

**“IMPROVING ACCESS TO SAFE
WATER: PERSPECTIVES FROM
AFRICA AND THE AMERICAS”
IANAS - NASAC**

**WATER RESOURCES IN ARGENTINA
A STRATEGIC VIEW
ACADEMIA NACIONAL DE CIENCIAS
EXACTAS, FÍSICAS Y NATURALES
ARGENTINA**

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Sao Carlos, 2010.

During the last century, water consumption has increased at a rate more than twice the population. It is estimated that 884 million people, 14% of the world's population, currently lack access to improved drinking water and 2,500 million people, 38% of the world's population, does not have adequate sanitation facilities. ["Joint Monitoring Programme for Water Supply and Sanitation. Progress on water and sanitation: special focus on sanitation". UNICEF, New York and WHO, Geneva, 2008].

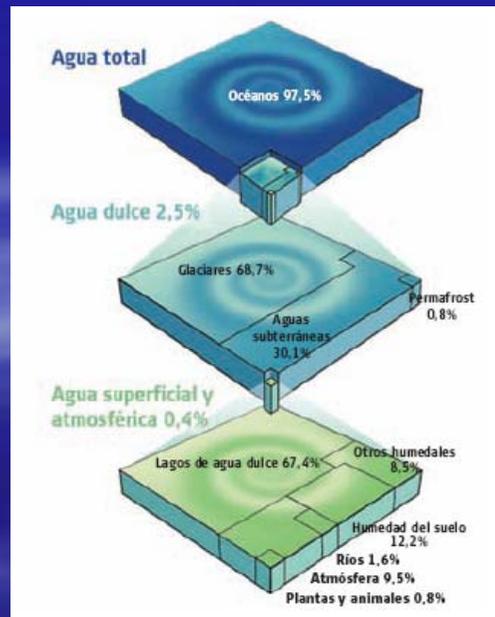
It is estimated that by 2030, two thirds of the population will live in towns and cities, which will cause a dramatic increase in water demand in urban areas. An estimated 2,000 million people live in squatter settlements and slums. This segment of the urban population suffers from lack of clean water and sanitation facilities ["Water, a shared responsibility". Second United Nations report on the development of water resources in the world, 2006].

Daily water consumption varies between 171 liters/person a day in Latin America and Caribbean (230 in Argentina), 200 to 300 in most European countries and 575 liters in the United States. By contrast, people who lack access to piped water in developing countries consume extremely less water, in part, because they have to travel long distances with it.

The international standards set by organizations like the World Health Organization (WHO) and the United Nations Fund for Children (UNICEF) suggest a minimum consumption of 20 liters a day from a source within one kilometer of home. This is enough for drinking and basic personal hygiene. If water needs for bathing and washing are considered, the amount per person increases to about 50 liters per day. Much of the world's poor population is well below the minimum thresholds for basic water needs. The crisis of water is mainly a crisis of poverty.

Water availability

Our planet Earth owns an important amount of water, unequally distributed in time and space, and naturally presented under different forms: in air, on the surface, under the soil and in the oceans (from “Disponibility of water” RAMSAR, 2009). The reduced availability of fresh water is menaced by over consume, pollution and misuse.



Agua total: 1.386 millones km³.

Agua dulce: 35 millones km³

Glaciares y hielos: 24,4 millones km³

Agua subterránea: 10,5 millones km³

Lagos, ríos y atmósfera: 0,1 millones km³

Agua salina: 1.351 millones km³

“Agua y cultivos”, ONU 2002.

The annual average precipitation on Earth reaches 119.000 km³. Near 72.000 km³ evaporate to the atmosphere. The remained 47.000 km³ flow towards lakes, reservoirs and water courses or infiltrate nourishing the groundwater. It is estimated that between 9.000 km³ and 14.000 km³ are utilizable by man.

ARGENTINE WATER AVAILABILITY

- Population: 38.871.000 inhabitants
- Precipitation: 600 mm/year

Total volume of renewable water resources (2005): 814.000.000.000 m³/year

- Volume per inhabitant (2000): 21.981 m³/year
- Volume per inhabitant (2005): 20.940 m³/year

Total of renewable water resources use: 4%

SURFACE WATER AVAILABILITY

ARGENTINA

Surface: 2.791.810 km²

Population density: 13 hab/km²

Water disponibility: 22.500 m³/hab

Irregular spatial water distribution

2/3 of the country is under arid or semi arid climate conditions

La Plata Basin has 85% of the total flow

Several provinces of the region are under the water stress index proposed by PNUD

CLIMATE REGIONS

Regions	% country surface	% country population
Humid regions	24%	68 %
Semi arid regions	15 %	26 %
Arid regions	61 %	6 %

