalized areas, for the most part consisting of people displaced or emigrants from the rural areas, have grown very rapidly, creating complex social, economic, and sanitary problems. The inappropriate location of their settlements, usually located in plots illegally occupied or zones with high risks of natural disasters, do not allow the local governments and service providers to deliver water and sanitation services on a regular basis. In this sense, these inhabitants have fewer possibilities to access to adequate drinking water supply and sanitation services.

Population migration has not only occurred in terms of rural and urban environment, but also in terms of developing countries toward the most developed and rich countries. In addition, the occurrence of belligerent conflicts, as in some Central American countries and in Colombia, has also affected this phenomenon of population displacement.

Economic overview

During the 1960s and 1970s, per capita Gross Domestic Product (GDP³) in Latin America expanded at annual average rates of 2.5% and 3.5% respectively. Conversely, the 1980s and 1990s were decades of general economic crisis with real income per capita falling in the 1980s (commonly referred to in the region as "the lost decade") and only rising at an annual average rate of slightly over 1% in the 1990s (Ocampo, 2003).

The origin of these two decades of near stagnant per capita growth is traceable to the economic buoyancy of the 1960s and 1970s, which led these economies to take on unsustainably high levels of foreign currency denominated debt. The prices of the commodities, on which these economies were largely dependent, fell sharply because of the worldwide recession in the decade of the 1980s. Only Colombia succeeded in avoiding defaulting or having its foreign debts compulsorily rescheduled, the rest faced severe fiscal problems. The immediate general response to this latter problem was to resort to printing money thereby engendering inflation, and in some cases, most notably in Argentina and Brazil, hyperinflation (Ocampo, 2003).

In order to overcome inflation and to promote a return to a sustainable pattern of growth, all of these economies, including Cuba, liberalised their economies to varying degrees. The essence of these reforms, the implementation of which has been in some cases a source of considerable domestic controversy, consists of tighter fiscal and monetary control, greater openness to foreign investment, the introduction of flexibility into labour market regulations and the implementation of large-scale privatisation programmes. The greater insertion of these economies into the global marketplace has resulted in significant changes in production systems and labour organisation. This,

³ The GDP is the sum of value added by all resident producers in the economy plus any product taxes (less subsidies) not included in the valuation of output. It is calculated without making deductions for depreciation of fabricated capital assets or for depletion and degradation of natural resources. Value added is the net output of an industry after adding up all outputs and subtracting intermediate inputs.

alongside the large-scale redundancies made in the public sector as part of their restructuring, has led to a considerable fall in labour demand in the formal sector, particularly among the unskilled, thereby further accentuating both the importance of the informal sector and the unemployment (Ocampo, 2003).

Human development

Though overall economic performance has been weak, all of these countries, with the exception of Guatemala, have been successful in converting income into human development. Comparing their rankings on the basis of the United Nations Development Programme's (UNDP) Human Development Index (HDI)⁴, with their rankings by per capita GDP, for 10 of them their most recent HDI ranking was higher (for two, Ecuador and Nicaragua, they were the same). This indicated that they have been able to advance their human development goals beyond the levels achieved by their economic peers.

In this regard, Cuba was particularly successful, its HDI ranking being 47 places higher; mention should also be made of the fact that though the UN classifies none of the countries of the region as high-income societies. Argentina, Chile, Colombia, Costa Rica, Mexico, Panama, Uruguay and Venezuela were all classified as "high human development nations".

These performances would have been much better if the advances in health, which continued through and despite the turbulent 1980s and 1990s, would go in parallel with improvements in education. Even where governments have maintained their commitment to education and training and endeavoured to limit the extent of financial cutbacks, austerity measures have often compromised access, quality, or equity, indeed, sometimes all three.

It is still considerably below twelve years, judged by the Economic Commission for Latin America and the Caribbean as the education necessary to earn a wage that will make it possible to rise above poverty in the course of a person's active life. However, this average masks the disparities existent. Those disparities depend on the income of the parents, and the type of area where they live (rural or urban).

Based on the UNDP's composite measure of human poverty, the Human Poverty Index (HPI)⁵, poverty affects more than 5% of the population of all of the countries of this region with the exceptions of Argentina, Chile, Costa Rica, Cuba and Uruguay. In Bolivia, El Salvador, Guatemala, Honduras and Nicaragua this lack of progress is over 20% of the population.

⁴ The HDI is a composite index measuring average achievement in three basic dimensions of human development—a long and healthy life, knowledge and a decent standard of living.

⁵ The HPI is a composite index measuring deprivations in the three basic dimensions captured in the human development index—a long and healthy life, knowledge and a decent standard of living.

Urbanisation level

More than 70 percent of the population in Latin America and the Caribbean live in urban centres. Winpenny (2003) states that looking ahead to the next 25 years; the urban populations in Latin America and the Caribbean will increase by 50%. It is the most urbanized region in the developing world and nowhere is the urbanisation of poverty more evident (Cerrutti, 2003).

In Latin America and the Caribbean, 361 million people of the total population of 491 million live in cities. This proportion of near 75 percent reflects a predominantly urbanized continent. Demographic experts predict this indicator will increase to 78 percent by 2015, with close to 400 million people living in Latin America and the Caribbean urban areas. While still growing rapidly, Latin America and the Caribbean urbanisation rates are stabilising. Within the context of slower urbanisation growth, the underlying pattern of urbanisation has changed during recent decades. Through the 1960s, urbanisation patterns in Latin American countries focused primarily on a capital, such as Mexico City, Lima, and Panama City. Exceptions were dual-city growth in Ecuador (Quito-Guayaquil) and Brazil (Rio de Janeiro-São Paulo), as well as Colombia with an urban network of several large cities. More recent census data reflect changes in this trend. The largest cities are growing less quickly than expected (e.g., Mexico City, São Paulo), and a more balanced and distributed growth among other large and medium-sized cities is evident in the region (Cerrutti, 2003).

Following substantial migration flows to Latin American and the Caribbean cities, many unskilled people faced extremely limited job and income opportunities. One result of this trend is the estimated 58 million people who live in poverty in Latin American and the Caribbean urban areas. This represents one out of every five urban dwellers in the region. In comparison, 52 million Latin Americans rural area inhabitants live below the poverty line. Although this represents approximately one half of rural people, the concentration of total poverty in urban areas, i.e. 58 million of a 110 million in poverty (or 52%) highlights the need for poverty alleviation and economic stimulation efforts in urban areas (USAID, 2004).

Due to the lack of formal employment opportunities, many of the urban poor resort to income generation through the informal economy, which represents more than half of urban employment in many Latin American and the Caribbean urban areas. The existence of thousands of street vendors is a major feature of cities such as Mexico City, São Paulo and Lima. Even smaller cities such as Cali or Salvador face the same situation, where these vendors often live precariously day-to-day, operating with little or no access to capital and without the skills necessary to foster the increased productivity and success of their enterprises. Latin America and the Caribbean income inequality indicators are some of the highest in the world. In many of the metropolitan areas of this region, such as Panama City, Mexico City, and Tegucigalpa, a stark contrast highlights between the extreme poor and rich by the juxtaposition of peripheral area shantytowns with wealthy urban dwellers luxurious environs (USAID, 2004).

At the same time, enormous, disenfranchised youth populations, plagued by high unemployment and disappointed with politicians who are either unable or unwilling to respond to their needs, challenge them. Unmitigated, the problems of Latin American cities limit economic growth prospects, perpetuate poverty, feed violence, crime and civil disorder, and threaten stability and democratic values that have been hard gained

over the past two decades (Cerrutti, 2003).

Regional status regarding MDGs

This region has the potential to reach many of the MDGs. Although it is a relatively wealthy (compared with Africa and developing countries of Asia), it is also the most unequal region in the world. Inequalities are high both across and within countries. The region includes two very poor countries (Haiti and Nicaragua) and regional averages for country indicators mask wide disparities in social indicators by income, ethnicity, gender and geographic location. Regarding water and sanitation, more than 130 million people do not have safe drinking water in their homes, and only 86 million have connection to adequate sanitation systems, reflecting access inequity. The percentages of population without drinking water services and sanitation are 5 times higher in rural areas than in the cities (PAHO, 2003).

Since 1960s, the evaluation of drinking water and sanitation services has been carried out under the regional coordination of the Pan-American Health Organisation, and in the last decade indicated significant progress in the delivery of these services in the Latin America and the Caribbean (WHO et al., 2000). However, significant challenges related to improvement in the efficiency and quality of the delivery of the services still persist.

Although sanitary services have received considerable investments, the benefits achieved by the population in these areas though improved, in many cases has been less than expected, due to steady growth, and in some instances, the explosive expansion of, especially, marginalized areas. The lack of full employment among many of the residents, has made the cost recovery of services difficult, which results in deficient operation and maintenance of the systems, and most serious, the deferment of investments. In most of the cases, due to the limited resources of the sector, the Government tends to allocate the resources available in urban areas rather than rural ones, where people have less both power in political circles and access to the decision-making level.

In Latin America and the Caribbean, 85% of the population has drinking water services, either with connection or with easy access to one public source (WHO, UNICEF and WSSCC, 1999). Comparing the evolution of these services in Latin America and the Caribbean with other regions of the world during the last three decades, the coverage situation is reasonably acceptable. However, in terms of universalisation of coverage, the absolute numbers are troubling, when taking into account the fact that the remaining 15% (over 75 million people) do not have access to some form of reliable drinking water free of health hazards. Furthermore, some 54 million people (about 11%) are supplied through systems defined as "easy access". If hygiene, sanitary surroundings and health education are taken into account, then these systems pose a significant health risk, mainly to the most vulnerable populations, such as children and the elderly (Rangel, 1999).

In addition, in Latin America and the Caribbean, intermittent water supply systems serve more than 219 million people, who represent 60% of the population served through household connections. Considering that control, surveillance, and certification of the quality for these systems are almost nonexistent in the region, these systems constitute a latent danger for the users, increasing the possibilities of exposure to

diarrhoea and other water-borne diseases (PAHO and WHO, 2001).

The population without drinking water services is five times higher in rural areas compared to the urban ones. Regarding the latter, problems in delivery of services are serious in peri-urban areas, mainly in the poverty belts that are around the large cities of Latin America and the Caribbean. In the rural areas, with regard to drinking water supply, the solutions are thought almost exclusively toward technical issues and to the selection and use of appropriate technology to the environment. Mobilisation and community participation is included in most of the cases as a cost reduction option of local labour supply, without providing a comprehensive view of the operation of the systems and the long-term problems of operation and maintenance of installations. In this context, in the rural environment, the results in terms of functionality and acceptance of the infrastructure, lead to solutions with systems categorized by the community in many cases as "second class" (PAHO and WHO, 2001).

After the reappearance of cholera in the region in 1991, a majority of the countries increased the monitoring of drinking water quality and improved its control, in particular the disinfection of water distribution systems. The disinfection of water was introduced at the household level where there were no collective public supply systems, and where they operated intermittently. In 1995, 23 countries of the region notified that the majority of the people that lived in urban communities received water in accordance with WHO guidelines for drinking water quality (PAHO, 1999). In rural areas, the disinfection of the drinking water systems has progressed, however many problems still need to be solved. The problems include lack of reliable chlorine supply, lack of continuous operation, and inadequate maintenance of the systems at the local level. It has been, and continues to be, obstacles to ensuring quality water for all populations on a continuous basis (Rangel, 1999).

In the region, only 49% of the population have connection to conventional sanitary sewerage systems and additional 30% have service with *in situ* sanitation systems, such as latrines or septic tanks. More than 100 million people, 21% of the population, do not have systems for wastewater and excreta disposal. From them, almost 40 million (10% of the urban pop.) are in urban areas while 66 million (50% of the rural pop.) in rural ones. Consequently, the great challenge relates to the need for increase coverage in sanitation services, and improvements in the performance of sanitary sewerage systems and alternative *in situ* technological models. The Evaluation 2000 (WHO et al., 2000) indicates that only 14% of the wastewater collected by the few existing sewerage systems has any type of treatment (see annexes). The situation becomes more troubling since regional experts have indicated that the efficiency of these treatment systems is very low (Rangel, 1999). The lack of wastewater treatment continues to be one of the most serious sanitary problems in the Region. The high costs of conventional treatment installations, operation and maintenance represent a serious obstacle in developing countries. The alternative is the utilisation of low-cost technologies that provide adequate solutions to the problem (WHO et al., 2000). More detailed information regarding the general state of the sector is included in the annexes.

Concerning the regional sanitation problems, several critical areas are identified but are still without solutions. These include insufficient political support of governments for pertinent sectoral institutions, a lack of sanitary awareness among the population, and the need to change the methodologies and criteria used for financing installations

necessary for wastewater treatment (PAHO and WHO, 2001).

Evolution of the Coverage

Since the 1960s WHO and PAHO have made periodic evaluations of the drinking water and sanitation sector based on national data both provided by national countries and primary sources by means of surveys (WHO *et al.*, 2000). These evaluations are done every five years and serve as an important reference for elaboration of policies and actions for the sector at the global, regional and mainly at the national levels (WHO *et al.*, 2000). This process of periodic evaluation started in Latin America in the 1950s, and subsequently the English-speaking Caribbean, Guyana and Suriname were included. (WHO *et al.*, 2000)

Considering that the decade of the nineties corresponded to a change of century and millennium, it was decided at the end of the millennium that the scope of the evaluations should be expanded beyond previous evaluations, including a permanent database to continuously show and update the information. In general, the evaluations show a growth in population and coverage for Latin America (PAHO and WHO, 2001).

Traditionally, in Latin America priority was in the coverage aspects of water quality and services. It is possible that the importance that was given to improvements in water quality, disinfection and sanitation at the beginning of the 1990s was in part due to reorientation in investments allocation generated by the outbreak of cholera that affected several countries of the region, at the expense of resources previously devoted to increasing coverage in water. This could explain the slower increase in these aspects in the decade of 1990 (PAHO and WHO, 2001). The evolution of coverage in drinking water and sanitation in Latin America and the Caribbean is shown in the table 3.

Table 3 Evolution of coverage in drinking water and sanitation

<i>Year</i>	<i>Total*</i>	<i>With Water</i>		<i>With Some Degree of Sanitation</i>	
1960	209	69	33%	No data	--
1970	287	152	53%	No data	--
1980	339	236	70%	200	59%
1990	429	341	80%	284	66%
2000	497	420	85%	393	79%

*(population in million)

Source: WHO/PAHO (2001)

In the Region of Latin America and the Caribbean, increase in the coverage of water supply and sanitation in urban areas implies the expansion of the infrastructure or the improvement in operational conditions of existing installations. In several cases the facilities require rehabilitation and expansion. Old pipes frequently present serious problems of leakage that can be solved only by replacement.

In the countries of the region, serious deficiencies still exist in the operation and maintenance of buildings and equipment. This causes discontinuity in service provision, leakages in the distribution systems, disinfection failures, and faulty meters. All of which contribute to reduce the efficiency of the service in terms of quantity (continuity) and quality of the water available to the users. The problem of leakages in the distribution systems is often one of the causes for the lack of water in distant areas,

which has great impact on the financial imbalance of the institutions due to the quantity of unaccounted-for-water (PAHO and WHO, 2001).

With regard to sewerage systems, coverage increase implies the expansion of the infrastructure: networks and treatment systems. Urban growth in many cities of the region has resulted in sanitary sewerage systems obsolete and unable to cope with the growing quantity of domestic wastewater and industrial effluents. Studies conducted in the Region indicate a large number of wastewater treatment installations abandoned or functioning precariously (Rangel, 2001).

In Latin America and the Caribbean region, there are sufficient developments in the water supply and sanitation coverage, with over 85% of the region's population having access to improved water and sanitation facilities. The chances of countries in this region meeting the water & sanitation MDG are mixed, but achievable nonetheless. However, Haiti stands out as a country in need of urgent external assistance, with as little as 28% of the population with access to improved sanitation due to its incapacity to supply water and sanitation services to most of its population (PAHO and WHO, 2001).

Inequities in Access and Use

Inequity in the delivery of basic services, particularly drinking water supply, among the most economically disadvantaged groups is of great concern in the countries. A study using multiple purpose household surveys was conducted on the general conditions of dwellings and inequities in supply, use, and expenditure of drinking water. The study was conducted on eleven countries of Latin America and the Caribbean: Bolivia, Brazil, Chile, Colombia, Ecuador, El Salvador, Jamaica, Nicaragua, Panama, Paraguay, and Peru (PAHO and WHO, 2001b).

Inequities in access to drinking water services for families relate to inequities at the levels of expenditure/income of the same. In the various countries analysed, access and use of drinking water services with household connection increased to the extent that there are population groups with higher levels of expenditure/per capita income. Differences in access to drinking water are not due exclusively to differences in family income or expenditures. In the rural areas, a small portion of people has access to water supplied by domiciliary connection, even though the comparison is among groups of similar income levels. The low population density of the rural areas makes impossible to meet the specific fixed costs of the investment in public networks, explaining these differences. Moreover, the capacity of these areas in capturing the attention of the authorities and public investment funds is limited and therefore the opportunities to access to drinking water services are lower. Differences in access to and use of drinking water services between urban and rural areas are such that not even high-income families' in rural homes with household connections reach that of the poorer families in urban areas. Inequity in access to drinking water through household connection is not always greater in those areas where inequity in the distribution of income is also greater. In some countries, access to household connection services in urban areas can be quite homogeneous among the different homes even though in terms of distribution of income there is great inequity. On the contrary, it is possible to find situations where there is great inequity in terms of access and not so in terms of income or family expenditure (Rangel, 2001).

Moreover, in some countries the rural areas present average levels of access to drinking water with very low household connection and in turn with low indexes of inequities referred to the family income/expenditure. This implies a scenario in which access to water is deficient for all. In the countries where situation of the systems was analysed with regard to the regularity of the water supply, it was found that continuity is not always greater in areas where families with greater income live. This is associated with the quality of the delivery of the service, with the possible existence of restrictions of the water resource, and the operation and deficient maintenance of the systems (Rangel, 2001).

The requirements to achieve the MDGs in water and sanitation

Different factors affect the degree of success in the implementation of a strategy to achieve the MDGs in water and sanitation. Political, institutional, financial and human factors are essential to achieve the success in this task (UN, 2000; Annan, 2000; UN, 2001; Sachs, 2001; Devarajan *et al.*, 2002; Figuères, 2003; ECLAC *et al.*, 2003; IDB, 2003, McGranahan, 2003; WSSCC, 2004).

Political factors are mostly represented by the will of the politicians to support activities that lead to the achievement of these goals. In this regard, the signature of the Millennium Declaration by all the Heads of State of the region is assumed as a proof of their will. It means that all the governments in the region support policies, regulations, and actions the activities carried out to reduce the number of people without access to water and sanitation services in the region (UN, 2000; Annan, 2000; UN, 2001; WSSCC, 2004).

Institutional factors are mostly represented by the functioning of the institutions related to water and sanitation in the countries.

The main reasons that explain the inadequate performance of the sector in the past are mostly related to:

- The inefficiency of the organisations responsible for the sector, and their inability to set appropriate policies that implemented allow an adequate management of the service providers, including setting of tariffs that guarantee the cost recovery and self sustain.
- The inappropriate institutional framework of the sector resulted in the overlapping, confusion, and excessive involvement of politics in the functions of services provision, setting of policies, and control of the service providers.

In order to overcome these deficiencies, and make more efficient the performance of those institutions, reforms have been implemented in most of the countries in the region. In some others, reforms are under implementation in order to improve the performance of the institutional frameworks in all the countries. Reforms will include the separation of the activities related to policymaking and planning, and service provision and systems administration. The regional experience suggests this division is essential when the services provision is decided to be privatised, and highly recommended when the delivery of the services is going to be kept public (ECLAC, 2000; Jouravlev, 2001). In this regard, with the improvement of the conditions to perform the sector, institutional factors are not bottlenecks in the achievement of the MDGs in water and sanitation (Jouravlev, 2001).

Regarding financial factors, several studies have been made (Briscoe, 1995; Camdessus, 2003; Devarajan *et al.*, 2002, Fay, 2000; Fay, 2003; IDB, 2003a; IDB, 2004b; Mehta, 2003; Mehta, 2004; Pargal, 2003).

Investments in infrastructure for water supply and sanitation during the period 1995-2005 reached approximately USD 15 billion per year in the region (Fay, 2000), see more details in the annexes. Moreover, on November 2003, during the inauguration of the Conference on Financing Water and Sanitation Services in Latin America, the President of Inter-American Development Bank stated the investment needs of about USD 40 billion in the next 12 years to meet the Millennium Development Goals (IDB News, 2003). Additionally, in January, he claimed that an annual investment of USD 10 billion was necessary for water systems (Agua Latinoamerica, 2004).

The issue of human resources has not received much attention, although capacity building in the sector was a matter of concern during the last decade (Alaerts *et al.*, 1999; Alaerts *et al.*, 1991; van der Beken, 2002; IHP, 1999; Biswas *et al.*, 1996; Cunge and van der Beken, 2003; Galvis, 2001; Kolsky and Cotton, 1996). Accordingly, few studies assessed the local capacities in the water sector of developing countries (Anwar, 1991; Sureshbhai, 1993; Patel, 1993).

Recently, UNESCO made an estimate: to reach the MDG, Africa will need 3.5 times the number of water experts it has now, Asia 2.5 times more and Latin America 0.5 times as many (Figuères, 2003). Although the estimations have been made public, the analysis behind of them has not. Therefore, the reliability of those figures is reserved, and background information is not available. Inventories regarding the human capacities in the sector have taken place in the past (Cairncross, 2004), although studies regarding the current situation have not been found. Therefore, there is not a clear idea about the available capacities and the capacities needed.

The Higher Education

Approximately half of the students in higher education today live in the developing world (Maldonado, 2002).

It is not possible to speak of the higher education in Latin America as a whole, when the countries in the region are so different and their higher education systems so diverse. Enrolment rates vary from 47 percent of the age cohort in Argentina, to 11 percent in Nicaragua (UNESCO, 2001). The complete range of variations may be observed in the Table 4.

Table 4. Gross enrolment ratios in tertiary education (GER), 1990 and 1998

<i>Country</i>	<i>Enrolment rates 1990</i>	<i>Enrolment rates 1998</i>
Argentina	39	47
Uruguay	30	35
Chile	20	34
Costa Rica	28	31
Venezuela	29	29
Peru	30	28

Bolivia	21	28
Colombia	14	21
Cuba	21	19
El Salvador	16	18
Mexico	15	18
Brazil	12	13
Honduras	9	12
Nicaragua	7	11

Source: UNESCO (2000)

Regarding private enrolments, they range from 71 percent in Chile to 0 percent in Cuba. Both enrolment rate and private participation in higher education have slightly increased since the last evaluation made by 1990 (UNESCO, 2001). More detailed results are included in the table 5.

Table 5. Private participation in tertiary education in selected countries, 1998

<i>Country</i>	<i>Private enrolment rates</i>
Argentina	21
Uruguay	11
Chile	71
Bolivia	18
Cuba	0
El Salvador	75
Mexico	29
Brazil	61

Adapted from: UNESCO (2001)

Institutions for higher education in Latin America also differ in various aspects. Some of the old Catholic universities in Spanish America were created in the 16th century, while the first universities in Brazil date from the 1930s. In some countries, private universities focus on the elite, while public universities receive inadequate financial support and students with limited resources and modest educational backgrounds. In others, public higher education is highly selective and of good quality. There, poorer students, mostly from low-quality schools (also public), have to look for places in low-cost, low-quality institutions, such as night schools (Schwartzman, 1999).

Although the global trend is the movement toward the access of higher education to all, a common feature in the countries of Latin America is the inability of governments to keep the pace in responding to the demands, except for Argentina and Uruguay, which have reached European levels of student enrolment through public education. Brazil and Colombia, where although the public system is small, the private sector supplies most of the growing demand (Fernandez, 2002; Arrosa, 2002; ICFES, 2002).

In all cases, public institutions for higher education are coming under strong pressure to produce more, in quantity and quality, for the same amount or fewer resources; the private system, as it moves in to fill the gaps, will press for public subsidies and be questioned about the relevance of its products and services (Schwartzman, 1999).

While universities in Latin America and the Caribbean cherish their traditions of academic autonomy, they have always avoided administrative self-rule-taking responsibility for managing resources, establishing priorities, and making approaches

and ends meet. These are things the private sector deals with, and public universities have to deal with, if they are to become more efficient and cost-effective (Schwartzman, 1999).

The most challenging issue for institutions for higher education has had to do with content. Higher education institutions in Latin America were established to provide education and certification in the established professions of law, medicine, and engineering. New institutions have grown by creating second-rate versions of the traditional professional schools, providing the same titles with low level of recognition among the public. The consequence was increasing frustration, as people found themselves with second-class titles, while the practitioners of the traditional professions felt threatened by the growing and less qualified competition graduated in the new institutions. Moreover, the bigger offer of professionals available threatened the fair competition between well and ill qualified professionals. In that sense, the competency is based in quantity and not in quality, leading to low wages and poor incentives to perform (Schwartzman, 1999).

In the 1960s and 1970s, it was thought that the introduction of American-style graduate education and academic research would be the solution to this situation. As higher education continued to expand, the graduate and research programs of the 1960s and 1970s remained, at best, islands of quality and competence, without extending much beyond their establishments.

A completely new environment for higher education may emerge in the region: with less state-sector and more private-sector education; wider use of evaluation and external assessment; introduction of new organizational structures and a more managerial culture; expansion of technical, vocational, and general education; and extending overall access. Some countries and institutions respond better than others to these changes. Those that succeed will likely be better able to use another feature of globalisation in the new century, the easy access to information, communication, technical assistance, and exchange on a truly global scale (Schwartzman, 1999).

Higher education in the Water Sector

In the region of Latin America and the Caribbean, several training programmes are already available in the region in various universities, polytechnic academies and institutes (PAHO-WHO, 1991). The deficiency of many of the present training programs for engineers is that they still pay attention exclusively to technical subjects (Kolsky, 1996). Although in the last decades, it has been discovered that many projects failed due to a too rigid approach. Non-technical questions such as community participation, costs recovery, and hygiene education have acquired more importance. Nowadays, sociological issues and institutional framework are as important as technical issues for the success of the water and sanitation projects (Cairncross, 1992; Kolsky, 1996; Galvis, 2001).

In some cases, it is possible to be centred in the undergraduate or graduate programs, but in other cases, the university could carry out programs that include refresher or short courses. Several countries of the region have the ability to implement human resource development programs for the drinking water and sanitation sector. Nevertheless, in many cases, that capacity is not utilised in a regular and timely fashion. Other countries still do not have the mechanisms or resources to guarantee the education of the

personnel for the sector (IHP, 1999).

The lack of adequate business management in many of the drinking water and sanitation institutions frequently implies the lack of human resources in management and policy making, which has meant a high turnover of the personnel of the sector. This characterises the drinking water and sanitation sector as an employer of trained human resources from other sectors. In the Region, there is concern over the training of staff in companies responsible for water supply and sanitation services, particularly in areas such as technical engineering, business and institutional development. In a majority of the countries, this has led to progress in staff training in the aforementioned areas. However, this concern is only observed in large organisations including central government, municipalities or water service providers (PAHO and WHO, 2001).

In Chile, the quality and capacity of human resources has contributed to the proficient operation of the sector. The country has an excellent system of academic preparation for professionals and technicians in all aspects of sanitary engineering, through universities, professional and technical training centres, and technological centres that promote research and development (PAHO and WHO, 2001).

In addition, some professional associations have contributed to the education and knowledge of human resources of the sector. Similarly, Mexico with the Mexican Centre of Training in Water and Sanitation (CEMCAS), which belongs to the Mexican Institute of Technology of the Water (IMTA), serves as a system for academic training for personnel, at operation level, in charge of providing drinking water services, sewerage, and wastewater treatment (Rangel, 2001).

In a sizable number of countries of the Region, particularly the countries of the Caribbean, there is a shortage of trained human resources in the sector, both in quality and quantity. Consequently, professionals of other specialties have joined the technical cadres responsible for the design, construction, operation, maintenance and management of the institutions related to the sector. Furthermore, due to political interference, low remuneration, and lack of incentives, trained staff quit the companies providing these services in a short period (Rangel, 2001).

Most of the training is obtained through the education system of the countries, including universities, technical schools and industrial training institutions. However, there are water supply and sanitation companies, directly, or through associations or sub regional mechanisms, such as, AWWA, WEF, CAPRE, ANDESAPA, WASA, among others, which carry out specific courses or activities directly related to the activities of drinking water supply and sanitation (WHO/PAHO, 2000).

Throughout the whole continent, the Inter-American Association of Sanitary and Environmental Engineering (AIDIS) organises refresher seminars and short courses to keep updated the professionals of the region. Nationally, non-governmental organisations in the sector in most of the countries of the region (Argentina, Bolivia, Brazil, Colombia, Costa Rica, Cuba, Chile, Ecuador, El Salvador, Guatemala, Haiti, Honduras, Mexico, Nicaragua, Panama, Paraguay, Peru, Dominican Republic, Uruguay, and Venezuela) carry out training activities for professionals, technicians, and workers (WHO/PAHO, 1991). These associations include:

AIDIS Argentina
Bolivian Association of Sanitary and Environmental Engineers (ABIS)
Brazilian Association of Sanitary Engineering (ABES)
Colombian Association of Sanitary and Environmental Engineers (ACODAL)
Costa Rican Association of Water Resources and Environmental Sanitation (ACREH)
Cuban Association of Sanitary and Environmental Engineers (ACIS)
Dominican Association of Sanitary and Environmental Engineers (ADIS)
Ecuadorian Association of Sanitary and Environmental Engineers (AEISA)
Federal Council of Health Services Entities (COFES)
Guatemalan Association of Sanitary and Environmental Engineers (AGISA)
Haitian Association of Sanitary and Environmental Engineers (AIDISH)
Honduran Association of Sanitary Engineers
Mexican Federation of Sanitary Engineering and Environmental Science (FEMISCA)
Mexican Association of Hydraulics (AMH)
Nicaraguan Association of Sanitary and Environmental Engineers (ANISA)
National Federation of Sanitary Workers (FENTOS)
Panamanian Association of Sanitary and Environmental Engineers (PAN Aidis)
Paraguayan Association of Sanitary and Environmental Engineers (AIDISPAR)
Peruvian Association of Sanitary and Environmental Engineers (APIS)
Salvadoran Section of AIDIS
Venezuelan Association of Sanitary and Environmental Engineers (AVISA)
Uruguayan Section of AIDIS

The training covers a broad range of subjects including business, administration, finances, economics, and legal and environmental aspects that complement the academic training at the university level. In addition, graduate courses at the master's and doctorate levels are offered in Engineering with application in Sanitary Engineering (for more information check <http://www.aidis.org.br>).

3 METHODOLOGY

The assessment of professionals required at postgraduate level to achieve the MDGs on water and sanitation was conducted by means of implementing several activities related to needs assessment techniques.

Initially, a review of literature was carried out on five main issues:

- the state of water and sanitation in Latin America and the Caribbean,
- capacity building in the water and sanitation sector,
- water related higher education and postgraduate education,
- needs assessment methodology, and
- expert opinion analysis.

The implementation of needs assessment is observed as the more appropriate method to answer the research questions. The fundamental premise of needs assessment is that in order to make effective decisions about current or future training needs, data must first be gathered. Data gathering is the cornerstone of any needs assessment project.

To find out the data required to answer the research questions, the most suitable manner is made out of numbers, and context. Hence, there is need to elicit qualitative information regarding the topics under study (primary data), and add it to the quantitative data available in the literature found both in the Netherlands and in the region (secondary data).

Elicitation of expert opinion suits as the main source of qualitative data. It is expected from this method to elicit a broad view of the sector, considering the specific issues included in the questions of research. Additionally, it is expected to obtain information regarding other topics that experts may consider of relevance for the study. In this sense, not only the information elicited will be obtained, but also additional information that may help to create a realistic context concerning the performance of sector, and from there, their requirements in qualification, in the region.

Official reports at national and regional levels appear to be the main sources of quantitative data available in the region. It is expected from those data to obtain numerical information regarding the performance of both the water and sanitation sector and the institutions for higher education in the region under study.

In order to draw conclusions applicable for the whole region of Latin America and the Caribbean, the selection of (five) representative countries helps to reduce the uncertainties due to geographical realities. Although the selection of one single country would lead to more detailed findings, it decreases the chances for achieving a more reliable result. In that sense, preciseness is, to some extent, sacrificed, to be more importance to accuracy of the result.

In this research, experts of the water and sanitation sector in the selected countries are approached to request the information required. These local experts, as knowledgeable individuals about the realities of the sector, are the most suitable to forecast the reality within a certain period, and would be able to evaluate the resources needed under these

conditions. It is assumed that scenarios prognosed by the experts are based on the reality of the country (current performance of the sector), and the expected outputs set by the targets. Therefore, information given by them can be comparable within each country.

As the most suitable tool to collect the data required, personal interviewing to selected experts in the region is chosen. Analysis of expert opinion is used to reduce the number of fallacies included in the experts discourse, and diminishes the effect of the personal biases in the result of this study.

In the following paragraphs, this chapter describes the methodology applied along the different stages of the research.

3.1 Needs Assessment

Needs assessment has been found as the most suitable methodology to find out the answers to the research questions. Therefore, in the following paragraphs a short description about the method is presented.

Definitions

Gap is the difference between what is and what should be- the difference between an actual state (what results are) and a desired state (what results should be) (Kaufman, *et al*, 1993).

A needs assessment is a systematic process to setting priorities for future action (Witkin, 1984). A need assessment is a formal analysis that shows and documents the gaps between current results and desired results (ideally concerned with gaps in outcomes), arranges the gaps (needs) in priority order, selects the needs to be resolved. They involve identifying and justifying gaps in result and placing the gaps in prioritised order for attention (Kaufman, 1982).

Approaches

Depending on the extent of intervention intended from the need assessment, several approaches have been created to provide a frame of reference (Gupta, 1999). Those approaches are listed in order of simplicity from the simplest to the most complex.

- Training needs assessment,
- job and task analysis,
- competency-based assessment, and
- strategic needs assessment

Taking into consideration that literature found focused almost entirely in needs assessment for organisations, and in some cases to community needs, no information directly applicable to the scope of this research was found. Therefore, it was necessary to assume a parallel between the organisations mostly approached and the whole water and sanitation sector in the national context.

A training needs assessment is considered as more suitable for this study, since local practices for postgraduates in order to achieve the goals are assumed to be similar in all the countries under study. They include setting of policies, design of programmes to

increase the coverage and implementing and assessing projects.

According to the literature, a strategic needs assessment would be applicable for this study, since the intervention to carry out intends to improve the performance of the water and sanitation sector in all the region, a wider approach than the finally chosen. However, the absence of a common plan to meet the MDGs targets for all the countries, under study does not allow comparisons among them and, hence, it is not possible to draw sound conclusions. Thus, this approach is not applied.

Sometimes constraints are observed by using this method; the follow resistances are included:

- opposition from people who fear change
- interviewees might fear the information may be abused
- experts would resent needless work

Considering the first point is not applicable to this study, measures were taken only in regard to the other two points. Accordingly, in relation to the second point, experts were informed about the scientific character of this research, and the strict confidentiality of the information provided by them. With reference to the third point, an explanation was given about the motivation, purpose and scope of the study, encouraging them to cooperate with the project.

Tools

Several tools may be applied to collect the data in a needs assessment. This study included the application of two techniques for collection of data: review of literature and interviews to experts.

Interviews are recommended for involving people in thinking actively and creatively about problems and needs. Advantages of this tool are:

- respondents can ask for clarification of questions,
- stakeholders who participate are more likely to feel that they have an important part to play in the needs assessment,
- adjustments in methodology can be made to accord with communication styles of different linguistic groups when such differences might affect the needs assessment (Witkin, 1984)

Taking into account that utilisation of several tools contribute to the obtaining of more reliable results; focus groups, surveys and questionnaires, and observation, tools widely applied in this type of studies, were considered to be applied in this study. However, they were not undertaken due to practical reasons. The feasibility to carry out focus groups is very low taking into consideration that experts mostly belong to different organisations in different cities and countries. With regard to surveys and questionnaires, a preliminary survey proved that response rates using online surveys (considered as the easiest and fastest way to get answers back) would be extremely low. Situation worsened considering the long extension of the responses expected to the questionnaire. Concerning observation, the complexity of this task is beyond the possibilities of this (or any) study about this topic. Probably a resources limitless and lifetime project would be able to directly 'observe' the performance of the sector and support the findings obtained with application of the other tools employed.

Review of literature

The review of literature in English, Spanish and Portuguese language was conducted. The full references of the titles reviewed are listed in the Bibliography included at the end of this document. The literature was found in the libraries of UNESCO-IHE Delft, Delft University of Technology, Leiden University, Erasmus University Rotterdam, Utrecht University and University of Amsterdam. Moreover, Internet search has been widely used mainly by means of Google® search engine and water-related websites listed in the useful sites list. Experts interviewed during the research provided additional titles, from the libraries of Inter-American Association of Sanitary and Environmental Engineering (AIDIS) in São Paulo, the Pan-American Centre for Sanitary Engineering and Environmental Sciences (CEPIS) in Lima, the Argentinean Chapter of AIDIS in Buenos Aires, the Brazilian Association of Sanitary Engineering (ABES) in Rio de Janeiro, the University of Brasilia, the World Bank funded Water and Sanitation Program in Lima, and the Mexican National Commission of Water (CNA) in Mexico D.F.

Interviews

Interviews can be seen as conversations with the purpose of gaining in-depth insight into someone's perspective. For this study, interviews were conducted in person. The advantages of an interview are that it is personal and gives the researcher an in-depth understanding of the interviewee perspectives. Interviews help to identify issues and areas of need to explore and or provide input to questionnaire content. These interactive processes have been highly recommended for the need assessment (Witkin, 1984, Reviere et al., 1996).

Personal interviews although more costly and time consuming, involve the nonverbal cues that would help the interviewer redirect the questions. Interviews conducted were conducted in structured manner, with a formal set of objectives and a corresponding list of questions to guide the interviewing process. Moreover, as part of the interview, the interviewee was invited to freely express in confidence (as aforementioned during the introduction to the interview) his/her thoughts, knowledge and experience.

The interview sessions consisted of divided of three main parts. Firstly, the researcher gave a short description of the study to the respond. Then, a copy of the questionnaire was presented to the interviewees and the set of questions was asked. While experts were giving their answers, the analyst followed this process and asked them for their arguments for the responses given. Although this may be interpreted as a possible source of bias introduced by the interviewer. However, experience and other paired comparison studies teaches that experts are in general not easily disturbed by this sort of questions (Rodić, 2000). This study confirmed that finding, answers answered and gave their arguments without hesitation. Finally there was room to the interviewees to remark on additional issues or relevant topics for the research, according to their opinion.

Taking into consideration there is much evidence to support the conclusion that the verbal collected in the social science research practice are very often of dubious validity and reliability (Foddy, 1993), an effort was made in order to overcome problems previously faced. It was made applying an improved question-answer methodology

based on diverse research findings (Foddy, 1993). In that sense, recommendations of several authors such as: Phillips (1971), Cicourel (1982), Douglas (1985) and Brigs (1986) have been used to understand the question-answer behaviour as a communication process in which the respondents must understand the question in the way the interviewer intended, and vice versa.

All the interviews were made in person and most of them in the premises of the interviewees. Questionnaires were given in hardcopy to the interviewees during the meeting. In order to keep the utmost of the information given by the experts, all the interviews were taped in MC-60 micro cassettes using a Sony Microcassette-recorder M-450. These tapes were recorded to be further typed and processed.

Questionnaire

A questionnaire was prepared for the collection of data during the fieldwork by means of personal structured interviews. Mostly open-ended questions were used to give freedom to the experts to express their insights and knowledge regarding the questions posed. Closed-ended questions were included to obtain precise information about the interviewee and his/her organisation in order to know about both the background and experience of the expert interviewed, and the organisation that he/she represents. Detailed design of questions was carried out in order to elicit, as much valid information was possible avoiding misunderstanding of the questions, and intending to collect as more reliable information as possible.

The set of questions are intended to elicit information related to three main topics:

- Firstly, information is requested about the organisation to where the interviewee belongs.
- Secondly, questions are asked about Millennium Development Goals in water and sanitation, related activities, and national targets.
- And thirdly, questions related to capacity building in the water and sanitation sector are formulated.

The questions were formulated intending to answer the questions of research. As the questions are not assumed to be sensitive for the experts to interview, it was presumed that direct questions lead to draw the realities within the region. Accordingly, questions were formulated to elicit, directly, information related to the needs in quantity and quality of professionals.

As the researcher himself had had neither particular theoretical knowledge nor practical experience with capacity building for the water and sanitation sector in Latin America and the Caribbean, he is unbiased towards any of the possible opinions expressed by the experts. Other biases that may arise in making judgements include:

- unstated assumptions and mindsets,
- structural biases,
- motivational biases, and
- cognitive biases (Otway, 1992).

In the preparation of the questionnaires, an attempt was made in order to minimise this biases as much as possible.

In this sense, prior to answering the questions formulated, the experts were given a clear and unambiguous description of the scope of the study, and the Millennium Development Goals to which the questions related. This would supposedly reduce the possibility of unstated assumptions and mindsets experts might have.

Structural biases may influence the answers from the experts according to their professional background and the type of organisations in which they are involved. This environment may set the paradigms that rule their thinking. These kinds of biases are not expected to occur since interviewees have been selected assuming their wide experience in the sector being involved in different type of institutions within. The assumptions were confirmed in a further stage of the study.

Motivational biases can influence answers from the experts to have a stake in the outcome of the research. The fact that the study was carried out by an educational institution contributed towards experts feeling 'free' to speak openly. It may be expected, if the research were carried out by a donor agency or an international bank (as possible sources of financial funds), the experts would not have provided the same answers. Most of the experts were willing to co-operate with this research, since rarely they are consulted in these topics. However, some voices arose in the fact that many studies are made and few outcomes are known.

Individual cognitive biases include overconfidence, anchoring and availability (Otway 1992), as well as representativeness and control (Cooke, 1991).

Overconfidence is not expected to play a role in this research, since qualitative rather quantitative questions are requested. Nonetheless, the overconfidence arose in the experts' responses is checked by asking them the justifications to their answers.

In order to reduce anchoring biases, relevant factors have been taken into account while combining answers, including countries of origin, type of organisations to which they belong and academic background (e.g., medical doctors, civil engineers, sanitary engineers).

Availability biases are not expected to occur, since the open questions selected to present did not include any option to select, and the sequence of questioning does not include background information that might affect the answers.

Representation of all kind of experts of Latin America and the Caribbean belonging to different type of organisations in the five selected countries leads to expect a minimal influence of bias of representativeness. It is expected that their knowledge and experience constitute a sufficiently representative sample for the current state of the higher education in the water and sanitation sector.

Bias of control is not expected since the questions do not pertain to any specific case where experts may have been personally involved.

In order to eliminate the language barrier between the researcher and both his supervisor and the interviewees, where applied, questionnaire as prepared in English and subsequently translated to Spanish and Portuguese, planned to be held in the interviewees' local language. Spanish is the researcher's mother tongue, Portuguese was checked, and corrected, by native speakers. Moreover, none obstacles were faced by the interviewer, since most of the interviews were held in Spanish (his mother tongue), and some in Portuguese (with whose command is very fluent). The previous knowledge of the interviewer about the subjects under discussion, and the presentation of the purpose of the interview during the presentation of it, allowed that those topics were clearly defined during the interviews. Summarising, the topic was properly defined to let each respondent clearly understand what is being talked about; applicability of questions was checked, adjusting them in order to get information that respondents might have; and

the perspective adopted by the respondents is specified, so that each respondent gives the same kind of answer.

In order to check the accuracy of the questions included, pilot studies were made. Those were checked with both native speaking person of Spanish and Portuguese. Then, discussions were held in order to adjust the questions in such way that interviewees did not misunderstand the questionnaire. In the same sense, the wording, and order of the questions was modified. As result of the pilot study, some adjustments were made, in order to make some questions clear. After the comments were received regarding the questionnaire during the pilot study, the questionnaire was modified to reach its final form included in the annexes.

Selection of sample

Countries to study

The study intends to analyse the situation in Latin America and the Caribbean. The region comprise 46 countries, each of them with different levels of economic development, water and sanitation institutional frameworks, varied degrees of coverage in water services, and different geographical conditions that sometimes affect the performance of the sector. In that sense, the selection of representative countries is found as the most suitable manner to analyse the situation in the whole region.

The criterion chosen to select the countries that represent the majority of the population in the region are number of inhabitants. Number of inhabitants is crucial due to its relevance to cover the most of the region analysed. Analysing the most populated countries more accurate conclusions may be drawn for most of the population in the region.

Following this criterion, and in order to analyse the situation of the services in the Region, countries have been divided into five different groups (Rangel, 2000). In order to facilitate the selection of the representative countries, the countries in each group present similar characteristics in the evolution and development of the sector. The grouping used is as follows:

- Group I: Brazil and Mexico, two countries of middle level of development and coverage. Due to their dimensions, (together, they comprise more than 50% of the population of the region), the size of their economies, and the high development reached in some areas they will be considered separately.
- Group II: Countries of the Andean region such as Bolivia, Colombia, Ecuador, Peru and Venezuela.
- Group III: Countries of the South Cone as Argentina, Chile, Paraguay and Uruguay.
- Group IV: Countries of Central America and the Hispanic Caribbean. The group includes Belize, Costa Rica, Cuba, El Salvador, Guatemala, Haiti, Honduras, Nicaragua, Panama and Dominican Republic.
- Group V: Other countries of the Caribbean. This group includes Antigua and Barbuda, Bahamas, Barbados, Dominican, Granada, Guyana, Jamaica, San Cristóbal-Nevis, Saint Lucia, Saint Vincent and the Grenadines, Surinam and Trinidad and Tobago (Rangel, 2000).

Table 6 Population of the Region by Groups of countries (1998)

<i>Group</i>	<i>Urban population*</i>	<i>Urban %</i>	<i>Rural population*</i>	<i>Rural %</i>	<i>Total population*</i>	<i>Total %</i>
Group I	197	77	60	23	257	52
Group II	77	72	30	28	107	21
Group III	51	85	9	15	60	12
Group IV	35	54	30	46	65	13
Group V	5	70	2	30	8	1.5
Lat. America and the Caribbean	365	74	131	26	497	100

*(population in million)

Source: Rangel (2000)

The countries of the group V are not considered under the study. Due to its low population and the relatively high coverage rates in services of water and sanitation.

Countries are chosen according to representativeness in their own groups. In this regard, both Brazil and Mexico are included; Peru and Colombia represent the Andean region, while Argentina represents the South-cone area.

Furthermore, in order to cover the area including the less developed areas of Group IV, a division of Brazil is proposed. Countries from Central America and the Hispanic Caribbean (Group IV) present low rates of coverage compared to the rest of the region.

Population of north-eastern corresponds to 75 percent of the population in Central America and Hispanic Antilles, while rates of coverage of water supply and sanitation services are 41% and 78% respectively below the rates indicated for the group IV (Miranda, 2003; PMSS, 2004), specified in the Table 7. North-eastern of Brazil may be used to reflect the situation in the region IV.

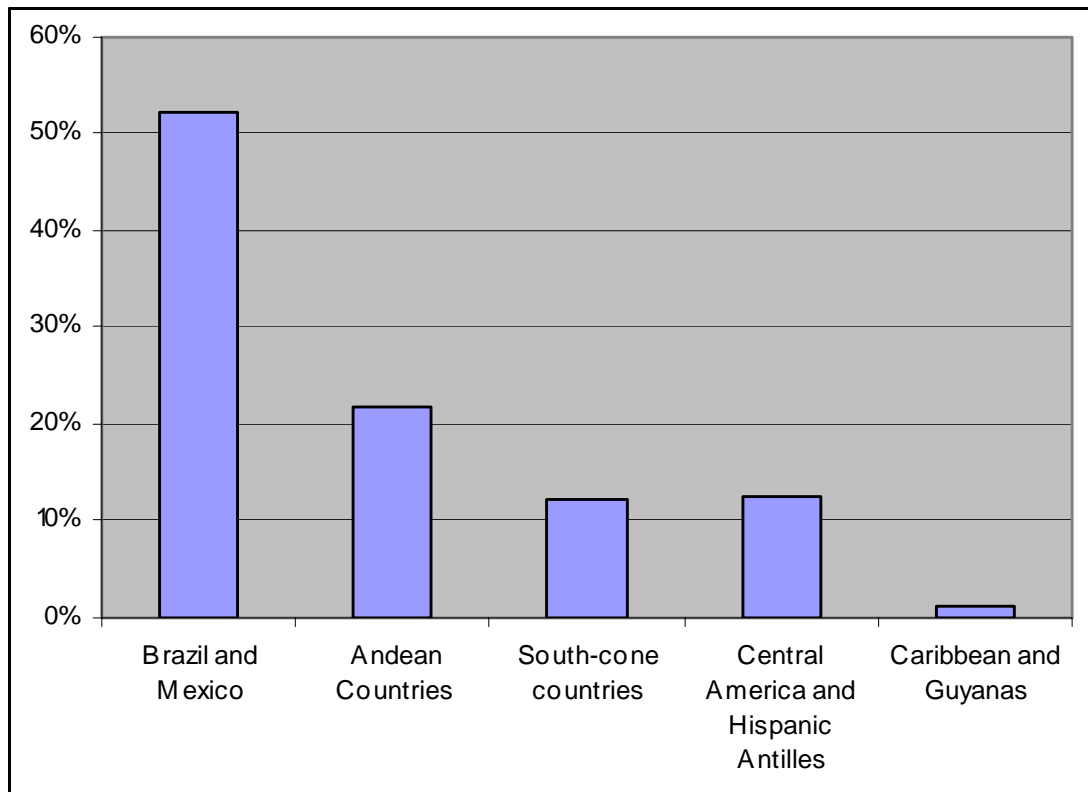
Table 7 Coverage rates for water supply and sanitation in the Group IV

<i>Country</i>	<i>Total Population</i>	<i>Sanitation</i>		<i>Water Supply</i>	
		<i>Total population served</i>		<i>Total population served</i>	
		<i>No. of inh.</i>	<i>%</i>	<i>No. of inh.</i>	<i>%</i>
Costa Rica	3.3	3.198	97.0	3.3	99.6
Cuba	11.0	9.643	87.7	10.0	91.1
Dominican Republic	7.4	5.68	77.0	5.4	73.1
El Salvador	5.3	4.091	77.0	2.8	53.3
Guatemala	10.6	7.141	67.2	7.1	66.7
Haití	7.2	1.846	25.7	2.8	38.9
Honduras	5.5	4.453	81.5	4.2	77.1
Nicaragua	4.1	2.437	58.9	2.6	61.7
Panamá	2.6	2.381	90.5	2.2	84.3
Total Central America	57.0	40.87	71.7	40.4	70.8

(population in million)

Source: Rangel (2000)

Figure 2 Latin America and the Caribbean. Percentage of population of the groups 1998



Source: Rangel (2000)

Local experts

An expert for this study is the one who is knowledgeable about the complete sector. The ideal expert for this study has a wide experience in the sector, experience long and wide that covers all the activities of the sector from different perspectives. This, allowed by involvement in different institutions, along the time; it must be aware about the experiences and lessons learned, at project level, but also at program and policy level; it has to understand the complexity of the sector and be able to mix up the experiences and settled knowledge acquired during its career.

Who is to be the judge of skill?

Presumably, either the expert or the non-expert.

But it cannot be the non-expert, for he does not know what constitutes skill (otherwise he would be an expert).

Nor can it be the expert, because that would make him a party to the dispute, and hence untrustworthy to be a judge in his own case.

Therefore, nobody can be the judge of skills (Hankinson, 1995)⁶

The need to select a number of expert people to whom the questions of research will be conveyed compelled to identify clearly the different kind of actors in this research. The

⁶ Sextus Empiricus, *Against the Logicians*, vol. 2 of *Sextus Empiricus (works)*, Loeb Library Edition, trans. R.G. Bury (Cambridge, Mass.: Harvard University Press, 1993), 29-31. This reconstruction of the argument of Anacharchis is based loosely on the translations of Bury and Hankinson (owing somewhat more to Hankinson's) and represents not the exact wording of the complete argument but what is taken to represent a précis of the essential problem posed (Walton, 1997).

water sector and the education sector are the ones more directly related with the study, and within each of them, individuals and organisations are sources of valuable information. Moreover, there are persons and organisations that are related to both sectors. Preferably, these ones will be considered most during this research.

The formal use of expert opinion method contains a number of pitfalls (Otway, 1992). Those pitfalls including the selection of wrong experts, wrong issues to discuss, and the failure to recognise biases. In order to avoid these pitfalls as possible, an effort has been made in order to select the right experts and the right issues for discussion. The selection of issues for discussion has been presented at an earlier stage. The selection of experts is explained herewith.

As hierarchies apply for both organisations and individuals, there is need to decide which organisations are most relevant in the sector, and which organisations would experts belong to. Therefore, the first task defined to draw the names of the experts to interview was to determine the key organisations within the sector in the five selected countries.

In general, experts would involve personnel interests or wills in the answers provided. In this regard, considering of opinions from experts involved to the sector from different type of organisations, the relevance of these biases could be decreased, or at least equally given to all of the stakeholders of the sector considered in this study.

In particular, the non-expertise of the researcher regarding topics related to the sector in the whole region, made him unbiased towards any of the opinions provided by the experts. However, it may have affected the results of the selection process due to lack of knowledge about the functioning of the sector in the region. In order to overcome this deficiency, the review of literature provided information relating the stakeholders involved in the throughout the region and from there recognise the main organisations to be addressed.

This paradox is applied when experts need to be selected as source of information. In this case, it applies both for the research in general, and for this particular activity in specific. The selection of experts by peer designations is recommended as the best available (Rodić, 2000). Accordingly, an online survey was sent in English, Spanish, and Portuguese (to see the invitation format, please refer to the annexes) to experts of the region.

The addressees were chosen after a pre-selection of people from the five selected countries who perform their activities in the water and sanitation sector in the region, and belong to any of the following organisations:

- UN organisations related to the topic (i.e. UNICEF, WHO, UN-Habitat),
- international organisations of water supply and sanitation (i.e. WSSCC, World Bank's Water and Sanitation Program),
- Universities, research institutes,
- National, state and local governments,
- Non governmental organisations,
- Associations of professionals

Individuals were obtained from several water and sanitation-related websites, attendance lists of the main water meetings, and the links related to them. 560 people

and contact data were identified, and the list of ‘experts’ turned out to be a long list with some experts within. In order to purge the list, the 67 individuals found more than once in the initial search were invited to participate in an online survey prepared to that end, and where experts were invited to nominate up to five experts both from the region, and their respective country. More details about the selection process are included in the annexes.

Then, as few of the experts invited to participate (only 25% of the expected) responded the questionnaire, an additional selection was made in order to complete the group of experts, intending to have a set of interviewees belonging to different organisation of the sector. Experts included belonged to different key organisations within the sector such as governmental agencies (at national, regional and municipal level), UN organisations, water service providers, universities, institutions for research and development, associations of professionals.

The desk study in Delft produced a list of 54 experts in the five countries. Additionally, other experts suggested some names during the interviews in the field, where their relevance was put forward. They were contacted when it was feasible to set an appointment; they were willing and available to receive the interviewer. The experts identified during the trip, including those met, are listed in the annexes.

Contacting the first batch of experts was crucial in order to find out who are the real experts in the field, according to peers selection. After the second selection stage, experts approached were defined as experts according to the selection criteria set by the researcher, but their peers did not identify them. Those criteria included mainly occupation of a high hierarchical position in a relevant organisation, and previous lecturing or research relations with the academy.

Two months before the journey to conduct the interviews, most of the contacts were made. Within one and one-and-a-half month before, all the interviews were confirmed with the experts presented in the annexes. The number of experts, selected per country, was set in order to give to each region a number chances to respond proportional to its population. This criterion intended to avoid the over-representation of some countries, and vice versa. It finally produced a very close relationship between numbers of interviewees in a country per unit of population. When experts were approached, no specific criteria was set to define the number of experts should belong to each category. The search did not produce experts belonging to all the types of organisations considered in the five the countries and, therefore, experts where mainly chosen according to their expertise rather than the institution to which they belong. The following tables show the distribution of experts approached by region and country.

Table 8 No. of experts approached per country and region

<i>Country</i>	<i>No. of Experts</i>	<i>% of experts in the whole group</i>
All Group I	21	39
Brazil (Average)	11	20
Mexico	10	19
All Group II	16	30
Colombia	9	17
Peru	7	13
All Group III	11	20

Brazil (more developed)	6	11
Argentina	5	9
All Group IV	2	4
Brazil (less developed)	2	4
Regional Organisation*	4	7
Total	54	100

* International organisation with activities in all the region of Latin America and the Caribbean.

Table 9 No. of experts approached per type of organisation

<i>Country</i>	<i>No. of Experts</i>	<i>% of experts in the whole group</i>
Central government	11	20
Regional government	3	6
Multilateral organisation	2	4
Service provider	7	13
UN offices	5	9
NGO	5	9
Institutions for education and research	13	24
Association of professionals	8	15
Total	54	100

Considering that data gathered from interviews could be properly complemented with statistical information from the countries under study, acquisition of those data was carried out with the national offices in charge of that activity.

4 RESULTS AND DISCUSSION

According to the methodology proposed and explained throughout the previous chapter, the findings of this research are shown and discussed in the following paragraphs.

Representative people from different regions, countries, and organisations were interviewed. Experts from all the selected countries and from most of the organisations addressed provided information for the research. However, the number of interviewees was not balanced according to the initial selection by country. Firstly, according to the plan, many experts were consulted in Brazil. Conversely, few were finally contacted in Mexico and Colombia where several experts were not willing or available to receive the interviewer. In those cases, an especially in the Colombian, the representativeness of the experts is very low according to the population of the country. Secondly, only in Brazil there was opportunity to consult different specialists from different roles and type of institutions. A longer stay there, and the existence of a well-documented network of institutions working in the sector, mostly concentrated in Brasilia, allowed it. However, limited information was obtained from the less developed area from Brazil, since one of the two interviewees agreed did not take place reducing significantly the representation of the opinions from this part of the country.

In general, collection of data process was successful, but not enough to compare and weigh the results comparing them with statistical data available in the countries; in institutions such as statistics agencies, different governmental agencies related or private guilds. Moreover, no opinions were obtained from non-governmental organisations, and accordingly, the results obtained from this research will lack their perspective.

In general, at the end of the trip 40 interviews were held. The number of experts interviewed is included per region, country and type of organisation in the Tables below, and listed in the annexes.

Table 10 No. of experts interviewed per region

<i>Country</i>	<i>No. of Experts</i>	<i>% of experts in the whole group</i>
All Group I	14	35.0
Brazil (Average)	7	17.5
Mexico	7	17.5
All Group II	10	27.5
Colombia	4	10.0
Peru	6	17.5
All Group III	11	25.0
Brazil (more developed)	8	15.0
Argentina	3	10.0
All Group IV	1	7.5
Brazil (less developed)	1	7.5
Latin America and the Caribbean*	4	15.0
Total	40	100.0

*International organisations with activities in all the region of Latin America and the Caribbean.

Table 11 No. of experts interviewed per country

<i>Country</i>	<i>No. of Experts</i>	<i>% of experts in the whole group</i>
Brazil	16	40.0
Mexico	7	17.5
Colombia	4	10.0
Peru	6	15.0
Argentina	3	7.5
Latin America and the Caribbean*	4	10.0
Total	40	100.0

*International organisations with activities in all the region of Latin America and the Caribbean.

Table 12. No. of experts interviewed per type of organisation

<i>Country</i>	<i>No. of Experts</i>	<i>% of experts in the whole group</i>
Central government	8	20.0
Regional government	6	15.0
International institution	2	5.0
Service provider	6	15.0
UN offices	6	15.0
NGO	0	0
Institutions for education and research	8	20.0
Association of professionals	4	10.0
Total	40	100.0

These tables show the unbalance expressed in previous paragraphs. More developed areas are over represented (according to the size of its population) while less developed areas were not sufficiently covered. The Andean area was properly represented according to the criteria initially defined. However, this good balance observed was not found within the region. Peru with one fourth less population than Colombia had 50 percent more experts interviewed.

Another issue important to point out is the number of regional experts interviewed in this study. Regional experts represented 10% of the total amount of experts contacted. This figure is far below the initially expected. Then, to build answers reflecting the situation in the entire region there is need to build one by using separated national visions, instead of being summarised from different experts and complemented with national particularities.

It is observed that national governments and capacity building institutions are well represented in the sample. However, although municipalities are in charge of the provision of services, only one expert was interviewed from there. Additionally, the expert found turned out not being an expert on the field, and due to the changes in the municipal administration replaced the expert intended to visit. Then, no experts were found in the municipalities visited.

Additionally, service providers were well represented, although only public organisations were included. No single expert was identified as employee of a private operator. This situation becomes crucial taking into consideration that in Argentina, one

of the countries under study, most of the services are privatised and the trends in the region are defining that path.

Although initially was recommended by the experts met during a previous stage to see officers of water and sanitation from UNICEF offices, it turned out that in most of the countries that position does not exist anymore. Then, in order to have a “neutral” perspective from the sector, expected from UNICEF officers, regional offices of the Pan-American Health Organisation were contacted. Specifically advisors in environmental health were visited. Only in Argentina this position did not exist at the moment of the research.

In general, biases originated by national and organisational representativeness were avoided with the initial selection of experts. However, although after the interviews it turned out that those biases were avoided, arose that some organisations were not considered and its consideration is very relevant in some sub regions. In this regard, a perspective more related to the public sector was observed.

Information recorded is typed and saved in electronic files in Spanish and Portuguese in order to preserve the complete contents of the interviews. Moreover, as results are mainly obtained from personal interviews those will produce different answers for every question included in the questionnaire. Responses obtained from the interviews are processed and combined by country, sub-region and for the whole region. In parallel, information is combined according to the role of the stakeholders in the water sector throughout the five selected countries.

In order to complement the information obtained from the interviews, information supplied is checked with literature revised. In that sense, analysis of agreements or disagreements with published literature is presented to enrich the discussion. In the same sense, contradictory information supplied by different experts is analysed and presented without any prior judgement.

Information supplied by interviewees was aggregated taking into consideration the information given by them in terms of general responses. Specificities were not considered during the aggregation of the information supplied, and were only included when expressed a clear example of the particular situation described. Thus, differences observed were not hidden and all the views expressed are considered as part of the results obtained. A first attempt aggregated responses at national level. Furthermore, regional answers were drawn.

Contradictions between the opinions expressed, were presented according to the different reference frameworks created by the position of the interviewees, and explained according to the paradigms within which each respondent based his opinion. In that regard, as the validity of the paradigms is not under question, even contradictory opinions are valid results.

4.1 State of the water and sanitation sector

The main problem in the provision of water and sanitation services in Latin America and the Caribbean is related to inequities in the delivery, rather than lack of water resources along the continent.

There is a wide range of factors that affect the current state of the sector. This situation encourages the collection of complementary opinions or insights thereof, feeding the panorama of the whole situation. Each of the respondents emphasised the problems the sector according to their personal experience and position. The diversity of organisations represented, facilitates the analysis of those views in order to link different answers, and finally understand the logic that runs the water and sanitation sector in the region from a plural perspective.

It is important to mention that additionally to water and sanitation coverage and level of services, other issues have been addressed in the region in order to seek the sustainability in the provision of services. These subjects, that include vulnerability analysis, and prevention of disasters caused by natural phenomena, have become in issues of concern especially in both the Andean region and Central America and the Hispanic Antilles. There, the high frequency of earthquakes, volcano eruptions, and hurricanes threat the sustainability of the services if special measures are not taken. In that sense, publications are available, and activities to raise awareness in this topic have been carried out in the region.

The need to provide universal clean water and basic environmental sanitation remains the first environmental health priority for the Latin America and the Caribbean region, based on the high rates of diarrhoeal and other water-borne diseases as stated in the policy document (Rangel, 2000). Studies on access, use, and expenditures for safe drinking water found significant inequities in household service are linked to urban and rural poverty, and in particular, a failure to prioritise peri-urban and rural water services (PAHO, 1999). Apparently there are not difficulties in order to inventory the programmes in execution to reduce the number of people without provision of services of water and sanitation. However, local initiatives and activities carried out by community-based organisations, local NGOs or local governments are not easily traced.

The progress made by the water supply and sanitation sector in coverage since the decade of the 1960s, is shown in Table below. In the past decade, about 80, 75, and 35 million people in the region were supplied with drinking water, sewer connections, and *in situ* sanitation (latrines or septic tanks) respectively (see annexes).

Table 13 Evolution of coverage in drinking water and sanitation

Year	Total*	With Water ^a		With Sanitation					
				With Sewerage		With Latrines or Septic Tanks		With Some Degree of Sanitation	
1960	209	69	33%	29	14%	No data	--	No data	--
1970	287	152	53%	59	21%	No data	--	No data	--
1980	339	236	70%	95	28%	105	31%	200	59%
1990	429	341	80%	168	39%	116	27%	284	66%
2000	497	420	85%	241	49%	152	31%	393	79%

*(population in million)

^a with household connection or easy access.

Source: Rangel (2000)

The big effort made in order to overcome the lack of drinking water and sanitation

services during the last decades, has notably increased the number of people with services. It is observed in the Table 14, and in the Figures 3 and 4.

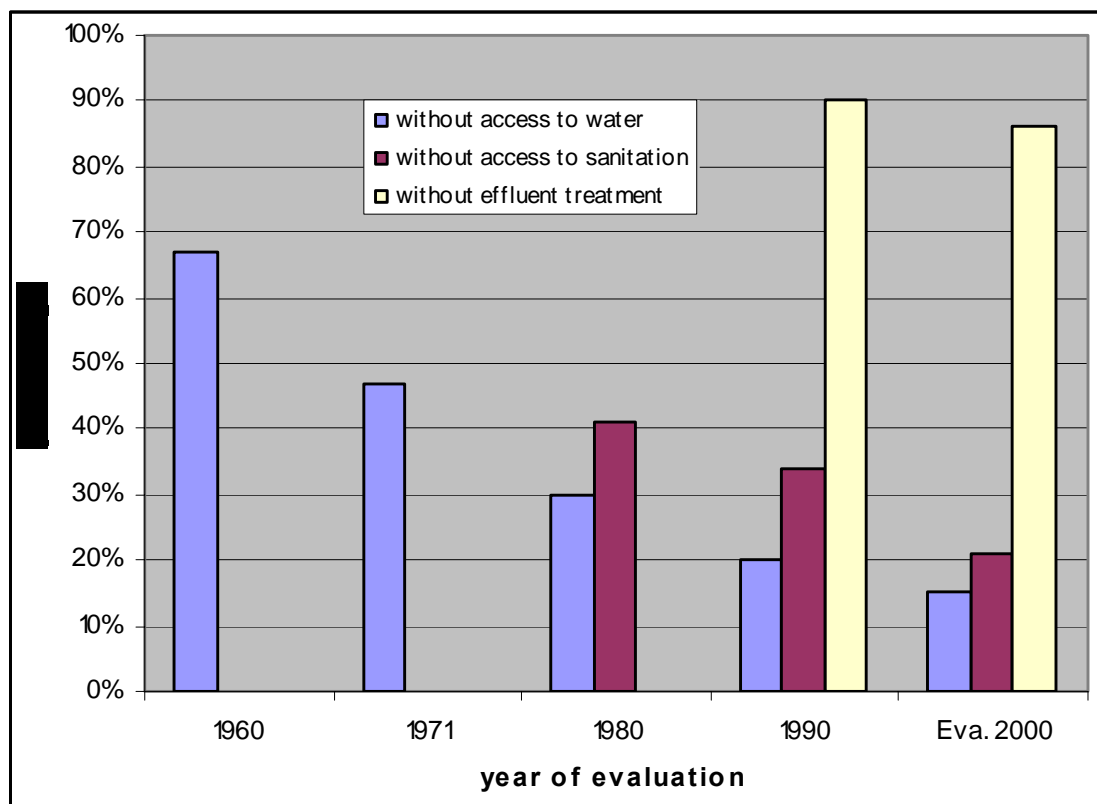
Table 14 Population without water and sanitation in Latin America and the Caribbean

<i>Year</i>	<i>Total</i>	<i>Without Access to Drinking Water</i>		<i>Without Some Degree of Sanitation</i>		<i>Sewerage Without Effluent Treatment</i>	
1960	209	140	67%	n.d.	-	n.d.	-
1971	287	135	47%	n.d.	-	n.d.	-
1980	339	103	30%	139	41%	n.d.	-
1990	429	88	20%	145	34%	150	90%
Eva. 2000	497	77	15%	103	21%	208	86%

Source: PAHO, 2001

n.d.: no data available

Figure 3 Percentage of people without access to drinking water and sanitation and percentage of effluents without treatment. Progression between 1960-2000



Notwithstanding this tremendous effort, 77 million inhabitants (26 million urban and 51 million rural) in the region still remain without access to safe drinking water, and 103 million (37 million urban and 66 million rural) lack any kind of sanitation (PAHO, 1999; ECLAC, 1999). See Table 14.

Although real progress has been made in expanding service coverage, there are still concerns about service quality and reliability as well as drinking water quality. In addition, there has been little progress in wastewater treatment and reduction of water pollution. Today, less than 14% of all sewage collected is treated. Usually, by using

inadequate and poorly operated treatment plants. The rest is all discharged without any treatment.

According to the figures observed, the forty years trend shows that coverage rates in water supply will be reduced at a slower pace than sanitation related ones. In that sense, could be expected, for the coming years, that actions will be more focused to reduce the gaps in sanitation than in water provision (Rangel, 2000).

Considering that the baseline for the MDGs is 1990, an analysis of the increase of coverage may be made according to

Regarding the last decade, considering that 1990 is the baseline for the achievement of the MDGs, progress towards their achievement may be observed in the table 15, included as follows:

Table 15 Evolution of coverage in drinking water and sanitation in selected countries

Country	<i>Halve, by 2015, the proportion of people without sustainable access to safe drinking water</i>								<i>Have achieved, by 2020, a significant improvement in the lives of at least 100 million slum dwellers</i>			
	<i>Population with sustainable access to an improved water source</i>								<i>Urban population with access to improved sanitation</i>			
	<i>Rural (1990)</i>		<i>Rural (1998)</i>		<i>Urban (1990)</i>		<i>Urban (1998)</i>		<i>Urban (1990)</i>		<i>Urban (1998)</i>	
	<i>No. of inh.</i>	<i>%</i>	<i>No. of inh.</i>	<i>%</i>	<i>No. of inh.</i>	<i>%</i>	<i>No. of inh.</i>	<i>%</i>	<i>No. of inh.</i>	<i>%</i>	<i>No. of inh.</i>	<i>%</i>
Brazil	22.9	61	22.7	65	26.9	95	121.3	96	23.8	84	118.7	94
Mexico	16.2	68	16.4	65	48.2	81	66.5	94	41.7	70	61.3	87
Colombia	8.8	82	8.8	73	21.1	87	28.1	98	20.4	84	27.9	97
Peru	1.6	24	4.0	51	10.1	68	14.7	87	11.3	76	15.2	90
Argentina	3.1	73	1.2	30	27.5	97	27.5	85	24.6	87	28.8	89

Adapted from: WHO/UNICEF (2000), WHO/UNICEF (2001), ECLAC (1999) (population in million)

In the regional context, according to the current trends, it can be predicted that both in access to water and access to sanitation, the targets defined by the MDGs will be reached by 2015.

However, the sector, according to these trends, only will reach the targets set, and there is no possibility to achieve higher rates of coverage, although performances in water supply during the last decade show a trend to achieve higher rates than expected for the targets. The reason why these higher rates are not expected, is because in the long term trend the coverage for water supply have been reducing along the four last decades. Hence, it is expected that performances in water provision will be below the pace currently followed (UNDP, 2003). In the figure 4, the progress made to achieve the targets set by 2015 in Latin America and the Caribbean is shown. Although the whole region does not appear on track to achieve the target on sanitation, according to the Joint Monitoring Programme (WHO/UNICEF, 2004), the region is nearly on track to achieve the target. The progress is shown in the table below.

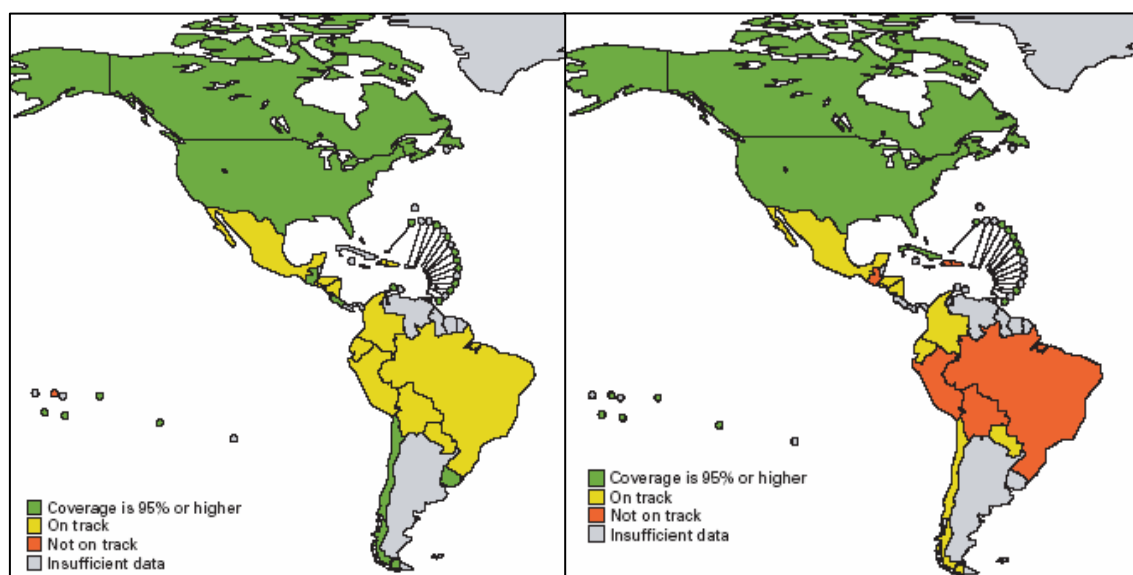
Table 16 Evolution of coverage in sanitation in selected countries

Region	Coverage in 1990 (%)	Coverage in 1992 (%)	Coverage needed in 2002 to be on track (%)	Coverage needed by 2015 to achieve the MDG target (%)
Latin America and the Caribbean.	69	75	77	84

Adapted from: WHO/UNICEF (2004)

Although enormous investments have been made in order to bridge the gap in water and sanitation provision during the last three decades, results obtained so far are far behind the expectations. The disappointment in that regard includes the existence of infrastructure operated for a short period of time and currently abandoned. In the last decade, the gap has been reduced. However, currently more people lack access to water and sanitation.

Figure 4 Progress in Drinking Water (right) and Sanitation (left) Coverage 1990 - 2002



Source: WHO/UNICEF (2004)

In Latin America and the Caribbean, universal coverage is still lacking with coverage average about 85% for drinking water, 49% for sewerage, and 31% for *in situ* sanitation. Also, drinking water quality is not assured and water resources are unprotected, as only 14% of wastewater collected receives any kind of treatment. Furthermore, there are significant differences in the service levels achieved for urban and rural populations. For water supply, almost 90% of the urban population has access to water supply while only 61% of the rural population have services. These coverage figures need to be interpreted carefully, since service levels vary and intermittent services are then included. Sanitation in urban areas is 63% by sewerage and 27% by *in situ* sanitation options. In rural areas, only half of the population is connected to sewers or is served by *in situ* sanitation. Across the region, differences are also observed in the share of urban and rural populations served, with large pockets of rural dwellers lacking access to safe water in Brazil, Mexico, Paraguay, the Andean Countries and Central America (PAHO and WHO, 1999).

It has been detected that coverage levels are much lower in rural, small urban or

marginal-urban areas than in main cities, where most of the population settles (Rangel, 2000; PAHO and WHO, 1999). Small municipalities, who do not have enough capacities to deliver the services, even though regulatory framework has given to them the responsibility in the delivery of those services, have faced several problems. Municipalities have usually provided the service by means of water and sanitation departments. In order to assure the sustainability in the provision of services, municipalities have separated the structure in charge of the delivery of services, and have given to them autonomy. However, lack of financial resources (and autonomy) does not allow them to hire qualified personnel to plan, design, maintain and operate the facilities required. Hence, when isolated projects, financed with external loans usually made by the central governments, need to be carried out, the qualified labour force to install and start-up the facilities is contracted in the capital cities. Therefore, there are not qualified personnel locally available. In this sense, locals are many times not able to operate and maintain (repair) the facilities.

In general, perception regarding the status of the sector and its performance is well in terms of coverage, though, there is awareness there are many things to improve. However, issues relating to level of service such as: continuity in the provision, water quality delivered, and discharged, are more under discussion.

Brazil

The Brazilian Government is implementing the National System of Information in Sanitation –SNIS-, that gathers all the information related to the service providers in the Country. The SNIS allows the evaluation of the development of the sector and the effectiveness of the developed actions.

In Brazil, where most of the service providers belong to the state, the open comparison among the performances between companies stimulates the competition among companies, leading to an improvement in their performance. Moreover, the SNIS serves as reference for the establishment of information systems at state level, within the scope of the respective regulatory frameworks. Aiming at the capacity building in the public sector for the performance of its functions as service providers, they organise courses in the areas of legislation and project management.

Table 17 Coverage of water and sanitation in Brazil by December 1998

<i>Type of population</i>	<i>Total population</i>		<i>Drinking water</i>		<i>Sanitation</i>	
	<i>Million inhab.</i>	<i>%</i>	<i>Million inhab.</i>	<i>%</i>	<i>Million inhab.</i>	<i>%</i>
Urban	126.8	78.4	114.9	90.6	118.7	93.6
Rural	35.0	21.6	6.9	19.7	18.5	53.0
Total	161.8	100.0	121.8	75.3	137.2	84.8

Sources: WHO/UNICEF (2001a), WHO/UNICEF (2001b)

To reach the goal of the universalisation of water and sanitation provision, a great effort is required in the increase of the investments. However, some companies in the sector currently present low levels of efficiency, with high losses and low productivity, limiting the capacity of generation of resources for investment. High levels of efficiency are condition for the modernization of the sector, being essential to achieve the universalisation. In this sense, the fulfilment of goals of performance improvement

putting the condition for the access to the resources of the FGTS⁷ (Guarantee Funds) stimulates the companies to enhance efficiency.

The increase of the efficiency is also related to the competitiveness and capacity of change of the organization of the sector to the specific realities in which the market moves (i.e. differences have to be noticed between rural and urban areas). Thus, tools of modernisation are the flexibility of the service providers, as well as their capacity of increase and diversify in different business. Greater participation of the private sector is expected to contribute to increase the efficiency, technological innovation and to introduce new sources of financing. To that end, the Federal Government is supporting initiatives of states and cities to extend the participation of private agents, by means of concessions, strategic partnerships or other forms of management, in processes that guarantee transparency and competition. In accordance to the government's will, the participation of the private sector must still privilege the necessary investments to the universalisation of the services, and the access to the poor.

Over all, because the deficit of sanitation services provision reflects the social and regional inequities within the Brazilian society. The poor, who live in small settlements, urban slums and the regions North and Northeast, are those that suffer more with the absence or insufficiency of basic sanitation. In order to tackle this situation, the Federal Government reorganized financing mechanisms and decentralized the decision process on the allocation of the resources. Additionally, it is subsidizing investments in the sector with resources of the budget of the Union (Brazil is a federative republic made out the union of 26 states) and external sources, given at sunken investments to states and cities. At the same time, process of tariff recovery for the companies and the feasibility of the renegotiation of the debts of the public sector were verified. That will extend its capacity of generation of resources and its limit of credit. Such facts had led to retake the investments, especially since 1995, when the process of fall in these investments was stanchd and a cycle of strong recovery was initiated.

Taking special consideration on the urban dwellers with family income below 2 minimum wages, it is observed the connection of 470 thousand new residences to the water networks, and 300 thousand to the sewers, during the period between 1995 and 1997. The increment observed in this segment of income is proportionally superior to the average growth of the coverage, demonstrating the effectiveness of the compensatory actions developed in order to reduce the inequities. Even though, the universalisation will not be met during this decade. By 1990, figures of coverage in water supply reached 96% of coverage, while only 78% of the population has proper sanitation facilities (by that time, more than 25 million people lacked access to proper sanitation). Conversely, in 2000 coverage of water supply has been reduced to 89% while safe sanitation coverage increased up to 85%.

According to one of the experts, needs to investments are around US\$ 62 billion (EUR 53 billion) in sanitation and water supply programs by 2020, in order to serve adequately the demand. Currently, 45 million Brazilians who live in urban and rural areas do not have access to water supplies. While access to proper sanitation has improved, it lagged behind water supply services.

⁷ FGTS are sources of funding for implementation of projects in Brazil. These guarantee funds are usually spent investing in projects of infrastructure such as roads, water and sanitation, telecommunications, railroads and the like.

Mexico

A yearly publication regarding all the issues related to the water sector provided by the National Commission of Water gathers all the information related to the coverage rates in all the country. *El Agua en Mexico* (CNA, 2003) allows the evaluation of the development of the sector and the effectiveness of the developed actions.

Specific programs, jointly designed combining the federal investment with the investment of the states and municipalities, have allowed the sustainable increase in the coverage of the services of drinking water and sanitation both in the urban and rural areas. In 1990 the coverage of the national drinking water infrastructure was of 78%, for 1998 the value was increased to 86,4%, representing the increase in the number of inhabitants with this service in 19.7 million. Regarding wastewater treatment, progress also has been considerable. Thus, to December of 1998 there were 914 systems of municipal wastewater treatment in the national inventory. From there, 727 were in operation. 21.8% of the total wastewater collected in urban localities at national level receives treatment.

In sum, the total number of inhabitants who have access to services is of 82,8 million for drinking water and 69,4 million for sewage system. The detailed figures are included in the table below.

Table 18 Coverage of water and sewerage in Mexico by December 1998

<i>Type of population</i>	<i>Total population</i>		<i>Drinking water</i>		<i>Sewerage</i>	
	<i>Million inhab.</i>	<i>%</i>	<i>Million inhab.</i>	<i>%</i>	<i>Million inhab.</i>	<i>%</i>
Urban	70.5	73.6	66.5	94.3	61.3	87.0
Rural	25.3	26.4	16.3	64.4	8.1	32.0
Total	95.8	100.0	82.8	86.4	69.4	72.4

Source: Compendio Básico del Agua en México, septiembre de 1999, CNA

Although the reached results are important, at the present time the actions are intensified in order to supply services of drinking water and sewage system to all the inhabitants, in special to those of the rural communities that still lack these services. The growth in the coverage rates of water and sanitation services provision has increased remarkably between 1990 and 2000. By 1990, the coverage of drinking water was at 69% increasing up to 87% in 2000. In parallel, sanitation has arisen from 45% to 72%.

Considering that the baseline for achievements of MDGs is 1990, it could be stated that Mexico already reached the targets defined by MDG for 2015. However, the increasing population and its high growth rate will require a high level of investments in order to keep following the present pace and bridge the gap in water and sanitation by 2015.