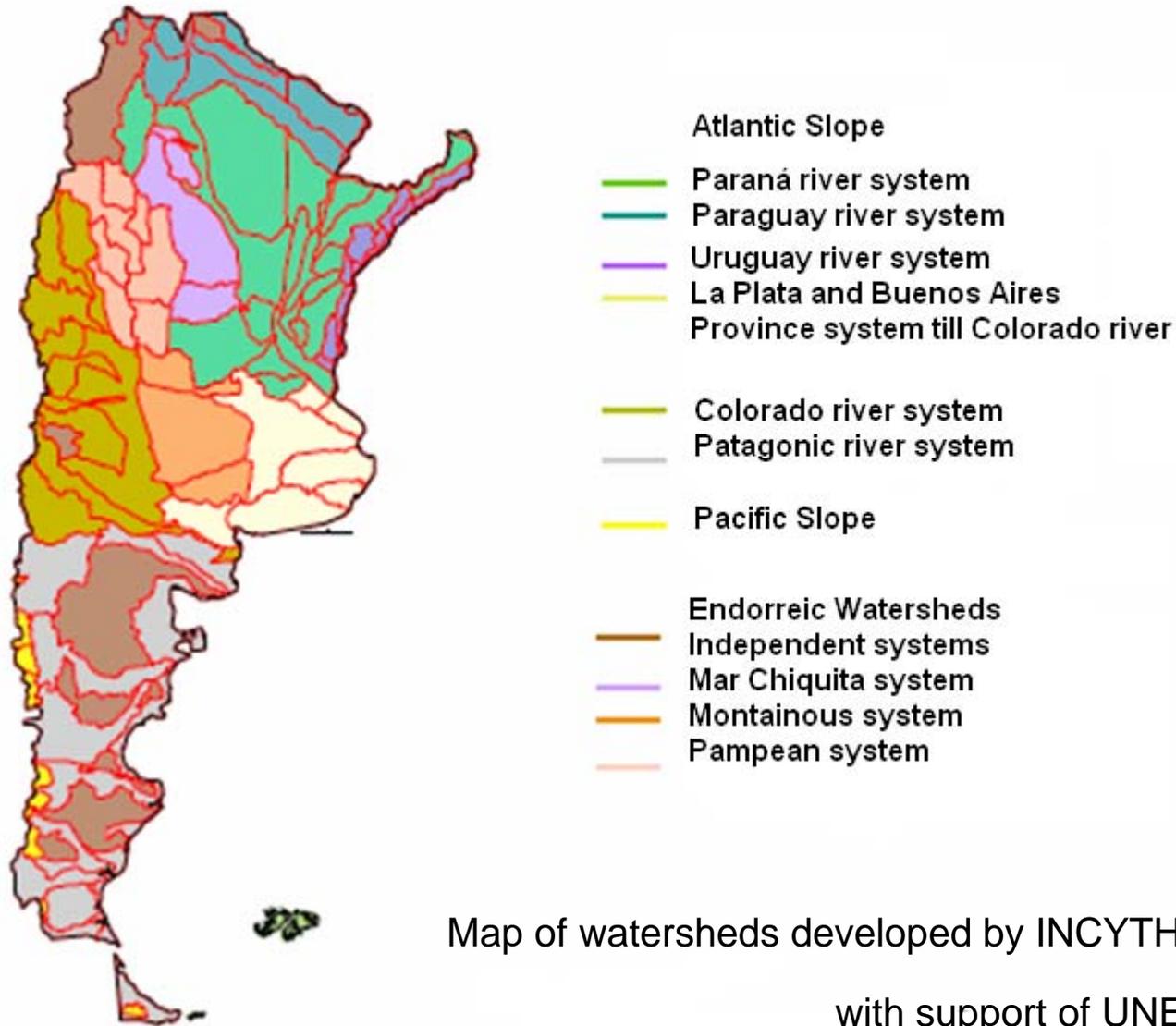
* Source: World Bank, 2000.

Superficial water resources distribution by basin Argentina

Basin	Mean discharge [m ³ /seg]	%
Del Plata	22.178	85,84
Central Region (Santiago del Estero/Córdoba/ La Pampa)	186	0,71
Cuyo/Norwest	319	1,24
Colorado/Negro	1.095	4,24
Patagonics	846	3,28
Pacific Watersheds	1.212	4,69
Total	25.836	100

* Source: INCYTH / UNESCO, 1994.

MAP OF WATERSHEDS AND SUPERFICIAL HYDRIC REGIONS OF ARGENTINA



Map of watersheds developed by INCYTH (today INA)

with support of UNESCO, 1994.