Currently, the high growth of the population and the limited resources available, do not allow the country to increase the percentage of coverage at this moment. Currently, the actions taken are more emphasised in wastewater treatment.

Colombia

The *Inventario Nacional del Sector de Agua Potable y Saneamiento Basico* includes all

the issues related to the water and sanitation sector in Colombia. The database, developed by the former Ministry of Economic Development intended to gather all the information related to the infrastructure available by the sector, and coverage rates in the country (Ministerio de Desarrollo Economico, 1998). This system allows the evaluation of the development of the sector and the effectiveness of the developed actions. However, the system is outdated and, according to the experts, there is lack of information that may facilitate the formulation of a specific sectoral development plan. According to one of the experts, after the Evaluation 2000 (WHO *et al.*, 2000) a sanitary rural inventory was carried out, but no outcomes have been produced until the elaboration of this document.

The coverage of water supply services in urban areas was 89.2% by 1998. Population without water supply provision with domiciliary connection is about three million. Regarding connections to the sewage system, those reached 78.6% by 1998. Then, approximately six million is the population without access to sewage system. Additional information is included in the table 17.

Table 19 Coverage of water and sanitation in Colombia by December 1998

<i>Type of population</i>	<i>Total population</i>		<i>Drinking water</i>		<i>Sewerage</i>	
	<i>Million inhab.</i>	<i>%</i>	<i>Million inhab.</i>	<i>%</i>	<i>Million inhab.</i>	<i>%</i>
Urban	28.7	70.3	25.6	89.2	27.9	97.0
Rural	12.1	29.7	5.0	41.7	6.1	51.0
Total	40.8	100.0	30.6	75.2	34.0	83.4

Sources: WHO/UNICEF (2001a), WHO/UNICEF (2001b)

In general, it is observed that highest rates of water provision are observed in smaller municipalities (below 2500 people), while for sewage coverage those correspond to the nine largest cities of Colombia. On the other hand, the lowest coverage rates in both in water supply and sewerage arises in the thirteen capital cities with populations below 100,000 inhabitants. This situation (atypical compared with the other countries analysed) reflects the higher efficiency in the provision of water services in smaller municipalities, compared to middle-sized cities, where it turned out being less efficient. On the other hand, highest rates of coverage of sewerage in the main cities reflect the higher capacity of investment (as sewerages are usually much more expensive than water distribution networks), due to the scale of their market.

Regarding rural areas, five out of twelve million inhabitants, corresponding to 41.7% have access to any water source with discontinued services of 6 hours average per day. From them, only 10% has good level of service (in terms of water quality). Hence it is observed that according to coverage figures, 5 million people have access to water services. However, only 500 thousand have good level of service in terms of quality (regardless the continuity aspects). In sewerage, only two million people (16.6% of the population) have acceptable systems for wastewater disposal. Thus, indicators of coverage must be analysed with wariness, since connections to conventional networks are considered, without including individual solutions of water supply and wastewater disposal, including *in situ* solutions, very common especially in rural zones.

Peru

The drinking water coverage levels arose from 58% to 75% in the period between 1990 and 2000. In the same period, the sanitation coverage levels arose from 42% to 74%.

According to the Evaluation Report of the Decade of Water supply and Sanitation in Peru (PAHO, 1990), at national level, the coverage of drinking water services was 58.4%, while for sanitation the rates reached 47.0%. The census of 1993 carried out by the local agency for statistics (INEI), outcome coverage rates of 70.6% in 63.5% in water supply and sanitation respectively. For 1998 the coverage at national level, was of 75.4% for water supply, and 73.7% for sanitation.

Table 20 Coverage of water and sanitation in Peru by December 1998

<i>Type of population</i>	<i>Total population</i>		<i>Drinking water</i>		<i>Sewerage</i>	
	<i>million inhab.</i>	<i>%</i>	<i>Million inhab.</i>	<i>%</i>	<i>Million inhab.</i>	<i>%</i>
Urban	17.0	68.3	12.9	76.2	15.2	89.5
Rural	7.9	31.7	2.3	29.2	3.1	39.5
Total	24.9	100.0	15.2	61.4	18.3	73.7

Sources: WHO/UNICEF (2001a), WHO/UNICEF (2001b)

In the census of 1993 coverage by means of domiciliary connections for urban areas represented 67.6% while 21.1% represented access to water by means of public sources. Conversely, for 1998 coverage with domiciliary connections arise up to 76.3%, while 10.6% of the population was supplied with public sources near the houses, demonstrating the efforts to improve the level of services replacing the public standposts by domiciliary connections.

As it can be observed, a significant increase has been achieved in the water and sanitation coverage with respect to the water supply and sanitation decade⁸; with a greater impact in the rural areas. The importance is emphasized with the reduction of deficits in sanitation both in urban and rural areas. It was expressed by the efforts to construct sewage networks and carry out projects of latrines. It can also be noticed there is a slower increase in the coverage rates of water supply in urban areas. It may be explained due to the investment of resources in activities related to the improvement in the level of services, through implementation of domiciliary connections.

Argentina

The information system for the water and sanitation sector in Argentina is fragmented. Each province performs the water sector independently, and the tasks carried out individually are inventoried separately. The coverage reached by the water and sanitation sector may be consulted in general statistics collected and processed by the national agency of statistics (INDEC). However, not additional resources are available to analyse the performance of the whole sector.

⁸ The Water Supply and Sanitation Decade (WSSD) was launch as an initiative of the UN members in Mar del Plata in 1979. During this decade, started in 1980, efforts were made in order to achieve the universalisation of water and sanitation services in the world. For more information see Cairncross, R. (1992).

By December of 1998, more than 27 million of the urban population had access to drinking water systems. From there, 23 million (85%) were served with domiciliary connection and the rest had access to a nearby public water stand post. Urban population with access to systems of wastewater disposal benefited nearly 90% of the total urban population represented by 28.8 million inhabitants. There, 62% of them (18 million) had domiciliary connections to the sewage system and 11 million had proper, individual or shared, *in situ* facilities, for excreta disposal. Hence, 15%, and 10% of the total urban population did not have either drinking water or wastewater disposal services (WHO/UNICEF, 2001a). This situation, has forced them to utilise individual systems without the minimum required conditions of safety and hygiene.

Only 30% of the rural population, had access to drinking water (92% of them had domiciliary connection, while 8% had access to a public standpost). Regarding sanitation, 48% of the rural population were served with proper disposal facilities, from where only 2% of them were served with domiciliary connections to the sewage network. The rest, 98% of the rural population did not have domiciliary connections to the network sewage system, but was served with systems *in situ*. Thus, 70% of the population do not access to safe water, and 52% do not have safe sanitation.

In average, coverage rates for water and sanitation in Argentina where, by 1998, 79% (29 million inh.) and 84% (31 million inh.) respectively. Conversely, by 1990, baseline of the MDGs on water and sanitation, the coverage rates where 64% (21 million inh.) and 89% (29 million inh.) respectively (WHO/UNICEF, 2001b). Then, although improvements were made during the decade of the nineties in water provision, sanitation did not perform in the same way and, although the number of people covered increased, the rates of population without access increased as well. Additional information is included in the Table 21.

Table 21 Coverage of water and sanitation in Argentina by December 1998

<i>Type of population</i>	<i>Total population</i>		<i>Drinking water</i>		<i>Sanitation</i>	
	<i>Million inhab.</i>	<i>%</i>	<i>Million inhab.</i>	<i>%</i>	<i>Million inhab.</i>	<i>%</i>
Urban	32.5	88.8	27.5	84.7	28.8	88.5
Rural	4.1	11.2	1.2	29.8	2.0	49.7
Total	36.6	100.0	28.7	78.6	30.8	83.9

Sources: WHO/UNICEF (2001a), WHO/UNICEF (2001b)

As well as the achievement of the Millennium Development Goals requires the clear understanding of the current situation, it is needed to carry out activities to provide with access to water and sanitation services to the communities lacking. In the forthcoming paragraphs, activities planned and executed in order to achieve the goals in the five countries under study are presented.

4.2 MDGs in water and sanitation: Progress and limitations

Identification and comparison of activities carried out by the countries in order to achieve the goals is a complex task. Some countries already have established their own targets. Those targets, often agree with the ones presented by the MDGs (UN, 2000), and previously by Vision 21 (WSSCC, 2000). However, sometimes they differ from the

MDGs although intend to overcome the same shortages. In most of the countries it is general the absence of a strategy to achieve the MDGs for water and sanitation in the countries considered. The deficits in water and sanitation have been tackled carrying out programmes according to the availability of external funding. In this sense, only short-term programmes and projects, mainly financed by external loans have helped to develop the sector. Although there are plans to overcome the deficits, availability of financial resources defines which activities are executed and which are not. In that sense, actions do not necessarily respond to strategies derived from analytical plans, but to specific needs.

Moreover, in most of the countries few activities have been carried out in order to achieve the goals. In fact, MDGs are not widely known and activities are in execution due to plans intended by the countries to reduce the deficiencies, regardless the agreements signed in New York in 2000 (UN, 2000). Only some representatives of the government, PAHO-WHO officers and few experts within universities are involved with Millennium Development Goals and have working experiences with it although, in general, there is not general knowledge about the agreements assumed there.

Several factors affect the achievement of the Millennium Development Goals. In some cases, there is awareness about some institutional and political changes that are required to achieve them, and succeed in that purpose. Different approaches present a broad spectrum of limitations, going from global market limitations to local governance in communities. The broad range of bottlenecks is difficult to compare observing the different ranges of action of them.

Main limiting factor to achieve the goals are the economic and financial aspects. However, political will was related to most of the factors mentioned. Especially, because political actions affects the performance of all the stakeholders involved in the sector.

Reasons presented included the lack of support to develop the policy required to achieve the targets intended to achieve. Furthermore, most of the bottlenecks observed were derived from political actions, allowing the institutions to perform in improper way with the excuse that government and politicians do not allow the sector to perform properly.

Additionally, water and sanitation is a political issue, and therefore it is utilised to support or oppose the governments in charge. In that sense answers according to their personal or ideological interests, supporting or opposing governments were obtained. In general, these biases, derived from political orientation, were found mainly in universities and governmental institutions.

In summary, the answers provided in the whole region are included in the Table 22.

Table 22 Limiting factors to achieve the MDGs

<i>Factor</i>	<i>Number of times referred</i>					
	<i>Mexico</i>	<i>Colombia</i>	<i>Peru</i>	<i>Argentina</i>	<i>Brazil</i>	<i>Total</i>
Lack of financial resources	4	1	3	4	8	20
Lack of institutional capacities	1	1	4	0	6	12

Lack of political will	1	11	1	0	3	7
Lack of water	1	0	0	0	0	1

According to the current performance of the sector, responses were given regarding the achievement or not of the targets set by the countries within the Millennium Declaration.

Concerning the answers obtained in the whole region, the set of answers, included per country in the table 23, reflects the optimism to achieve the targets (except in Argentina), although remarks were made in the sense of lack of co-ordination in the activities, discontinuous performance of the sector (only pulled by isolated loans from international banks), and out-dated solutions for old problems.

Table 23 Will targets on water and sanitation be met?

<i>Will the targets be achieved?</i>	<i>Number of responses</i>				
	<i>Mexico</i>	<i>Colombia</i>	<i>Peru</i>	<i>Argentina</i>	<i>Brazil</i>
YES	6	3	6	0	13
NO	1	1	2	4	4

Brazil

Since PLANASA (*Plano Nacional de Saneamento* in Portuguese), a government funded program that during the sixties intended to universalise the coverage of water supply and sanitation services in Brazil, the target defined for national plans is the coverage of water and sanitation for 100% of the population. The target of universalisation established then is applied in the public policy even today.

During the implementation of that plan, considerable improvements were achieved. However, the availability of a national policy to tackle the lacks observed is not sufficient to overcome the deficits when there is no budget available to implement all the activities derived from it.

According to the law, the provision of water and sanitation services in Brazil is responsibility of the municipalities. In some of the cases, municipalities provide the services by their own means with departments within the municipality or autonomous agencies (*Serviços Autonomos de Agua e Saneamento*) specialised in the provision of the service. However, in most of the municipalities, one of the 27 state service providers is in charge of the delivery of services.

As availability of financial resources determine the capacity of investment to increase coverage in determined area, the possibilities of expansion in the coverage are higher in most developed areas, usually the most densely populated and with higher levels of income. Accordingly, Brazil shows different situations in each region according to its level of economic development. Thus, more developed areas with more resources available (i.e. the states of Sao Paulo, Rio de Janeiro and Rio Grande do Sul in the south-east) have a different performance compared to poor areas (i.e. the states of Bahia, Roraima, Tocantins, Pará, Ceará, Alagoas in the north and north-east) where resources are not sufficient to carry out the activities set by the plans.

In the northern and north-eastern areas of the country state governments fund isolated programs without having a great impact in the rates of coverage. Few resources

available are used to solve individual problems without following any water services master plan designed to that end. In parallel, several national and international NGOs are working to develop solutions in this way by applying low-cost technologies and hygiene promotion.

Conversely, in the south-east where financial resources are available conventional methods have been used in order to achieve higher levels of coverage. The main obstacle here to provide services is the appearance of sub-normal settlements illegally established, where due to the absence of rights on land, there is no possibility to provide water. In this sense, inhabitants of slums are not receiving –legally- water services since “they are not using the land they inhabit”.

The main limiting factor that affects the achievement of the targets set for water and sanitation in Brazil is the economic aspect. However, stress was pointed out in the fact that lack of political will could affect both the lack of financial resources, and the inadequate institutional capacities.

Regarding financial resources, lack of compromise of the developed countries arose as a principal factor, since they stimulated the assignment of the millennium declaration without a formal declaration of support to the achievement of the goals. It was hardly criticised the lack of clear plans to support the goals, according to the agreements set in the Goal 8.

Concerning institutional capacities, strong criticism was given to the lack of a water law, under discussions for long time. In fact, the law exists, but there are not mechanisms to regulate the law. Furthermore, there is not a public policy to tackle the shortages in coverage of water and sanitation, although a complete analysis of the situation is already made. With the absence of a policy, programmes and projects are not executed according to a master plan, but according to the availability of external funds to carry out those projects. In that sense, no coherence is observed, and isolated actions are taking place without any pattern.

Lack of political will is emphasised as a main limitation to achieve the goals, since the commitment of the government is not sufficient to achieve the goals when the efforts to achieve them have to stand opposite to the macroeconomic measures taken by the government in accordance to the agreements signed with the international banks.

There is no agreement in this regard. Although some experts from Brasilia stated that the achievement of the goals is few likely to occur, some other, especially in the most developed area in the south-east stated that the goals will be achieved without any problem by 2015. In the north-east of the country, a different approach is suggested: the expert states that the goals will be achieved if the approach currently followed is changed.

If community organisations, and small municipalities are enforced to construct, operate, and maintain their own facilities, the goals will be achieved. However, if the projects keep being carried out by the state service providers, the chances to achieve them will be low. Then, a change of paradigm in how the projects in water and sanitation are carried out is the key to achieve the goals in the less developed area of the country.

Mexico

In general, Mexico has performed well in achieving the goals. Several plans have been prepared and implemented during the last decade in order to decrease the amount of people without access to water and basic sanitation. The ongoing *Programa Nacional Hidráulico* (Comision Nacional del Agua, 2001) includes activities to reduce the deficits in water and sanitation provision for the period between 2001 and 2006.

In order to supply services to the less favoured areas, an governmental body called *Secretaria de Desarrollo Social* (Secretary of Social Development) provides financial resources to the National Commission of Water to implement projects, especially with indigenous communities. It is expected that, with this mechanism, by the end of 2006 services will be delivered to one fourth of the people who currently lack water services in rural areas. At the moment, the progress has already reached 13%, according to the plans. Regional and local plans of development are available to define activities to carry out. In order to obtain financial resources to that end, there are programmes established to provide sunken investments for projects. Examples of them are PROSSAPYS (Programme for the sustainability of systems for drinking water, sewerage and sanitation) for small communities in rural areas (CNA, 2003), and APAZU (Programme of Drinking Water, Sewerage and Sanitation in Urban Areas) (CNA, 2004). In the latter case, external funding organisations such as the Inter American Development Bank (IADB) provide loans to municipalities with the guarantee of the central government.

In 1994, when the North America Free Trade Agreement (NAFTA⁹) was signed, plans were established to install wastewater treatment plants in all the municipalities above 10000 inhabitants. Moreover, the regulation of the United States was copied and, therefore, there is regulation for sanitation currently in place. Although the number of facilities constructed and installed did not achieve the initially planned, setting the regulation forced the municipalities to treat the effluents until some extent, and at the moment, a number of municipalities have completed its sewerage and treatment plants.

Although improvements have been achieved, there are voices in opposition stating that plans are disjointed from the real needs of the country. In that sense, governmental efforts are mostly focused in the most developed and highly populated areas, where the size of the market would suggest the investment of capitals from private sources. On the other hand, where the density of population is lower, the coverage of services is lagging behind, especially in south of the country, where most indigenous communities live.

The experts considered the following critical aspects. First and more important, problems regarding water provision remain in the country. It is due to the unbalanced distribution of water and population. The main problem is in terms of availability of water to serve the highly densely populated areas in the north of the country, where symptoms of desertification have been detected. Low densely populated areas in the south produce most of the water available in the country, in areas where, contradictory, access to water and sanitation services is lower than the average of the country.

⁹ The North American Free Trade Agreement (NAFTA) is a regional agreement between the Government of Canada, the Government of the United Mexican States and the Government of the United States of America to implement a free trade area.

The higher level of development in the northern areas of the country has encouraged migrations that increase the growth population rate in this area. The transfer of huge amounts of water allows the water supply in these areas, from areas far away from the main production centres. This transfer represents for the government huge investments that and the conflict with the fact that water resources are limiting the capacity of service. Thus, population growth rate is an issue when coverage of water and sanitation services is tackled. Sustainability of water services in Mexico has become in a priority for the government, and efforts nowadays are more focused in an integrated water resources management than in isolated efforts to overcome the deficits in water and sanitation.

Secondly, the financial resources are those that limit the possibilities of development. In that sense, the greater participation of the private initiative has helped a little. However, the problem continues being lack of investments, especially after the devaluation of 1995, when the currency fell from \$3.5 to \$10 per American dollar and water and sanitation were set at the bottom list of priorities. Concerning availability of financial resources, the issue is not only availability of them, but also the distribution both in wealthy and poor areas. About the currency devaluation faced in the nineties, political aspects were pointed out as main cause of that event. Therefore, political will finally affect the current performance of the sector.

Thirdly, population is rising in more economically developed areas, where there are not enough water resources to provide the inhabitants settled there. A sensitive political issue is the lack of engagement with the restriction in the growth of the population, and it is seen as another limiting factor dependant on the shortage of water in the northern areas of the country.

Additional factors included are the lack of a structured, already existing but still latent because the shortage of financial resources, lack of coordination, and lack of direction. Moreover, there is not a diagnosis of the state of the sector.

There is confidence in the experts interviewed that Mexico will reach the targets set by the Millennium Development Goals for water and sanitation by 2015. However, the following remarks were given:

- Coverage of last 40% of the people required to achieve the goals will cost three or four times the first 60%. To deliver water in near communities can be cheap, but going to provide water in very remote zones, the last option considered due to its low feasibility, is going to be more expensive.
- The budget of the government is decreasing, and the programme CONTIGO (sponsored by the Secretary of Social Development) lasts only 6 years.
- It is possible to achieve the goals, even with fewer resources. However, there is need to reallocate the per capita consumption according to the availability of water. Therefore, with the same production it will be possible to deliver to more individuals.

It is expected that in the future, growth of the sector will follow the same pace that the population, as it is showed in the table below.

Table 24 Goals of the National Commission of Water (2001-2006)

<i>Indicator</i>		<i>2001</i>	<i>2002</i>	<i>2003</i>	<i>2004</i>	<i>2005</i>	<i>2006</i>
Percentage of people with drinking water provision	Target	88	88	88	89	89	89
	Progress	89	89				
Percentage of people with sewerage system	Target	76	77	77	77	78	78
	Progress	77	77				
Percentage of rural inhabitants with drinking water provision	Target	68	69	69	70	70	71
	Progress	69	70				
Volume of wastewater treated over volume of wastewater collected (%)	Target	23	28	31	36	60	65
	Progress	25	27				

Source: CNA, 2003; Estadísticas del Agua en México.

Colombia

Isolated actions carried out in Colombia by the municipalities in order to increase the levels of coverage in services of water and sanitation is not clearly observed from the central government. In fact, the current situation of the water sector in Colombia is neither priority nor relevant for the central government and the resources available for investments within the sector have been reduced. Activities have been stuck since institutionally the sector has been in transition during two years, since the Ministry of Economical Development disappeared (to which the Directorate of Water and Sanitation used to belong), and was merged with the Ministry of Environment. The new *Ministerio de Medio Ambiente, Vivienda y Desarrollo Territorial* (Ministry of Environment, Housing and Land Development in English) has been adjusting its new functions and have not left room and budget, to the directorate, paying more attention, and resources, to other matters of the ministry such as housing, according to the governmental plan presented during the presidential campaign.

At this moment, there are no centrally planned activities in order to tackle the shortages in the coverage of water and sanitation in the country. According to the government, about US\$ 300 million have been invested, by the municipalities, in the sector during this year without reaching any improvement in the levels of coverage (EL TIEMPO, 2004). However, there is no awareness that these activities must be maintained during a certain period to reach the goals.

Interviewees stated that MDGs are recognised as a set of goals and targets to meet, but there are neither financial resources nor political will to support activities in order to achieve them. It is said that formal commitment of the government has remained timid in relation to the real dedication required to face, and achieve, the goals. It is necessary to create a policy document, in which the activities required to reach the goals in the medium and long terms are mentioned. Moreover, there is not a tool to assess annually the activities implemented to reach the goals in the country.

There is need to trace a long term and middle term plan with activities specified annually. This allows allocating financial, technical, and human resources.

It is not sufficient to execute the civil works. The importance is most emphasised to the sustainability of the projects, including operational, maintenance, and commercial aspects. That is an integrated process that has to be accompanied by the management of the investments.

Much has been advanced regarding the raise of awareness of people. It is clear that availability of resources to invest is not enough to overcome the shortages. There is also

need to include management. However, the sustainability has to leak out the individuals, and it is only possible if all the stakeholders are aware thereof. At governmental level there is a consciousness, but there is need to continuously reinforce it, to avoid that it falls. It is important to generate this awareness from the educators, universities, community, providers of services and the government.

Colombia could reach the goal, if the level of investments is kept at the same rate. The problem in Colombia is not in the big cities (larger than 300000 inhabitants), which already have somehow a long process in that direction. The concern is mostly in the smaller municipalities and the rural areas. As the rural areas only have 30% of the total population, it is observed that in total Colombia could reach the goal. However, the levels of coverage in aqueduct and sewage system in the municipalities (with less than 12000 inhabitants) are very low, even the water resources are available. The problem is that the networks are very expensive, and for applying non-conventional technologies, especial geographical conditions are required, in order to provide an efficient service.

Peru

In Peru there is concern about the MDGs, although the targets and goals have not been widely socialised within the sector, and the plans to achieve the targets set by the MDGs have not been clearly defined. Currently, two main programmes, financed with external funds, are under implementation to increase the levels of coverage in the country. Initially, there is an investment of US\$ 80 million to carry out the National Program for Rural Water and Sanitation (PRONASAR) in order to address shortage in services in rural areas. In addition, SEDAPAL, the Drinking Water and Sewerage Service of Lima, is implementing projects for US\$ 20 million to tackle the marginal urban areas that lack services in the city of Lima. Funds from the Andean Community¹⁰, the Japanese government and other sources are planned to use in the coming years in order to reduce the gap.

There are big differences between the approaches followed to reduce the gap in water and sanitation services delivery in Peru. In Lima, due to the big market of the service provider (SEDAPAL), counting with eight million people (one third of the country), it is possible to have a cash flow that allows investments to achieve the targets. Conversely, companies in other municipalities face big problems due to considerably lower number of clients (i.e. Arequipa, the second largest city of the country corresponds to one ninth of the Lima's population). In that regard, according to studies carried out by the Peruvian government, while in the past only US\$ 8 million have been annually invested in the sector, to achieve the goal the requirements are of about US\$ 120 million per year.

The responsibility for the delivery of services is on the municipalities. Legally, municipalities have technical, administrative, and financially autonomy. However, in practice they do not have sufficient resources to perform appropriately. Then, the

¹⁰ The Andean Community is a subregional organization endowed with an international legal status, which is made up of Bolivia, Colombia, Ecuador, Peru and Venezuela and the bodies and institutions comprising the Andean Integration System (AIS). The Andean Integration System (AIS) is the series of bodies and institutions that work closely in pursuing the same objectives: to intensify Andean subregional integration, promote its external projection, and reinforce the actions connected with the process.

government supports activities to improve the delivery of services when the efficiency of the service companies (or municipal departments providing the service) is improved. In that sense, the central government is working in credit lines that lead to improve the financial feasibility of the providers, and later on, carry out integrated programmes including infrastructure and institutional development. Hence, the challenge is to become the providers efficient and in that sense, sometimes the solution may be a public private partnership. Currently three municipal providers are in this process. For companies with a market smaller than 40000 customers, it is very difficult to find a strategic partner. In those situations, subsidies from the government can be provided.

In Peru, municipal companies will face problems trying to fund the achievement of the goal. During last years, an annual investment of 8 million dollars has been done to cover all the municipal services, but estimations of the government have resulted in a required annual investment of 120 million dollars to achieve the MDGs. It means that financial aspects are crucial to overcome those failures in the coverage.

Additionally, solution of the inequities of the past regarding the allocation of the resources. Formerly, financial resources were allocated with centralised criteria. In that sense, Lima and the capital cities of the regions leaving without attention marginal urban areas and small municipalities.

The third main aspect to overcome is the improvement in the management habits. Companies have strong political influences in its management. Every time there is a change in the municipal administration, there is a change in the management of the water and sanitation service providers. The cadres are changed and the turnover is very high. Average life of a manager is the twelve months, which does not allow the development of a real management. As consequence of the political management, there is a huge tariffs delay since mayors have not adjusted them when required.

There are different responses regarding this topic. However, almost unanimously experts agreed in the achievement of the goals, the differences in the opinions regard in the performance of the sector in rural areas, and the possibility to get the funds required to boost the sector and improve the coverage there. Although financial resources are lacking, several external agencies of funding may support the local governments for the successful achievement of that task.

Argentina

After an economical and social crisis, in which the currency was devaluated by a third, Argentina is still adjusting its institutional apparatus in order to run according to the new economical conditions. After the crash of the economy, the level of investments in the water and sanitation sector decreased dramatically. Financial commitments with international banks are under re-negotiation, and currently there are no investments intended to bridge the gap of coverage in the water and sanitation services and achieve the targets defined by 2015. Although there are projects, about 500, those projects are waiting until there is a source of funding. There are not projects under development due to the social problems that impede the increase of tariffs (the private operator does not invest without a surplus derived from them). It is clear that a solution will not be found since simply there are not resources, even though debates and discussions are held trying to solve the funding problems to achieve the goals.

Water and sanitation are not recognised as political and social priorities in Argentina. The only moment when water and sanitation were considered as priorities was during the outbreak of Cholera. After that, implementation of actions related to water supply, sanitation and hygiene solved the problem and the sector went back to the bottom line of the priorities. During the researcher's sojourn in Buenos Aires, a surplus in the national budget was achieved and publicly announced in media. Two of the experts commented the event the surplus was allocated to increase the pensions of retired people in the country, demonstrating that water and sanitation sector is not an issue of priority for the government in the country.

When the Millennium Development Goals were set, Argentina began its crisis. At that moment all the investments were stopped. International credits for water and sanitation sector stopped. At that moment all the credit relations were closed, and only now are beginning to repair. Then, when the targets were set the social problems of Argentina did not allow paying attention to the water and sanitation sector. Most of the water and sanitation services are in private hands. Therefore, all the contracts of concession signed by the government had to be renegotiated. Currently this is still in process. Due to these limitations, it is very difficult to solve the problems of water and sanitation. Moreover, it depends on the private operator and the possibilities of credit.

Before the crisis, there was a policy for resolving and dealing the problems of water and sanitation. It was delegated to private operators, and it increased the levels of coverage. Furthermore, the State had access to credit and the co-operatives (created to provide services in small communities) had access to external funding to carry out its projects. After the crisis, all the credits are closed. And after it, it will have need to renegotiate the contracts, if the private concessionaires are interested and still trust in the country. Additionally, it will be needed to see if co-operatives would have access to credits.

This overview is very few optimistic for the achievement of the targets. It is thought that the targets are very ambitious as well. There are neither concrete actions nor funding plans to reach them in the developing countries. It is not clearly seen how developed countries will co-operate to achieve those goals in the less developed countries. The targets should be more realistic, according to the different priorities of each country.

There is unanimity that according to the current performance of the sector the goals will not be achieved. And although most of the experts stated their pessimism regarding the achievement of the goals due to the order of priorities of the government, it is stated that those goals might be achieved only if there is will to reach them, and that will has to include changes in the way how things are done n Argentina.

4.3 Human capacities available at postgraduate level

Assessments of human resources development (HRD) – education and training needs and resources – are recommended to be undertaken at the national, regional or municipal level, as appropriate (Johnson *et al.*, 1987). These assessments produce an inventory of what exists, identify gaps and formulate the elements of a short-term action plan (3–5 years) with a long-term outlook (10–15 years). The duration of these assessments would be 3–6 months and national specialists from educational institutions and operational agencies, companies and other organisations in the public and private

sector may carry them out.

Suggestions were made in the sense of how to figure out the number of professionals graduated in masters related to Sanitary Engineering in each country, consulting databases in the universities that offer the program, neglecting the masters who obtained their postgraduate title abroad, while other experts suggested the comprehensive collection of information from all the water and sanitation service providers in each country. However, none of the interviewees was able to produce the number of professionals involved in the water and sanitation sector in its respective country. Even more difficult for them was to estimate the number of masters included. The reasons for the difficulties to estimate this figure lie in the ill defined boundaries of the sector, as many professionals who work in water and sanitation, also work in other sectors (i.e. engineering and consultancy firms and its specialists carry out projects in different sectors such as water and sanitation, industry and construction). Additionally, service providers do not record the academic level of their employees, since they are not interested in the academic qualification of their professionals. They are more interested in specific training addressed to solve internal problems rather than encouraging the postgraduate education, and therefore information is not recorded accordingly. Conversely, academic institutions give importance to the level of academic qualification of its staff and therefore, the information in that regard is available.

Taking into consideration the difficulties observed in the estimation of the number of professionals involved in the water and sanitation sector with postgraduate education, the human resources available is assumed to be related to the availability of MSc. Programmes in the region. Therefore, the number of programmes provides an idea about the availability of human resources at postgraduate level. A search of those programmes was carried out and a comprehensive review was made in order to acknowledge the programmes offered in the countries under study. The quantity of programs per country is included in the table 25, and the complete lists of programmes are in the annexes.

Table 25 Number of water related* postgraduate programs

<i>Country</i>	<i>MBA</i>	<i>No. of MEng. Programmes</i>	<i>No. of MSc. Programmes</i>	<i>Total</i>
Mexico	0	10	64	74
Colombia	0	34	11	45
Peru	0	0	21	21
Argentina	0	10	20	30
Brazil	2	67	51	120
Total	2	121	167	290

Source: Adapted from Universia (2004)

* water related topics include hydraulics, hydrology, environmental sciences and public health.

There was consensus among the experts that the offer and number of postgraduates has increased rapidly during the last decade, and the high offer of professionals has encouraged the competition based on the academic qualifications. Therefore, young people are more willing to follow postgraduate education in order to obtain better positions in a competitive labour market, while seniors, usually with long experience, are more reluctant to do so due to they recognition among the sector. The wide

educational offer has benefited the availability of postgraduates in the sector in the whole region. However, an exception is observed in Argentina, where due to the long duration of the graduate courses (normally 6-7 years for engineering programmes), the postgraduates in engineering areas, including water related courses, is still very low.

In general terms, strengths of the practitioners were related to technical skills, good capacity solving problems and performing within a technical context. Professionals of the sector are mostly good designers and builders. The deficiencies in the education of professionals of the sector were already diagnosed in the documents prepared by PAHO-WHO (1999). No actions were taken to overcome these difficulties. It was expressed that actions needed to take in order to overcome this problem are out of the field of action of the experts in the water. There is no recognition of the responsibilities of each stakeholder in the sector.

In the consultancy bodies, as well in the academy, the outdated paradigm of delivering services only by domiciliary connections (in urban areas) and standposts and latrines (in rural ones) still stands. However, there is need to reevaluate it since a broader offer of levels of service may be provided according to economic, cultural, technical, and social limitations. Professionals aware of this offer are required.

Regarding weaknesses, engineers involved in the water and sanitation sector are few times aware about the importance of social sciences, and humanities to solve problems. They usually prefer clear-cut analyses and tangible results, and feel uncomfortable negotiating and involving politics in their tasks. For most of the engineers, economics and financial resources matter, which is very good when a technical or financial problem arises. However, it has been observed that engineers in sanitation design facilities regardless costs and operation and maintenance. Very often designers ignore that the main constraints in the execution of works of infrastructure are the maintenance and operation, rather than the installation costs, and therefore sometimes facilities are designed without considering the cost-recovery of the installation, affecting the long-term sustainability of the project. Moreover, exclusive consideration of financial and technical issues does not help to solve problems when intangible values are under negotiation, and social sciences or humanities are necessary to avoid overlooking benefits or harms that may really affect the service users. Practitioners are not aware about the importance of local conditions, and mostly are taught to design the same infrastructure regardless the local particularities of the region, population or community. Therefore, engineers working as designers in the water and sanitation sector are in most of the cases using wrong approaches to design.

Although all organisations within the sector require, to varying extent, more qualification in its staff, there is a general consensus that small communities are less capable to carry out their own process of drinking water provision and sanitation services delivery. Rural areas and small municipalities, mostly served by community organisations such as co-operatives, or small offices within the municipalities do not have sufficient qualified people to provide services in a proper way. Professionals rarely go to work in these areas due mainly to lack of economic incentives.

Brazil

Although there is an information system of the water and sanitation sector in Brazil, information surveyed does not include the staff qualifications of the 26 state service providers and about 2800 municipalities who provide services in the country. Aware of

the size of the sector, and the different schemes of provision of services (i.e. state companies, municipal service providers, private companies, department of the municipalities, co-operatives of service provision), none of the experts interviewed attempted to estimate a number of postgraduates involved in the sector. However, it is clearly identified the difference between the big state companies, with high level of specialisation, compared with small municipal or rural providers. The Brazilian Association of Sanitary Engineering (ABES) has 12000 associates. However, postgraduates, professionals, technicians and students constitute it and data regarding the specific number of each of the groups in the association is not available.

The interviewees in Brazil showed that need of training are mostly observed in small municipalities, while national agencies and state service providers have good capacities to perform. Due to the service provision in some areas by the municipalities, most of them lack trained people to run properly the systems of water and sewerage. About 2800 municipalities in Brazil provide the services of water and sanitation, from them, only 20 have a structured organisation, the rest deliver the services without high degree of specialisation in its instruments, staff, and procedures.

Mexico

Although most of the interviewees did not know how many postgraduates are available in Mexico, predictions were made based on two methods:

- Considering the number of postgraduates in the National Autonomous University of Mexico (UNAM), about 600 along its 20 years of history, it is roughly estimated that 2000 professionals with, at least, master education are available working in the water and sanitation sector in Mexico. The assumptions made considered that the school of environmental engineering in the UNAM graduate 30% of the postgraduates in the country.
- The second alternative involves the number of people registered in the professional association. From them, two thirds of the professionals associated to FEMISCA is assumed, based on previous experience, to hold a masters degree (formerly the association was exclusively formed by postgraduates in sanitary engineering). Although currently the association has only 1400 associates, ten years ago, that figure reached 2400. Assuming that proportion of masters is kept at the same level had before, 1600 postgraduates are available in Mexico to work in activities related to water and sanitation.

According to data available from Mexican National Association for Universities and Institutions for Higher Education, in 2002 376 students were enrolled in masters studies in programmes related to water supply and sanitation (ANUIES, 2000).

The national regulatory agency, the *Comision Nacional del Agua* (CNA), has offices throughout the whole country, supporting state implementation plans providing both technical and managerial assistance. In that sense, the CNA has enough human capacities to support programs in all the provinces. However, local problems do not have easy solution due to the absence of those capacities in small municipalities, who receive less attention than bigger ones, and usually do not have sufficient resources to face their problems. Although the government, the industry, the water service providers, require improving their professional level, organisations in the main cities are well provided. Conversely, in the rural areas the situation is radically different. There, people

in charge of the services have high school as maximum. There are directors who only finished elementary school and learned to switch on and switch off the pumping system.

Colombia

There is not knowledge in the experts regarding the number of postgraduates working in the water sector. Although the Colombian Association of Sanitary and Environmental Engineers (ACODAL) involves 1200 associates, most of them are professionals without masters degree. Regarding the number of masters, it is not recorded according to the sources consulted. In order to inventory and certificate the resources available in the country, it has been considered to make the national system of certification for the sector. It will apply for the universities, intending to define programmes at higher education level to match the realities of the sector.

It was emphasised that professionals with masters level are mostly required by organizations of the government. However, consultancies, co-operation agencies, and universities also require specialists with managerial vision.

Peru

As the graduate programme in sanitary engineering has been offered Peru more than 65 years, professionals working in the water and sanitation sector are mostly graduates from this programme, which nowadays includes 600 graduates. Although some civil engineers are also involved in the sector after having followed postgraduate education in this subject, the experts did not know their number.

Aspects related to construction of works of infrastructure are mostly studied, and some others relating treatment of wastewater are few preferred. Management skills are weak and there is not awareness about the importance of social aspects in the execution of projects. Social, institutional, and political aspects are absent in the educational programmes offered by the universities. It was noticed in some experts that the solutions to the water and sanitation problems are still approached in the universities from a technical approach, and few importance is given in the curricula to other aspects.

The needs in human resources cross the whole sector. Hence, there is need to face them from different perspectives. Since the current structure of the sector is young (about 12 years), some weaknesses have been observed. At the governmental level there is need of postgraduates to plan, define policy, and set regulation; the service providers need qualified people to work in management, although there is also lack of people with knowledge about social aspects in order to have criteria of prioritisation.

Argentina

Currently in Buenos Aires, the university has about five pupils, and in average, ten pupils are graduated yearly in the whole country. In summary, currently there are about 250 sanitary engineers. Concerning specifically Argentina, the basic education in technical aspects is very good. The tradition of the education has a long recognition because of its high quality. On the other hand, the alumni acknowledge the reality of their own country, but not the reality of the world. Therefore, the fact that most of the professionals do not go abroad limit their field of formation, lacking a contextual vision of the problems around. Sometimes decision makers are not aware about their decisions

due to lack of consciousness regarding water and sanitation needs.

4.4 Human capacities at postgraduate level required

Responses obtained from interviewees in all the countries agreed that the sector requires other resources to be enabled in order to achieve the goals. Lack of qualified human resources is clearly stated as not being a factor that limits the development of the sector. Conversely, in some cases it was stated that enough qualified professionals are not involved to the sector due to financial constraints of the organisations, and was clearly stated that the distribution within the countries was uneven. There were signs of the lack of capacities in rural areas. Although most of the experts argued that capacities in the centralised agencies of the government were enough to overcome the shortages in those areas. Without financial support to boost the sector, it is not necessary to train more people to perform within it. As financial resources are program (or even project) dependant, there is no way to plan the development of the sector and accordingly design a strategy of capacity building. Creating one might increase the levels of unemployment or underemployment when financed projects are not under execution anymore. In that case, operators or technicians are most required to run and maintain properly the facilities installed, not professionals, and even less, masters.

In general, it was a feeling that increasing number of trained people would improve notably the performance of the sector, but it does not guarantee the accomplishment of the targets set by 2015. On the other hand, targets would be met without increasing the number of masters, but taking measures addressed to attack the problems in rural and marginal-urban areas, where solution of problems does not require engagement of masters or engineers but technicians.

The achievement of the MDGs is a political issue that cannot be solved only following the patterns currently followed by the governments in that regard. Conversely, long term, sustainable solutions have to be found, and therefore capacities have to be built according to the real context in which they will be performed. Training of trainers is the best way to convey the right message to the right people, allowing them to adjust according to local realities.

There is awareness that all the stakeholders involved in the water and sanitation sector have needs. However, it is clear that technical needs are sufficiently covered by the local offer. However, other aspects such as economic, financial, social, and institutional aspects are not sufficiently available. In this sense, it is contradictory the fact that there are enough masters, but there are areas of knowledge in which there are lack of people well trained to perform some specific tasks. It seems there are many postgraduate courses offering education in fields not required, or at least less related to the sector in contents. Although there is wide offer of programmes, those are not covering areas of knowledge in which water and sanitation sector lacks personnel. There is consensus in the fact that social, financial, and political aspects must be dealt at postgraduate level, but there are not actions to overcome that situation. It may be due to the lack of political interest in the sector, reflected in the low level of investments, high turnover, and low sustainability of the projects executed.

Brazil

Brazil has since the 1960s a strong structure in training in water and sanitation issues, created to implement the *Plano Nacional de Saneamento* (PLANASA), that included the creation of programmes in sanitary engineering in public universities throughout the whole country, including both the poorest areas in the north and the north-east, and the more developed in the centre and the south. Accordingly, regarding technology, the country has competences, has human resources and knowledge. Solutions ‘wrongly’ adopted do not reflect the technological excellence of the country. It reflects the problems in the transfer of technologies locally developed (PMSS, 2002).

Furthermore, an interviewee stated that lack neither of technical or institutional capacity nor to lack of natural or human resources do not originate the lack of water and sanitation in some places. It is due insufficient cost recovery for the services, as the general population does not have adequate income to pay the costs and profit that would motivate commercial interest to provide the services.

Mexico

According to one expert, nowadays it is more difficult for the engineers graduated in sanitary engineering to be hired. They are not being absorbed because there is not sufficient demand to cope with the generation of specialists. There is over offer of professionals.

Nevertheless, other voices stated that postgraduates are needed; in that regard, two methods were suggested to calculate the requirements.

- Considering organisations that operate municipal services with more than 5000 inhabitants, and rural providers, it could be assumed that five and ten professionals are involved in each rural and urban company respectively. If 10000 professionals would be involved there (there are about 1000 and 500 providers respectively), and 10-20% of the professionals had postgraduate studies, about 1000-2000 postgraduates could enable companies to improve the performance of their companies, and contribute to increase the rates of coverage.
- One of the respondents suggested the provision of one graduate of masters to each municipality above 50000 inhabitants in the country. It means that about 2500 municipalities would require at least one postgraduate. From them, about 700 already have, at least one masters in their staff. It is important to notice that this suggestion was related to the provision of one master who could be able to manage all the issues related to environmental health, and not only sanitary engineering.

There is need to modify the curricula on environment with emphasis in water and sanitation, to assess the way in which the information is delivered, and to analyse the topics in an integrated way. Accordingly, there is need to see at the topics as integrated elements of a problem, to include multidisciplinary work allowing the holistic solution to real problems by means of integrating multidisciplinary working teams.

Colombia

According to respondents, Colombian situation is similar to the rest of the region, with additional factor that professionals involved in water and sanitation projects are not willing to move to the countryside, because of the risks of being kidnapped or

extortionated by the illegally established army groups (i.e. guerrillas, paramilitaries). Due to that, the government has reduced the investments in areas under conflict. Therefore there is no need of professionals to carry out activities there, leaving populations without access to safe water and proper sanitation. However, the lack of masters working in the sector was clearly expressed. One of the experts explicitly remarked the problems encountered while trying to get an expert in financial aspects for water services and suggested increasing the number of masters by five giving more attention to financial and managerial issues. Moreover, another interviewee estimated that the number of professionals with masters level should be at least doubled. However, another stated there are sufficient professionals with postgraduate education available to achieve the goals. Considering the disagreement among the experts, the wide range of answers obtained, and the lack of strong-based arguments to support the figures estimated as factors to increase the number of postgraduates, a conclusion in this regard is not made.

Voices were raised in the sense that is not only important how many professionals with masters are available, but also how are they geographically distributed. Moreover, universities should be strength according to the regional targets to achieve. Currently, there are universities working in water and sanitation in most of the regions of the country, and it is renown that the local universities are able to generate the masters required according to the needs of the country (i.e. it was expressed the growth in the number of masters courses offered in water related issues in the country). In Colombia, the universities have a high level of education and some of them are at the vanguard since they are related to international universities. However, the less developed areas, where the gap in access to water and sanitation is larger, do not have universities that provide education in these topics.

A particular issue found in the literature concerns to the small participation of the professionals graduated from the universities within the different economical sectors of the country. In 1999, only 0.4% of the graduates were employed by companies of public services (water, gas, and electricity), while the number of postgraduate programmes related to those areas were increased by 54% (IEASLC-ICFES, 2002). This supports the opinion provided by the experts, and highlight the surplus of programmes related to the sector. Specifically considering that the gas sector is yearly growing at a 3.1% and the electricity sector at a 4.4% (Lynch, 2002), far beyond the growth of the water and sanitation sector. It is more probable that most of the graduates employed belong to one of these sectors.

Peru

In Peru, needs of sanitary engineering are limited by financial resources, as water and sanitation sector does not move forward, people are less interested in working in this area.

The low demand of professionals from this sector and lack of financial incentives discourages young people to choose education in this area. Even considering the needs of improvement in this sector, and the amount of activities to carry out that would require highly qualified people, the water and sanitation sector in Peru is not a source of employment for professionals. There is not a clear idea about the number of professionals required to achieve the goals in the country, since those goals might be achieved by means of utilising not specialised people, by using low-cost technologies

and graduate professionals or technicians, widely available in the country. One of the respondents was very critical about the approach taken in this research, suggesting that the achievement of the goal is not related to how many masters are available, but to how many small scale projects of low complexity are implemented involving rural communities.

However, it was alerted that by the coming decade, all the engineers working in the sector would need a postgraduate diploma, according to the challenges faced by the sector (including the large scale projects currently carried out) and the rising competitiveness. However, the limitation to achieve this purpose is the behaviour of the labour market, since small communities do not have enough financial resources to hire a specialist to run the water and sanitation services.

There is need to develop human resources in areas that complement the business such as communication, and conflict resolution. Few people are prepared to deliver service in rural areas, where there is an important need to provide services to indigenous people. To do so, there is need to recognise other languages, dialects, and even different ways to see life. Solutions that may work out in Lima, are not necessarily valid somewhere else. If the vision of the world is not understood, sustainability of the projects will fail, and the technological solutions will not help. As these tasks require different kinds of expertises, people graduated from the universities will require the abilities to establish, and make part of interdisciplinary working groups consisting of engineers, anthropologists, sociologists, managers, economists, social communicators, social workers, and the like.

Argentina

In Argentina, currently the sector has a very high level of unemployment due to the crisis and privatisation of service providers. In fact, two main postgraduate programs in sanitary engineering in Argentina are facing the absence of candidates to join them due to the low wages in the positions offered (when they are rarely available). It means that the market is stating that training of more specialists in the topic is not needed. Although in general the offer of post graduation programmes is increasing very fast. During the period between 1996 and 1999, the offer of the post-graduation programmes grew by of 56% (Fernandez, 2002). Additionally, after privatisation of water services in Argentina, when professionals working in consultancy expected an increase in the amount of work and, consequently, in the increase of employment in the sector; reality showed that private main service providers such as Vivendi and SUEZ brought consultants from France, United States and the Netherlands instead of hiring the local specialists. In fact, it was mentioned that most of Argentinean consultants were getting involved in projects in the entire continent, due to the stagnant situation of the sector within the country.

The problem forecasted for the future is the absence of a mass of professionals in the area with wide experience in the sector. Although a large group of engineers is getting retired, in Argentina there are few engineers of intermediate ages (about 40 years) and less students of engineering. Then, a topic of concern is that young engineers will not be enough to achieve the goals, if the financial resources required are available. At least regarding professionals with experience, because after investments return to the sector, people will be again interested in following studies in this topic. However, by then, they will not have enough experience to perform well their job.

4.5 The local universities and their role in the sector

In general, the respondents have seen universities as institutions in charge of carrying out education, research and extension. Accordingly, while education and research are observed as activities performed well considering the resources available, extension is the aim fewer fulfilled and therefore the reason why universities are more often criticised.

In most of times, universities are isolated from the practice and are apparently more focused on teaching and research, although products in that sense are scarce. They are stagnant and do not move forward in the direction required by the sector to improve its performance. Relations with governmental agencies in charge of the sector are few times observed, and efforts in that direction are in most of the cases hindered by either the structure of the university, which rigidity impedes the change and adjustment, or the structure of the governmental agencies, sometimes unwilling to involve additional actors to the implementation and planning of the projects. Therefore, there are few cases in which universities are involved in projects and aim to reinforce the strengths and overcome the weaknesses observed in the professionals of the region.

Most experts from the countries under study considered the existent capacities to be sufficient to reach the targets set by the Millennium Declaration. Some experts in Peru, however, expressed some doubts, and it seems to be the weakest country in this regard, although there was not explicit mention thereof.

Difficulties are faced when there is need to assess the capacities of the country in numerical comparable terms, but it is clear that among the sub-regions under study the Andean region shows less development than the others, in terms of number of postgraduate programs related to the sector found. In this regard, analysis of programmes offered per unit of inhabitants helped to draw the status of the professionals in the region and compare the availability of institutions delivering education in water and sanitation subjects.

Personnel involved to universities, have a wide recognition of their titles and academic background among the some of the respondents. However, it was pointed out that some of the members of academic institutions are outdated and are not interested in update their knowledge. There is a general impression that most of the lecturers are not interested in what is happening in the sector, converting the university in an isolated “ghetto” (the emphasis was given by one of the interviewee) with its own internal conflicts.

Higher education institutions are seen as providers of professionals to the water and sanitation sector. However, depending on the position of the interviewee the positions were different. Whereas some academicians highlight the efforts of universities in order to develop technologies and carry out research, service providers and experts from governmental offices observe lack of developments in that sense. The role of the universities varies depending of the country as follows.

In Colombia and Argentina, universities compete with the consultants. The universities are seen as small companies. The professors are employed of the consulting universities who are considered as disloyal competitors, since they do not pay taxes, and always have lower

prices compared to a consultancy firm. In the universities consultancy is seen as a source of them.

Brazil

In general, 98.6% of 26,000 lecturers that work in postgraduate courses in Brazil have doctorate degree (Arrosa, 2002). Regarding the water and sanitation sector, there is in Brazil a strong body of academicians working from different perspectives, including engineering, social aspects, finances and public health. There are sufficient and highly qualified researchers from the south to the north, although in the latter number of researchers per capita are less. Low-cost technologies for water supply and sanitation have been developed throughout the whole country.

Brazilian universities perform in different way according to the level of development of the region to which belong. Although several programmes in sanitary engineering were established in public universities throughout the country, level of development of the regions where universities are based and its role there have been ruled by the economic development. Accordingly, in the north there are few developments of appropriate technologies to improve the conditions of living of the poor, although teaching activities are carried out. Regarding extension of universities, there are some focal points where there is strong development in this sense; School of Engineering of Sao Carlos (University of Sao Paulo) has an international recognition for its technological developments, while in Brazil is highly recognised by its successful implementation of its own technologies. School of Public Health of University of Sao Paulo is recognised by its works in the relations between water, sanitation and public health working in the field throughout the state and, even the country. University of Minas Gerais have developed a good will related to public health engineering from social approach, while University of Bahia have stressed its capacities in the work with rural communities both in technical, social and institutional aspects.

However, the impact is very limited. Lot of work has been made by the universities in the water and sanitation sector, but lack of transfer of knowledge and technologies have not allowed the technologies to be widely known. For example, only after 10 years the condominal sewerage was developed as low-cost technology in Brazil, it is going to be applied in Peru. There is huge distance between what is developed and what is known. Even people who manages the sector are not aware about the possibilities that academy can offer to solve problems.

In order to promote the research activities within the universities, and throughout the Brazilian scientific community, the Research Program in Basic Sanitation -PROSAB- supports initiatives to develop and improve technologies for easy applicability, low cost of implementation, operation and maintenance. The research must be done in areas of water supply, wastewater, and solid wastes and must result in the improvement of the conditions of life of the Brazilian population, especially the underprivileged. The Program stimulates the integration among the researchers from different institutions, making the exchange of information possible among them. Moreover, it promotes the qualification of new research groups, allows the standardization of analysis methodologies, and encourages the formation of partnerships.

Mexico

Three types of institutions provide the higher education delivered in Mexico for the water supply and sanitation sector:

- Public universities (i.e. UNAM, UAM Iztapalapa)
- Private universities
- Specific institutions (IMTA, INSP¹¹)

In the first case, due to their commonly big size, complex and bureaucratic organisation, universities are not flexible to adjust according to the requirements of the market, in terms of generation of a specific type of required professionals. In the second place, universities give education based on classroom activities, without resources to provide practical knowledge. These centres of education are mostly private centres created since the boom of higher education in last decade (as consequence of the economic boom caused by the signature of the NAFTA with the United States and Canada) and without enough infrastructure and academic resources to provide education of good quality. The third group of institutions is made out of smaller institutions where there is room to give education at postgraduate level and carry out research by means of solving problems of organisations of the sector. In this sense, the Mexican Institute for Water Technology (IMTA) balances teaching, research and extension, supporting companies to solve their problems, increasing its importance within the sector and giving room to development of technologies.

A point that is important to remark is that the National Commission of Water has a highly qualified staff, more qualified than most of the universities'. Hence, as there is no observed need in the involvement of universities in the planning or design of water and sanitation policy, there are no possibilities for them to participate during those activities. However, the main source of funding for the research in the public universities is the government via the National Commission of Water, who both carries out activities isolated and in conjunction with provincial or federal universities.

Colombia

In Colombia, there is acceptance about the tasks performed by the academic bodies. In general, universities have a good dynamic in the development of the sector. In that sense, there is approval about their capabilities to educate the professionals required to achieve the goals. Universities have sufficient resources to achieve the requirements of additional masters, if any. Several universities are involved in education for the sector. However, there are regions where there is a gap observed.

A special case is observed in Valle University, where simultaneously CINARA¹² provides both formal education courses at graduate and postgraduate level, carries out research and implement development projects in areas related to water and sanitation for small

¹¹ National University Autonomous of Mexico (*Universidad Nacional Autonoma de Mexico*)
Metropolitan Autonomous University Iztapalapa (*Universidad Autonoma Metropolitana*)
Mexican Institute of Water Technology (*Instituto Mexicano de Tecnologia de Agua*)
National Institute of Public Health (*Instituto Nacional de Salud Publica*)

¹² *Instituto de Investigacion y Desarrollo en Agua Potable, Saneamiento Basico y Proteccion del Recurso Hidrico* (Institute of Research and Development in Drinking Water, Sanitation and Conservation of the Water Resources in English).

municipalities and rural areas. Its approach includes technical, institutional, and economic aspects with a multidisciplinary group that includes engineers, sociologists, social workers, economists, social communicators, architects, anthropologists, and the like. Such case is special taking into the consideration the fact that most of the shortage in water and sanitation are in rural areas, while most of the universities are based, and working to solve problems, in urban ones. However, its role is an exception to the rule.

Regarding research and technological development, the technological development of the sector has been related only to engineering aspects, having given little importance to topics such as marketing, administration or management. Currently there are no co-ordinated strategies on aspects of research and technological development for the sector, but isolated attempts to conduct activities according to the projects under execution.

Peru

Only 30-40% of the academicians in the National University of Engineering are full-time lecturers. Most of the lecturers are part-time due to the low wages. The low budget of the education system, does not allow the involvement of research in the academic activities. Sometimes research is carried out as part of consultancy projects with the municipal service provider (SEDAPAL). Experience of the lecturers is mostly very long, however, their academic qualifications are not strong. Peru has the oldest programme in sanitary engineering in the region, the programme offered by the National University of Engineering (UNI). However, there are not many more programmes in this area, and mostly professionals from civil engineering perform activities related to the sector.

It is agreed that the academicians need to follow programmes of continued education to internalise the changes in the sector and propose programmes that respond to those needs. More experienced practitioners need to go back to the university to learn about appropriate technologies and management. There is no any institution in charge of technological development and research in the sector. The crisis of the Peruvian university has relegated the activities of research in general manner. The education of human resources is supported in the professional level, by the faculties of civil engineering of the universities of the country and by the School of Sanitary Engineering of the Faculty of Environmental Engineering in the National University of Engineering (UNI), where annually an average of 30 professionals graduate in the specialty. While at postgraduate level, 15 students are currently following the programme.

The shortage of enabled human resources (mainly in the provinces) has generated that professional of other specialties have become responsible for design, construction, operation, maintenance and administration of the institutions related to the sector. Years ago, the National Program of Drinking Water and Sanitation (PRONAP) made a significant effort to enable the human resource of the service providers, but unfortunately due to political interferences, low remunerations and lack of incentives, the enabled personnel quitted their jobs in the companies after short time.

Argentina

The Argentinean universities have the capacities to produce the professionals required but there is need to implement reforms. These reforms should be done in such way that water subjects have an integral approach, and include elements from other specialities. Universities have the base to educate professionals at management level, including three

universities with masters programmes in sanitary engineering. The problem is the lack of students. The role of the university in this sector has an atmosphere of frustration, due to the lack of interested students.

In Argentina, the National Institute of the Water (INA) is in charge of the research and technology development regarding water resources. In the country there are not graduate programmes in sanitary engineering. Mostly, professionals involved in the sector are civil engineers with postgraduate education in sanitary engineering from one of the two masters programmes offered in the country. The University of Buenos Aires (UBA) and the National University of Rosario, offer the Specialization in sanitary engineering. The duration of both programmes is of approximately 2 years. Additionally, the UBA offers the Masters in sanitary engineering and environmental sciences. The National University of Rosario also offers a Doctorate in Engineering with application in the area of sanitary and environmental engineering. Likewise, activities carried out by public and private universities must be considered, offering masters that deal with managerial, economic, financial, legal and environmental aspects. These are addressed to prepare professionals of different specialities in updated managerial skills, so that they assume functions of high direction of companies, organizations and institutions of the water and sanitation sector.

4.6 Discussion of the methodology

Methodology applied has been widely applied in the past producing reliable results. However, additional activities are required to allow the researcher the check the information obtained. Answers obtained from the interviews are difficult to judge, considering the wide range of expertises that are here involved. In that sense, the application of additional tools for collection of data might contribute to the generation of more reliable results.

It was observed that expert's opinion enlightened the background and general overview on the national water sector in all the five countries considered in this study. Additionally, they contributed to build a general overview about the region. However, their factual knowledge on manpower requirements at postgraduate level is not extensive. Therefore, expert opinion methodology is not very helpful to estimate roughly a requirement, but to generate the framework necessary to determine the activities to that end. In that sense, the analysis of databases available is required to avoid that data are biased by the knowledge of the researcher on the conditions of country, or in the expert's information.

Selection of countries

- According to literature reviewed, people lived under similar economic circumstances (Miranda, 2003). However, several experts in Brazil stated that north-eastern Brazil is far more developed than Central America and Hispanic Antilles. Thus, interviews in north-eastern Brazil did not represented the realities in that area. In that sense, it would be better including one country in Central America to better represent the region.

- Argentina is selected as representative country due to its high population; it represents 61% of the population of the group III. However, since December 2001 the country has

faced a particular condition, characterised by an economic crisis and out of any regular pattern of growth. In that sense, Argentinean situation is in a disadvantaged position compared to their neighbours in the sub region. The big impact of the crisis in the economy of its neighbours, forced the researcher to include it anyway and support the buoyancy of the region with the more optimistic vision of south-eastern Brazil, which turned out being a decision rightly made. Finally, results from both countries built responses similarly, confirming the initial assumptions, and gave a wider idea about the status of the sector there.

- Considering the continental extension of Brazil, it is divided in three main regions according to their level of development. Hence, experts from the southeast represent more developed areas, experts in Brasilia represent average regions, and interviewees in the northeast represent the less developed ones. The results obtained agreed to the assumptions made.

Selecting and contacting experts

Application of internet-based tools

The application of Internet based tools did not give successful results both in the selection of experts and the collection of data. This situation, faced during the first stage was confirmed during the fieldwork, with the non-response from some experts who agreed responding the questions via e-mail, due their lack of time at the moment initially set for the interview.

Institutional frameworks are different depending on the country

- Regarding governmental organisations, different institutions are involved in the sector, and depending on the country, different organisations are in charge thereof. In that sense, it is difficult to identify where crucial individuals are located. At national level, it is seen that in Brazil, Mexico and Colombia, water and sanitation are managed as sub sectors of the Water sector ruled by the Ministry of Environment. Conversely, in Peru, and Argentina, the -sub-sector is managed separately by the ministries of Housing and Sanitation; and Planning, Public Investment and Services respectively.

- People involved in the private sector was not identified with application of the methodology chosen. An alternative has to be implemented in order to obtain the opinion of them.

- Although in Brazil and Mexico national agencies are in charge of setting the policies for the sector; in Brazil regulation is in charge of state secretaries (water, energy or sanitation) while in Mexico, regional offices of the National Commission of Water (CNA) are in charge of this task. Conversely, in Argentina the sector is decentralised and each province has its own regulatory framework, while in Colombia and Peru, it is concentrated at the central government level.

- Facing the level of complexity, and differences found in the different countries, finding out who is the right person to interview may be confusing. Selection of experts based in their positions in decision-making levels within key organisations is not necessarily correct. Although it worked out in most of the cases, in others, some interviewees claimed the inadequate selection of some so-called experts, based in their position. According to their arguments, it becomes more relevant, when it is considered the high turnover of the employees, especially at those positions, mainly within the government or in governmental dependent offices.

- Apparently selection of experts was going to be easier in smaller countries; Argentina,

Colombia and Peru. However, there were many problems to contact them due to several reasons. In Colombia, it seemed there was little concern about the topic, reflected in the low willingness to meet in some of the cases (number of interviewees who did not attend the interview was much higher than the average for the complete set of countries). In Argentina, the high fragmentation of the sector makes difficult to identify the experts there. For this reason, there was no opportunity to gather the perspectives from private service providers and consultants. The first case becomes crucial, considering that private suppliers deliver most of the water and sanitation services provided in the country.

- Modifications in the agenda, such as inclusion and exclusion of experts to interview, affected the initial plan. Although a number of experts were not available for the interview, the main proportions of experts along the region kept more or less the same. In that sense, the only cases were a huge decrease in the number of experts interviewed was observed in Colombia. Moreover, in north-eastern Brazil only one of the two planned interviewees was contacted.

- Some experts identified after the online survey were not expected to meet. However, as information published in Internet is sometimes outdated, few experts expected were not available anymore and some others facilitated meeting them. This situation allowed the researcher to include some crucial experts in the final list.

Collection of data

Positive and negative points were found during the application of this tool for collection of data. Whereas it was concise and requested the main information required, it lacked ways to check information provided by the experts. Although it was expected that some data were not possible to check through the interviewee, and the uncertainties in that regard would arise, this tool did not provide any chance to check that information, and therefore the sole application of this tool is not enough to assess the requirements intended to measure. Questionnaire allowed interviewees to give to the researcher a clear idea about the concerns that people are facing in the sector, and reflected the situation of the country in short time in a precise and clear way. Additionally, it gave the opportunity to know about other issues not even mentioned by the literature, showing, for instance, additional lines of work in the sector such as disasters, successful experiences in which local community governance may lead their own processes of development in provision of services, institutional arrangements in place, and the development of new water related postgraduate programmes.

5 CONCLUSIONS AND RECOMMENDATIONS

“... If [the cited expert] is a great authority and the consensus of authorities is large, then the argument becomes stronger. But it’s never 100 percent conclusive. All the authorities in the world might agree on something that they later discover to be wrong. So we shouldn’t think that something must be so because the authorities say it is. ...” (Walton, 1997)

5.1 Conclusions

1. In agreement to the Global Water and Sanitation Assessment 2000 and the Human Development Report 2003, in average Latin America and the Caribbean region is on track to achieve the Millennium Development Goals in water supply (target 10) by 2015, considering the performance of the sector during the period between 1990 and 2000. However, Argentina and Colombia face difficulties to achieve the goals.
2. During the first ten years, 50% of the gap in water supply has been bridged, and with 15 years left the chances to achieve the target are very high assuming a similar performance in the future. It occurs even considering that the rates of coverage have not increased rapidly due to the expenditures in upgrading the level of services especially during the last decade.
3. In sanitation, the situation is a little different. Although according to the same statistics the likelihood is less, the gap is not such big, and currently there is more effort in this direction in order to provide services to especially small municipalities and rural areas where the shortage of sanitation services provision is larger.
4. Considering that sanitation is far more expensive than provision of drinking water, to achieve the targets huge investments have to be done. In that sense, about 40 billion dollars are needed to invest annually in the region by 2015 to meet the goal. However, remarkable activities are not in execution in most of the countries, and only Mexico and Peru are carrying out some actions in this direction.
5. Financial constraints are observed as the main limiting factor to overcome the shortage of services provision. However, institutional limitations and absence of local capacities sometimes do not allow the successful execution of low-cost technologies that would increase the levels of coverage at fewer costs.
6. Number of qualified manpower required to achieve the MDGs in water and sanitation in the region are available. Excess of qualified professionals without employment is a noticeable fact in the sector. There is over offer of technical specialists, but there are deficiencies in some fields of knowledge.
7. Practitioners in the water and sanitation sector have strong qualifications in topics related to technical skills, they have good capacity solving problems and performing within a technical context. However, few times are aware about the importance of social sciences and humanities to solve problems. Clear-cut analyses and tangible results are

usually preferred while negotiation processes and politics negotiating are mostly not considered as part of their tasks.

8. Most of the universities in the region are training professionals for conditions under which they are not going to perform. It is common the thought that everything may be solved with engineering skills, while in the field most common failures in projects are related to social, political, financial or economic factors.

9. In order to overcome the lack of context in the engineers, measures have to be taken in the delivery of the courses. There would be need of introducing humanist sciences along with technical subjects. It is necessary to include subjects in topics related to management and social problems. It would be required to increase the level of awareness in the professionals at community level, and in politic agenda.

10. Practitioners are not aware about the importance of local conditions, and mostly are taught to design the same infrastructure regardless the local particularities of the region, population or community. Outdated study materials offer a narrow range of technological possibilities encouraging the design of facilities regardless costs, and aspects related to operation and maintenance.

11. Main needs of qualification are observed in small municipalities, although national agencies and state service providers have good capacities to perform. Especially in Brazil, Peru, and Colombia, small urban concentrations require qualified people that mostly are not available.

12. Qualification for people involved in water and sanitation provision in small settlements of rural areas is required. However, according to the level of services provided and the technologies mostly utilised, postgraduate education is not needed. A professionals in the way between engineering and management may supply the solution to the problems in the rural areas, because sustainable processes are dealt and all the disciplines become involved. Thus it is important that the professional who performs in this area is itself poly functional in all the disciplines.

13. There is not any inventory regarding the capacities available in the sector, however there are not needs of more people to perform the activities already under execution. There is not awareness in the sense of qualifying people to perform better the sector, and it has been clearly stated that lack of qualified human resources is not the critical factor that hinders the achievement of the goals. In that sense, current pace of educational of professionals should be, at least, maintained.

14. Universities in Latin America and the Caribbean offers graduate courses on water and sanitation related issues and not only civil engineers are able to perform as specialists in water issues. By 1991, more than fifty programmes, at graduate and postgraduate level, were offered in water and sanitation issues. Currently, 290 postgraduate programmes are offered in the five countries under consideration for this study.

15. Academic institutions related to the sector, with some exceptions, have few concern relating the current state of the sector. In that sense, universities are isolated and misinformed regarding the activities and plans under planning and execution. Few

examples in Colombia and Brazil showed universities actively involved in the development of policies and plans. However, mostly academicians are few interested in these issues and more concerned to technical and blackboard lecturing.

16. According to the number of water related programmes at postgraduate level available in the region, it seems there are not problems in the generation of sufficient postgraduates to tackle the problems generated by the lack of provision of water and sanitation services. Nevertheless, aspects related to quality of the programmes, and relevance of the subjects are issues under question.

17. The variability in the answers obtained from the experts does not allow to estimate a number of postgraduates required to achieve the targets set by the MDGs. Although some estimations were made, there are not representative signs that help to envisage additional needs of the sector in the region.

18. The limitation of financial resources and the absence of policies accompanied by middle and long-term programmes, supported with own financial allocation, discouraged experts to draw the requirements in post graduated personnel required to achieve the goals. However, sufficient capacities are available in the region to generate the manpower required when those financial resources are available and the sector get up from its rest; educational programmes are already available in the region in various education institutions, although its distribution is in most of the countries uneven.

5.2 Recommendations

Regarding contents

Millennium Development Goals

1. After comparing current levels of investment with investments required to achieve the MDGs in water and sanitation, and considering current fiscal situation of the countries in the region, it is clear that personnel involved in the sector must be qualified. There is need to look for different and creative approaches that help to solve the deficits observed in water and sanitation services provision.

2. The water and sanitation sector in the region is not performing having in mind the Millennium Development Goals. Activities implemented and under execution are part of the development plans designed by the governments to lead the country during their period of mandate.

3. With the exception of Mexico, there is absence of long and middle term plans, with periodical financial allocation, that allow the design of a policy intended to reduce the gaps in water and sanitation provision.

2. Since availability of a specific number of specialists in the field of water supply and sanitation is not a decisive factor in the development of the sector, educational formats and contents of courses should be reviewed.

3. Networking is an incipient activity in the region. Although there are some technological and non-technological developments that would optimise the performance of the sector, especially in rural and marginal-urban areas, water and sanitation sector is

very fragmented. Activities intended to create networks would facilitate the transfer of knowledge and experiences in order to share solutions to common problems.

4. Millennium Development Goals should be socialised in order to get public support. Few people involved in the sector is really concerned about the compromises acquired by the governments, and therefore there is not a critic mass that criticise, support, and contribute in activities that boost programmes and projects in this regard.

5. Universities, research institutes and education institutions should be involved in the activities carries out by the governments, supporting not only technically but scientifically to tackle unconsidered issues such as finances, economics, social and cultural aspects.

6. Water and sanitation problems should be approached from a broader context, a context that includes the whole water cycle and involving practices on integrated water resources management.

7. National institutions require tackling water and sanitation issues with institutional frameworks that link all the activities regarding water uptake, treatment, distribution, collection, and treatment. This might include inventories regarding availability of water, especially in highly densely populated areas. In those cases, conflicts for use of water have to be considered when different uses are in confrontation.

8. As water and sanitation is not a priority for the governments, and public health is not an issue of relevance nowadays, water and sanitation has to be involved within a broader sector called the water sector. Although several countries are already functioning in this way, there are some others who are not. The Integrated Water Resources Management allows to water and sanitation sector the access to more decisive scenarios, where development aspects are of concern. In this arena, the water and sanitation will show its importance as engine of development and reinforce its position.

Development of local capacities

1. Academicians should be trained in issues related to water and sanitation. Lecturers are mostly outdated and delivering education out of the real contexts. In that sense, their human capacities of the educational institutions must be reinforced, facilitating the spread of knowledge along the region. In that way, when financial resources are available to carry out the projects required bridging the gaps, academic institutions will be ready to provide appropriate education to the professionals in the sector.

2. Elaboration of training programs and subjects has to concentrate more in the key problems of the sector. Currently, these subjects include appropriate technologies, finances, politics, institutional and social aspects, tariffs, etc. However, depending on the specific situation, some other shall be included or excluded. Those programmes have to develop capacities of conceptual reflection, approach of solution of problems; develop abilities to cooperate with other disciplines, including elaboration of suitable multidisciplinary exercises, in form of case studies taken from the real life.

3. Curricula have to be hand to hand with the performance and developments of the sector. Curricula shall include all the aspects related to the sector, and not only the

technical ones. Practical exercises should be included, in order to allow masters to understand the complexity of the problems from a holistic approach. Multidisciplinary has to be taken into consideration, since the only gathering of people of different backgrounds does not guarantee multidisciplinary work.

4. Universities, or regulatory institutions of the sector in the region should implement mechanisms to evaluate the quality of both the programmes offered, as in some countries occurs, and the academic staff delivering education of the sector.

5. A complete system of accreditation should be implemented by the sector in order to reduce the politics inferences in the performance, and qualify the practitioners involved in the sector.

6. Detailed studies have to be carried out if results per country want to be obtained. In that sense, a detailed analysis of the situation has to be done, including all the stakeholders involved in the sector. Analysis of additional sources of information and a more complex analysis shall be done considering differences between rural and urban areas.

7. Results obtained from this research shall be socialised to all the participants of the study. This document may be used as baseline to determine strategies to follow in order to overcome the shortages found.

8. Where applicable, developing country governments are encouraged to request that external support agencies fund HRD activities as part of their development co-operation programmes, from the assessment through the implementation stages.

Quantification of needs

1. More detailed studies analysing local databases must be carried out in order to estimate the needs in a more accurate manner. This assessment may help to determine which databases or organisations may be addressed for that end.

2. Quantification of needs must be carried out at operational level, since professional practitioners are currently available, but less trained personnel is not available in small communities that require them most for the operation and maintenance of the facilities.

3. Qualitative and quantitative data must be considered in order to quantify the needs of postgraduates required to achieve the targets in water and sanitation of the MDGs.

Regarding methodology

In general, the methodology chosen to carry out the research turned out being more effective than initially expected. Experts explained in detail the situation of the sector in their countries, and were very willing to share their knowledge and experiences in most of the cases, including statistical data as well. However, some issues could be better analysed if the methodology allowed the application of other tools. In some issues, there are difficulties to confront the opinions of the experts with other sources. Under those circumstances, contradictory positions are difficult to judge.

In order to allow this methodology for an extensive data collection, including interviews with experts, a longer mission shall be needed

Needs assessment

1. An extensive study in this regard should include a wider review of literature, involving statistical data that would reduce the levels of uncertainty in the phase of collection of data.
2. Questionnaires should be sent in advance to the interviewees, in order to give them chance to look for additional information important for the study.
3. Interviews have to be taped in order to keep as much information as possible, and to give more opportunities to analyse answers avoiding mistakes due to unclear contexts.
4. Experts should be requested to suggest other experts of the field, inquiring about contact information.
5. Experts should be informed about findings obtained during the research; they are mostly very interested in the outcomes of this kind of studies, and very willing to give feedback in this regard.
6. Application of focus groups is recommended in order to estimate the needs by using the inputs of different experts within the sector. This tool provides the possibility of compare and contrast different approaches to overcome the shortages in this regard.
7. Other stakeholders such as NGOs and private operators shall be included in more detailed analysis. Moreover, service providers at different scales of population are important referents of the sector.

Selection of areas of study

1. Criteria to select regions under study shall be set by the researcher. Furthermore, to decide which areas match better to those criteria it is advised to select them with the advice of local experts.
2. It is recommended to consider in further studies the analysis of urban and rural areas, as considered in this research. Moreover, analysis of middle size cities is very important, since most of the urbanisation processes are in cities of about 2 million people.

Selection of experts

1. Experts shall be contacted by phone and be requested for the selection of other experts (by peers selection). Usually they are willing to co-operate with academic research.
2. In order to contact the experts, it is advisable to confirm at least twice the attendance of the interviewee. It increases the chances of meeting the selected expert.

Design of the questionnaire

1. Some questions of the questionnaire should be sent in advance to the interviewees. It allow them to search for additional information, specifically statistical data difficult to find during short visits.
2. However, not all the questions should be delivered in advance, it reduces the

possibilities to get spontaneous responses, involving less institutional approaches.

Interviewing

1. For ease of the analysis of data, few qualitative data should be involved. Then, if quantitative data are available, Interviews should include more quantitative questions, and this would apply for a more detailed study. However, for a broad study, where quantitative data do not exist, like in this case, qualitative data cannot be missed.
2. Recording of interviews gave good results in order to keep the all the information for its further analysis. However, analysis of tapes involves a lot of time, and it is recommended to be aware regarding the time required for that analysis. The analysis of each interview may take two or up to three times the original duration of the interview.

Analysis of information

1. There are some software packages for analysis of qualitative information. Further studies that follow similar methodologies to this one, might use those tools for ease in the management of information.
2. In order to complement the information obtained during the interviews, it is recommended to analyse other sources of information by an extensive analysis of statistical data from the national databases.

5.3 Topics for further development

1. Evaluation of quality in postgraduate programmes water and sanitation related in the region of Latin America and the Caribbean. Quality includes relevance of the contents, capability of staff and quality of the subjects delivered.
2. Identification of needs of postgraduate education in water related issues in Latin America and the Caribbean region addressed to docents, and academic staff in the universities of the region.
3. Assessment of the possibilities to develop networking projects such as Streams of Knowledge, PROSAB, etc., in which university research groups may share their findings between universities, but also involving productive sector, government, and funding agencies in the region.
4. Identification of the needs of training in less developed countries where higher education is not developed. Alternative methods of education may apply to overcome the shortages in countries such Haiti and Belize.
5. Design of appropriate curricula that involves the elements mostly lacked in the programmes provided in the region and contribute to the more effective performance of the sector towards the achievement of the goals.
6. Development of strategies and tools to share knowledge and experiences of the water and sanitation sector in the region. It includes the participation of all the stakeholders involved in the sector, and gives room to share information regarding successful and failed experiences in projects carried out by the sector considering aspects related to building of local capacities.

6 REFERENCES

Capacity building in the water sector

- Abrams, L. (1996). Capacity Building for water supply and sanitation development at local level. The Threshold Concept. A paper delivered at the 2nd UNDP Symposium on Water Sector Capacity Building. Delft, Netherlands, 4 - 6 December 1996
- Alaerts, G.J., Hartvelt, F.J.A. and Patorni, F.-M. (Eds.) (1999) Water Sector Capacity Building: Concepts and Instruments. Proceedings of the Second UNDP Symposium on Water Sector Capacity Building Delft, 1996. A.A. Balkema. Rotterdam.
- Alaerts, G.J., Blair, T.L. and Hartvelt, F.J.A. (Eds.) (1991) A Strategy for Water Sector Capacity Building. Proceedings of the UNDP Symposium on Water Sector Capacity Building Delft, 1991. IHE Report Series. Delft. The Netherlands.
- Beken, A. van der (2002) Water Related Education, Training, and Technology Transfer. Paper (18 pp.) published in Volume II.§7. "Water Science and Resources" of 'Knowledge for Sustainable Development: An Insight into the Encyclopaedia of Life Support Systems' Johannesburg. South Africa.
- Biswas, A.K., Hartvelt, F. and Tortajada, C. (Eds.)(1996) Special thematic issue: Capacity Building for Integrated Water Management. International Journal of Water Resources Development. Carfax Publishing Company. Abingdon, UK.
- Cunge, J.A. and van der Beken, A. (2003) A Review of Recent Papers on Water-Related Education and Training and some critical and provocative thoughts for discussion. Encyclopaedia of Life Support Systems. European Thematic Network of Education and Training (ETNET21) for Environment-Water.
- Galvis, G. (2001) Hygiene, sanitation, and Water Supply: WET for sectoral, intersectoral and multidisciplinary development. Presented in Human Capacity Building in the Water Sector through innovation and collaboration Water-Education-Training (WET). Delft, The Netherlands.
- IHP (International Hydrological Program) (1999) Long-Term Vision for Water, Life and the Environment (World Water Vision). working paper to initiate the consultation towards a vision *WATER-EDUCATION-TRAINING (W-E-T) -a sector vision of educators and those to be educated* – Paris.
- Kolsky, P, and Cotton A.P (1996). Educating Engineers in Water and Sanitation, Chapter 12 (pp136-148) in *Educating for Real: the training of professionals for development practice*, ed. by Nabeel Hamdi. Intermediate Technology Press: London.
- UNDP (1997) Capacity Development. Technical Advisory Paper 2. United Nations

Development Programme. Management Development and Governance Division
Bureau for Policy Development. New York

UNDP (1998) Capacity Assessment and Development In a Systems and Strategic
Management Context. Technical Advisory Paper No.3. United Nations
Development Programme. Management Development and Governance Division
Bureau for Development Policy. New York

UNEP (2002) Capacity Building for Sustainable Development: An overview of UNEP
environmental capacity development initiatives. Division of Environmental Policy
Implementation. New York

UNESCO Institute for Statistics (2003) Global Education Statistics: Comparing
Education Statistics Across the World. Montréal.

UNESCO Institute for Statistics (2001) UNESCO Statistical Yearbook. Montréal.

Methodology applied

Barker, A. and Peters, B.G. (Eds.) (1993) The Politics of Expert Advice. Edinburgh
University Press. Edinburgh.

Brigs, C.L. (1986) Learning how to ask: A sociological appraisal of the interview in
social science research, 'Studies in Social and Cultural Foundations in Language'.
Cambridge University Press. Cambridge.

Cicourel, A.V. (1982) Interviews, surveys and the problem of ecological validity,
American Sociologist 17: 11-20

Cooke, R. M. (1991), Experts in Uncertainty: Opinion and Subjective Probability in
Science. Oxford University Press, Oxford.*

Douglas, J.D. (1985) Creative interviewing, vol. 159, Sage Library of Social Research.
Sage Publications. London.

Foddy, W. (1993) Constructing Questions for Interviews and Questionnaires: Theory
and Practice in Social Research. Cambridge University Press. Cambridge. U.K.

Gupta, K. (1999) A Practical Guide to Needs Assessment. American Society for
Training and Development. Jossey-Bass/Pfeiffer. San Francisco, California. U.S.A.

Johnson, D.E., Meiller, L.R., Clancy Miller, L. and Summers, G.F. (Eds.) (1987) Needs
Assessment. Iowa State University Press. Ames, Iowa. U.S.A.

Kaufman, R. (1982). Identifying and solving problems: A systems approach. University
Associates. San Diego.

Kaufman, R., Rojas, A., & Mayer, H. (1993). Needs assessment: A user's guide.
Englewood Cliffs, NJ: Educational Technology.

- Ontway, H. and von Winterfeldt, D. (1992) Expert Judgement in Risk Analysis and Management: Process, Context and Pitfalls, *Risk Analysis* 12 (1): 83-93
- Patel, S. M. (1993) Training Needs Assessment: A model and its applicability for the Gujarat Water Supply and Sewerage Board of India. M.Sc. Thesis. International Institute for Infrastructural Hydraulic and Environmental Engineering (IHE). Delft. The Netherlands.
- Phillips, D.L. (1971) Knowledge from what: Theories and methods in social research, Chicago Rand McNally.
- Phillips, J.J. and Holton, E.F. (Eds.) (1995) In Action: Conducting Needs Assessment. American Society for Training and Development. Alexandria Virginia. U.S.A.
- Reviere, R., Berkowitz, S., Carter, C.C. and Graves Ferguson, C. (Eds.) (1996) Needs Assessment: A Practical Guide for Social Scientists. Taylor & Francis. Washington.
- Rodić, L. (2000) Reliability of Landfill Technology. PhD thesis. Delft University of Technology. Uitgeverij Eburon. Delft. The Netherlands
- Rossett, A. (1987) Training Needs Assessment. Educational technology Publications, Inc. Englewood Cliffs, New Jersey. U.S.A.
- Walton, D.N. (1997) Appeal to Expert Opinion: arguments from authority. The Pennsylvania State University Press. University Park, Pennsylvania. U.S.A.
- Witkin, B.R. and Altschuld, J.W. (1995) Planning and Conducting Needs Assessments: A Practical Guide. SAGE Publications Inc. Thousand Oaks. California. U.S.A.
- Witkin, B.R. (1984) Assessing Needs in Educational and Social Programs. Jossey-Bass Inc. Publishers. San Francisco, California. U.S.A.