(a) The mean discharge includes 100% of the Uruguay river flow and the surface is the total surface of the basin. The surface of the basin portion of Argentina is 918.000 km².

(b) Small rivers of the Puna Region are not included

Source: *Balance hídrico de la República Argentina. INCYTH / UNESCO, 1994.*

BASIN (WATERSHED)	Mean Discharge		Volume	Surface	Discharge per surface
	m ³ /s	%	hm ³	km ²	l/seg.km ²
ATLANTIC					
la Plata River ^(a)	22.031	85,27	694.770	3.092.000	7,1
Prov. Buenos Aires	147	0,57	4.636	181.203	0,8
Colorado River	319	1,24	10.060	92.840	3,4
Patagonic rivers	1.941	7,52	61.211	356.033	5,5
SUB TOTAL	24.438	94,6	770.677	3.722.076	
MEAN VALUE					6,5
PACIFIC					
Varios	1.212	4,69	38.222	33.455	36,2
INNER BASINS					
Independents ^(b)	42	0,16	1.325	248.871	0,2
Mar Chiquita	114	0,44	3.595	22.030	5,2
Serrano	24	0,09	757	26.555	0,9
Pampeano	6	0,02	189	600	10
SUB TOTAL	186	0,71	5.866	298.056	
MEAN VALUE					0,6
TOTAL	25.836	100	814.764	4.053.587	
MEAN VALUE					6,4

GROUNDWATER RESOURCES

LOCATION	Depth	Discharge	Salinity
	m	m ³ /hora	mg/l
Valle inferior Río San Francisco	140	130	200
Cono tucumano	60	150	500
Embalse Río Hondo	60	300	200
Valle Santa María	50	150	200
Valle de Catamarca	30	150	300
Sierra de Córdoba	100		
Valle de Conlara	50	200	1600
Abanico del Río San Juan	200	150	700
Abanico del Ríos Mendoza y Tunuyán	90	110	1200
Abanico Ríos Diamante y Atuel	80	150	1800
Valle Río Tunuyán	80	120	600
Cuenca Paranaense	40	60	600
N.O. Corrientes	10	40	200
Bahía Blanca	700	330	1000

ARGENTINE REPUBLIC. WATER USES

Needs:

Irrigation 70,5%

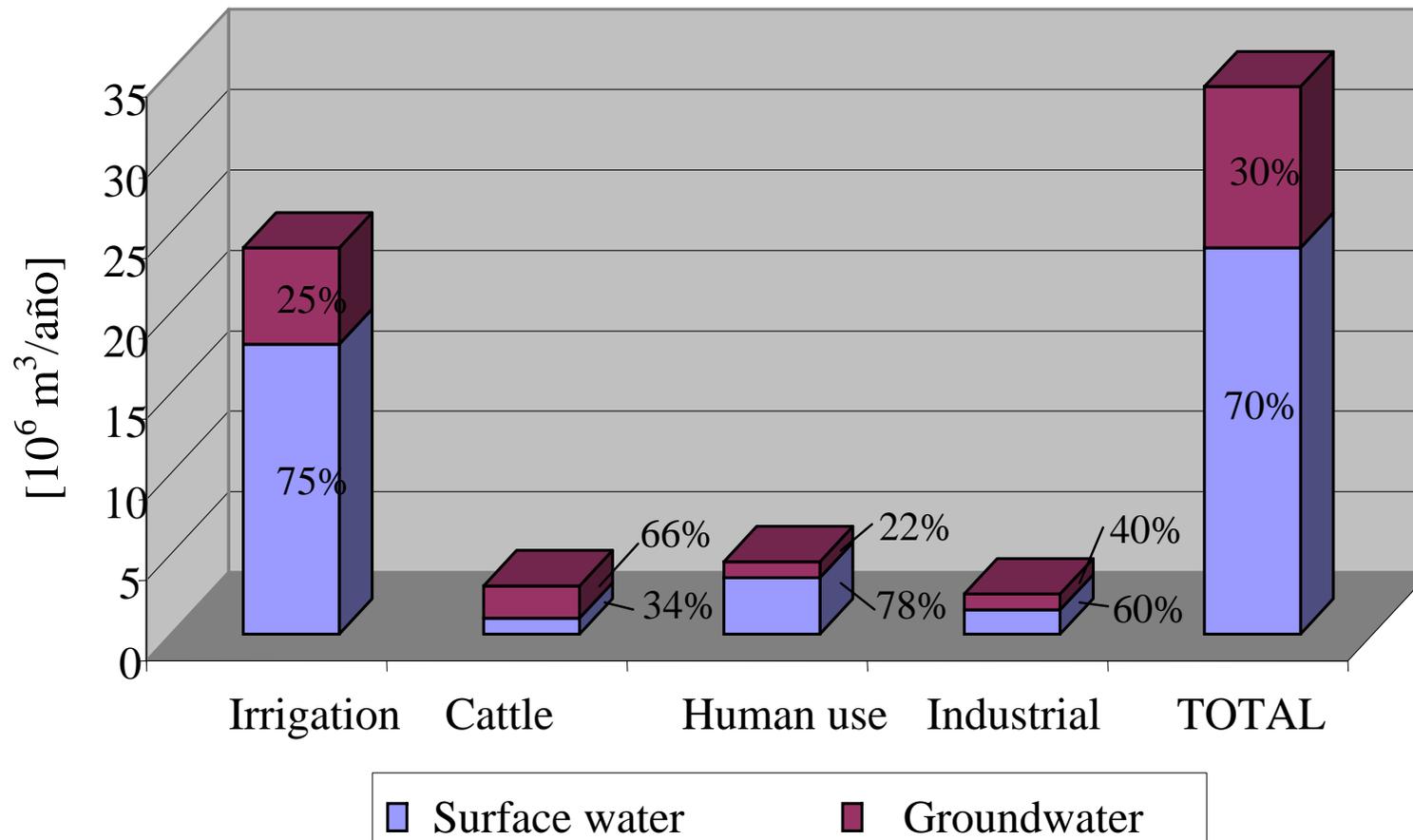
Human water supply 13%

Cattle raising 9%

Industrial use 7,5%

30% of the total water in Argentina for the different uses has groundwater origine

Water uses Argentina (1993-1997)