Millennium Development Goals and water and sanitation sector

- Annan, K (2000) 'We the peoples' The role of the United Nations in the 21st Century. United Nations. New York
- Anwar, A. (1991) Analysis of Professional Manpower Requirements in the Water Supply and Sanitation Sector in Indonesia. M.Sc. Thesis. IHE Delft. Delft, The Netherlands
- Briscoe, J. (1995) Financing Water and Sanitation Services: The Old and New Challenges. Keynote address to the World Congress of the International Water Supply Association, Durban.
- Cairncross, S. (1992) Sanitation and Water Supply: Practical Lessons from The Decade. The World Bank, Washington.
- Cairncross, S. (2003) Sanitation in the developing world: current status and future solutions. *International Journal of Environmental Health Research* 13, S123 –

S131. London

- Cairncross, S. (2004) Personal communication. London. February 2004
- Calaguas, B (2004) Personal communication. London. February 2004
- Camdessus, M. (2003) Financing Water for All. Report of the World Panel on Financing Water Infrastructure, James Winpenny, ed. World Water Council, Marseille, France.
- Cosgrove, W.J.; Rijsberman, F.R. (2000) World water vision: making water everybody's business. Earthscan Publications Ltd. London.
- Devarajan , S., Miller, M.J., Swanson, E.V. (2002) Goals for Development: History, Prospects and Costs
- Fay, M. and Yepes, T. (2003) Investing in infrastructure: What is needed from 2000 to 2010? World Bank Policy Research Working Paper 3102, July 2003. Washington
- Figüeres, C. (2003) Will the UN be able to live up to its expectations for attaining the Millennium Development Goals? UNESCO-IHE Institute for Water Education. UN Day Celebrations. 24 October 2003, Amsterdam, The Netherlands
- Galvis, G. (2003) ¿In Search of Better sanitation – Will MDGs Help to Advance Progress Towards Achieving Access to Improved sanitation? ¿What Actions are Required – A Regional Perspective? Water Week. Washington.
- Inter-American Development Bank –IDB– (2003a) Poverty Reduction and Promotion of Social Equity Strategy Document. Inter-American Development Bank. Washington, D.C.
- International Monetary Fund and The World Bank (2003). Achieving the MDGs and Related Outcomes: A Framework for Monitoring Policies and Actions. Washington
- International Monetary Fund and Organisation for Economic Co-operation and Development (2000), *A Better World for All: Progress Towards the International Development Goals*. United Nations, and World Bank. Washington, D.C.
- Jolly, R (2004) Personal communication. London. February 2004
- Jolly, R (2003) Assessment of progress towards the WSSD goal for Sanitation: Delivering Clean Water for All. Water Supply and Sanitation Collaborative Council. Geneva
- Leipziger, D., Fay, M., Wodon, Q. and Yepes, T. (2003) Achieving the Millennium Development Goals, The Role of Infrastructure. World Bank Policy Research Working Paper 3163. Washington, D.C.
- McGranahan, G. (2003) Beyond Inaccurate Crisis Narratives; Meeting the Water and

- Sanitation MDGs. In Satterthwaite, D. (Ed.) (2003) *The Millennium Development Goals and Local Processes. Hitting the Target or Missing the Point?* International Institute for Environment and Development. London.
- McGranahan, G (2004) Personal communication. London. February 2004
- Mehta, M. (2003) *Meeting the Financing Challenge for Water Supply and Sanitation. Incentives to promote reforms, leverage resources, and improve targeting.* The Water and Sanitation Program. The World Bank. New York
- Mehta, M. and Knapp, A. (2004) *The Challenge of Financing Sanitation for Meeting The Millennium Development Goals.* Paper commissioned by the Norwegian Ministry of the Environment, for the 12th Session of the United Nations Commission on Sustainable Development (CSD-12). New York
- Organisation for Economic Co-operation and Development (1996) *Shaping the 21st Century: The Contribution of Development Co-operation.* Paris.
- Pan-American Health Organisation (2003). *Water crisis affects 130 million people in the Americas* Press Release. Pan-American Health Organisation/World Health Organisation. October 3, 2003. Washington.
- Pan-American Health Organisation and World Health Organisation (2001b). *Serie de informes técnicos / Desigualdades en el acceso, uso y gasto con el agua potable en América Latina y el Caribe.* Programa de Políticas Públicas y Salud, División de Salud y Desarrollo Humano. Programa de Saneamiento Básico, División de Salud y Ambiente. Pan-American Health Organisation/World Health Organisation. Washington
- Pargal, S. (2003) *Regulation and private sector investment in infrastructure: Evidence from Latin America.* World Bank Policy Research Working Paper 3037. Washington.
- Sachs, J. D. (2001) *Macroeconomics and Health: Investing in Health for Economic Development.* Report of the Commission on Macroeconomics and Health. World Health Organization. Geneva
- Satterthwaite, D. (Ed.) (2003) *The Millennium Development Goals and Local Processes. Hitting the Target or Missing the Point?* International Institute for Environment and Development. London.
- Satterthwaite, D (2004) Personal communication. London. February 2004
- Sureshbhai, P (1993) *Training Needs Assessment. A model and its applicability for the Gujarat Water Supply and Sewerage Board of India.* M.Sc. Thesis. IHE Delft. Delft, The Netherlands
- UNDP (2003) *Human development Report 2003. Millennium Development Goals: A contract among nations to end human poverty.* Oxford University Press. New York.
- UNICEF (1995) *UNICEF Strategies in Water and Environmental Sanitation.* New York

UN (United Nations) (2003) Water for People, Water for Life. The United Nations World Water Development Report. World Water Assessment Programme. Paris.

UN (United Nations) (2001) Road map towards the implementation of the United Nations Millennium Declaration. Report of the Secretary-General. United Nations. New York

UN (United Nations) (2000) A/RES/55/2. 18 September. New York. [<http://www.un.org/millennium/declaration/ares552e.pdf>]. March 2003.

UN-HABITAT (2003) Water and Sanitation in the World Cities. Local Action for Global Goals. Earthscan Publications. London.

UNPF (United Nations Population Fund) (2003) Achieving the Millennium Development Goals / Global Population and Water: Access and Sustainability. Series Population and development strategies. New York

WHO, UNICEF and WSSCC (2000) Global Water Supply and Sanitation Assessment Report. Joint Monitoring Programme for Water Supply and Sanitation. Geneva.

WHO and UNICEF (2004) Meeting The MDG Drinking Water and Sanitation Target. A Mid-Term Assessment of Progress. Joint Monitoring Programme.

WMO and UNESCO (1997) Water Resources Assessment - Handbook for Review of National Capabilities. Geneva

WORLD BANK (2003) World Development Indicators. Washington D.C.

WSSCC (2000) Vision 21. A shared vision for Hygiene, Sanitation and Water Supply and A Framework for Action. Water Supply and Sanitation Collaborative Council. Geneva.

WSSCC (2004) Resource Pack on the Water and Sanitation - Millennium Development Goals. Water Supply and Sanitation Collaborative Council. Geneva

Information about Latin America and the Caribbean

Agua Latinoamerica (2004) *Destaca Bid que Latinoamerica Requiere Inversion en Infraestructura*. Inter American Association of Sanitary Engineering – AIDIS -. march/april 2004: Vol. 4, No. 2

Brea, J.A. (2003) Population dynamics in Latin America. *Population Bulletin*. Vol. 58 (1) March 2003. Washington

Cerrutti, M. and Bertonecello, R. (2003) Urbanization and Internal Migration Patterns in Latin America. Paper prepared for Conference on African Migration in Comparative Perspective, Johannesburg, South Africa.

Economic Commission for Latin America and the Caribbean –ECLAC-/CELADE

(Centro Latinoamericano y Caribeño de Demografía) (1999), “América Latina: proyecciones de población urbana y rural 1970 - 2025”, Boletín Demográfico No 63, LC/G.2052, marzo de 1999, Santiago de Chile,

Economic Commission for Latin America and the Caribbean –ECLAC-, Inter-American Development Bank –IDB-, United Nations Development Programme –UNDP-, World Bank (2003) Brasilia Declaration: Proposal for Implementing the Millennium Development Goals. ECLAC-UN, IDB, UNDP, World Bank. November 17, 2003

Economic Commission for Latin America and the Caribbean –ECLAC- (2003) 2002 Statistical yearbook for Latin America and the Caribbean. ECLAC-UN. Santiago de Chile

Fay, M. (2000) Financing the Future: Infrastructure Needs in Latin America, 2000-05. Washington.

Galvis, G. (2004) Objetivos de Desarrollo del Milenio (ODM) y la Cumbre de Johannesburgo Asociadas con Agua Potable y Saneamiento. Presented in *Realidad y Perspectivas para el Desarrollo del Sector de Agua Potable y saneamiento en la Subregión Andina. International Workshop*. Andean Community. General Secretary JICA, Japan International Cooperation Agency and the co-operation of CEPIS/SDE, PAHO. Lima. Peru.

Inter-American Development Bank –IDB– (2003b) Mexico and Central America Need to Invest \$23 Billion to Meet Millennium Development Goal of Expanding Water and Sanitation Services. Press Release April 22, 2004

Inter-American Development Bank –IDB– (2004a) President of IDB inaugurates Conference on Financing Water and Sanitation Services in Latin America. Regional experts contribute to developing Bank strategy for sector. Press Release November 10, 2003

Inter-American Development Bank –IDB- (2004b) Obstacles and constraints for increasing investment in the water and sanitation sector in Latin America and the Caribbean. Washington.

Jouravlev, A. (2001) Serie recursos naturales e infraestructura. Administración del agua en América Latina y el Caribe en el umbral del siglo XXI. División de Recursos Naturales e Infraestructura. Economic Commission for Latin America and the Caribbean –ECLAC-. Santiago de Chile.

Lattes, A., Rodríguez, J. and Villa, M. (2002). Population dynamics and urbanization in Latin America. Concepts and data limitations. Paper presented in the IUSSP Expert Meeting. Bellagio, March 2002.

Maldonado, M. (2002) Higher Education Research in Latin America: Trends and Resources. *International Higher Education*. The Boston College Center for International Higher Education. No. 28. (23-25)

Moura Castro de, C. and Levy, D.C. (1997) Higher Education in Latin America and the Caribbean. A Strategy Paper. SDS/SOC Interamerican Development Bank. Washington, D.C.

Ocampo, J.A. and Martin, J. (Eds.) (2003) A Decade of Light and Shadow. Latin America and the Caribbean in the 1990s. Economic Commission for Latin America and the Caribbean (ECLAC). Santiago, Chile

PAHO-WHO (1991) Directorio de Programas de Formacion en Ingenieria Sanitaria y Ambiental en America Latina y el Caribe. In co-operation with Interamerican Association of Sanitary and Environmental Engineers. Division of education and training. Washington.

Pardón, M. (2004) Personal communication. Lima

Rangel, L.C. (Ed.) (2001) Regional report on the evaluation 2000 in the Region of the Americas: Water supply and sanitation, current status and prospects. Pan-American Health Organisation, Washington, D.C.

Schwartzman, S. (1999) International Higher Education, Fall 1999. Prospects for Higher Education in Latin America. Boston

Schwartzman, S. (2001) The future of education in Latin America and the Caribbean. Presented in the Seventh Meeting of the Intergovernmental Regional Committee of the Major Project in the Field of Education in Latin America and the Caribbean. Working Document. UNESCO

UNESCO Institute for Statistics (2001) Latin America and the Caribbean. Regional Report. Montréal.

USAID (2004) Latin America & Caribbean Brief. Making cities Work. Washington

Argentina

AIDIS and AIDIS Argentina (2001) Catalogo Interamericano de Ingenieria Sanitaria y Ambiental 2001-2003. Edicion Argentina. Tomo I. Buenos Aires

AIDIS and AIDIS Argentina (2001) Catalogo Interamericano de Ingenieria Sanitaria y Ambiental 2001-2003. Edicion Argentina. Tomo II. Buenos Aires

WHO and UNICEF (2001) Access to Improved Sanitation in Argentina. Coverage Estimates 1980-2000. WHO/UNICEF Joint Monitoring Programme for Water Supply and Sanitation. Geneva.

WHO and UNICEF (2001) Access to Improved Drinking Water Sources in Argentina. Coverage Estimates 1980-2000. WHO/UNICEF Joint Monitoring Programme for Water Supply and Sanitation. Geneva.

Fernandez, N. (2002) La Educacion Superior en la Argentina. Institute for Higher Education in Latin America and the Caribbean –UNESCO-IESALC-. Buenos Aires.

Brazil

- Arrosa, M.S. (2002) A Educação Superior No Brasil. Institute for Higher Education in Latin America and the Caribbean –UNESCO-IESALC-. Porto Alegre
- CEPIS (2000) Evaluacion a los Servicios de Agua Potable y Saneamiento en las Americas. Brasil. Lima. available online in <http://www.cepis.ops-oms.org/>
- Miranda, V.M. (2003) Indicadores Demográficos e Sociais e Econômicos do Nordeste. Consultoria Legislativa da Câmara dos Deputados. Câmara dos Deputados. Brasília
- PAHO (2003) Water crisis affects 130 million people in the Americas Press Release. PanAmerican Health Organisation/World Health Organisation. October 3, 2003. Washington
- PMSS (2002) O Pensamento do Setor Saneamento no Brasil: Perspectivas Futuras. Série Modernização do Setor Saneamento. Programa de Modernização do Setor Saneamento. Brasilia
- PMSS (1995) Demanda, Oferta e Necessidades dos Serviços de Saneamento. Série Modernização do Setor Saneamento. Programa de Modernização do Setor Saneamento. Brasilia
- SNIS (2001) Diagnóstico dos Serviços de Água e Esgotos – 2000. Sistema Nacional de Informações sobre Saneamento – SNIS. Brasília
- SNIS (2004) Diagnóstico dos Serviços de Água e Esgotos – 2002. Sistema Nacional de Informações sobre Saneamento – SNIS. Brasília
- Thadeu, M. (2002) Desafios para Tratamento de Esgotos Sanitários em Minas Gerais: Modelos de Gestão. Secretaria Especial de Desenvolvimento Urbano da Presidência da República Federativa do Brasil. Brasilia
- UN Wire (2003) Brazil: in need of US\$ 62 billion for water projects by 2020. Source Weekly No. 41-42, 22 October 2003. International Reference Centre. Delft, the Netherlands
- WHO and UNICEF (2001) Access to Improved Sanitation in Brazil. Coverage Estimates 1980-2000. WHO/UNICEF Joint Monitoring Programme for Water Supply and Sanitation. Geneva.
- WHO and UNICEF (2001) Access to Improved Drinking Water Sources in Brazil. Coverage Estimates 1980-2000. WHO/UNICEF Joint Monitoring Programme for Water Supply and Sanitation. Geneva.
- WHO/PAHO (2001) Desigualdades en el acceso, uso y gasto con el agua potable en América Latina y el Caribe –Brasil-. Serie de Informes Técnicos No. 2. Programa de Políticas Públicas y Salud. División de Salud y Desarrollo Humano. Programa de Saneamiento Básico. División de Salud y Ambiente. Washington, DC

Colombia

CEPIS (2000) Evaluacion a los Servicios de Agua Potable y Saneamiento en las Americas. Colombia. Lima. available online in <http://www.cepis.ops-oms.org/>

EL TIEMPO (2004) Gobierno promete examinar con lupa los recursos que los municipios destinan al acueducto. El Tiempo, 2 Julio 2004. Bogota. Colombia

ICFES (2002) La Educacion Superior en Colombia. Institute for Higher Education in Latin America and the Caribbean –UNESCO-IESALC-. Bogota.

Lynch, R. (2002) An Energy Overview of Colombia. U.S. Department of Energy Office of Fossil Energy. Washington.

Ministerio de Desarrollo Economico (1998) Inventario Nacional del Sector de Agua Potable y Saneamiento Básico, Ministerio de Desarrollo. Santafé de Bogota. Colombia

WHO and UNICEF (2001) Access to Improved Sanitation in Colombia. Coverage Estimates 1980-2000. WHO/UNICEF Joint Monitoring Programme for Water Supply and Sanitation. Geneva.

WHO and UNICEF (2001) Access to Improved Drinking Water Sources in Colombia. Coverage Estimates 1980-2000. WHO/UNICEF Joint Monitoring Programme for Water Supply and Sanitation. Geneva.

WHO/PAHO (2001) Desigualdades en el acceso, uso y gasto con el agua potable en América Latina y el Caribe –Colombia-. Serie de Informes Técnicos No. 4. Programa de Políticas Públicas y Salud. División de Salud y Desarrollo Humano. Programa de Saneamiento Básico. División de Salud y Ambiente. Washington, DC

Mexico

ANUIES (2002) Anuario Estadístico 2002. Población Escolar de Posgrado. Concentración Nacional de la Población de Maestría por Area, Subarea y Programa. Mexico D.F.

ANUIES (2002a) Anuario Estadístico 2002. Población Escolar de Posgrado. Concentración Nacional de la Población de Especialización por Area, Subarea y Programa. Mexico D.F.

ANUIES (2002b) Anuario Estadístico 2002. Población Escolar de Posgrado. Población Escolar por entidad, Institución y Programa. Mexico D.F.

CEPIS (2000) Evaluacion a los Servicios de Agua Potable y Saneamiento en las Americas. Mexico. Lima. Available online in <http://www.cepis.ops-oms.org/>

Comisión Nacional del Agua (2001) Programa Nacional Hidraulico 2001-2006: CNA, Mexico D.F.

Comisión Nacional del Agua (2004) Estadísticas del Agua en México, 2004: CNA,

Mexico D.F.

Comisión Nacional del Agua (2003) Estadísticas del Agua en México, 2003: CNA, Mexico D.F.

Comisión Nacional del Agua (2004) Evaluación de resultados del Programa de Agua Potable, Alcantarillado y Saneamiento en Zonas Urbanas (APAZU), Informe final: CNA. Subdirección General de Infraestructura Hidráulica Urbana, Mexico D.F.

Comisión Nacional del Agua and Instituto Mexicano de Tecnología del Agua (2003) Evaluación de Resultados del Programa para la Sostenibilidad de los Servicios de Agua Potable y Saneamiento en Comunidades Rurales, en el Ejercicio Fiscal 2003, Informe Final: CNA. Subdirección General de Programas Rurales y Participación Social, Mexico D.F.

INEGI (2003) Distribución porcentual de la matrícula escolar en posgrado según sexo para cada área de estudio y programa, 2001. From: ANUIES (2002). Anuario Estadístico, 2001. Población escolar de posgrado. México, D.F.

WHO and UNICEF (2001) Access to Improved Sanitation in Mexico. Coverage Estimates 1980-2000. WHO/UNICEF Joint Monitoring Programme for Water Supply and Sanitation. Geneva.

WHO and UNICEF (2001) Access to Improved Drinking Water Sources in Mexico. Coverage Estimates 1980-2000. WHO/UNICEF Joint Monitoring Programme for Water Supply and Sanitation. Geneva.

Peru

CEPIS (2000) Evaluación a los Servicios de Agua Potable y Saneamiento en las Américas. Peru. Lima. available online in <http://www.cepis.ops-oms.org/>

Lujan Peralta, H. (1988) La Educación Superior en Perú. Institute for Higher Education in Latin America and the Caribbean –UNESCO-IESALC-. Lima.

WHO and UNICEF (2001) Access to Improved Sanitation in Peru. Coverage Estimates 1980-2000. WHO/UNICEF Joint Monitoring Programme for Water Supply and Sanitation. Geneva.

WHO and UNICEF (2001) Access to Improved Drinking Water Sources in Peru. Coverage Estimates 1980-2000. WHO/UNICEF Joint Monitoring Programme for Water Supply and Sanitation. Geneva.

WHO/PAHO (2001) Desigualdades en el acceso, uso y gasto con el agua potable en América Latina y el Caribe –Perú-. Serie de Informes Técnicos No. 11. Programa de Políticas Públicas y Salud. División de Salud y Desarrollo Humano. Programa de Saneamiento Básico. División de Salud y Ambiente. Washington, DC

Water and Sanitation Program WSP and Canadian International Development Agency ACIDI (2003) Los Servicios de Agua y Saneamiento en el Perú. Un diagnóstico y estadísticas. Water and Sanitation Program World Bank. Lima, Peru

Useful websites

- World Bank Group

The World Bank Group's website explaining and detailing the monitoring progress of the Millennium Development Goals.

Website: <http://www.developmentgoals.org/>

- United Nation Millennium Development Goals

The United Nation's website dedicated to the Millennium Development Goals.

Website: <http://www.un.org/millenniumgoals/>

- United Nations Development Programme

The United Nations Development Programme's website detailing the Millennium Development Goals.

Website: <http://www.undp.org/mdg/>

- Global Water Supply and Sanitation Assessment Report

The WHO and UNICEF Joint Monitoring Programme for Water Supply and Sanitation provides a snapshot of water supply and sanitation worldwide at the turn of the millennium using information available from different sources.

Website:

http://www.who.int/docstore/water_sanitation_health/Globassessment/GlobalTOC.htm

- WHO/UNICEF Joint Water Monitoring Programme

The website hosts both general information and precise water and sanitation data, providing a picture of the situation worldwide at different scales (global, regional and country) enabling you to "zoom" in and out. Information is presented in the form of short texts to which are linked tables, graphs and maps.

Website: http://www.wssinfo.org/en/411_ga2000_en.html

- UNICEF: Water, Sanitation & Environment

UNICEF's website dealing with water, sanitation and health issues, within the context of children.

Website: <http://www.unicef.org/wes/>

- IRC International Water & Sanitation Centre

News and information, advice, research and training, on low-cost water supply and sanitation in developing countries.

Website: <http://www.irc.nl/>

- WaterAid

WaterAid is an international NGO dedicated exclusively to the provision of safe domestic water, sanitation and hygiene education to the world's poorest people.

Website: <http://www.wateraid.org>

- Water & Sanitation Programme

The WSP is an international partnership of the world's leading development agencies concerned with water and sanitation services for the poor.

Website: <http://www.wsp.org/english/index.html>

- Water Supply and Sanitation Collaborative Council

The Water Supply and Sanitation Collaborative Council is a leading international organisation that enhances collaboration in the water supply and sanitation sector, specifically in order to attain universal coverage of water and sanitation services for poor people around the world.

Website: <http://www.wsscc.org>

- Plan of Implementation of the World Summit on Sustainable Development, Johannesburg, September 2002

Website:

http://www.un.org/esa/sustdev/documents/WSSD_POI_PD/English/POIToc.htm

- Inter-American Development Bank –IDB-

The IDB Group is the main source of multilateral financing for economic, social and institutional development in Latin America and the Caribbean. It also plays a leading role in regional integration.

Website: <http://www.iadb.org>

- Inter-American Association of Sanitary and Environmental Engineering – AIDIS-

AIDIS is a non-profit organisation that gathers the main associations of professionals and students throughout the Americas working in environmental protection, health and sanitation.

Website: <http://www.aidis.org.br>

- Brazil National Water Agency –ANA-

This agency is a response to the increasing demands over scarce water resources by conflicting uses, such as agriculture, industry, urban consumption, and recreation in Brazil. Amongst ANA's attributions is the planning and management of the national water resources, while being subject to the principles, guidelines and instruments defined by the National Policy on Water Resources.

Website: <http://www.ana.gov.br>

- El Instituto Mexicano de Tecnología del Agua –IMTA-

The Mexican Institute of Water Technology (IMTA) is an autonomous public organization linked to the former Ministry of Agriculture and Water Resources (SARH) with the main objective of developing technology and training the necessary qualified human resources in order to ensure the rational utilization and integrated management of water resources.

Website: <http://www.imta.mx>

- Universidad Autonoma Nacional de Mexico –UNAM-

The UNAM is the most important university in the country and the most significant academic institution in the foundation and development of the nation.

Website: <http://www.unam.mx>

- Federación Mexicana de Ingeniería Sanitaria y Ciencias Ambientales A.C.. (FEMISCA)

The Mexican Federation of Sanitary and Environmental Engineering –FEMISCA- is the oldest Mexican association related to sanitation, prevention and environmental pollution.

Website: <http://www.femisca.org>

- **Pan-American Health Organisation -PAHO-**
 The Pan American Health Organization (PAHO) is an international public health agency with 100 years of experience in working to improve health and living standards of the countries of the Americas. It serves as the specialized organization for health of the Inter-American System.
 Website: <http://www.paho.org>
- **Pan-American Centre for Sanitary Engineering and Environmental Sciences –CEPIS-**
 CEPIS is the centre for environmental technology of the Pan-American Health Organisation, Regional office for the Americas of the World Health Organisation.
 Website: <http://www.cepis.ops-oms.org>
- **Associação Brasileira de Engenharia Sanitaria e Ambiental –ABES-**
 ABES is a non-governmental organisation whose main objective is to contribute to the improvement of quality of living of Brazilian people through the knowledge of its associates.
 Website: <http://www.abes-dn.org.br>
- **Instituto de Investigacion y Desarrollo en Abastecimiento de Agua, Saneamiento Basico y Conservacion del Recurso Hidrico –CINARA-**
 Cinara is a research and development institution in water, sanitation and water resources conservation. It is part of the Faculty of Engineering of Valle University in Cali, Colombia.
 Website: <http://www.cinara.org.co>
- **Associação Nacional dos Serviços Municipais de Saneamento -ASSEMAE-**
 National Association of Municipal Sanitation Services is a non-profit organisation that gathers almost two thousand Brazilian municipalities that manage, direct or indirectly, and publicly, the provision of services related to water supply, sanitation, urban drainage, solid wastes, and vectors control.
 Website: <http://www.assemae.org.br>
- **Companhia de Tecnologia de Saneamento Ambiental –CETESB-**
 The Company of Technology and Environmental Sanitation –CETESB- is an agency for the Government of Sao Paulo responsible for the control, surveillance, monitoring, and licensing of activities that generate pollution in air, soil, and water.
 Website: <http://www.cetesb.sp.gov.br>
- **Companhia de Saneamento Basico do Estado de Sao Paulo –SABESP-**
 The State Company of Basic Sanitation of Sao Paulo is one of the largest sanitation companies in the world. Sabesp's work to serve 24,8 million clients spread throughout the state of São Paulo.
 Website: <http://www.sabesp.com.br>
- **Associação das Empresas de Saneamento Básico Estaduais –AESBE-**
 State Companies of Basic Sanitation Association –AESBE- is a non-profit civil organisation that was established by the 24 state companies of basic sanitation in Brazil in 1985.
 Website: <http://www.aesbe.org.br>

- Comision Nacional del Agua –CNA-
National Commission of Water is the regulatory agency of water resources management in Mexico.

Website: <http://www.cna.gob.mx>

- Ente Nacional de Obras Hidraulicas y Saneamiento –ENHOSA-
ENHOSA coordinates the efforts to help municipalities and provinces to get funds for the Water and Sanitation Sector in Argentina.

Website: <http://www.enohsa.gov.ar>

- Subsecretaria de Recursos Hidricos. Secretaria de Obras Publicas Argentina
Sub secretary of Water Resources is responsible in the assistance to elaborate and execute the national water policy and suggest the regulatory framework related to water resources management.

Website: <http://www.obraspublicas.gov.ar/hidricos/>

- Red Latinoamericana de Educación y Capacitación en Recursos Hídricos -LA
WETnet-

Latin American Network for Water Education and Training is an initiative based on the recognition of the fact that the human resource component forms a key critical factor in the development of sustainable water management scenes, with the purpose of contributing to the education and the invigoration of human capacities.

Website: <http://www.la-wetnet.org/>

- Departamento de Engenharia Ambiental. Escola Politecnica. Universidade Federal da Bahia –UFBA-

The Department of Environmental Engineering of the Federal University of Bahia is the main hub of knowledge on sanitation in north-eastern of Brazil.

Website: <http://www.eng.ufba.br/departamentos/saneamento.htm>

- Programa de Pesquisa em Saneamento Básico –PROSAB-
PROSAB, the Brazilian government funded program in research for basic sanitation, focuses in development of technologies that improve conditions of living of Brazilian population, specially the poor, who require most actions in basic sanitation.

Website: <http://www.finep.gov.br/prosab>

- Associação Brasileira de Recursos Hídricos –ABRH-

The ABRH is an organisation that intends to assemble people and institutions related to planning and management of water resources in Brazil.

Website: <http://www.abrh.org.br>

- Dirección General de Agua Potable y Saneamiento Básico

The Colombian General Directorate for Water Supply and Basic Sanitation.

Website: <http://www.minambiente.gov.co/sias/default.html>

- Servicio de Agua Potable y Alcantarillado de Lima –SEDAPAL-

SEDAPAL S.A. is a State company of private right in charge of providing the services of water supply and wastewater disposal in the provinces of Lima and Callao.

Website: <http://www.sedapal.com.pe>

- Facultad de Ingeniería Ambiental. Universidad Nacional de Ingeniería –UNI-
The oldest programme in Sanitary Engineering in Latin America. It offers graduate and postgraduate courses intending to contribute to the Peruvian development.
Website: <http://fia.uni.edu.pe/>

7 APPENDICES

Annex 1 Map of the region



Annex 2 Millennium Development Goals, Targets and Indicators

GOALS AND TARGETS

INDICATORS

Goal 1: Eradicate extreme poverty and hunger

Target 1: Halve, between 1990 and 2015, the proportion of people whose income is less than one dollar a day

1. Proportion of population below \$1 per day
2. Poverty gap ratio [incidence x depth of poverty]
3. Share of poorest quintile in national consumption

Target 2: Halve, between 1990 and 2015, the proportion of people who suffer from hunger

4. Prevalence of underweight children (under-five years of age)
5. Proportion of population below minimum level of dietary energy consumption

Goal 2: Achieve universal primary education

Target 3: Ensure that, by 2015, children everywhere, boys and girls alike, will be able to complete a full course of primary schooling

6. Net enrolment ratio in primary education
7. Proportion of pupils starting grade 1 who reach grade 5
8. Literacy rate of 15-24 year olds

Goal 3: Promote gender equality and empower women

Target 4: Eliminate gender disparity in primary and secondary education preferably by 2005 and to all levels of education no later than 2015

9. Ratio of girls to boys in primary, secondary and tertiary education
10. Ratio of literate females to males of 15-24 year olds
11. Share of women in wage employment in the non-agricultural sector
12. Proportion of seats held by women in national parliament

Goal 4: Reduce child mortality

Target 5: Reduce by two-thirds, between 1990 and 2015, the under-five mortality rate

13. Under-five mortality rate
14. Infant mortality rate
15. Proportion of 1 year old children immunised against measles

Goal 5: Improve maternal health

Target 6: Reduce by three-quarters, between 1990 and 2015, the maternal mortality ratio

16. Maternal mortality ratio
17. Proportion of births attended by skilled health personnel

Goal 6: Combat HIV/AIDS, malaria and other diseases

Target 7: Have halted by 2015, and begun to reverse, the spread of HIV/AIDS

18. HIV prevalence among 15-24 year old pregnant women
19. Contraceptive prevalence rate
20. Number of children orphaned by HIV/AIDS

Target 8: Have halted by 2015, and begun to reverse, the incidence of malaria and other major diseases using effective malaria prevention and treatment measures

22. Proportion of population in malaria risk areas

21. Prevalence and death rates associated with malaria

23. Prevalence and death rates associated with tuberculosis

Goal 7: Ensure environmental sustainability*

Target 9: Integrate the principles of sustainable development into country policies and programmes and reverse the loss of environmental resources

Target 10: Halve, by 2015, the proportion of people without sustainable access to safe drinking water

Target 11: By 2020, to have achieved a significant improvement in the lives of at least 100 million slum dwellers

24. Proportion of TB cases detected and cured under DOTS (Directly Observed Treatment Short Course)

25. Proportion of land area covered by forest

26. Land area protected to maintain biological diversity

27. GDP per unit of energy use (as proxy for energy efficiency)

28. Carbon dioxide emissions (per capita)

[Plus two figures of global atmospheric pollution: ozone depletion and the accumulation of global warming gases]

29. Proportion of population with sustainable access to an improved water source

30. Proportion of people with access to improved sanitation

31. Proportion of people with access to secure tenure [Urban/rural disaggregation of several of the above indicators may be relevant for monitoring improvement in the lives of slum dwellers]

Goal 8: Develop a Global Partnership for Development*

Target 12: Develop further an open, rule-based, predictable, non-discriminatory trading and financial system

Includes a commitment to good governance, development, and poverty reduction – both nationally and internationally

Target 13: Address the Special Needs of the Least Developed Countries

Includes: tariff and quota free access for LDC exports; enhanced programme of debt relief for HIPC and cancellation of official bilateral debt; and more generous ODA for countries committed to poverty reduction

Target 14: Address the Special Needs of landlocked countries and small island developing states (through Barbados Programme and 22nd General Assembly provisions)

Target 15: Deal comprehensively with the debt problems of developing countries through national and international measures in order to make debt sustainable in the long term

Target 16: In cooperation with developing countries,

Some of the indicators listed below will be monitored separately for the Least Developed Countries (LDCs), Africa, landlocked countries and small island developing states.

Official Development Assistance

32. Net ODA as percentage of DAC donors' GNI [targets of 0.7% in total and 0.15% for LDCs]

33. Proportion of ODA to basic social services (basic education, primary health care, nutrition, safe water and sanitation)

34. Proportion of ODA that is untied

35. Proportion of ODA for environment in small island developing states

36. Proportion of ODA for transport sector in landlocked countries

Market Access

37. Proportion of exports (by value and excluding arms) admitted free of duties and quotas

38. Average tariffs and quotas on agricultural products and textiles and clothing

39. Domestic and export agricultural subsidies in OECD countries

40. Proportion of ODA provided to help build trade capacity

Debt Sustainability

41. Proportion of official bilateral HIPC debt cancelled

42. Debt service as a percentage of exports of goods and services

43. Proportion of ODA provided as debt relief

44. Number of countries reaching HIPC decision and completion points

develop and implement strategies for decent and productive work for youth

45. Unemployment rate of 15-24 year olds

Target 17: In cooperation with pharmaceutical companies, provide access to affordable, essential drugs in developing countries

Target 18: In cooperation with the private sector, make available the benefits of new technologies, especially information and communications

46. Proportion of population with access to affordable essential drugs on a sustainable basis

47. Telephone lines per 1000 people

48. Personal computers per 1000 people

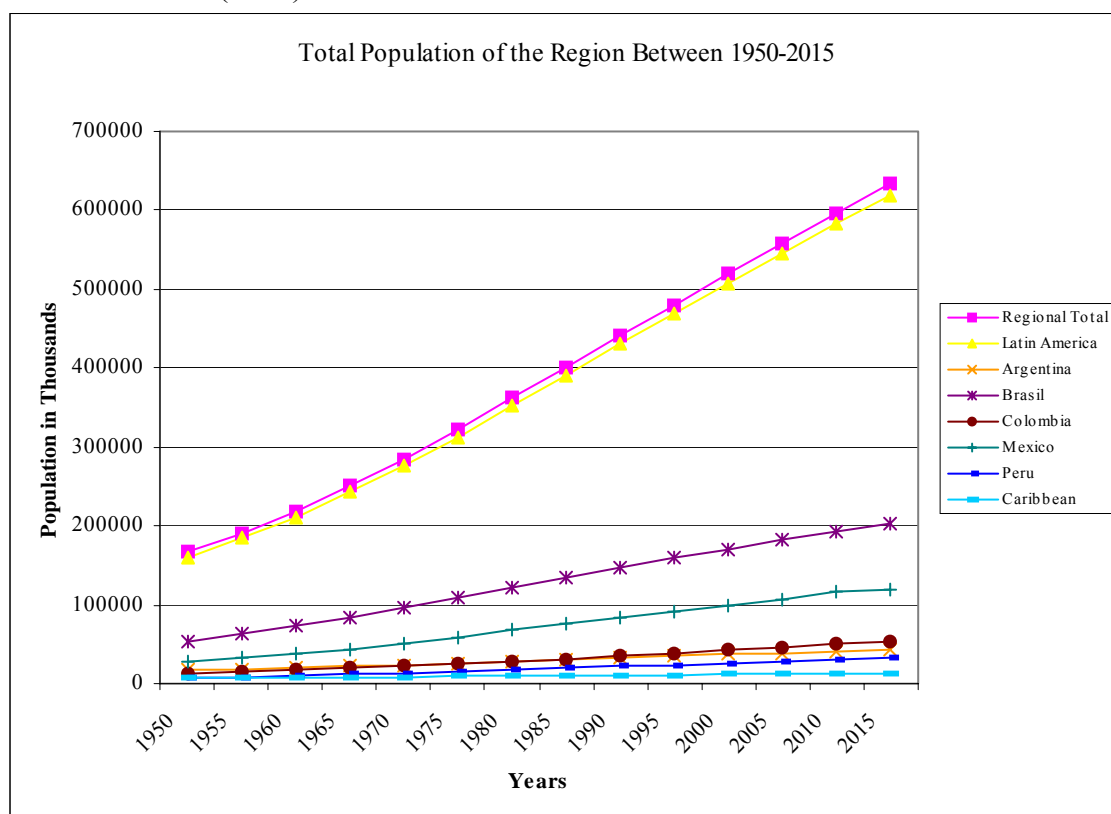
Annex 3 Total Population* of the Region between 1950-2015

Country	1950	1955	1960	1965	1970	1975	1980
Regional total	167.03	190.74	218.27	250.43	284.85	321.94	361.45
Latin America	160.69	183.90	210.82	242.29	276.15	312.70	351.68
Brazil	53.98	62.89	72.76	84.35	96.02	108.17	121.67
Mexico	27.74	31.74	36.95	43.15	50.60	59.10	67.57
Colombia	12.57	14.53	16.86	19.59	22.56	25.38	28.45
Argentina	17.15	18.93	20.62	22.28	23.96	26.05	28.09
Peru	7.63	8.67	9.93	11.47	13.19	15.16	17.32
Caribbean	6.35	6.84	7.44	8.14	8.70	9.24	9.77

Country	1985	1990	1995	2000	2005	2010	2015
Regional total	400.98	440.72	480.42	519.97	558.84	596.66	633.21
Latin America	390.60	429.91	469.08	508.11	546.48	583.82	619.91
Brazil	135.26	148.03	159.61	170.69	181.60	192.24	202.45
Mexico	75.47	83.23	91.15	98.88	106.15	115.89	119.18
Colombia	31.66	34.97	38.54	42.32	46.04	49.67	53.18
Argentina	30.31	32.53	34.77	37.03	39.30	41.47	43.50
Peru	19.52	21.75	23.84	25.94	27.95	29.96	31.97
Caribbean	10.38	10.81	11.34	11.86	12.37	12.85	13.30

(population in million)

Source: ECLAC (1999)



Annex 4 Total Population - Drinking Water Supply (1998)

Groups	Total population	Connection	%	E. Access	Population Served		Unservd Pop.		
					%	Total	%	Total	%
<i>Group I</i>	257.6	203.2	79	23.7	9	226.9	88	30.7	12
Brazil	161.8	121.8	75	22.2	14	144.0	89	17.8	11
Mexico	95.8	81.4	85	1.5	2	82.9	87	12.9	13
<i>Group II</i>	106.8	75.9	71	11.6	11	87.5	82	19.2	18
Bolivia	8.0	5.1	65	0.7	9	5.8	73	2.1	27
Colombia	40.8	30.6	75	6.3	15	36.9	91	3.8	9
Ecuador	12.2	7.8	64	0.8	6	8.5	70	3.6	30
Peru	25.0	15.2	61	3.5	14	18.7	75	6.1	25
Venezuela	21.1	17.1	81	0.4	2	17.5	83	3.6	17
<i>Group III</i>	60.1	42.8	71	5.5	9	48.3	80	11.8	20
Argentina	36.6	24.5	67	4.2	12	28.7	79	7.8	21
Chile	14.9	13.1	88	0.9	6	14.1	94	0.9	6
Paraguay	5.4	2.3	42	0.1	1	2.4	43	3.0	56
Uruguay	3.2	2.9	90	0.2	7	3.1	98	0.1	2
<i>Group IV</i>	61.4	36.2	59	11.2	18	47.4	77	13.9	23
Belize	0.2	0.2	81	0.0	10	0.2	91	0.0	9
Costa Rica	3.3	3.0	89	0.2	6	3.2	95	0.2	5
Cuba	11.1	8.1	72	2.3	21	10.3	93	0.8	7
Dominican Republic	8.2	4.0	48	3.2	39	7.2	88	1.0	12
El Salvador	6.1	3.2	52	0.5	7	3.7	59	2.5	41
Guatemala	11.1	6.8	62	2.1	19	8.9	80	2.2	20
Haiti	7.7	1.6	21	1.9	25	3.6	46	4.1	54
Honduras	6.0	4.5	75	0.3	6	4.8	81	1.1	19
Nicaragua	4.7	2.5	54	0.6	12	3.1	67	1.6	34
Panama	2.7	2.3	82	0.1	5	2.4	87	0.4	13
<i>Group V</i>	5.9	3.5	59	1.6	27	5.1	8	0.8	14
Antigua & Barbuda	0.0	0.0	86	0.0	7	0.1	93	0.0	7
Bahamas	0.3	0.2	71	0.1	26	0.3	96	0.0	4
Barbados	0.3	0.3	100	0.0	0	0.3	100	0.0	0
Guyana	0.8	0.6	82	0.1	11	0.7	93	0.1	7
Jamaica	2.6	1.0	38	1.1	42	2.1	81	0.5	20
Saint Lucia	0.1	0.1	75	0.0	23	0.1	98	0.0	2
Saint Vincent & The Grenadines	0.1	0.1	73	0.0	20	0.1	93	0.0	7
Suriname	0.4	0.3	73	0.1	13	0.4	86	0.1	14
Trinidad & Tobago	1.2	0.8	66	0.3	20	1.1	86	0.2	14
Total LAC	491.8	361.6	74	53.7	11	415.3	84	76.5	16

(population in million)

Source: Rangel (2001)

Urban Population - Drinking Water Supply (1998)

<i>Groups</i>	<i>Total urb.</i>	<i>Connect.</i>	<i>% Conn.</i>	<i>E. access</i>	<i>% E. access</i>	<i>Urb. Serv.</i>	<i>% Urb. serv.</i>	<i>Urb. unserv.</i>	<i>% Urb. unserv.</i>
<i>Group I</i>	197.2	180.6	92	7.2	4	187.8	95	9.4	5
Brazil	126.8	114.9	91	6.4	5	121.3	96	5.5	4
Mexico	70.5	65.7	93	0.8	1	66.5	94	3.9	6
<i>Group II</i>	77.0	64.4	84	5.1	7	69.5	90	7.5	10
Bolivia	4.8	4.2	87	0.3	6	4.4	93	0.3	7
Colombia	28.7	25.6	89	2.5	9	28.1	98	0.6	2
Ecuador	7.6	5.9	77	0.3	5	6.2	81	1.4	19
Peru	17.0	12.9	76	1.8	11	14.7	87	2.2	13
Venezuela	18.9	15.8	84	0.2	1	16.0	85	2.9	15
<i>Group III</i>	51.0	40.2	79	4.8	9	45.0	88	6.0	12
Argentina	32.5	23.4	72	4.1	13	27.5	85	5.0	15
Chile	12.7	12.1	95	0.5	4	12.6	99	0.1	1
Paraguay	2.9	2.0	69	0.0	1	2.0	70	0.9	30
Uruguay	2.9	2.7	94	0.1	5	2.9	98	0.1	2
<i>Group IV</i>	31.6	24.3	77	4.9	15	29.2	92	2.5	8
Belize	0.1	0.1	100	0.0	0	0.1	100	0.0	0
Costa Rica	1.4	1.4	99	0.0	0	1.4	100	0.0	0
Cuba	8.4	7.0	84	1.2	15	8.2	98	0.1	2
Dominican Republic	5.3	3.2	62	1.8	35	5.1	96	0.2	4
El Salvador	3.1	2.7	86	0.2	6	2.9	92	0.2	8
Guatemala	3.9	3.4	87	0.4	11	3.8	99	0.0	1
Haiti	2.6	0.4	15	0.9	34	1.3	49	1.3	51
Honduras	2.8	2.5	89	0.1	5	2.6	94	0.2	6
Nicaragua	2.5	2.2	88	0.2	7	2.4	95	0.1	5
Panama	1.5	1.3	87	0.0	1	1.3	88	0.2	12
<i>Group V</i>	3.9	2.7	70	1.0	24	3.7	94	0.2	6
Antigua & Barbuda	0.0	0.0	90	0.0	5	0.0	95	0.0	5
Bahamas	0.2	0.2	69	0.1	30	0.2	98	0.0	2
Barbados	0.3	0.3	100	0.0	0	0.3	100	0.0	0
Guyana	0.2	0.2	92	0.0	7	0.2	98	0.0	2
Jamaica	1.4	0.8	59	0.5	39	1.4	98	0.0	2
Saint Lucia	0.1	0.1	75	0.0	23	0.1	98	0.0	2
Saint Vincent & The Grenadines	0.1	0.0	73	0.0	20	0.1	93	0.0	7
Suriname	0.3	0.3	91	0.0	8	0.3	98	0.0	2
Trinidad & Tobago	1.3	0.8	66	0.3	20	1.1	86	0.2	14
Total LAC	360.8	312.3	87	22.9	6	335.2	93	25.6	7

(population in million)

Source: Rangel (2001)

Rural Population - Drinking Water Supply (1998)

<i>Groups</i>	<i>Total rural.</i>	<i>Connect.</i>	<i>% Connect.</i>	<i>E. access</i>	<i>% E. access</i>	<i>Rural serv.</i>	<i>% Rural serv.</i>	<i>Rural unserv.</i>	<i>% Rural unserv.</i>
<i>Group I</i>	60.4	22.6	37	16.5	27	39.1	65	21.3	35
Brazil	35.0	6.9	20	15.9	45	22.7	65	12.3	35
Mexico	25.3	15.7	62	0.7	3	16.4	65	9.0	35
<i>Group II</i>	29.8	8.2	28	7.0	23	12.0	40	6.4	22
Bolivia	3.2	3.2	30	3.2	14	3.2	44	3.2	56
Colombia	12.1	5.0	42	3.8	31	8.8	73	3.3	27
Ecuador	4.5	1.9	42	0.4	9	2.3	51	2.2	49
Peru	7.8	2.3	29	1.7	22	4.0	51	3.9	49
Venezuela	2.2	1.4	61	0.2	9	1.6	70	0.7	30
<i>Group III</i>	9.1	2.6	28	0.7	8	3.3	36	5.8	64
Argentina	4.1	1.1	27	0.1	2	1.2	30	2.9	70
Chile	2.2	1.0	45	0.4	20	1.4	66	0.8	34
Paraguay	2.5	0.3	11	0.0	2	0.3	13	2.2	87
Uruguay	0.3	0.2	56	0.1	37	0.3	93	0.0	7
<i>Group IV</i>	29.7	11.9	40	6.3	21	18.2	61	11.5	39
Belize	0.1	0.1	63	0.0	19	0.1	82	0.0	18
Costa Rica	1.9	1.5	81	0.2	10	1.7	92	0.2	8
Cuba	2.8	1.1	39	1.0	38	2.1	76	0.7	24
Dominican Republic	3.0	0.7	25	1.4	48	2.2	73	0.8	27
El Salvador	3.0	0.5	17	0.3	9	0.8	25	2.3	75
Guatemala	7.2	3.5	48	1.6	22	5.1	70	2.1	30
Haiti	5.1	1.2	24	1.0	20	2.3	45	2.8	55
Honduras	3.2	2.0	63	0.2	7	2.2	70	1.0	30
Nicaragua	2.2	0.3	14	0.4	19	0.7	34	1.4	66
Panama	1.2	0.9	76	0.1	10	1.1	86	0.2	14
<i>Group V</i>	2.0	0.7	37	0.7	33	1.4	70	0.6	30
Antigua & Barbuda	0.0	0.0	79	0.0	11	0.0	89	0.0	11
Bahamas	0.1	0.0	80	0.0	6	0.0	86	0.0	14
Barbados				0.0		0.0		0.0	
Guyana	0.6	0.5	79	0.1	12	0.5	91	0.1	9
Jamaica	1.1	0.1	13	0.5	47	0.7	59	0.5	41
Saint Vincent & The Grenadines	0.1	0.0	73	0.0	20	0.0	93	0.0	7
Saint Lucia				0.0		0.0		0.0	
Suriname	0.1	0.0	34	0.0	24	0.1	58	0.1	42
Trinidad & Tobago	0.0	0.0		0.0		0.0		0.0	
Total LAC	131.0	46.0	35	31.2	24	74.0	56	45.6	35

(population in million)

Source: Rangel (2001)

Total Population – Sanitation (1998)

<i>Groups</i>	<i>Total pop.</i>	<i>Connect.</i>	<i>% Connect.</i>	<i>In situ</i>	<i>% in situ</i>	<i>Pop. serv.</i>	<i>% Pop. serv.</i>	<i>Population unserv.</i>	<i>% Pop. Unserv.</i>
<i>Group I</i>	257.6	132.8	52	73.9	29	206.7	80	50.9	20
Brazil	161.8	76.9	48	60.4	37	137.2	85	24.6	15
Mexico	95.8	55.9	58	13.5	14	69.4	72	26.4	28
<i>Group II</i>	106.8	57.1	53	21.8	20	78.9	74	27.9	26
Bolivia	8.0	2.2	28	2.8	35	5.0	63	2.9	37
Colombia	40.8	24.5	60	9.5	23	34.0	83	6.8	17
Ecuador	12.2	5.2	42	1.9	16	7.1	58	5.1	42
Peru	24.8	13.1	53	5.2	21	18.3	74	6.5	26
Venezuela	21.1	12.1	57	2.4	11	14.5	69	6.6	31
<i>Group III</i>	60.1	31.2	52	20.1	33	51.3	85	8.8	15
Argentina	36.6	17.8	49	12.9	35	30.7	84	5.9	16
Chile	14.9	11.5	77	2.4	16	13.9	93	1.0	7
Paraguay	5.4	0.4	7	3.2	60	3.6	67	1.8	33
Uruguay	3.2	1.5	46	1.6	48	3.0	94	0.2	6
<i>Group IV</i>	61.4	16.7	27	29.8	48	46.4	76	14.9	24
Belize	0.2	0.0	20	0.1	29	0.1	48	0.1	52
Costa Rica	3.3	0.7	21	2.4	73	3.1	94	0.2	6
Cuba	11.1	4.3	38	6.2	55	10.4	94	0.7	6
Dominican Republic	8.2	1.7	20	5.7	69	7.4	90	0.9	10
El Salvador	6.2	2.0	32	2.2	36	4.2	68	1.9	32
Guatemala	11.1	4.7	42	4.1	37	8.8	79	2.3	21
Haiti	7.7	0.0	0	2.0	26	2.0	26	5.7	74
Honduras	6.0	1.5	26	2.7	44	4.2	70	1.8	30
Nicaragua	4.7	0.8	17	2.7	59	3.6	76	1.1	24
Panama	2.8	1.0	35	1.6	58	2.6	93	0.2	7
<i>Group V</i>	5.9	1.1	19	4.3	74	5.4	92	0.4	8
Antigua & Barbuda	0.1	0.0	0	0.1	96	0.1	97	0.0	3
Bahamas	0.3	0.0	14	0.3	86	0.3	100	0.0	0
Barbados	0.3	0.0	2	0.3	97	0.3	99	0.0	1
Guyana	0.8	0.1	8	0.6	77	0.6	85	0.1	15
Jamaica	2.6	0.7	29	1.6	61	2.3	90	0.2	10
Saint Lucia	0.1	0.0	7	0.1	83	0.1	89	0.0	11
Saint Vincent & The Grenadines	0.1	0.0	3	0.1	93	0.1	96	0.0	4
Suriname	0.4	0.0	0	0.4	86	0.4	86	0.1	14
Trinidad & Tobago	1.3	0.2	19	1.0	80	1.3	100	0.0	0
Total LAC	491.8	238.8	49	149.9	30	388.7	79	103.0	21

(population in million)

Source: Rangel (2001)

Urban Population – Sanitation (1998)

<i>Groups</i>	<i>Total urb.</i>	<i>Connect.</i>	<i>% Connect.</i>	<i>In situ</i>	<i>% in situ</i>	<i>Urb. serv.</i>	<i>% Urb. serv.</i>	<i>Urban. unserv.</i>	<i>% Urb. unserv.</i>
<i>Group I</i>	197.2	127.5	65	52.5	27	180.0	91	17.2	9
Brazil	126.8	74.9	59	43.8	35	118.7	94	8.1	6
Mexico	70.5	52.6	75	8.7	12	61.3	87	9.1	13
<i>Group II</i>	77.0	52.5	68	13.2	17	65.8	85	11.2	15
Bolivia	4.8	2.2	45	1.8	37	3.9	82	0.8	18
Colombia	28.7	22.5	79	5.3	18	27.9	97	0.9	3
Ecuador	7.6	4.7	61	0.7	9	5.4	70	2.3	30
Peru	17.0	11.4	67	3.8	23	15.2	90	1.8	11
Venezuela	18.9	11.8	62	1.6	9	13.4	71	5.5	29
<i>Group III</i>	51.0	31.0	61	14.9	29	45.9	90	5.2	10
Argentina	32.5	17.8	55	11.0	34	28.8	89	3.7	11
Chile	12.7	11.4	90	0.5	4	11.9	93	0.9	7
Paraguay	2.9	0.4	13	2.1	72	2.5	85	0.4	15
Uruguay	2.9	1.5	51	1.3	45	2.8	95	0.1	5
<i>Group IV</i>	31.6	15.4	49	13.2	42	28.5	90	3.1	10
Belize	0.1	0.0	39	0.0	32	0.1	71	0.0	29
Costa Rica	1.4	0.7	47	0.6	41	1.3	89	0.2	11
Cuba	8.4	4.1	48	4.1	49	8.1	97	0.3	3
Dominican Republic	5.3	1.7	31	3.4	64	5.0	96	0.2	4
El Salvador	3.1	2.0	64	0.7	22	2.7	86	0.4	14
Guatemala	3.9	3.6	93	0.1	2	3.7	95	0.2	5
Haiti	2.6	0.0	0	1.2	46	1.2	46	1.4	54
Honduras	2.8	1.5	55	1.1	39	2.6	94	0.2	6
Nicaragua	2.5	0.8	32	1.5	61	2.3	93	0.2	7
Panama	1.5	1.0	64	0.5	35	1.5	99	0.0	1
<i>Group V</i>	3.9	0.8	20	3.0	76	3.7	96	0.2	4
Antigua & Barbuda	0.0	0.0	0	0.0	98	0.0	98	0.0	2
Bahamas	0.2	0.0	16	0.2	84	0.2	100	0.0	0
Barbados	0.3	0.0	2	0.3	97	0.3	99	0.0	1
Guyana	0.2	0.1	33	0.1	64	0.2	97	0.0	3
Jamaica	1.4	0.4	30	0.8	60	1.3	90	0.1	10
Saint Lucia	0.1	0.0	7	0.1	83	0.1	89	0.0	11
Saint Vincent & The Grenadines	0.1	0.0	3	0.1	93	0.1	96	0.0	4
Suriname	0.3	0.0	0	0.3	99	0.3	99	0.0	1
Trinidad & Tobago	1.3	0.2	19	1.0	80	1.3	100	0.0	0
Total LAC	360.8	227.2	63	96.7	27	323.9	90	36.9	10

(population in million)

Source: Rangel (2001)

Rural Population – Sanitation (1998)

<i>Groups</i>	<i>Total rural</i>	<i>Connect.</i>	<i>% Connect.</i>	<i>In situ</i>	<i>% in situ</i>	<i>Rural serv.</i>	<i>% Rural serv.</i>	<i>Rural unserv.</i>	<i>% Rural unserv.</i>
<i>Group I</i>	60.4	5.3	9	21.4	35	26.7	44	33.7	56
Brazil	35.0	2.0	6	16.6	47	18.5	53	16.5	47
Mexico	25.3	3.3	13	4.8	19	8.1	32	17.2	68
<i>Group II</i>	29.8	4.6	15	8.5	29	13.1	44	16.7	56
Bolivia	3.2	0.1	2	1.0	33	1.1	35	2.1	65
Colombia	12.1	2.0	17	4.1	34	6.1	51	5.9	49
Ecuador	4.5	0.5	10	1.2	27	1.7	37	2.9	63
Peru	7.8	1.7	22	1.4	18	3.1	40	4.7	60
Venezuela	2.2	0.3	14	0.7	33	1.1	48	1.2	52
<i>Group III</i>	9.1	0.2	2	5.3	58	5.4	60	3.7	40
Argentina	4.1	0.0	1	1.9	47	2.0	48	2.1	52
Chile	2.2	0.1	5	1.9	89	2.1	94	0.1	6
Paraguay	2.5	0.0	0	1.2	47	1.2	47	1.3	53
Uruguay	0.3	0.0	2	0.2	82	0.3	85	0.0	15
<i>Group IV</i>	29.7	1.3	4	16.6	56	17.9	60	11.8	40
Belize	0.1	0.0	0	0.0	25	0.0	25	0.1	75
Costa Rica	1.9	0.0	1	1.8	96	1.8	97	0.1	3
Cuba	2.8	0.2	8	2.1	76	2.3	84	0.4	16
Dominican Republic	3.0	0.0	0	2.3	79	2.3	79	0.6	21
El Salvador	3.0	0.0	0	1.5	50	1.5	50	1.5	50
Guatemala	7.2	1.1	15	4.1	56	5.1	71	2.1	29
Haiti	5.1	0.0	0	0.8	16	0.8	16	4.3	84
Honduras	3.2	0.0	0	1.6	50	1.6	50	1.6	51
Nicaragua	2.2	0.0	0	1.2	56	1.2	56	1.0	44
Panama	1.2	0.0	0	1.1	86	1.1	87	0.2	13
<i>Group V</i>	2.0	0.3	17	1.4	70	1.7	86	0.3	14
Antigua & Barbuda	0.0	0.0	1	0.0	93	0.0	94	0.0	6
Bahamas	0.1	0.0	4	0.0	96	0.1	100	0.0	0
Barbados	0.0	0.0		0.0		0.0		0.0	
Guyana	0.6	0.0	0	0.5	81	0.5	81	0.1	19
Jamaica	1.1	0.3	28	0.7	63	1.0	91	0.1	9
Saint Lucia	0.0	0.0		0.0		0.0		0.0	
Saint Vincent & The Grenadines	0.1	0.0	3	0.0	93	0.0	96	0.0	4
Suriname	0.1	0.0	0	0.1	56	0.1	56	0.1	44
Trinidad & Tobago	0.0	0.0		0.0		0.0		0.0	
Total LAC	131.0	11.6	9	53.2	41	64.8	49	66.2	51

(population in million)

Source: Rangel (2001)

Annex 5 Questionnaire applied

Questionnaire handed to the experts

Presentation

Target group

The key persons to be interviewed come from the following organisations:

- United Nations
 - Pan-American Health Organization –Division of Environmental Health-
 - United Nations Children’s Fund –Official of Water and Sanitation-
 - UN-Habitat
 - World Bank –Water and Sanitation Program-
 - Water Supply and Sanitation Collaborative Council
- National Government -Offices and Programs for Water and Sanitation-
- Regional Government - Offices and Programs for Water and Sanitation-
- Water service provider (Public and private companies, associations of operators)
- Universities and research institutions
- Associations of professionals
- Non Governmental Organisations

Selection criteria for key person

- Knowledge about the needs for water and sanitation in terms of Target 10 of the Millennium Development Goals.
- Direct experience with Millennium Development Goal number 7, target 10.
- Involvement in projects on water and sanitation provision at different scales
- Knowledge about the state of higher education in sanitary and environmental engineering
- Knowledge of the state of water and sanitation sector in the country

Methodology of the interview

Prior to the interviews, within one or two weeks in advance, a brief document explaining the purpose of the research will be sent to all the key persons. The interviews will be held in person following a structured questionnaire with open-ended questions. These interviews are planned to take 1½ hours each covering Millennium Development Goals and issues related to education for water and sanitation sector.

Structure of the interview

The interview consist of the following parts:

1. Introduction and presentation of the research. (20’)
2. Session of questions and answers (60’)
3. Suggestions and comments from the key person (10’)

Introduction

First at all, I would like to introduce myself. My name is Diego Mejia-Velez and I am a Colombian student of the Master of Science program in Sanitary Engineering at UNESCO-IHE Institute for Water Education based in Delft, the Netherlands.

I would also like to express my gratitude for your willingness to receive me. Your

inputs during this interview will be very valuable for the success of this research.

As you know from my email, this interview is part of a project that aims to estimate the requirements in education of engineers at Postgraduate level in the water and sanitation sector in order to achieve the Millennium Development Goal number 7. Specifically, its Target 10: Halve, by 2015, the proportion of people without sustainable access to safe drinking water and basic sanitation. This particular study covers the geographical area of Latin America and the Caribbean while parallel studies are being carried out in Asia and Africa with the same purpose.

It is clear that several factors are needed in order to achieve the Millennium Development Goals in water and sanitation. Economic, financial, institutional, social, and political factors are crucial in order to meet them. Hence, it is obvious that strengthening the higher education system is not the only factor needed. However, availability of human resources has been identified as a key factor to consider. For example, a significant effort has been put in capacity building for the purpose of involvement of communities during the whole project cycle in water and sanitation projects, as this has been a key recommendation for the long-term success of those projects, especially in the poor urban and rural areas. Conversely, the role of higher education in the water and sanitation sector has not been widely assessed. This study aims to provide a preliminary assessment about the state of professional resources at Postgraduate level that are available, on one hand, and required, on the other hand, in the water and sanitation sector in Latin America and the Caribbean.

Considering your expertise and extensive experience in the sector, and the importance of your organisation within the sector, I would be very grateful if you shared your insights in this regard with me. I would very much appreciate both your answers based on personal experiences as well as official documents or institutional plans. I would like to remind you that this is an academic exercise and all the information you consider important is more than welcome.

Questionnaire

Formalised elicitation of expert opinions is the main method chosen for this need assessment study. This interview is the main tool for it. The information obtained from this interview is strictly confidential. Therefore your name will not be related to any of your statements or the conclusions drawn in this research unless you suggest it.

This interview consists of four main components.

- The first part covers information related to your personal data, experience, and your organisation.
- Next stage includes enquiries related to the millennium development goals in your country.
- Thirdly, the role of higher education in the water and sanitation sector will be discussed, and
- Finally, you are kindly invited to share any additional comments and observations you may have.

First Part Basic Information

Could you please confirm this information?

Name: Ing. ALEJANDRO RODRIGUEZ JIMENEZ
Organisation: Federación Mexicana de Ing. Sanitaria y Ciencias Ambientales, A. C. - FEMISCA-
Position: President

Do you mind stating for me:

In which field is your educational background?

What are your academic qualifications?

How many years have you been working in the water and sanitation sector?

Are you part of other organisations, networks or associations? If so, please mention their name(s) and your position there.

How many years have you been working in your present organisation?

How many professionals, at Masters level, work in water and sanitation related issues in your institution? What is the percentage in the total staff?

Second Part

Millennium Development Goals

Do you know what figures have been set as Target 10 of the Millennium Development Goal related to water and sanitation in your country? In your position do you deal with this kind of figures?

Can you please describe the ongoing and carried out activities to achieve the Target 10?

Are universities already involved in activities intended to achieve the Target 10 in your country?

Which aspects do you consider to be the bottlenecks to achieve the Target 10 for 2015? Please rank them in order of relevance.

According to the current trends and conditions, what do you expect regarding the achievement of the target for 2015?

Third Part

Education for the Water and Sanitation Sector

Are you familiar with the number of professionals with Masters education already available in the water and sanitation sector?

Which strengths and weaknesses do you observe in the professionals currently working in the sector of water and sanitation in your country?

In your opinion, what kind of measures should be taken to overcome the weaknesses observed?

What type of organisations within the sector lack more engineers at Masters level?

Which specialisations do the organisations in the water and sanitation sector in your country require most?

How many professionals, at Masters level, are required in the water and sanitation sector to provide access to water and sanitation to meet the Target 10 in your country? What is your answer based on?

Do the universities have enough staff capacity and resources to train the professionals in the fields mostly required?

Are the curricula of universities in your country appropriate to meet the Target 10 under the particular local conditions?

How do you think the universities could more effectively support the activities to achieve the millennium development goals?

What is the role of the higher education system in the water and sanitation sector?

Should you have any additional comment, if you consider there are other items of relevance for my research, I would be very pleased to include them.

THANK YOU VERY MUCH FOR YOUR KIND CO-OPERATION

Delft, March 2004

Questionnaire handed to the experts (Portuguese version)

Apresentação

Grupo Alvo

As pessoas a entrevistar pertencem às seguintes organizações:

- Programas das Nações Unidas
 - Organização Pan-Americana da Saúde –Divisão de Saúde Ambiental-
 - Fundo das Nações Unidas para a Infância –Oficial de Água e Saneamento-
 - Nações Unidas-Hábitat
 - Banco Mundial –Programa de Água e Saneamento-
 - Conselho Colaborativo para Abastecimento de Água e Saneamento
- Governos Centrais (Federais) –Escritórios e programas para Água e Saneamento-
- Governos Estaduais (Estaduais) –Escritórios e programas para Água e Saneamento-
- Empresas de Água y saneamento (compañías publicas e privadas), associações de empresas)
- Universidades e instituições de pesquisa
- Organizações Não Governamentais

Crítérios de seleção para pessoas chave

- Conhecimento a respeito das necessidades em provisão de serviços de água e saneamento em termos da Meta 10 dos Objetivos de Desenvolvimento do Milênio.
- Experiência direta com o Objetivo de Desenvolvimento do Milênio número 7, Meta 10.
- Participação em projetos de provisão de água e saneamento a diferentes escalas
- Conhecimento a respeito do estado da educação superior em engenharia sanitária e ambiental.
- Conhecimento do estado do setor de água e saneamento no país.

Metodologia da entrevista

Com anterioridade à entrevista, com uma ou duas semanas de antecedência, um documento explicando brevemente o propósito da investigação será enviado a todas as pessoas chave. As entrevistas a sustentar, estão planejadas para ser pessoais e estruturadas com perguntas de final aberto. Estão planejadas para tomar 1 hora e média cada uma, abarcando os Objetivos de Desenvolvimento do Milênio e assuntos relacionados com a educação para o setor de água e saneamento.

Estrutura da entrevista

A entrevista consiste das seguintes partes:

4. Introdução e apresentação da investigação. (20')
5. Sessão de perguntas e respostas (60')
6. Sugestões e comentários por parte da pessoa chave(10')

Introdução

Primeiro que todo, desejaria apresentar-me. Meu nome é Diego Mejía-Vélez e sou estudante Colombiano do programa de Maestria em Ciências em Engenharia Sanitária em UNESCO-IHE, Instituto para Educação em Água estabelecido em Delft, Países Baixos.

Adicionalmente, desejo expressar-lhe meus agradecimentos por sua disponibilidade para receber-me. Seus aportes durante esta entrevista serão muito valor para o sucesso desta investigação.

Como você já o sabe a partir de meu correio eletrônico, esta entrevista é parte de um projeto que procura estimar os requerimentos em educação de engenheiros, a nível de mestrado, no setor de água e saneamento para atingir o Objetivo de Desenvolvimento do Milênio numero 7. Especificamente, sua Meta 10: Reduzir pela metade a proporção de pessoas que carecem de acesso ao água potável e saneamento básico. Este estudo cobre o área geográfica de América Latina e o Caribe enquanto paralelamente estudos com o mesmo propósito são levados a cabo em África e Ásia.

É claro que a conjugação de vários fatores é necessária para atingir os Objetivos de Desenvolvimento do Milênio em água e saneamento. Fatores econômicos, financeiros, institucionais, sociais e políticos são cruciais. Por tanto, é óbvio que o fortalecimento do sistema de educação superior não é o único fator requerido. No entanto, a disponibilidade de recursos humanos foi identificada como um fator chave para considerar. Por exemplo, um significativo esforço se realizou em fortalecimento de capacidades com o propósito de envolver às comunidades durante todo o ciclo do projeto em projetos de água e saneamento, já que esta foi uma recomendação para o sucesso a longo prazo dos projetos, especialmente em zonas rurais e urbano-marginais.

No entanto, o papel da educação superior no setor de água e saneamento não foi amplamente avaliado. Este estudo procura fornecer uma avaliação preliminar a respeito do estado dos recursos profissionais a nível de maestria, de uma parte, que estão disponíveis, e, de outro lado, requeridos no setor de água e saneamento em América Latina e o Caribe.

Considerando seu conhecimento e vasta experiência no setor, bem como a importancia de sua organização dentro do setor, lhe agradecería muito que me compartilhasse suas percepções nesse sentido. Apreciaria muito que suas respostas se baseassem em sua experiência pessoal bem como em documentos oficiais ou planos institucionais. Desejo recordar-lhe que este é um exercício acadêmico, e por tanto, toda a informação que você considere pertinente é mas que bem recibida.

Questionário

Análise formal de opinião do expertos é o principal método selecionado para a coleção de informação neste estudo de avaliação de necessidades e esta entrevista é sua principal ferramenta. A informação obtida a partir desta entrevista é estritamente confidencial. Portanto, seu nome não será relacionado com nenhum de seus enunciados ou as conclusões derivadas deles, a não ser que você sugira o contrário.

Esta entrevista se divide em quatro componentes principais.

- A primeira parte abarca informação relacionada com seus dados pessoais, experiência e sua organização.
- A seguinte etapa inclui aflições relacionadas com os Objetivos de Desenvolvimento do Milênio em seu país.
- Seguidamente, o papel da educação superior no setor de água e saneamento será

- discutido, e
- Finalmente, você está convidado a compartilhar os comentários adicionais e observações que você possa ter.

Primeira Parte **Informação Básica**

Poderia você confirmar esta informação?

Nome: Eng. ALEJANDRO RODRIGUEZ JIMENEZ
Organização: Federação Mexicana de Eng. Sanitária e Ciências Ambientais, A. C. - FEMISCA-
Posição: Presidente

Lhe importaria enunciar para mim:

Em que campo é sua educação profissional?

Quais são suas credenciais acadêmicas?

Quantos anos tem estado você trabalhando no setor de água e saneamento?

Faz você parte de outras organizações, redes ou associações? Em tal caso, por favor mencione seu(s) nome(s) e sua posição dentro delas.

Quantos anos tem estado você trabalhando em sua atual organização?

Quantos profissionais, a nível de mestrado, trabalham em assuntos relacionados com água e saneamento em sua instituição? Qual é sua porcentagem no total do pessoal?

Segunda Parte **Objetivos de Desenvolvimento do Milênio**

Conhece você que cifras foram estabelecidas como Meta 10 do Objetivo de Desenvolvimento do Milênio relacionado a Água e Saneamento em seu país? Em sua posição você maneja este tipo de cifras?

Pode você descrever as atividades executadas e em execução para atingir a Meta 10?

Estão as universidades atualmente envolvidas em encaminhadas a atingir a Meta 10 em seu país?

Quais aspectos considera você são os limitantes para atingir a Meta 10 para 2015? Por favor classifique-os em ordem de relevância.

De acordo com as condições e tendências atuais, Que espera você a respeito do alcance

da Meta para 2015?

Terceira Parte

Educação para o Setor de Água e Saneamento

É familiar para você o número de profissionais com educação em maestria atualmente disponíveis no setor de água e saneamento em seu país?

Quais pontos fortes e quais pontos fracos observa você nos profissionais que atualmente trabalham no setor de água e saneamento em seu país?

Em sua opinião, que tipo de medidas deveriam tomar-se para superar as debilidades observadas?

Que tipos de organizações dentro do setor carecem de mais engenheiros com nível de maestria?

Quais especializações são mais requeridas pelas organizações no setor de água e saneamento em seu país?

Quantos profissionais, a nível de maestria, são requeridos pelo setor de água e saneamento para fornecer acesso a serviços de água e saneamento necessários para cumprir com a Meta 10 em seu país? Em que está baseada sua resposta?

Têm as universidades suficiente pessoal capacitado para treinar os profissionais nas áreas onde são mais requeridos?

São os currículos das universidades em seu país os mais apropriados para atingir a Meta 10 sob as particulares condições locais?

Como pensa você que as universidades poderiam apoiar mais efetivamente as atividades tendentes a cumprir os Objetivos de Desenvolvimento do Milênio?

Qual é o papel do sistema de educação superior no setor de água e saneamento?

Se você tem algum comentário adicional, ou considera que há outros temas de relevância para minha pesquisa, seria um prazer incluí-los.

MUITO OBRIGADO POR SEU GENTIL COOPERAÇÃO

Delft, Março 2004.

Questionnaire handed to the experts (Spanish version)

Presentación

Grupo objetivo

Las personas a entrevistar pertenecen a las siguientes organizaciones:

- Programas de las Naciones Unidas
 - Organización Panamericana de la Salud –División de Salud Ambiental-
 - Fondo de las Naciones Unidas para la Infancia –Oficial de Agua y Saneamiento-
 - Naciones Unidas-Hábitat
 - Banco Mundial –Programa de Agua y Saneamiento-
 - Consejo Colaborativo de Agua y Saneamiento
- Gobiernos Centrales (Federales) –Oficinas y programas para Agua y Saneamiento-
- Gobiernos Estatales (Provinciales) –Oficinas y programas para Agua y Saneamiento-
- Prestadores de servicios (Compañías públicas y privadas, asociaciones de prestadores)
- Universidades e instituciones de investigación
- Organizaciones No Gubernamentales

Criterios de selección para personas clave

- Conocimiento acerca de las necesidades en provisión de servicios de agua y saneamiento en términos de la Meta 10 de los Objetivos de Desarrollo del Milenio.
- Experiencia directa con el Objetivo de Desarrollo del Milenio número 7, Meta 10.
- Participación en proyectos de provisión de agua y saneamiento a diferentes escalas
- Conocimiento acerca del estado de la educación superior en ingeniería sanitaria y ambiental
- Conocimiento del estado del sector de agua y saneamiento en el país.

Metodología de la entrevista

Con anterioridad a la entrevista, con una o dos semanas de antelación, un documento explicando brevemente el propósito de la investigación será enviado a todas las personas clave. Las entrevistas a sostener, están planeadas para ser personales y estructuradas con preguntas de final abierto. Están planeadas para tomar 1 hora y media cada una, abarcando los Objetivos de Desarrollo del Milenio y asuntos relacionados con la educación para el sector de agua y saneamiento.

Estructura de la entrevista

La entrevista consiste de las siguientes partes:

7. Introducción y presentación de la investigación. (20')
8. Sesión de preguntas y respuestas (60')
9. Sugerencias y comentarios por parte de la persona clave(10')

Introducción

Primero que todo, desearía presentarme. Mi nombre es Diego Mejía-Vélez y soy estudiante Colombiano del programa de Maestría en Ciencias en Ingeniería Sanitaria en

UNESCO-IHE Instituto para Educación en Agua establecido en Delft, los Países Bajos. Adicionalmente, deseo expresarle mis agradecimientos por su disponibilidad para recibirme. Sus aportes durante esta entrevista serán mucho valor para el éxito de esta investigación.

Como usted ya lo sabe a partir de mi correo electrónico, esta entrevista es parte de un proyecto que busca estimar los requerimientos en educación de ingenieros, a nivel de maestría, en el sector de agua y saneamiento para alcanzar el Objetivo de Desarrollo del Milenio número 7. Específicamente, su Meta 10: Reducir a la mitad la proporción de personas que carecen de acceso al agua potable y saneamiento básico. Este estudio cubre el área geográfica de América Latina y el Caribe mientras paralelamente estudios con el mismo propósito son llevados a cabo en África y Asia.

Es claro que la conjugación de varios factores es necesaria para alcanzar los Objetivos de Desarrollo del Milenio en agua y saneamiento. Factores económicos, financieros, institucionales, sociales y políticos son cruciales. Por tanto, es obvio que el fortalecimiento del sistema de educación superior no es el único factor requerido. Sin embargo, la disponibilidad de recursos humanos ha sido identificada como un factor clave para considerar. Por ejemplo, un significativo esfuerzo se ha realizado en fortalecimiento de capacidades con el propósito de involucrar a las comunidades durante todo el ciclo del proyecto en proyectos de agua y saneamiento, puesto que esta ha sido una recomendación para el éxito a largo plazo de los proyectos, especialmente en zonas rurales y urbano-marginales.

Sin embargo, el rol de la educación superior en el sector de agua y saneamiento no ha sido ampliamente evaluado. Este estudio busca suministrar una evaluación preliminar acerca del estado de los recursos profesionales a nivel de maestría, de una parte, que están disponibles, y, de otro lado, requeridos en el sector de agua y saneamiento en América Latina y el Caribe.

Considerando su conocimiento y vasta experiencia en el sector, así como la importancia de su organización dentro del sector, le agradecería mucho que me compartiera sus percepciones a este respecto. Apreciaría mucho que sus respuestas se basaran en su experiencia personal así como en documentos oficiales o planes institucionales. Deseo recordarle que este es un ejercicio académico, y por tanto, toda la información que usted considere pertinente es más que bienvenida.

Cuestionario

Análisis formal de opinión experta es el principal método seleccionado para la colección de información en este estudio de evaluación de necesidades y esta entrevista es su principal herramienta. La información obtenida a partir de esta entrevista es estrictamente confidencial. Por lo tanto, su nombre no será relacionado con ninguno de sus enunciados o las conclusiones derivadas de ellos, a menos que usted sugiera lo contrario.

Esta entrevista se divide en cuatro componentes principales.

- La primera parte abarca información relacionada con sus datos personales, experiencia y su organización.
- La siguiente etapa incluye inquietudes relacionadas con los Objetivos de

- Desarrollo del Milenio en su país.
- Seguidamente, el rol de la educación superior in el sector de agua y saneamiento será discutido, y
 - Finalmente, usted esta invitado a compartir los comentarios adicionales y observaciones que usted pueda tener.

Primera Parte
Información Básica

¿Podría usted confirmar esta información?

Nombre: Ing. ALEJANDRO RODRIGUEZ JIMENEZ
Organización: Federación Mexicana de Ing. Sanitaria y Ciencias Ambientales, A. C. - FEMISCA-
Posición: Presidente

Le importaría enunciar para mí:

¿En que campo es su educación profesional?

¿Cuales son sus credenciales académicas?

¿Cuantos años ha estado usted trabajando en el sector de agua y saneamiento?

¿Hace usted parte de otras organizaciones, redes o asociaciones? En tal caso, por favor mencione su(s) nombre(s) y su posición dentro de ellas.

¿Cuantos años ha estado usted trabajando en su actual organización?

¿Cuantos profesionales, a nivel de maestría, trabajan en asuntos relacionados con agua y saneamiento en su institución? ¿Cuál es su porcentaje en el total del personal?

Segunda Parte
Objetivos de Desarrollo del Milenio

¿Conoce usted que cifras han sido establecidas como Meta 10 del Objetivo de Desarrollo del Milenio relacionado a Agua y Saneamiento en su país? ¿En su posición usted maneja este tipo de cifras?

¿Puede usted describir las actividades ejecutadas y en ejecución para alcanzar la Meta 10?

¿Están las universidades actualmente involucradas en encaminadas a alcanzar la Meta 10 en su país?

¿Cuáles aspectos considera usted son los limitantes para alcanzar la Meta 10 para 2015?

Por favor clasifíquelos en orden de relevancia.

De acuerdo con las condiciones y tendencias actuales, ¿Qué espera usted acerca del alcance de la Meta para 2015?

Tercera Parte

Educación para el Sector de Agua y Saneamiento

¿Es familiar para usted el número de profesionales con educación en maestría actualmente disponibles en el sector de agua y saneamiento en su país?

¿Cuáles fortalezas y debilidades observa usted en los profesionales que actualmente trabajan en el sector de agua y saneamiento en su país?

En su opinión, ¿Qué tipo de medidas deberían tomarse para superar las debilidades observadas?

¿Que tipos de organizaciones dentro del sector carecen de más ingenieros con nivel de maestría?

¿Cuáles especializaciones son más requeridas por las organizaciones en el sector de agua y saneamiento en su país?

¿Cuántos profesionales, a nivel de maestría, son requeridos por el sector de agua y saneamiento para suministrar acceso a servicios de agua y saneamiento necesarios para cumplir con la Meta 10 en su país? ¿En qué está basada su respuesta?

¿Tienen las universidades suficiente personal capacitado para entrenar los profesionales en las áreas donde son más requeridos?

¿Son los currículos de las universidades en su país los más apropiados para alcanzar la Meta 10 bajo las particulares condiciones locales?

¿Cómo piensa usted que las universidades podrían apoyar más efectivamente las actividades tendientes a cumplir los Objetivos de Desarrollo del Milenio?

¿Cuál es el papel del sistema de educación superior en el sector de agua y saneamiento?

Si usted tiene algún comentario adicional, o considera que hay otros temas de relevancia para mi investigación, sería un placer incluirlos.

MUCHAS GRACIAS POR SU AMABLE COOPERACION

Questionnaire with interviewer notes

Presentation

Target group

The key persons to interview come from the following organisations:

- United Nations
 - Pan-American Health Organization –Division of Environmental Health-
 - United Nations Children’s Fund –Official of Water and Sanitation-
 - UN-Habitat
 - World Bank –Water and Sanitation Program-
 - Water Supply and Sanitation Collaborative Council
- National Government -Offices and Programs for Water and Sanitation-
- Regional Government - Offices and Programs for Water and Sanitation-
- Water service provider (Public and private companies, associations of operators)
- Universities and research institutions
- Associations of professionals
- Non Governmental Organisations

Selection criteria for key person

- Knowledge about the needs for water and sanitation in terms of Target 10 of the Millennium Development Goals.
- Direct experience with Millennium Development Goal number 7, target 10.
- Involvement in projects on water and sanitation provision at different scales
- Knowledge about the state of higher education in sanitary and environmental engineering
- Knowledge of the state of water and sanitation sector in the country

Methodology of the interview

Prior to the interviews, within one or two weeks in advance, a brief document explaining the purpose of the research will be sent to all the key persons. The interviews will be held in person following a structured questionnaire with open-ended questions. These interviews are planned to take 1½ hours each covering Millennium Development Goals and issues related to education for water and sanitation sector.

Structure of the interview

The interview consist of the following parts:

10. Introduction and presentation of the research. (20’)
11. Session of questions and answers (60’)
12. Suggestions and comments from the key person (10’)

Introduction

First at all, I would like to introduce myself. My name is Diego Mejia-Velez and I am a Colombian student of the Master of Science program in Sanitary Engineering at UNESCO-IHE Institute for Water Education based in Delft, the Netherlands.

I would also like to express my gratitude for your willingness to receive me. Your inputs during this interview will be very valuable for the success of this research.

As you know from my email, this interview is part of a project that aims to estimate the requirements in education of engineers at Masters level in the water and sanitation sector in order to achieve the Millennium Development Goal number 7. Specifically, its Target 10: Halve, by 2015, the proportion of people without sustainable access to safe drinking water and basic sanitation. This particular study covers the geographical area of Latin America and the Caribbean while parallel studies are being carried out in Asia and Africa with the same purpose.