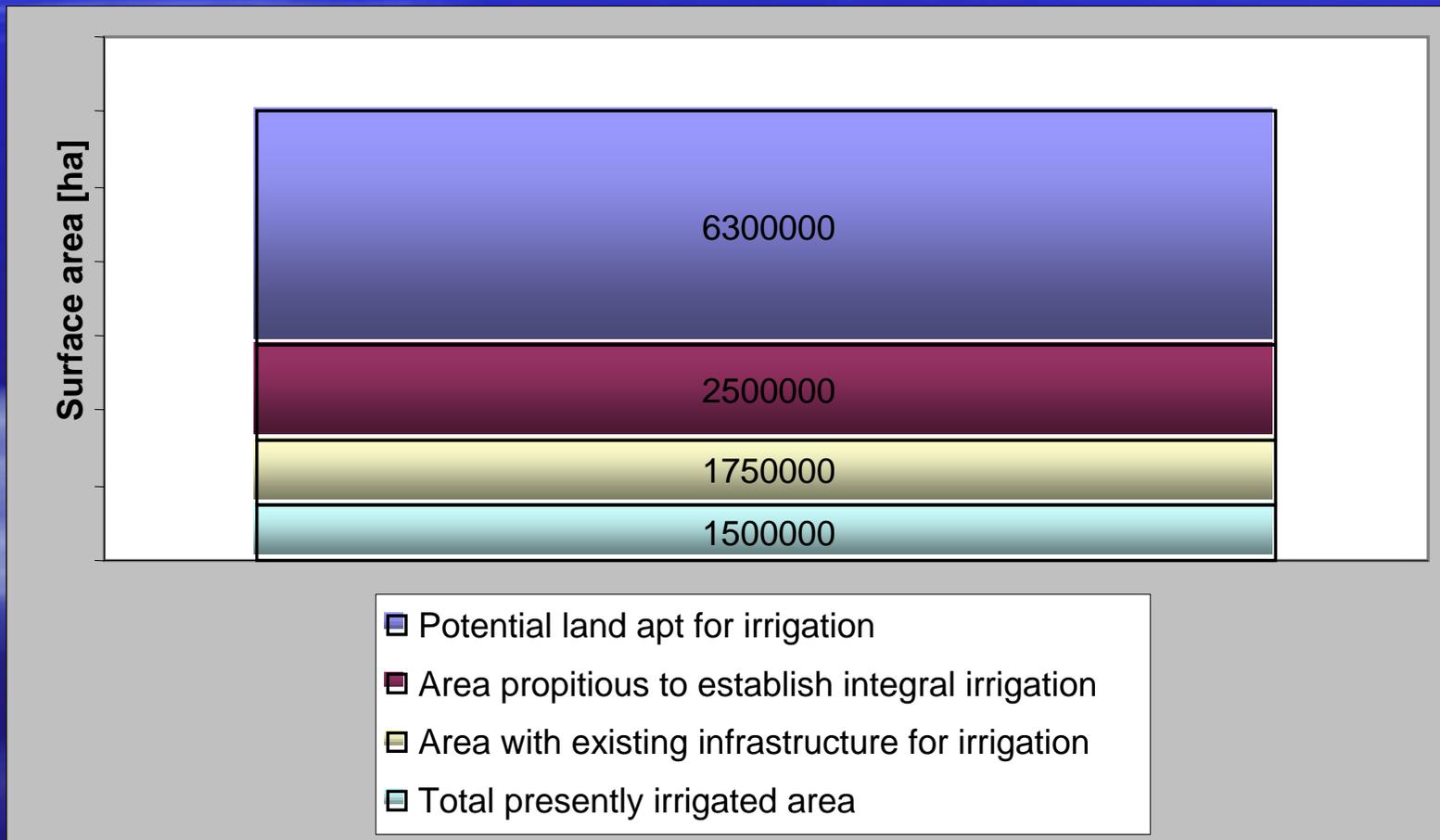


*Source: BIRF, 1995.

Region	Problems
Arid and Semi Arid	<p>(a) Limitation of production possibilities for agriculture products with high relative values.</p> <p>▲ Water shortage and seasonal variability</p> <p>(b) Conflicts generated by the over exploitation of groundwater reserves</p>
	<p>(c) Loss of production capacity due of salinity.</p>
Humid	<p>(d) Degradation of water quality by pollution of surface flows and groundwater originated from effluents without treatment.</p> <p>(e) Presence of high levels of natural salinity (Chaco semiarid and Patagonic Region), Excess of Arsenic and Fluor (punctual areas in Central Pampas region).</p>

WATER AND AGRICULTURE

The surface with irrigation infrastructure covers 1.75 millions of hectares, 5% of the total agricultural surface of the country. The potential land for irrigation is 6,300,000 hectares. 2.5 millions of them can be used for integral irrigation. The total irrigated surface is 1.5 millions of hectares (73% or 1,1 millions of hectares in the arid and semi arid regions).



WATER AND AGRICULTURE

68% of the surface under irrigation is located in arid and semi arid regions and 32% in humid regions, as complementary irrigation or rice production. 74% of the systems have public administration and 26% have private administration.

The problems of irrigation in Argentina are:

- Salinity or bad drainage. If the total irrigation surface is 1,5 millions of hectares, there are 500.000 hectares affected in different intensities by drainage and salinity problems.
- Technologic obsolescence of the irrigation systems. Gravity water distribution and poor maintenance.
- Efficiency lower than 40%.
- Water costs system.

WATER AND AGRICULTURE

VIRTUAL WATER

- 15% of the used water around the world is exported as virtual water
- If (in a global level) agriculture is the first economic sector with reference to water use, the interchange of agricultural products is the most important element in the virtual water commerce.

In general considerations, it is possible to consider:

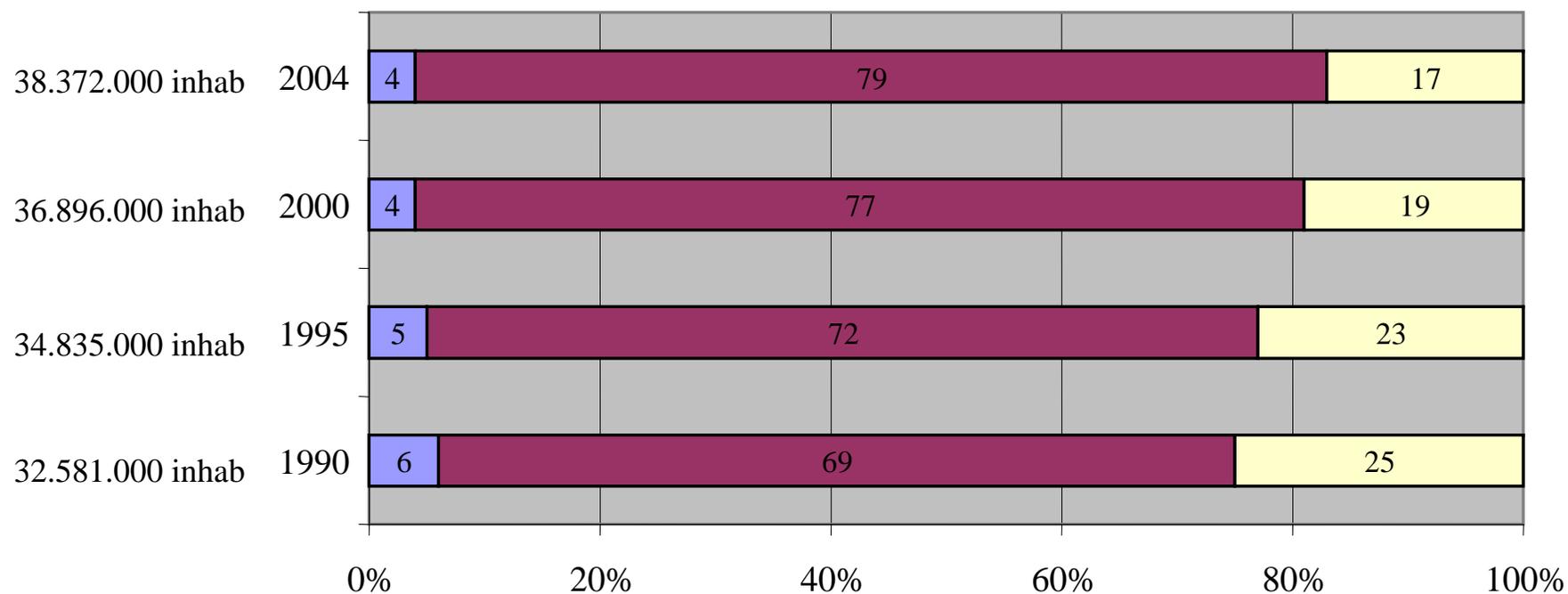
- 67% of the global virtual international commerce is related with agricultural aspects;
- 23% is related with the commerce of cattle products;
- 10% is related with industrial products.