It is clear that several factors are needed in order to achieve the Millennium Development Goals in water and sanitation. Economic, financial, institutional, social, and political factors are crucial in order to meet them. Hence, it is obvious that strengthening the higher education system is not the only factor needed. However, availability of human resources has been identified as a key factor to consider. For example, a significant effort has been put in capacity building for the purpose of involvement of communities during the whole project cycle in water and sanitation projects, as this has been a key recommendation for the long-term success of those projects, especially in the poor urban and rural areas. Conversely, the role of higher education in the water and sanitation sector has not been widely assessed. This study aims to provide a preliminary assessment about the state of professional resources at Masters level that are available, on one hand, and required, on the other hand, in the water and sanitation sector in Latin America and the Caribbean.

Considering your expertise and extensive experience in the sector, and the importance of your organisation within the sector, I would be very grateful if you shared your insights in this regard with me. I would very much appreciate both your answers based on personal experiences as well as official documents or institutional plans. I would like to remind you that this is an academic exercise and all the information you consider important is more than welcome.

Questionnaire

Formalised elicitation of expert opinions is the main method chosen for this need assessment study. This interview is the main tool for it. The information obtained from this interview is strictly confidential. Therefore your name will not be related to any of your statements or the conclusions drawn in this research unless you suggest it.

(TO ASSURE THE FULL RECORD OF ALL YOUR INPUTS I WOULD LIKE TO ASK YOUR PERMISSION TO RECORD THIS SESSION -WAIT FOR A RESPONSE-).

(IF RESPONDANT SAY NO, START WRITING)

(IF RESPONDANT SAY YES, START RECORDING)

This interview consists of four main components.

- The first part covers information related to your personal data, experience, and your organisation.
- Next stage includes enquiries related to the millennium development goals in your country.
- Thirdly, the role of higher education in the water and sanitation sector will be discussed, and

- Finally, you are kindly invited to share any additional comments and observations you may have.

First Part

Basic Information

Could you please confirm this information?

Name: Ing. ALEJANDRO RODRIGUEZ JIMENEZ
Organisation: Federación Mexicana de Ing. Sanitaria y Ciencias Ambientales, A. C. - FEMISCA-
Position: President

Do you mind stating for me:

In which field is your educational background?

What are your academic qualifications?

How many years have you been working in the water and sanitation sector?

Are you part of other organisations, networks or associations? If so, please mention their name(s) and your position there.

How many years have you been working in your present organisation?

How many professionals, at Masters level, work in water and sanitation related issues in your institution? What is the percentage in the total staff?

Thank you very much; this is the end of the first part of the interview.

Second Part

Millennium Development Goals

Do you know what figures have been set as Target 10 of the Millennium Development Goal related to water and sanitation in your country? In your position do you deal with this kind of figures?

Can you please describe the ongoing and carried out activities to achieve the Target 10?

Are universities already involved in activities intended to achieve the Target 10 in your country?

Which aspects do you consider to be the bottlenecks to achieve the Target 10 for 2015? Please rank them in order of relevance.

According to the current trends and conditions, what do you expect regarding the achievement of the target for 2015?

Thank you, this is the end of the second part of the interview.

Third Part Education for the Water and Sanitation Sector

Are you familiar with the number of professionals with Masters education already available in the water and sanitation sector?

Which strengths and weaknesses do you observe in the professionals currently working in the sector of water and sanitation in your country?

In your opinion, what kind of measures should be taken to overcome the weaknesses observed?

What type of organisations within the sector lack more engineers at Masters level?

Which specialisations do the organisations in the water and sanitation sector in your country require most?

How many professionals, at Masters level, are required in the water and sanitation sector to provide access to water and sanitation to meet the Target 10 in your country? What is your answer based on?

Do the universities have enough staff capacity and resources to train the professionals in the fields mostly required?

Are the curricula of universities in your country appropriate to meet the Target 10 under the particular local conditions?

How do you think the universities could more effectively support the activities to achieve the millennium development goals?

What is the role of the higher education system in the water and sanitation sector?

Thank you, this is the end of the third part of the interview.

Should you have any additional comment, if you consider there are other items of relevance for my research, I would be very pleased to include them.

THANK YOU VERY MUCH FOR YOUR KIND CO-OPERATION

(STOP RECORDING)

Delft, March 2004

Annex 6 Invitation to Select Local Experts

English version

+31.015.2151767

26 January 2004

Selection of experts on the water sector

Dear Sir/Madam,

I would like to ask your assistance in choosing experts -preferably local- in the water sector in Latin America and the Caribbean.

Specifically, I am interested in those who have working knowledge on the MDGs and are related to the water and to the education sector as well.

Those would best be able to render qualitative and, if possible, quantitative estimates the number of water professionals, at Masters levels, needed to achieve the UN Millennium Development Goals. In particular for meeting the Goal 7 -Ensure environmental sustainability- whose targets have been set as the following:

- Target 9: integrate the principles of sustainable development into countries policies and programmes and reverse the losses of environmental resources
- Target 10: Halve by 2015 the proportion of people without sustainable access to safe drinking water and basic sanitation
- Target 11: Have achieved by 2020 a significant improvement in the lives of at least 100 million slum dwellers.

This work is being carried out by UNESCO-IHE Institute for Water Education as part of the project UNIDAS¹³. This project has been initiated in order to establish a need assessment of professionals in water-related fields required worldwide. The study of Latin America and the Caribbean region constitutes a major part of my M.Sc. research.

Since the period of field application and experience of water management practices related to sustainability issues have been short, field data regarding existing and required professionals in integrated water resources management (IWRM) are scarce. Although both IWRM and Capacity building in the water sector have been issues in the last decade, due to its long-term impact they do not allow a quantitative and straightforward analysis of its consequences (reflected in manpower requirements and availability) by means of standard statistical calculations. For that reason, subjective data from experts in the water sector will be elicited by applying formal expert judgement methods.

¹³ Professionals required for meeting UN Millennium Development Goals. A need assessment

This preliminary inquiry is meant to select the experts in a formalized way by soliciting referrals from others in the field. This approach was assessed as the most objective one available.

In order to assemble the list of experts, I am kindly requesting you to answer the questions on the attached document and send it back to the email address pointed out below before January 30.

For your cooperation I thank you very much indeed.

Sincerely yours,

Diego Fernando Mejia-Velez

P.S. Should you have any questions or wish to provide additional insights into this matter, please do not hesitate to contact me on uneeedass_latam@yahoo.com or mejia3@unesco-ihe.org.

Please list those you consider to be experts in the education water sector in your own country and in the whole region as well. If you wish, you may rank your recommendations by numbering them. (You are most welcome to include your own name as well.).

National level	Regional level

How is your company involved in the water sector? Please the appropriate categories.

- a. United Nations institution
- b. National governmental agency
- c. Regional/Local governmental agency
- d. Water knowledge-based network
- e. Aid agency
- f. Bilateral agency
- g. Multilateral agency

- h. Non-governmental organisation
- i. Community based organisation
- j. Research institution (an university, research and development institution)
- k. Professional association
- l. Other, please specify

In what field is your formal professional education? Please check the appropriate category.

- a. Civil engineering
- b. Sanitary engineering
- c. Environmental engineering
- d. Hidrology
- e. Law
- f. Other, please specify

If you wish, you may remain anonymous. Otherwise, please write your name here.

Please fill in the e-mail in which you prefer to be contacted.

Please return this form via e-mail or send it to:

Mr. D. F. Mejía-Vélez
UNESCO-IHE Institute for Water Education
Postbus 3015-375, 2601 DA Delft, The Netherlands
mejia3@unesco-ihe.org
uneeass_latam@hotmail.com
uneeass_latam@yahoo.com

Once again, thank you very much for your kind cooperation

Spanish version

Selección de expertos en el sector del agua

Estimado Señor / señora,

Deseo solicitar su ayuda en la selección de expertos, preferiblemente locales, del sector del agua en América latina y el Caribe.

Específicamente, estoy interesado en aquellos que tienen conocimiento de los ODM y pertenecen tanto a los sectores del agua como a los de educación.

Los seleccionados, deberán ser los mas idóneos para proporcionar estimaciones cualitativas y, si es posible, cuantitativas del numero de profesionales del agua, a nivel de Maestría, necesarios para alcanzar los Objetivos de Desarrollo del Milenio de las Naciones Unidas. En particular para cumplir con el Objetivo 7 –Garantizar la Sostenibilidad del Medio Ambiente- cuyas metas han sido establecidas como las siguientes:

- Meta 9: Incorporar los principios del desarrollo sostenible en las políticas y los programas nacionales e invertir la pérdida de recursos del medio ambiente
- Meta 10: Reducir a la mitad, para el año 2015, el porcentaje de personas que carezcan de acceso sostenible a agua potable y saneamiento
- Meta 11: Haber mejorado considerablemente, para el año 2020, la vida de por lo menos 100 millones de habitantes de tugurios.

Este trabajo es ejecutado por UNESCO-IHE Instituto para Educación en Agua como parte del proyecto UNIDAS¹⁴. Este proyecto ha sido iniciado a fin de evaluar la necesidad de profesionales requeridos en el sector del agua alrededor del mundo. El estudio de la región de América Latina y el Caribe constituye la mayor parte de mi trabajo de tesis.

Dado el corto periodo de aplicación y, por ende, la poca experiencia adquirida en manejo sostenible de recursos hídricos, información de campo sobre el número de profesionales requeridos en Gestión Integrada del Recurso Hídrico (GIRH) es escasa.

Aunque la GIRH y el fortalecimiento de capacidades en el sector del agua han sido temas de especial atención durante la ultima década, debido a su impacto de mediano y largo plazo, no permite un análisis de sus consecuencias (reflejadas en disponibilidad de mano de obra y disponibilidad) por medio de cálculos estadísticos estandarizados. Por esta razón, información subjetiva proporcionada por expertos en el sector del agua será obtenida con la aplicación de métodos formales de juicio de expertos.

Esta búsqueda preliminar está dirigida a la selección de expertos en una manera formal por medio de la solicitud de referencias de otros miembros del sector. Este enfoque ha sido evaluado como el más objetivo disponible.

¹⁴ Profesionales requeridos para alcanzar los Objetivos de Desarrollo del Milenio de las Naciones Unidas. La evaluación de una necesidad

A fin de elaborar la lista de expertos, cordialmente le solicito responder las preguntas anexas a la presente y enviarlas de regreso a la dirección electrónica señalada antes del 30 de Enero.

Agradeciendo de antemano por su cooperación,

Cordialmente,

Diego Fernando Mejía-Vélez

P.D. En caso de que tenga alguna inquietud o desee suministrar opiniones adicionales acerca de esta materia, por favor no dude en contactarme enviando un e-mail a uneeadass_latam@yahoo.com o mejia3@unesco-ihe.org.

Por favor señale a quienes considere expertos en educación en el sector de agua tanto en su país como en América Latina y el Caribe. Si lo desea, puede jerarquizar su recomendación asignando un número. (Por favor siéntase cómodo de incluir su propio nombre si lo considera pertinente)

Nivel Nacional	Nivel de America Latina y el Caribe

De que manera su organización esta vinculada al sector del agua? Por favor indique la(s) categoría(s) correspondientes.

- a. Institucion de las Naciones Unidas
- b. Agencia del gobierno central
- c. Agencia del gobierno provincial o local
- d. Red de conocimiento en agua
- e. Agencia de ayuda para el desarrollo
- f. Agencia bilateral
- g. Agencia multilateral
- h. Organizacion no gubernamental
- i. Organizacion de base comunitaria

j. Institucion de investigacion (universidad, centro de investigacion y desarrollo)

k. Agremiacion de profesionales

l. Otro. Por favor indique cuál

En que área es su formación profesional formal? Por favor indique en el espacio apropiado.

a. Ingeniería civil

b. Ingeniería sanitaria

c. Ingeniería ambiental

d. Hidrología

e. Derecho

f. Otro. Por favor indique cuál

Si lo desea, usted puede permanecer anónimo. En caso contrario, por favor escriba su nombre aquí.

Por favor indique el e-mail en el cual prefiere ser contactado.

Una vez diligenciado este formato, por favor devolverlo vía e-mail o correo postal a:

Mr. D. F. Mejía-Vélez
UNESCO-IHE Institute for Water Education
Postbus 3015-375, 2601 DA Delft, The Netherlands
mejia3@unesco-ihe.org
uneeass_latam@yahoo.com

Una vez mas, muchas gracias por su amable cooperación.

Portuguese version

+31.015.2151767

26 de Janeiro de 2004

Ref.: Seleção de Especialistas no Setor de Recursos Hídricos

Caro (a) Senhor (a),

Solicito a sua colaboração na indicação de especialistas no Setor de Recursos Hídricos, preferencialmente no âmbito da América Latina e Região do Caribe.

Especificamente, estou interessado em especialistas com conhecimento das Metas de Desenvolvimento do Milênio das Nações Unidas - MDGs e estejam ligados tanto ao Setor de Recursos Hídricos como também ao Setor Educação.

Neste trabalho, preciso da indicação do nome de especialistas no Setor de Recursos Hídricos que posteriormente possam estimar a necessidade de profissionais com nível de Mestrado que serão requeridos para alcançar as Metas de Desenvolvimento do Milênio das Nações Unidas, em particular em relação a Meta 7 – Garantir a Sustentabilidade Ambiental – cujos objetivos estão relacionados a seguir:

Objetivo 9: Integrar os princípios do desenvolvimento sustentável nas políticas e programas nacionais e reverter a perda de recursos ambientais;

Objetivo 10: Reduzir pela metade, até 2015, a proporção da população sem acesso permanente e sustentável a água potável segura e saneamento;

Objetivo 11: Até 2020, ter alcançado um melhora significativa nas vidas de pelo menos 100 milhões de habitantes de bairros degradados.

Este trabalho está sendo conduzido pelo Instituto para Educação da Água UNESCO-IHE, como parte do projeto UNIDAS¹⁵. Este projeto foi iniciado com o propósito de estabelecer a avaliação precisa de profissionais relacionados ao Setor de Recursos Hídricos requeridos em todo o mundo. O estudo na América Latina e Região do Caribe constitui o principal tópico de minha pesquisa de Mestrado (Master of Science).

Devido o tempo de aplicação e experiências em gestão dos recursos hídricos relacionadas a sustentabilidade serem curtos, informações de campo e informações sobre profissionais requeridos para a gestão integrada dos recursos hídricos são escassos. Apesar de questões relacionadas a Gestão Integrada de Recursos Hídricos e Capacitação de Recursos Humanos no Setor de Recursos Hídricos estarem sendo bastante discutidas na última década, ainda não se tem uma avaliação de suas consequências (refletidas nas necessidades e disponibilidade de mão de obra) através de cálculos estatísticos padronizados. Por esta razão, informações subjetivas oriundas de especialistas no Setor de Recursos Hídricos serão obtidas por meio da aplicação de métodos formais de avaliação.

Este questionário preliminar tem o objetivo de selecionar os especialistas de uma forma sistemática, através da indicação de profissionais do próprio Setor. Este trabalho foi elaborado da forma mais objetiva possível. Para elaborar a lista de especialistas, solicito

15 Profissionais requeridos para alcançar as Metas de Desenvolvimento do Milênio das Nações. Avaliação de uma necessidade.

gentilmente que responda o questionário anexo e o devolva para o endereço de email assinalado abaixo, antes de 30 de Janeiro / Fevereiro.

Pela sua colaboração, agradeço antecipadamente,

Atenciosamente,

Diego Fernando Mejia-Velez

P.S. Caso tenha alguma dúvida ou queira sugerir adicionais idéias a este trabalho, por favor, não hesite em contactar-me através dos endereços: uneeedass_latam@yahoo.com ou mejia3@unesco-ihe.org.

Por favor, liste abaixo pessoas a quem considera especialista no Setor de Recursos Hídricos em seu país, assim como em toda a América Latina e Região do Caribe. Caso deseje, enumere sua recomendação. (Sinta-se a vontade para incluir seu próprio nome também).

Nível Nacional	Nível América Latina e Região do Caribe

Qual o ramo de sua organização? Por favor, selecione a categoria apropriada:

- a. Instituição das Nações Unidas
- b. Agência de Governo Nacional
- c. Agência de Governo Estadual ou Municipal
- d. Rede de Conhecimento sobre Recursos Hídricos
- e. Agência de Cooperação
- f. Agência Bilateral
- g. Agência Multilateral
- h. Organização Não Governamental
- i. Organização Comunitária

j. Instituição de Pesquisa (universidade, instituição de pesquisa e desenvolvimento)

k. Associação Profissional

l. Outro (a), por favor especifique

Qual a sua área de formação? Por favor, selecione, a categoria apropriada:

a. Engenharia Civil

b. Engenharia Sanitária

c. Engenharia Ambiental

d. Hidrologia

e. Direito

f. Outro (a), por favor especifique

Caso deseje, mantenha o anonimato, caso contrário, por favor, escreva seu nome aqui.

Por favor, preencha o endereço de e-mail em que deseja ser contactado:

Por favor, envie esse formulário via e-mail ou a:

Mr. D. F. Mejía-Vélez
UNESCO-IHE Institute for Water Education
Postbus 3015-375, 2601
DA Delft, The Netherlands

mejia3@unesco-ihe.org
uneeadass_latam@hotmail.com
uneeadass_latam@yahoo.com

Mais uma vez, muito obrigado pela sua gentil cooperação.

Annex 7 Methodology to find out experts in Latin America and the Caribbean

As the accomplishment of the goals set by the Millennium Declaration is the long-term objective of this research, people and organisations involved in events and activities related to the Millennium Goals will be considered as respondents. Makes sense point out that involvement means attendance to preparatory events and participation in the elaboration of documents rather than attendance to major meetings.

People considered as experts belong at list to one of the following groups:

- The education sector
- The water (and sanitation) sector

In order to build a multi-approached answer, respondents from several key informants involved within the sector from different perspectives. Therefore, for each category, there are different kinds of subgroups:

1. Regarding the education sector there are three clearly differenced groups: Local institutions; including universities, technical institutions that provide education about water at graduate level, resources centres for the water sector in the region, and foreign institutions that provide training in water issues, focused on applications in developing countries.

2. In the water sector a wider differentiation may be made including governments (at national, regional and local levels), NGOs, multilateral organisations, bilateral and aid agencies who support water-related projects in the region, consultants, water agencies, water knowledge-based networks, professionals associations, think tanks of the water sector.

Originally, a selection of experts by peers in the region was chosen as method for the selection of key people to interview in the region. Before that, a list of 62 people, based on publications and attendance to main events, was fashioned in order to request about the experts in the sector throughout the region. An email was sent to these experts on the second of March 2004 including a link to an online survey in which all of them were requested to suggest the names of experts anonymously. However, the low response rates achieved in the online survey carried out to that end, forced the research team to change the strategy for selection of people.

First at all, representatives of Water Supply and Sanitation Collaborative Council (WSSCC) were included, Heads of Division of Environmental Health in the WHO offices along the region are chosen as well as Coordinators of the World Bank's Water and Sanitation Program. Moreover, representative of universities, national, provincial and municipal governmental agencies are included as well as water service providers, research institutions and associations of professionals. The list of people to interview in Latin America and the Caribbean is presented in the Annex 2.

People in water and sanitation institutions

The search of people was made in two main stages: During the first stage organisations were identified, and during second stage individuals within the organisations were

chosen.

To select the organisations, first at all main MDGs related offices are considered. As World Bank and United Nations have been strong supporters for the achievement of the MDGs, they are included. Amongst UN organisations not all have a clear relationship with water and sanitation sector. Therefore, the most related are selected. Hence, regional or country offices of: FAO, UNDP, UNEP, UNESCO, UNICEF, and WHO were included as organisations to visit. Moreover, browsing their websites it will be possible to find local organisations working on water and sanitation.

Secondly, after the first list of organisations is drawn another list is done following the same logic. According to the premise “the friends of my friends are mine”, additional organisations were got following the same pattern. The same procedure was followed (iterating) until no more new names were added to the list. Five iterations were required to get those results.

The assumption was that not all the organisations were UN organisations partners. Thus, additional organisations would be found via using an internet search engine, in this case Google (<http://www.google.com>).

- Keywords: capacity building water supply sanitation (6th January 2004)

Refining more the search, a new assumption is stated: There are no regional organisations without website. Hence geographical scope is included.

- Keywords: capacity building water supply sanitation Latin America (8th January 2004)

And polishing the results a bit more, selected countries are included in the search. It is only shown the example of Mexico, but it applied for all the five countries under study.

- Keywords: capacity building water supply sanitation Mexico (12th January 2004)

In parallel, it was important to find out who were the experts who used to attend the main meetings in water and sanitation. The assumption made is that people who attend these meetings is informed about the MDGs, and has enough knowledge to share about the whole sector in his/her respective country.

In that sense, were checked the lists of attendance of the Sustainable Development Summit held in Johannesburg in 2002, the Second World Water Forum, held in The Hague in 2000, and the Third World Water Forum held in Kyoto in 2003. However, not all the lists were completely available. In that sense there is no much information available.

Therefore, attendance lists to smaller events were considered, as well as lists of members of continental associations such as AIDIS (Latin American Association of Sanitary Engineers) and IWRN (Inter-American Water Resources Network).

People and higher education institutions

There were two ways to collect and confirm sources of information available:

In order to find out how many and which programs are offered in the region, there is need to know which universities are in the selected countries. National university

associations are available in all seven countries and are members of whether the International Association of Universities –IAU-, the American Organisation for Higher Education –IOHE- or the Latin American Union of Universities (originally *Unión de Universidades de América Latina*, in Spanish) –UDUAL-. The intention was to get information from these organisations, where (the assumption was) the information would be easily available.

In the other hand, it is possible to check at the websites of referred universities in the mentioned countries whether they offer post-graduate educational programs in issues related to water. The website *Universia* (<http://www.universia.es>) includes a comprehensive list of the Latin American universities with their websites. There, it was possible to browse and find the academic offer including programs at master level where water related studies are conducted, if they exist. According to the plan designed to visit experts in the water and sanitation sector, some people, who belongs to both groups were contacted, while some others were contacted as well, but due to the recognition of the programmes they co-ordinate.

Most of the search in internet was made using English language, and the reason why it happened, even considering that countries under study are not English spoken countries, was because information in internet is more widely available in English than in Spanish or Portuguese. However, information related to universities and organisations for higher education was widely available in both Spanish and Portuguese.

Annex 8 Experts contacted

Argentina

- MIGUEL SAEIGH
Presidente. Ente Tripartito de Obras y Servicios Sanitarios –ETOSS-
- ALEJANDRO ISARRIA
- MANUELA FERNÁNDEZ
Dirección de Promoción Ambiental y del Desarrollo Sustentable Programa Red Universitaria de Intercambio y Colaboración para el Desarrollo Sustentable
- EDGARDO ATILIO BORTOLOZZI
Administrador. Ente Nacional de Obras Hidricas de Saneamiento –ENOHSA-
- CARLOS ANTONIO BOLSINGER
Director Ejecutivo. AIDIS ARGENTINA

Brazil

- ONIVALDO COUTINHO
Presidência. Fundacao Nacinal de Saude –FUNASA-
- SILVANO SILVERIO DA COSTA
Presidente. Associação Nacional dos Serviços Municipais de Saneamento – ASSEMAE-
- WALDER SURIANI
Superintendente executivo. Associação das Empresas de Saneamento Básico Estaduais - AESBE
- JACIRA CANCIO
Asesor Salud Ambiental. Organización Panamericana de la Salud –OPS-OMS-
- OSCAR DE MORAES CORDEIRO NETTO
Departamento de Engenharia Civil e Ambiental. Universidade de Brasilia
- PAULO VARELLA
Programa PROAGUA, Agencia Nacional de Aguas –ANA-
- JERSON KELMAN
Diretor-Presidente. Agência Nacional de Águas -ANA-
- LUIZ ROBERTO SANTOS MORAES
Professor Departamento de Engenharia Ambiental. Universidade Federal da Bahia – UFBA-
- MANFREDO PIRES CARDOSO
Membro Suplente. Conselho Nacional de Recursos Hidricos. Empresa Bahiana de Saneamento –EMBASA-
- CÉLIA POPPE
Coordinadora. PROSAB. Programa de Pesquisa em Saneamento Basico
- ANNA VIRGÍNIA MUNIZ MACHADO
Assessoria Técnica. Associação Brasileira de Engenharia Sanitária e Ambiental - ABES – Regional Representative WSSCC
- HAROLDO MATTOS DE LEMOS
Presidente. INSTITUTO BRASIL PNUMA
- NINON MACHADO DE FARIA LEME FRANCO
Director. Instituto Ipanema
Gender and Water Alliance
- LAURA VALENTE DE MACEDO

- Directora Regional. ICLEI - Consejo Internacional para Iniciativas Locales de Medioambiente, LAC
- JORGE GAVIDIA
Jefe de la Oficina Regional para América Latina y el Caribe, UN-HABITAT
UN-HABITAT Regional Office for Latin America and the Caribbean
 - ADRIANO DIOGO
Secretario. Secretaria do Verde e do Meio Ambiente/SMMA. Prefeitura de Sao Paulo
 - LUIZ AUGUSTO DE LIMA PONTES
Director Ejecutivo. Asociación Interamericana de Ingeniería Sanitaria y Ambiental - AIDIS-
 - JOSE GOLDEMBERG
Secretary of the Environment of the State of Sao Paulo
 - RUBENS LARA
Diretor-Presidente. CETESB
 - DALMO NOGUEIRA
Diretor-Presidente. SABESP
 - JOSE ROBERTO CAMPOS
Departamento de Hidraulica y Saneamiento Escola de Engenharia de Sao Carlos. Universidade De Sao Paulo
 - FERNANDO MANGABERIA
Associação Brasileira das Concessionárias Privadas de Serviços Públicos de Água e Esgoto -ABCON-

Colombia

- JORGE TRIANA
Presidente. Asociación Colombiana de Ingeniería Sanitaria y Ambiental – ACODAL-
- AUGUSTO OSORNO GIL
Director. Dirección de Agua Potable y Saneamiento Básico y Ambiental
- ALVARO PARDO-SÁNCHEZ
Miembro Consejo Consultivo. Interamerican Association of Sanitary and Environmental Engineers - International
- FRANCISCO BURBANO
Oficial Agua y Saneamiento. UNICEF
- LUZ ANGELA GOMEZ
Coordinadora Ejecutivo. Comision de Regulacion De Agua Potable y Saneamiento Basico -CRA-
- INES RESTREPO
Universidad del Valle, Ingeniería Sanitaria y Ambiental
- MARIELA GARCIA
Water and Gender Alliance
- EDGAR QUIROGA
Regional Representative WSSCC. Director. CINARA, Instituto de Investigación y Desarrollo de Agua Potable, Saneamiento Básico y Conservación del Recurso Hídrico
- ALBERTO GALVIS
Coordinador. Alianza UNIVALLE-IHE

Mexico

- ALEJANDRO RODRIGUEZ JIMENEZ
Presidente. Federación Mexicana de Ing. Sanitaria y Ciencias Ambientales, A. C. - FEMISCA-
- CESAR HERRERA
Dirección General Programación. Comisión Nacional del Agua -CNA-
- MA. DEL CARMEN GONZÁLEZ ALMEIDA
Ex Director de Saneamiento Básico. Dirección General de Salud Ambiental
- ROBERTO OLIVARES
Director Ejecutivo. Asociación Nacional de Empresas de Agua y Saneamiento de México A.C. ANEAS de México A.C.
- RODOLFO OGARRIO RAMÍREZ ESPAÑA -
Fundación Mexicana para la Educación Ambiental, A.C. -FUNDEA-
- JUAN PABLO VILLA
Asesor Salud Ambiental. Organización Panamericana de la Salud –OPS-OMS-
- FERNANDO MENESES GONZALEZ
Director Salud Ambiental. Sociedad Mexicana Salud Pública
- ALVARO ALDAMA
Presidente. Instituto Mexicano de Tecnología de Agua -IMTA-
- ASIT. K. BISWAS
- CECILIA TORTAJADA
Third World Centre for Water Management

Peru

- JUAN CARLOS BARANDIARAN
Director Investigación y Desarrollo. Servicio de Agua Potable y Alcantarillado de Lima –SEDAPAL-
- JORGE SALINAS DE CORDOVA
Presidente. Asociación Peruana de Ingeniería Sanitaria y Ambiental –APIS-
- MARCOS ALEGRE CHANG
Oficina de Asesoría y Consultoría Ambiental OACA
- OSCAR CASTILLO
Especialista Desarrollo Institucional. Water and Sanitation Program. Banco Mundial
- MAURICIO PARDON
Director. Centro Panamericano de Ingeniería Sanitaria y Ciencias del Ambiente – CEPIS-
- ERNESTO SALDIVAR
Superintendencia Nacional de Servicios de Saneamiento – SUNASS
- OTTO ROSACO GERKES
Decano Facultad Ingeniería Ambiental. Universidad Nacional de Ingeniería
- LUIS CORTEZ
Ecociudad

Annex 9 Experts identified and interviewed (*)

Argentina

- LUIS URBANO JÁUREGUI
JVP Consultores

Brazil

- MARCOS THADEU ABICALIL
Coordenador do Programa de Modernização do Setor de Saneamento. Secretaria Nacional de Saneamento Ambiental. Ministerio das Cidades.
- MIGUEL CRISÓSTOMO BRITO LEITE
DENSP / Fundación Nacional de Salud –FUNASA-.
- LEO HELLER
Diretor da Escola de Engenharia da Universidade Federal de Minas Gerais

Colombia

- CARMIÑA MORENO RODRIGUEZ*
Ex-Directora Dirección Nacional de Agua Potable y Saneamiento Básico
- NELSON OBREGON NEIRA*
Director. Maestría Hidrosistemas. Pontificia Universidad Javeriana.

Mexico

- ENRIQUE CIFUENTES
Instituto Nacional de Salud Publica –INSP-
- GERMAN BUITRON MENDEZ
Coordinador de Bioprocesos Ambientales. Instituto de Ingeniería. Universidad Nacional Autónoma de México –UNAM-

Peru

- IRIS MARMANILLO
Ministerio de Economía y Finanzas
- LUIS LEONIDAS CHAVEZ PAIS
Dirección General de Salud Ambiental –DIGESA-
- GUILLERMO LEON SUEMATSU*
Director Nacional de Saneamiento. Ministerio de Vivienda, Construcción y Saneamiento.
- HOMERO SILVA*
Asesor Salud Ambiental. Organización Panamericana de la Salud –OPS-OMS-
- GERARDO GALVIS CASTAÑO*
Asesor Regional en Calidad del Agua y Promoción de la Higiene. Centro Panamericano de Ingeniería Sanitaria y Ciencias Ambientales –CEPIS-

Annex 10 Experts confirmed

Argentina

- ALEJANDRO ISARRIA
- MANUELA FERNÁNDEZ
Dirección de Promoción Ambiental y del Desarrollo Sustentable Programa Red Universitaria de Intercambio y Colaboración para el Desarrollo Sustentable
- EDGARDO ATILIO BORTOLOZZI
Administrador. Ente Nacional de Obras Hidricas de Saneamiento –ENOHSA-
- CARLOS ANTONIO BOLSINGER
Director Ejecutivo. AIDIS ARGENTINA

Brazil

- ONIVALDO COUTINHO
Presidência. Fundacao Nacinal de Saude –FUNASA-
- SILVANO SILVERIO DA COSTA
Presidente. Associação Nacional dos Serviços Municipais de Saneamento – ASSEMAE-
- WALDER SURIANI
Superintendente executivo. Associação das Empresas de Saneamento Básico Estaduais - AESBE
- JACIRA CANCIO
Asesor Salud Ambiental. Organización Panamericana de la Salud –OPS-OMS-
- OSCAR DE MORAES CORDEIRO NETTO
Departamento de Engenharia Civil e Ambiental. Universidade de Brasilia
- PAULO VARELLA
Programa PROAGUA, Agencia Nacional de Aguas –ANA-
- JERSON KELMAN
Diretor-Presidente. Agência Nacional de Águas -ANA-
- LUIZ ROBERTO SANTOS MORAES
Professor Departamento de Engenharia Ambiental. Universidade Federal da Bahia – UFBA-
- CÉLIA POPPE
Coordinadora. PROSAB. Programa de Pesquisa em Saneamento Basico
- ANNA VIRGÍNIA MUNIZ MACHADO
Assessoria Técnica. Associação Brasileira de Engenharia Sanitária e Ambiental - ABES – Regional Representative WSSCC
- HAROLDO MATTOS DE LEMOS
Presidente. INSTITUTO BRASIL PNUMA
- NINON MACHADO DE FARIA LEME FRANCO
Director. Instituto Ipanema. Gender and Water Alliance
- LAURA VALENTE DE MACEDO
Directora Regional. ICLEI - Consejo Internacional para Iniciativas Locales de Medioambiente, LAC
- JORGE GAVIDIA
Jefe de la Oficina Regional para América Latina y el Caribe, UN-HABITAT
UN-HABITAT Regional Office for Latin America and the Caribbean
- ADRIANO DIOGO

- Secretario. Secretaria do Verde e do Meio Ambiente/SMMA. Prefeitura de Sao Paulo
- LUIZ AUGUSTO DE LIMA PONTES
Director Ejecutivo. Asociación Interamericana de Ingeniería Sanitaria y Ambiental - AIDIS-
 - JOSE GOLDEMBERG
Secretary of the Environment of the State of Sao Paulo
 - RUBENS LARA
Diretor-Presidente. CETESB
 - DALMO NOGUEIRA
Diretor-Presidente. SABESP
 - JOSE ROBERTO CAMPOS
Departamento de Hidraulica y Saneamento Escola de Engenharia de Sao Carlos. Universidade De Sao Paulo
 - FERNANDO MANGABERIA
Associação Brasileira das Concessionárias Privadas de Serviços Públicos de Água e Esgoto -ABCON-

Colombia

- IGNACIO RESTREPO BAQUERO
Presidente. Asociación Colombiana de Ingeniería Sanitaria y Ambiental – ACODAL-
- AUGUSTO OSORNO GIL
Director. Dirección de Agua Potable y Saneamiento Básico y Ambiental
- ALVARO PARDO-SÁNCHEZ
Miembro Consejo Consultivo. Interamerican Association of Sanitary and Environmental Engineers - International
- FRANCISCO BURBANO
Oficial Agua y Saneamiento. UNICEF
- CRISTIAN STAPPER BUITRAGO
Director Ejecutivo. Comisión de Regulación De Agua Potable y Saneamiento Básico -CRA-
- INES RESTREPO
Universidad del Valle, Ingeniería Sanitaria y Ambiental
- MARIELA GARCIA
Water and Gender Alliance
- EDGAR QUIROGA
Regional Representative WSSCC. Director. CINARA, Instituto de Investigación y Desarrollo de Agua Potable, Saneamiento Básico y Conservación del Recurso Hídrico
- ALBERTO GALVIS
Coordinador. Alianza UNIVALLE-IHE

Mexico

- ALEJANDRO RODRIGUEZ JIMENEZ
Presidente. Federación Mexicana de Ing. Sanitaria y Ciencias Ambientales, A. C. - FEMISCA-
- CESAR HERRERA
Dirección General Programación. Comisión Nacional del Agua -CNA-
- MA. DEL CARMEN GONZÁLEZ ALMEIDA

- Ex Director de Saneamiento Basico. Dirección General de Salud Ambiental
- ROBERTO OLIVARES
Director Ejecutivo. Asociacion Nacional de Empresas de Agua y Saneamiento de Mexico A.C. ANEAS de Mexico A.C.
- RODOLFO OGARRIO RAMÍREZ ESPAÑA -
Fundación Mexicana para la Educación Ambiental, A.C. -FUNDEA-
- JUAN PABLO VILLA
Asesor Salud Ambiental. Organización Panamericana de la Salud –OPS-OMS-
- FERNANDO MENESES GONZALEZ
Director Salud Ambiental. Sociedad Mexicana Salud Publica
- JORGE ARTURO HIDALGO TOLEDO
Coordinador de Desarrollo Profesional e Institucional. Instituto Mexicano de Tecnología de Agua -IMTA-
- ASIT. K. BISWAS
- CECILIA TORTAJADA
Third World Centre for Water Management

Peru

- JUAN CARLOS BARANDIARAN
Director Investigacion y Desarrollo. Servicio de Agua Potable y Alcantarillado de Lima –SEDAPAL-
- JORGE SALINAS DE CORDOVA
Presidente. Asociación Peruana de Ingeniería Sanitaria y Ambiental –APIS-
- MARCOS ALEGRE CHANG
Oficina de Asesoría y Consultoría Ambiental OACA
- OSCAR CASTILLO
Especialista Desarrollo Institucional. Water and Sanitation Program. Banco Mundial
- MAURICIO PARDON
Director. Centro Panamericano de Ingeniería Sanitaria y Ciencias del Ambiente – CEPIS-
- ERNESTO SALDIVAR
Superintendencia Nacional de Servicios de Saneamiento - SUNASS
- OTTO ROSACO GERKES
Decano Facultad Ingenieria Ambiental. Universidad Nacional de Ingenieria
- LUIS CORTEZ
Ecociudad

Annex 11 Contact information of experts interviewed (in chronological order)

Mexico

29th March 2004 - 8h30

ALEJANDRO RODRIGUEZ JIMENEZ

Presidente

Federación Mexicana de Ing. Sanitaria y Ciencias Ambientales, A. C. -FEMISCA-
Calzada de Tlalpan No. 972- Col. Nativitas - C.P. 03500

México, D.F. Mexico

Tel: (52-55) 5579-6723/5482

Fax: (52-55) 5579-5482

femisca@cmic.org

<http://www.femisca.org>

29th March 2004 - 10h30

JOSE FRANCISCO GAITAN NEME

Subgerente de Estudios Sociales Económicos y Ambientales

Comision Nacional del Agua -CNA-

Avenida Insurgentes Sur 2140

2°. Piso, Col. Chimalistac - C.P. 01070

México, D.F. Mexico

Tel: (52) 54-814110, (52) 54-814111

jose.gaitan@cna.gob.mx

<http://www.cna.gob.mx>

29th March 2004 - 11h30

CLEMENTE TREJO DOMINGUEZ

Subgerente de Integración de Catalogo de Proyectos.

Comision Nacional del Agua -CNA-

Avenida Insurgentes Sur 2140

2°. Piso, Col. Chimalistac - C.P. 01070

México, D.F. Mexico

Tel: (52) 54-814110, (52) 54-814111

clemente.trejo@cna.gob.mx

<http://www.cna.gob.mx>

29th March 2004 - 12h30

JULIAN RUIZ MARTINEZ

Jefe de Proyecto de Agua Potable, Alcantarillado y Saneamiento

Comision Nacional del Agua -CNA-

Avenida Insurgentes Sur 2140

2°. Piso, Col. Chimalistac - C.P. 01070

México, D.F. Mexico

Tel: (52) 54-814110, (52) 54-814111

julian.ruiz@cna.gob.mx

<http://www.cna.gob.mx>

31th March 2004 - 9h00
GERMAN BUITRON MENDEZ
Coordinador de Bioprocesos Ambientales
Instituto de Ingeniería
Universidad Nacional Autónoma de México –UNAM-
Ciudad Universitaria
Apartado Postal 70-472
Coyoacan
Mexico, DF, Mexico
gbm@pumas.iingen.unam.mx
<http://www.iingen.unam.mx>

1st April 2004 - 9h00
JORGE ARTURO HIDALGO TOLEDO
Coordinador de Desarrollo Profesional e Institucional
Instituto Mexicano de Tecnología de Agua -IMTA-
Paseo Cuauhnahuac 8532, Col. Progreso C.P. 62550
Jiutepec, Morelos, Mexico
Tel: (52) 7-319-42-41
Fax: (52) 777-319-34-22
jhidalgo@tlaloc.imta.mx
<http://www.imta.mx>

1st April 2004 - 17h00
JUAN PABLO VILLA
Asesor Salud Ambiental
Organización Panamericana de la Salud –OPS-OMS-
Oficina de la OPS-OMS en Mexico
Paseo de la Reforma 450, pisos 2 y 3
Colonia Juárez, Delegación Cuauhtémoc
C.P. 06600, México, D.F. México
Tel: (52) 55-5207-3009, (52) 55-5208-2874
Fax: (52) 55-52072964
villaj@mex.ops-oms.org
<http://www.mex.ops-oms.org>

Colombia

2nd April 2004 - 17h00
PATRICIA IVONNE RODEZNO DE SEJURADO
Asesora Salud Ambiental
Organización Panamericana de la Salud –OPS-OMS-
Oficina de la OPS/OMS en Colombia
Carrera 7 No.74-21, Piso 9
Edificio Seguros Aurora
Santafé de Bogotá, D.C., Colombia
Tel: (57) 1- 3478373
Fax: (57) 1-2547070
ops-col@latino.net.co

<http://www.col.ops-oms.org>

5th April 2004 - 11h00

CARMIÑA MORENO RODRIGUEZ

Ex-Directora Dirección Nacional de Agua Potable y Saneamiento Básico

Gerente Comercial

Aguas Capital

Avenida Suba No. 118 – 53

Tel. (57) 1-2718877 – (57) 1-2718899

carminam@cable.net.com

6th April 2004 - 11h00

NELSON OBREGON NEIRA

Director

Maestría en Hidrosistemas

Departamento de Ingeniería Civil

Pontificia Universidad Javeriana.