LEVELS AND GEOGRAPHIC DISTRIBUTION OF CONTAMINATION

SOME EXAMPLES:

- Misiones and several areas of the Bermejo river basin: increasing of solid sediments in rivers due to land erosion because deforestation and bad uses of lands.
- Uruguay river and Negro river : presence of plaguicides in surface water flows.
- Contamination of surface reservoirs as Río Hondo (Santiago del Estero), San Roque and Los Molinos (Córdoba), Lake Lacar (Neuquén) and Lake Nahuel Huapi (Río Negro) and urban rivers (Riachuelo, Reconquista) because the effluents without treatment of urban areas and industrial developments.
- Groundwater contamination because the human uncontrolled effluents in urban areas, as the region around Buenos Aires city, where is located an important aquifer (“Puelche”) with particular importance.
- Groundwater natural contamination (arsenic), particularly in Northwest areas of the country.

WATER SUPPLY FOR POPULATION

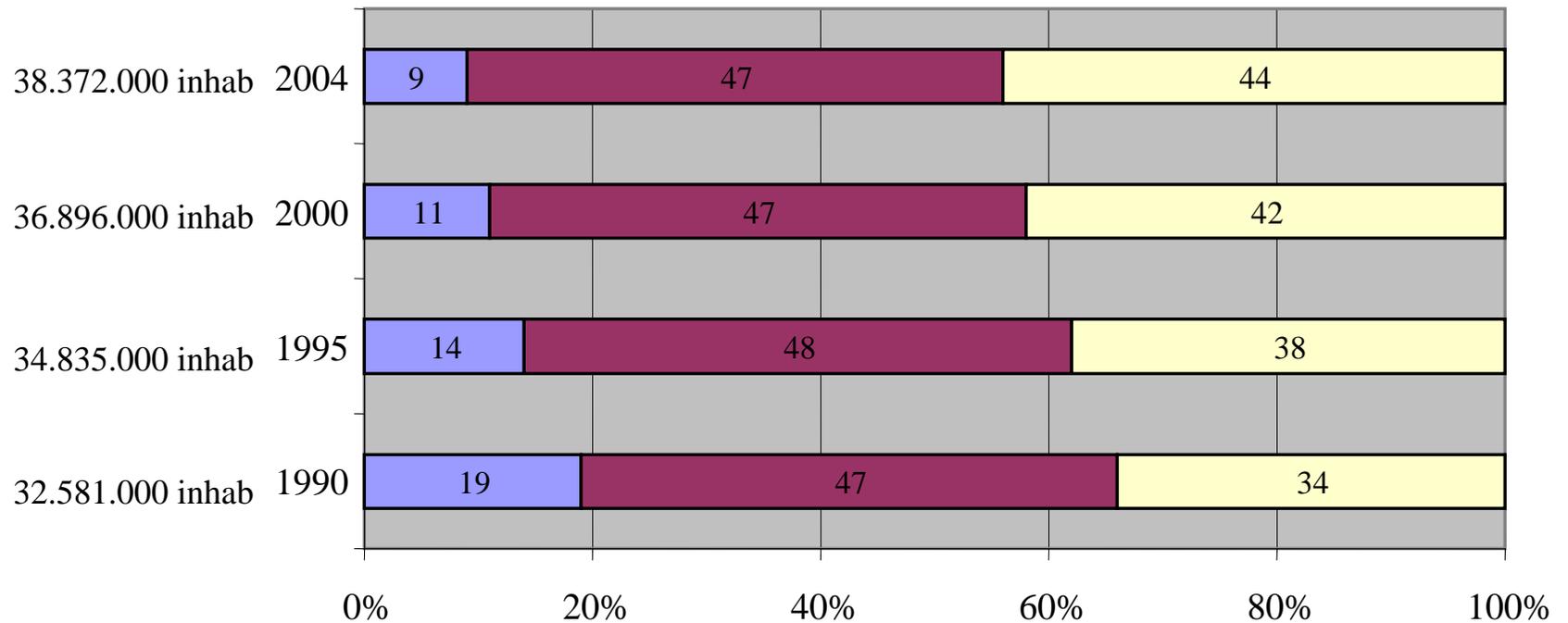


	1990	1995	2000	2004
Other type of connection	25	23	19	17
Household connection	69	72	77	79
Without connection	6	5	4	4

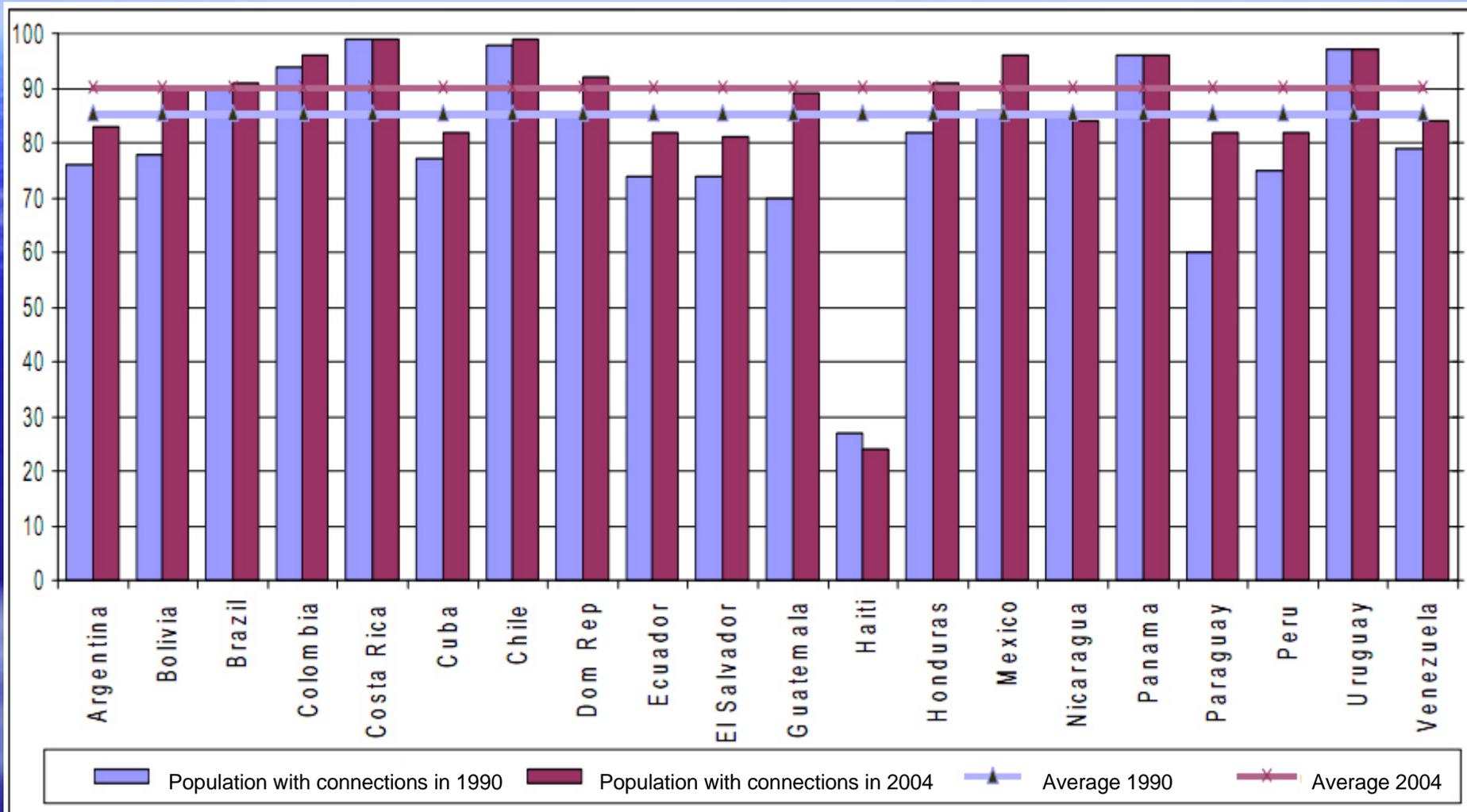
WATER IN URBAN AREAS

	Water supply	Sanitation
	%	%
Total of the country	96	68
Big urban regions		
Big Buenos Aires	73	52
Córdoba	96	35
Rosario	99	61
Mendoza	96	80
La Plata	92	68