Cra. 7 No. 40-62

Bogota, Colombia

Tel: (57) 1-3208320 Ext. 5281

Fax: (57) 1-2887969

nobregon@javeriana.edu.co

http://fing.javeriana.edu.co/ingenieria/maestria_hidrosistemas/

9th April 2004 - 11h00

INES RESTREPO TARQUINO

Instituto de Investigación y Desarrollo de Agua Potable, Saneamiento Básico y

Conservación del Recurso Hídrico. Universidad del Valle

Miembro comité técnico SAMTAC

Ciudad Universitaria Meléndez, Edif. 344

Cali, Colombia

Tel : (57) 2-3392345 – (57) 2-3396096 – (57) 2-3307986

Fax (57) 2-3393289

inrestre@mafalda.univalle.edu.co

<http://www.cinara.org.co>

Peru

12th April 2004 - 9h00

JUAN CARLOS BARANDIARAN

Gerente de Desarrollo e Investigación

Servicio de Agua Potable y Alcantarillado de Lima –SEDAPAL-

Autopista Ramiro Prialé N° 210,

El Agustino, Lima, Peru

Tel: (51) 1-3173405

Fax: (51) 1-3173406

jbarand@sedapal.gob.pe

<http://www.sedapal.com.pe>

12th April 2004 - 11h00

GUILLERMO LEON SUEMATSU
Director Nacional de Saneamiento.
Ministerio de Vivienda, Construcción y Saneamiento.
Director
Servicio de Agua Potable y Alcantarillado de Lima –SEDAPAL-
Autopista Ramiro Prialé N° 210, El Agustino Lima
Tel: (51) 1-3173405
Fax: (51) 1-3173406
gleon@uni.edu.pe
<http://www.vivienda.gob.pe>

12th April 2004 - 16h00
HOMERO SILVA
Asesor Salud Ambiental
Organización Panamericana de la Salud –OPS-OMS-
Oficina de la OPS-OMS en Peru
Los Cedros 269, San Isidro
Tel (51) 1-4213030
Fax (51) 1-2226405
hsilva@per.ops-oms.org
<http://www.per.ops-oms.org.com>

13th April 2004 - 8h30
OSCAR CASTILLO
Specialist in Institutional Development
Water and Sanitation Program. World Bank
Av. Alvarez Calderon 185, Piso 9
Ed. Axxis, San Isidro
Lima, Peru
Teléfono (51) 1-2150685
Fax (51) 1-2150689
wspandean@worldbank.org
<http://www.wsp.org/english/and/peru.html>

13th April 2004 - 11h00
MAURICIO PARDON OJEDA
Director
Centro Panamericano de Ingeniería Sanitaria y Ciencias Ambientales –CEPIS-
Los Pinos 259 Camacho
Lima, Peru
Tel: (51) 1-4371077
Fax: (51) 1-4378289
mpardon@cepis.ops-oms.org
<http://www.cepis.ops-oms.org>

13th April 2004 - 12h30
GERARDO GALVIS CASTAÑO
Asesor Regional en Calidad del Agua y Promoción de la Higiene
Centro Panamericano de Ingeniería Sanitaria y Ciencias Ambientales –CEPIS-
Los Pinos 259 Camacho
Lima, Peru

Tel: (51) 1-4371077
Fax: (51) 1-4378289
ggalvis@cepis.ops-oms.org
<http://www.cepis.ops-oms.org>

14th April 2004 - 8h00
OTTO ROSASCO GERKES
Decano
Facultad de Ingeniería Sanitaria y Ambiental.
Universidad Nacional de Ingeniería
Av. Túpac Amaru 210 Rimac
Lima, Perú,
Tel: (51) 1-4811070 Anexo 277
Fax: (51) 1-4821585
decano_fia@uni.edu.pe
<http://fia.uni.edu.co>

14th April 2004 - 9h30
VICTOR MALDONADO YACTAYO
Secretario Académico
Facultad de Ingeniería Sanitaria y Ambiental.
Universidad Nacional de Ingeniería
Av. Túpac Amaru 210 Rimac
Lima, Perú,
Tel: (51) 1-4811070 Anexo 277
Fax: (51) 1-4821585
sacade_fia@uni.edu.pe
<http://fia.uni.edu.co>

Argentina

15th April 2004 - 15h00
CARLOS ANTONIO BOLSINGER
Director Ejecutivo
AIDIS Argentina
Av. Belgrano 1580 Piso 3º, (1093)
Buenos Aires, Argentina
Tel: (54) 11-43815832
Fax: (54) 11-43815903
aidisar@aidisar.org
<http://www.aidisar.org>

16th April 2004 - 9h00
VICTOR POCHAT
Director Nacional de Políticas, coordinación y Desarrollo Hídrico
Subsecretaria de Recursos Hídricos
Secretaria de Recursos Naturales y Desarrollo Sustentable
Hipolito Yrigoyen 250 Piso 11
Buenos Aires, Argentina
Tel: (54) 11-43497401

Fax: (54) 11-43497400

vpochat@miv.gov.ar

<http://www.miv.gov.ar>

16th April 2004 - 17h00

EDGARDO ATILIO BORTOLOZZI

Administrador

Ente Nacional de Obras Hidráulicas y de Saneamiento –ENOHSA-

Avenida Leandro N. Alem 628 - Pisos 10 y 11 (1001)

Buenos Aires, Argentina

Tel: (54-11) 4891-6500

Fax: (54-11) 4313-0286

ebortolozzi@enohsa.gov.ar

<http://www.enohsa.gov.ar>

Brazil

20th April 2004 - 9h00

WALDER SURIANI

Superintendente Ejecutivo

Asociación de Empresas de Saneamiento Estatales –AESBE-

Setor Bancario Norte Qd. 01 Bloco B, Ed. CNC – sala 403

Brasilia, DF, Brasil

Tel: (55) 61-326-4888

Fax: (55) 61-326-4888

aesbe@aesbe.org.br

<http://www.aesbe.org.br>

20th April 2004 - 11h00

JACIRA CANCIO

Asesora Salud Ambiental

Organización Panamericana de la Salud –OPS-OMS-

Escritorio da OPAS/OMS no Brasil

Setor de Embaixadas Norte, Lote 19

Brasília, D.F., Brasil

Tel: (55) 61-4269595, (55) 61-4269550, (55) 61-4269500

Fax: (55) 61-4269591

Casa (55) 61-4269542

cancioj@bra.ops-oms.org

<http://www.opas.org.br>

20th April 2004 - 14h00

OSCAR DE MORAES CORDEIRO NETTO

Profesor Adjunto

Departamento de Ingeniería Civil y Ambiental. Facultad de Tecnología

Universidad de Brasilia.

Faculdade de Tecnologia - Prédio SG-12, Térreo

Universidade de Brasília - Campus Universitário - Asa Norte

Brasília, DF, Brasil

cordeiro@unb.br

<http://www.unb.br>

22th April 2004 - 14h30

JERSON KELMAN

Director Presidente

Agencia Nacional de Aguas –ANA-

Setor Policial Área 5 Quadra 3 Blocos B e L

Brasília, DF, Brasil

Tel : (55) 61-4455400, (55) 61-445-5441

kelman@ana.gov.br

<http://www.ana.gov.br>

23th April 2004 - 9h00

LUIZ ROBERTO SANTOS MORAES

Profesor - investigador en Ingeniería Sanitaria y Ambiental.

Universidad Federal de Bahía –UFBA-

Rua Prof. Aristides Novis, 02 - Federação

Salvador, Bahia, Brasil

Tel: (55) 71-2039783

Fax: (55) 71-2456126

moraes@ufba.br

<http://www.ufba.br>

26th April 2004 - 10h30

ANNA VIRGINIA MUNIZ MACHADO

Asesora Técnica

Asociación Brasileña de Ingeniería Sanitaria –ABES-

Representante de País del consejo Colaborativo de Agua y Saneamiento –WSSCC-

Av. Beira Mar, 216 - 13º andar

Castel, Rio de Janeiro, Rio de Janeiro, Brasil

Tel: (55) 21-22103221

Fax: (55) 21-22626838

astec@abes-dn.org.br

<http://www.abes-es.org.br>

26th April 2004 - 13h30

CÉLIA MARIA POPPE DE FIGUEIREDO

Coordinadora

Programa de Pesquisa em Saneamento Básico –PROSAB-

Instituição FINEP

Praia do Flamengo, 200 / 2º andar

Flamengo - Rio de Janeiro – Brasil

cmfigue@finep.gov.br

<http://www.finep.gov.br>

28th April 2004 - 8h00

PATRICIA MARRA SEPE

Jefe Oficina de Asistencia Técnica.

Secretaria do Verde e Meio Ambiente / SMMA

City of São Paulo

Rua do Paraíso, 10º andar Numero 387

Paraíso, Sao Paulo, Brasil
Tel: (55) 11-33722200
Fax: (55) 11-2832578
psepe@prefeitura.sp.gov.br
http://www6.prefeitura.sp.gov.br/secretarias/meio_ambiente

29th April 2004 - 8h00
RUBENS LARA
Director Presidente
Compañía de Tecnología de Saneamiento Ambiental –CETESB-
Av. Prof. Frederico Hermann Júnior, 345
São Paulo, São Paulo, Brasil
Tel. (55) 11-30306087
Fax (55) 11-30306083
rubenslara@cetesb.sp.gov.br
<http://www.cetesb.sp.gov.br>

29th April 2004 - 9h00
LINEU JOSE BASSOI
Director de Ingeniería Tecnología y Calidad Ambiental
Compañía de Tecnología de Saneamiento Ambiental –CETESB-
Av. Prof. Frederico Hermann Júnior, 345
São Paulo, São Paulo, Brasil
Tel. (55) 11-30306050
Fax (55) 11-30306094
lineub@cetesb.sp.gov.br
<http://www.cetesb.sp.gov.br>

29th April 2004 - 10h00
EDUARDO MAZZOLENIS DE OLIVEIRA
Gerente Departamento de Tecnología de Aguas Superficiales y Efluentes Líquidos
Compañía de Tecnología de Saneamiento Ambiental –CETESB-
Av. Prof. Frederico Hermann Júnior, 345
São Paulo, São Paulo, Brasil
Tel. (55) 11-30306070
Fax (55) 11-30306116
sma.eduardom@cetesb.sp.gov.br
<http://www.cetesb.sp.gov.br>

29th April 2004 – 11h00
OSWALDO LUCON
Asesor
Secretary of the Environment of the State of Sao Paulo
Av. Prof. Frederico Hermann Junior, 345 - 5º
São Paulo, São Paulo, Brasil
Tel: (55) 11-30306195, (55) 11-30306196
Fax: (55) 11-30306233
oswaldol@cetesb.sp.gov.br
<http://www.ambiente.sp.gov.br/>

29th April 2004 - 12h30

SUANI TEIXEIRA COELHO
Secretaria Adjunta
Secretary of the Environment of the State of Sao Paulo
Av. Prof. Frederico Hermann Junior, 345 - 5º
São Paulo, São Paulo, Brasil
Tel: (55) 11-30306181, (55) 11-30306186
Fax: (55) 11-30306185
smasuani-coelho@cetesb.sp.gov.br
<http://www.ambiente.sp.gov.br/>

29th April 2004 – 15h00
AMERICO DE OLIVEIRA SAMPAIO
Asesor para desarrollo tecnológico
Compañía de Saneamiento Básico del Estado de São Paulo –SABESP-
Rua Costa Carvalho, 300
São Paulo, São Paulo, Brasil
Tel. (55) 11-33888492
<http://www.sabesp.com.br>

29th April 2004 - 16h00
NEUZA MARIA SIMÕES
Superintendente de Planeamiento y Gestión Empresarial.
Compañía de Saneamiento Básico del Estado de São Paulo –SABESP-
Rua Costa Carvalho, 300
São Paulo, São Paulo, Brasil
Tel: (55) 11-33888136
Fax: (55) 11-38135402
nmariasi@sabesp.com.br
www.sabesp.com.br

30th April 2004 - 11h00
LUIZ AUGUSTO LIMA PONTES
Director Ejecutivo
Asociación Interamericana de Ingeniería Sanitaria y Ambiental –AIDIS Interamericana-
Sede Permanente Abel Wolman
Rua Nicolau Gagliardi, 354
São Paulo, Sao Paulo, Brasil
Tel: (55) 11-38124080
Fax: (55) 11-38142441
aidis@aidis.org.br
<http://www.aidis.org.br>

30th April 2004 - 16h00
SILVANO SILVERIO DA COSTA
Presidente
Associação Nacional dos Serviços Municipais de Saneamento – ASSEMAE-
Diretor Departamento de Operacao e Manutencao
Servico Autonomo de Agua e Esgoto de Guarulhos
Av. Emilio Ribas, 1247. Gopouva
Guarulhos, Sao Paulo, Brasil
Tel: (55) 11-64408820, (55) 11-2080764

ssilveriocosta@ig.com.br
presidencia@assem-ae.org.br
<http://www.assem-ae.org.br>

Argentina (interview held in Delft, the Netherlands)

13th May 2004 - 08h30

DAMIÁN INDIJ

Coordinador

Red Latinoamericana de Educación y Capacitación en Recursos Hídricos -LA WETnet-

Intendente Alfaro 179 10°C

Acassuso, Buenos Aires - Argentina

Tel: (54) 11-47938486

Fax: (54) 11-47422164

dindij@sinectis.com.ar

<http://www.la-wetnet.org>

Annex 12 Statistics of the countries under study

Argentina

Capital city: Buenos Aires

Population (2003-07-01): 38,740,807

Area: 2,766,890 sq.km.

GDP per capita: US\$ 2711

Argentina : Main urban agglomerations (above one million inhabitants)		
<i>Name</i>	<i>population 1991-05-15 census</i>	<i>population 2001-11-18 census</i>
Buenos Aires	10.9	11.5
Gran Cordoba	1.2	1.4
Gran Rosario	1.1	1.2
(population in million) Source: INDEC , Argentina.		

<i>Argentina Data Profile</i>			
	1998	2001	2002
People			
Population, total	35.2 million	36.2 million	36.5 million
Population growth (annual %)	0.9	0.9	0.9
Source: World Development Indicators database, April 2004			

Brazil

Capital city: Brasilia

Population (2003-07-01): 182,032,604

Area: 8,511,965 sq.km.

GDP per capita: US\$ 2610

Brazil: Main cities (above one million inhabitants)			
<i>Name</i>	<i>Population 1996-08-01 census</i>	<i>Population 2000-08-01 census</i>	<i>population 2003-07-01 est.</i>
São Paulo	9.9	10.4	10.7
Rio de Janeiro	5.6	5.9	6.0
Salvador	2.2	2.4	2.6
Belo Horizonte	2.1	2.2	2.3
Fortaleza	2.0	2.1	2.3
Brasília	1.8	2.1	2.2
Curitiba	1.5	1.6	1.7
Manaus	1.2	1.4	1.5
Recife	1.3	1.4	1.5
Porto Alegre	1.3	1.4	1.4
Belém	1.1	1.3	1.3
Guarulhos	1.0	1.1	1.2
Goiânia	1.0	1.1	1.1
Campinas	0.9	1.0	1.0

Source: [IBGE](#), Diretoria de Pesquisas, Population Census, Brazil.
(population in million)

Brazil Data Profile			
	1998	2001	2002
People			
Population, total	165.9 million	172.4 million	174.5 million
Population growth (annual %)	1.3	1.3	1.2
Source: World Development Indicators database, April 2004			

Colombia

Capital city: Bogota

Population (2003-07-01): 41,662,073

Area: 1,138,910 sq.km.

GDP per capita: US\$ 1652

Colombia : Main cities (above one million inhabitants)		
<i>Name</i>	<i>population 1991-05-15 census</i>	<i>population 2001-11-18 census</i>
Santa Fé de Bogota	5.2	6.7
Cali	1.7	2.3
Medellín	1.6	2.0
Barranquilla	1.1	1.3
Source: Departamento Administrativo Nacional de Estadística (DANE), Colombia. (population in million)		

Colombia Data Profile			
	1998	2001	2002
People			
Population, total	40.8 million	43.0 million	43.7 million
Population growth (annual %)	1.9	1.7	1.6
Source: World Development Indicators database, April 2004			

Mexico

Capital city: Mexico

Population (2003-07-01): 104,907,991

Area: 1,972,550 sq.km.

GDP per capita: US\$ 6446

Mexico: Main cities (above one million inhabitants)	
<i>Name</i>	<i>population 2000-02-14 census</i>
Ciudad de México (Mexico City)	8.6
Guadalajara	1.6
Ecatepec de Morelos	1.6
Puebla (de Zaragoza)	1.3
Nezahualcóyotl	1.2
Juárez	1.2
Tijuana	1.2

León	1.1
Monterrey	1.1
Zapopan	1.0
Source: INEGI , Mexico. (population in million)	

Mexico Data Profile			
	1998	2001	2002
People			
Population, total	95.3 million	99.4 million	100.8 million
Population growth (annual %)	1.4	1.4	1.4
Source: World Development Indicators database, April 2004			

Peru

Capital city: Lima

Population (2003-07-01): 28,409,897

Area: 1,285,220 sq.km.

GDP per capita: US\$ 2100

Peru : Main urban agglomerations (above one million inhabitants)		
<i>Name</i>	<i>population 1993-07-11 census</i>	<i>population 2000 est.</i>
Lima Metropolitana	6.4	7.5
Source: INEI , Peru. (population in million)		

Peru Data Profile			
	1998	2001	2002
People			
Population, total	25.2 million	26.3 million	26.7 million
Population growth (annual %)	1.7	1.6	1.5
Source: World Development Indicators database, April 2004			

Annex 13 Water Related Postgraduate Courses

Brazil

<i>University</i>	<i>Programme</i>
Universidade De Mogi Das Cruzes	Especialização Em Administração Ambiental: Produção Mais Limpa
Pontificia Universidade Catolica Do Rio De Janeiro	Especialização Em Análise E Avaliação Ambiental
Universidade Gama Filho	Especializacao Em Ciências Ambientais
Universidade De Franca	Especialização Em Ciências Ambientais Com Ênfase Em Educação Ambiental E Gestão Ambiental
Universidade Regional Integrada Do Alto Uruguai Y Das Missoes	Especialização em Ciências Ambientais: Tecnologia Ambiental
Universidade Santa Cecilia	Especialização Em Controle E Gestão Ambiental
Universidade De Brasilia	Especialização Em Desenvolvimento Sustentável E Direito Ambiental
Pontificia Universidade Catolica De Minas Gerais	Especializacao Em Direito Ambiental
Universidade Federal De Pelotas	Especializacao Em Direito Ambiental
Universidade Gama Filho	Especializacao Em Direito Ambiental
Universidade De Mogi Das Cruzes	Especialização Em Direito Ambiental
Universidade Estácio De Sá	Especialização Em Direito Ambiental
Universidade Estadual De Maringa	Especialização Em Direito Ambiental
Universidade Metodista De Piracicaba	Especialização Em Direito Ambiental
Universidade Santa Cecilia	Especialização Em Direito Ambiental
Universidade De Sao Paulo	Especialização em Direito Ambiental
Pontificia Universidade Catolica Do Rio De Janeiro	Especialização Em Direito Ambiental Brasileiro
Universidade Gama Filho	Especializacao Em Educação Ambiental
Universidade De Passo Fundo	Especialização Em Educação Ambiental
Universidade De Santa Cruz Do Sul	Especialização Em Educação Ambiental
Universidade Federal De Paraiba	Especialização Em Educação Ambiental
Universidade Federal De Santa Maria	Especialização Em Educação Ambiental
Universidade Santa Cecilia	Especialização Em Educação Ambiental
Universidade Catolica De Brasilia	Especializacao em Educação Ambiental
Universidade De Sao Paulo	Especialização em Educação Ambiental
Universidade Regional Integrada Do Alto Uruguai Y Das Missoes	Especialização em Educação Ambiental
Universidade Federal Fluminense	Especialização Em Educação Em Saúde Pública
Universidade Estadual Do Rio De Janeiro	Especialização Em Educação Para Gestão Ambiental
Universidade Da Amazonia	Especializacao em Engenharia Ambiental Urbana
Universidade De Sao Paulo	Especialização em Engenharia de Controle da Poluição Ambiental
Universidade De Sao Paulo	Especialização em Engenharia de Saneamento Básico
Pontificia Universidade Catolica De Minas Gerais	Especialização Em Engenharia De Saúde Pública
Universidade Federal De Espirito Santo	Especialização Em Engenharia Do Meio Ambiente
Universidade Estadual Do Rio De Janeiro	Especialização Em Engenharia Sanitária E Ambiental
Universidade Federal De Minas Gerais	Especialização Em Engenharia Sanitária E De Meio Ambiente
Universidade Federal Da Bahia	Especialização Em Gerenciamento Dos Recursos Hídricos: Aspectos Técnicos Jurídicos E Institucionais

Universidade Do Estado De Santa Catarina	Especialização Em Gestao Ambiental
Universidade Sao Judas Tadeu	Especialização Em Gestao Ambiental
Universidade Federal De Espirito Santo	Especialização Em Gestão Ambiental
Universidade Do Vale Do Paraiba	Especialização Em Gestao Ambiental
Universidade Regional Do Noroeste Do Estado Do Rio Grande Do Sul	Especialização Em Gestao Ambiental
Universidade De Sao Paulo	Especialização em Gestão Ambiental
Universidade Catolica Dom Bosco	Especialização Em Gestão Ambiental (Ucdb - Dourados)
Universidade Federal De Vicoca	Especialização Em Gestao De Recursos Hidricos
Escola Politecnica De Pernambuco	Especialização Em Gestão E Controle Ambiental
Universidade De Sao Paulo	Especialização em Gestão e Tecnologias Ambientais
Universidade Federal De Pelotas	Especialização em Gestões Regionais de Recursos Hídricos
Universidade Federal De Parana	Especialização Em Saneamento Ambiental Para O Desenvolvimento Urbano Sustentável
Universidade Federal De Pernambuco	Especialização Em Saneamento E Gestão Ambiental
Universidade De Mogi Das Cruzes	Especialização Em Saúde Ambiental
Universidade Estácio De Sá	Especialização Em Saude Publica
Universidade Federal Do Piaui	Especialização Em Saude Publica
Universidade Metodista De Piracicaba	Especialização Em Saude Publica
Universidade De Passo Fundo	Especialização Em Saúde Pública
Universidade De Franca	Especialização em Saúde Pública
Universidade De Sao Paulo	Especialização Em Saúde Pública - Ribeirão Preto
Universidade De Passo Fundo	Especialização Em Tecnologia Ambiental
Universidade De Riberao Preto	Especialização Em Tecnologia Ambiental
Universidade Regional Integrada Do Alto Uruguai Y Das Missoes	Especialização Em Tecnologia Ambiental
Universidade Federal De Goias	Especializacao Em Tratamento E Disposição Final De Residuos Sólidos E Líquidos
Universidade Estadual Do Sudoeste Da Bahia	Especialização Gestão De Recursos Hídricos
Pontificia Universidade Catolica De Minas Gerais	Gerenciamento Ambiental De Bacias Hidrograficas
Universidade De Riberao Preto	Mba Em Gestao De Tecnologia Ambiental
Universidade Santa Cecilia	Mba Em Gestão Do Saneamento Ambiental
Universidade Estadual Do Rio De Janeiro	Mestrado Em Administração De Saúde: Gestão De Sistemas De Saúde
Universidade Federal Fluminense	Mestrado em Ciência Ambiental
Universidade De Sao Paulo	Mestrado Em Ciência Ambiental - Interdisciplinar (Procam)
Universidade De Sao Paulo	Mestrado Em Ciências Da Engenharia Ambiental - São Carlos
Universidade Federal De Ceara	Mestrado Em Ciências Da Hidrologia E Do Planejamento De Recursos Hídricos
Universidade Federal Do Amazonas	Mestrado Em Ciências Do Ambiente E Sustentabilidade Na Amazônia
Universidade Do Vale Do Itajaí	Mestrado em Ciências y Tecnologia Ambiental
Universidade Estadual De Paraiba - Campina Grande	Mestrado Em Desenvolvimento E Meio Ambiente
Universidade Federal De Ceara	Mestrado Em Desenvolvimento E Meio Ambiente
Universidade Federal De Paraiba -Joao Pessoa	Mestrado Em Desenvolvimento E Meio Ambiente
Universidade Federal Do Piaui	Mestrado Em Desenvolvimento E Meio Ambiente
Universidade De Brasília	Mestrado Em Desenvolvimento Sustentável
Universidade Federal De Espirito Santo	Mestrado Em Engenharia Ambiental
Universidade Federal De Santa Catarina	Mestrado Em Engenharia Ambiental
Universidade Regional De Blumenau	Mestrado Em Engenharia Ambiental
Universidade Federal De Ouro Preto	Mestrado em Engenharia Ambiental

Universidade Federal Da Bahia	Mestrado em Engenharia Ambiental Urbana
Universidade Estadual Do Rio De Janeiro	Mestrado Em Engenharia Ambiental: Saneamento Ambiental
Universidade Estadual De Londrina	Mestrado Em Engenharia De Edificações E Saneamento
Universidade Federal De Parana	Mestrado em Engenharia de Recursos Hídricos e Ambiental
Universidade Federal De Goias	Mestrado em Engenharia do Meio Ambiente
Universidade Federal Do Rio Grande Do Norte	Mestrado Em Engenharia Sanitaria
Universidade Federal De Paraiba	Mestrado Em Engenharia Urbana
Universidade Federal De Pernambuco	Mestrado Em Gestão E Políticas Ambientais
Universidade De Sao Paulo	Mestrado Em Hidráulica E Saneamento - São Carlos
Universidade Catolica De Brasilia	Mestrado Em Planejamento E Gestão Ambiental
Universidade De Franca	Mestrado Em Promoção De Saúde
Universidade Federal De Ceara	Mestrado Em Recursos Hidricos E Saneamento Ambiental
Universidade Federal Do Rio Grande Do Sul	Mestrado Em Recursos Hidricos E Saneamento Ambiental
Universidade De Sao Paulo	Mestrado Em Saneamento Basico
Universidade Federal De Minas Gerais	Mestrado Em Saneamento, Meio Ambiente E Recursos Hídricos
Universidade De Sao Paulo	Mestrado Em Saude Ambiental
Universidade Federal De Maranhao	Mestrado Em Saúde E Ambiente
Universidade Federal De Ceara	Mestrado Em Saude Publica
Universidade Federal De Minas Gerais	Mestrado Em Saude Publica
Universidade Federal De Santa Catarina	Mestrado Em Saúde Pública
Universidade De Sao Paulo	Mestrado em Saúde Pública
Fundacao Oswaldo Cruz	Mestrado Em Saude Publica – Ensp
Fundacao Oswaldo Cruz	Mestrado Em Saude Publica - Nesc/Cpqam
Universidade Federal De Mato Grosso Do Sul	Mestrado em Tecnologia Ambientais
Universidade De Riberao Preto	Mestrado Em Tecnologia Ambiental
Universidade De Brasilia	Mestrado Em Tecnologia Ambiental E Recursos Hidricos

Mexico

<i>University</i>	<i>Programme</i>
Universidad Autónoma De Sinaloa	Especialidad En Ingeniería Ambiental
Universidad Juárez Autónoma De Tabasco	Especialidad En Ingeniería Y Protección Ambiental
Universidad Veracruzana, Xalapa	Especializacion en Diagnostico Y Gestión Ambiental
Instituto Tecnológico De Ciudad De Juárez	Especialización En Ingeniería Ambiental
Instituto Tecnológico De Saltillo	Especialización En Ingeniería Ambiental
Instituto Tecnológico De Tijuana	Especialización En Ingeniería Ambiental
Instituto Tecnológico De Tuxla Gutiérrez	Especialización En Ingeniería Ambiental
Universidad Autónoma Metropolitana	Especialización En Ingeniería Ambiental
Universidad Autónoma Del Estado De México	Especialización En Salud Publica
Universidad Veracruzana, Xalapa	Especialización En Salud Publica
Universidad Autónoma Chapingo	Ingeniería Agrícola Y Uso Integral Del Agua
Universidad Autonoma De Chihuahua, Chihuahua	Maestría En Aguas Subterráneas
Universidad Autonoma Metropolitana, Unidad Iztapalapa	Maestría En Biotecnología
Centro De Investigacion En Materiales Avanzados, Chihuahua	Maestría En Ciencia Y Tecnología Ambiental
Benemérita Universidad Autónoma De Puebla	Maestría En Ciencias Ambientales

Instituto Tecnológico Y De Estudios Superiores De Monterrey	Maestría En Ciencias Ambientales
Universidad Autónoma De Nayarit	Maestría En Ciencias Ambientales
Universidad Autónoma De Querétaro	Maestría En Ciencias Ambientales
Universidad Veracruzana, Xalapa	Maestría En Ciencias Ambientales
Universidad Autónoma Del Estado De México	Maestría en Ciencias Ambientales
Universidad Autónoma Del Estado De México	Maestría en Ciencias Ambientales con Énfasis en Salud Ambiental, Química Ambiental, y Tecnología Ambiental
Universidad Del Mar	Maestría En Ciencias Ambientales Con Especialidad En Ingeniería Ambiental
Universidad Autónoma De Sinaloa, Culiacán	Maestría En Ciencias Ambientales Y Desarrollo Sustentable
Universidad Autónoma De Nuevo León	Maestría En Ciencias Con Especialidad En Hidrología Subterránea
Universidad Autónoma De Nuevo León	Maestría En Ciencias Con Especialidad En Ingeniería Ambiental
Universidad Autónoma De Nuevo León	Maestría En Ciencias Con Especialidad En Ingeniería En Salud Pública
Universidad De Guanajuato	Maestría En Ciencias Del Agua
Universidad Autónoma Del Estado De México	Maestría en Ciencias del Agua
Universidad Autónoma De Querétaro	Maestría En Ciencias En Hidráulica
Instituto Tecnológico De Minatitlán, Minatitlán	Maestría En Ciencias En Ingeniería Ambiental
Universidad Autónoma Metropolitana	Maestría En Ciencias En Ingeniería Ambiental
Instituto Tecnológico Y De Estudios Superiores De Monterrey	Maestría En Ciencias En Sistemas Ambientales
Universidad Veracruzana, Xalapa	Maestría En Diagnóstico Y Gestión Ambiental
Universidad Autónoma De Baja California Sur	Maestría En Economía Del Medio Ambiente Y Recursos Naturales
Universidad Iberoamericana Puebla	Maestría En Estudios Regionales En Medio Ambiente Y Desarrollo
Universidad Autónoma De Querétaro	Maestría en Gestión Integrada de Cuencas
Universidad Autónoma De Coahuila	Maestría En Gestión Integral Del Agua
Colegio De Postgraduados, Montecillo	Maestría En Hidrociencias
Universidad Autónoma De Chihuahua	Maestría En Hidrología Subterránea
Universidad Autónoma San Luis Potosí	Maestría En Hidrosistemas
Instituto Tecnológico De Sonora, Ciudad Obregón	Maestría En Ingeniería (Administración De Recursos Naturales)
Instituto Tecnológico De Mexicali, Mexicali	Maestría En Ingeniería Ambiental
Universidad Autónoma De Aguascalientes, Aguascalientes	Maestría En Ingeniería Ambiental
Universidad Autónoma De Yucatán	Maestría En Ingeniería Ambiental
Universidad Del Noreste	Maestría En Ingeniería Ambiental
Universidad Nacional Autónoma De México	Maestría En Ingeniería Ambiental
Instituto Tecnológico Y De Estudios Superiores De Monterrey	Maestría En Ingeniería Ambiental (Evaluación)
Universidad Autónoma De Ciudad Juárez	Maestría En Ingeniería Ambiental Y Ecosistemas
Instituto Tecnológico Y De Estudios Superiores De Monterrey	Maestría En Ingeniería Ambiental: Evaluación E Impacto
Universidad Valle Del Grijalva	Maestría En Ingeniería Del Medio Ambiente
Instituto Tecnológico De Sonora, Ciudad Obregón	Maestría En Ingeniería En Administración De Recursos Hidráulicos

Universidad Autonoma De Sinaloa, Culiacán	Maestría En Ingeniería En Recursos Hidráulicos: Aprovechamientos
Instituto De Estudios Superiores En Ingeniería, Puebla	Maestría En Ingeniería Geohidrológica
Instituto Politecnico Nacional, Gustavo A. Madero	Maestría En Ingeniería Hidráulica
Universidad Juárez Autónoma De Tabasco	Maestría En Ingeniería Hidráulica
Universidad Autonoma De Chiapas, Tuxtla Gutiérrez	Maestría En Ingeniería Hidráulica Ambiental
Universidad Autonoma De Chiapas, Tuxtla Gutiérrez	Maestría En Ingeniería Hidráulica Sanitaria
Instituto De Estudios Superiores En Ingeniería, Puebla	Maestría En Ingeniería Sanitaria Y Ambiental
Universidad Juárez Autónoma De Tabasco	Maestría En Ingeniería Y Protección Ambiental
Universidad De Guadalajara, Guadalajara	Maestría En Ingeniería Y Protección Ambiental
Universidad Juarez Autonoma De Tabasco, Villahermosa	Maestría En Ingeniería Y Protección Ambiental
Universidad Autónoma De Yucatán	Maestría En Manejo Y Conservación De Recursos Naturales Tropicales
Instituto Politecnico Nacional, Gustavo A. Madero	Maestría En Medio Ambiente Y Desarrollo Integrado
Universidad Autonoma De Zacatecas, Zacatecas	Maestría En Planeación De Recursos Hidráulicos
Instituto Tecnológico Y De Estudios Superiores De Monterrey	Maestría En Planeación Y Administración Ambiental
Universidad Iberoamericana. Plantel Leon, León	Maestría En Protección Y Conservación Ambiental
Universidad Autonoma De Chihuahua, Chihuahua	Maestría En Recursos Hidráulicos De Zonas Áridas
Instituto Politécnico Nacional	Maestría En Recursos Naturales
Universidad Autónoma Chapingo	Maestría En Recursos Naturales Y Medio Ambiente En Zonas Áridas
Universidad Autónoma De Campeche	Maestría En Salud Publica
Universidad Autónoma De Tamaulipas	Maestría En Salud Publica
Universidad Autónoma Del Estado De México	Maestría En Salud Publica
Universidad Veracruzana, Xalapa	Maestría En Salud Publica
Universidad Autónoma De Nuevo León	Maestría En Salud Pública, En La Modalidad De Área Específica

Colombia

<i>University</i>	<i>Programme</i>
Universidad De Los Andes	Especialización En Acueducto Y Alcantarillado
Universidad Del Norte	Especialización En Análisis Y Gestión Ambiental
Universidad Nacional De Colombia	Especialización En Aprovechamiento De Recursos Hidráulicos
Universidad De Antioquia	Especialización En Calidad De Aguas
Universidad Del Magdalena	Especialización En Ciencias Ambientales
Universidad Del Rosario	Especialización En Derecho Ambiental
Universidad San Buenaventura	Especialización En Economía Ambiental Y Desarrollo Sostenible
Universidad Industrial De Santander	Especialización En Educación Ambiental
Universidad Distrital Francisco José De Caldas	Especialización En Educación Y Gestión Ambiental
Universidad Icesi	Especialización En Gerencia Del Medio Ambiente

Fundación Universitaria De Boyacá	Especialización En Gestión Ambiental
Pontificia Universidad Javeriana	Especialización En Gestión Ambiental
Universidad Autónoma De Occidente	Especialización En Gestión Ambiental
Universidad Pedagógica Y Tecnológica De Colombia	Especialización En Gestión Ambiental
Universidad Nacional De Colombia	Especialización en Gestión Ambiental
Universidad Tecnológica De Pereira	Especialización En Gestión Ambiental Local
Politécnico Colombiano Jaime Isaza Cadavid	Especialización En Gestión Del Recurso Hídrico
Universidad Del Norte	Especialización En Hidráulica De Ríos Y Costas
Pontificia Universidad Javeriana	Especialización En Hidrosistemas
Universidad De La Sabana	Especialización En Ingeniería Ambiental
Universidad Industrial De Santander	Especialización En Ingeniería Ambiental
Universidad Nacional De Colombia	Especialización En Ingeniería Ambiental – Área Sanitaria
Universidad Industrial De Santander	Especialización En Ingeniería De Preservación De Recursos Hídricos Y De Suelos
Universidad Del Norte	Especialización En Ingeniería De Saneamiento Ambiental
Universidad De Cartagena	Especialización En Ingeniería Sanitaria Y Ambiental
Universidad Del Valle	Especialización En Ingeniería Sanitaria Y Ambiental
Universidad De Los Andes	Especialización En Manejo Integrado Del Medio Ambiente
Universidad Industrial De Santander	Especialización En Microbiología Ambiental
Universidad Militar Nueva Granada	Especialización En Planeación Ambiental Y Manejo De Los Recursos Naturales
Universidad Industrial De Santander	Especialización En Química Ambiental
Universidad Nacional De Colombia	Especialización En Recursos Hidráulicos
Escuela Colombiana De Ingeniería	Especialización En Recursos Hidráulicos Y Medio Ambiente
Escuela Colombiana De Ingeniería	Especialización En Saneamiento Ambiental
Universidad De Medellín	Especialización Legislación Ambiental
Universidad Nacional De Colombia	Maestría En Aprovechamiento De Recursos Hidráulicos
Universidad De Antioquia	Maestría En Ingeniería Ambiental
Universidad Nacional De Colombia	Maestría En Ingeniería Ambiental
Universidad Del Valle	Maestría En Ingeniería Sanitaria Y Ambiental
Universidad Nacional De Colombia	Maestría En Medio Ambiente Y Desarrollo
Universidad Nacional De Colombia	Maestría En Recursos Hidráulicos
Universidad Del Cauca	Maestría en Recursos Hidrobiológicos Continentales
Universidad De Antioquia	Maestría En Salud Pública
Universidad Nacional De Colombia	Maestría En Salud Pública
Universidad Del Valle	Magíster En Salud Pública

Peru

<i>University</i>	<i>Programme</i>
Universidad Nacional Mayor De San Marcos	Maestría En Ciencias Ambientales
Universidad Peruana Cayetano Heredia	Maestría En Ciencias Ambientales
Universidad Nacional De Educación Enrique Guzmán Y Valle	Maestría En Educación Ambiental Y Desarrollo Sostenible
Universidad Nacional De Ingeniería	Maestría En Gestión Ambiental
Universidad Nacional De Trujillo	Maestría En Gestión Ambiental
Universidad Nacional Federico Villarreal	Maestría En Gestión Ambiental
Universidad Nacional Del Centro Del Perú	Maestría En Gestión Ambiental Y Desarrollo Sostenible
Universidad Nacional Jorge Basadre Grohmann	Maestría En Gestión Ambiental Y Desarrollo Sostenible
Universidad Nacional Del Piura	Maestría En Ingeniería Ambiental

Universidad Nacional De Trujillo	Maestría En Ingeniería Ambiental
Universidad Nacional De Trujillo	Maestría En Ingeniería De Recursos Hídricos
Universidad Nacional De San Agustín	Maestría En Ingeniería Hidráulica Y Ambiental
Universidad Agraria La Molina	Maestría En Recursos Hidricos
Universidad De San Martín De Porres	Maestría En Salud Publica
Universidad Nacional Del Centro Del Perú	Maestría En Salud Publica
Universidad Nacional Del Altiplano	Maestría En Salud Publica
Universidad Nacional Federico Villarreal	Maestría En Salud Publica
Universidad Nacional Jorge Basadre Grohmann	Maestría En Salud Publica
Universidad Nacional Mayor De San Marcos	Maestría En Salud Publica
Universidad Nacional De Ingeniería	Maestría En Tratamiento De Aguas Y Reuso De Desechos
Universidad Peruana Unión	Maestría Internacional En Salud Pública

Argentina

<i>University</i>	<i>Programme</i>
Instituto De Enseñanza Superior Del Ejército	Especialización En Gestión Ambiental
Universidad De Belgrano	Especialización En Derecho Ambiental
Pontificia Universidad Católica Argentina	Especialización En Derecho Ambiental
Universidad Nacional De San Luis	Especialización En Gestión Ambiental
Instituto Tecnológico De Buenos Aires	Especialización En Gestión Ambiental
Universidad Nacional De Cuyo	Especialización En Ingeniería Ambiental
Universidad Tecnológica Nacional	Especialización En Ingeniería Sanitaria
Universidad De Buenos Aires	Especialización En Ingeniería Sanitaria Y Ambiental
Universidad De Buenos Aires	Especialización En Recursos Naturales (Fac. Derecho)
Universidad Nacional De Rosario	Especialización En Tecnología Ambiental
Universidad De Buenos Aires	Maestría En Ciencias Ambientales
Universidad Nacional De Córdoba	Maestría En Ciencias De La Ingeniería - Mención En Recursos Hídricos
Universidad Nacional De Rosario	Maestría En Documentación Y Sistemas De Información Sanitaria
Universidad Nacional De La Rioja	Maestría En Economía Y Desarrollo Sustentable
Universidad Nacional Del Litoral	Maestría En Gestión Ambiental
Universidad Nacional De San Martín	Maestría En Gestión Ambiental
Universidad Nacional De La Matanza	Maestría En Gestión Ambiental
Universidad De Buenos Aires	Maestría En Gestión Del Agua
Universidad Nacional De Cuyo	Maestría En Ingeniería Ambiental
Universidad Nacional Del Litoral	Maestría En Ingeniería De Los Recursos Hídricos
Universidad Tecnológica Nacional	Maestría En Ingeniería Sanitaria
Universidad De Buenos Aires	Maestría En Ingeniería Sanitaria Y Ciencias Del Ambiente
Universidad De Buenos Aires	Maestría En Protección Ambiental
Universidad De Buenos Aires	Maestría En Salud Publica
Universidad Nacional De Córdoba	Maestría En Salud Pública
Universidad Del Salvador	Maestría En Salud Pública
Universidad Nacional De Catamarca	Maestría En Salud Pública
Universidad Nacional De Rosario	Maestría En Recursos Hídricos En Zona De Llanura
Universidad Nacional De Tucumán	Maestría En Salud Ambiental
Universidad Nacional De Rosario	Maestría En Salud Pública
Universidad Nacional De Tucumán	Maestría En Salud Publica