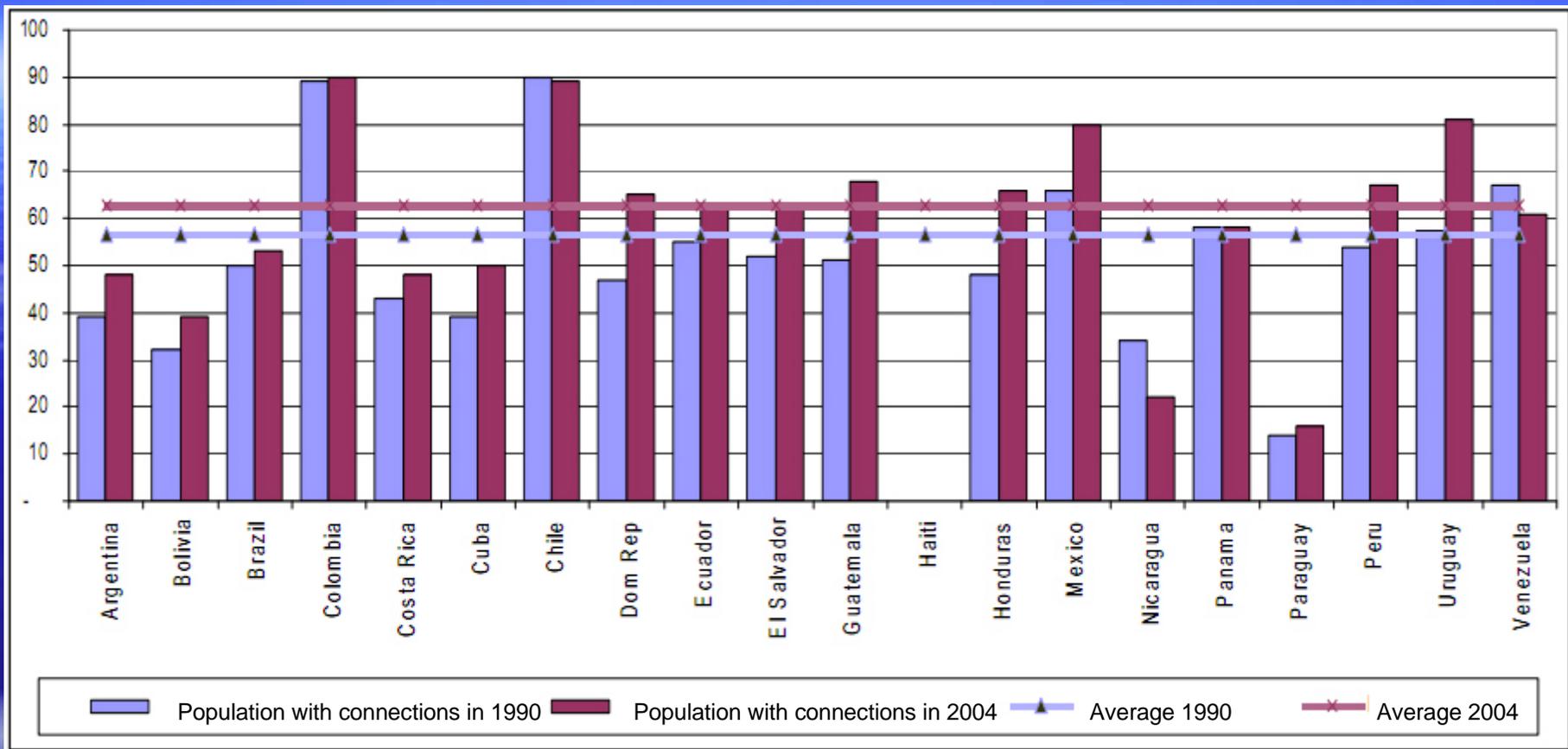
WATER SANITATION



	1990	1995	2000	2004
Other type of connection	34	38	42	44
Household connection	47	48	47	47
Without connection	19	14	11	9



Evolution of the percentage of population with access to drinking water through household connections between 1990 and 2004. Source: WHO/UNICEF: World Health Organization and United Nations Fund for Children: Joint Monitoring Programme for Water Supply and Sanitation.



Evolution of the percentage of population with sewerage services through household connections between 1990 and 2004. Source: WHO/UNICEF: World Health Organization and United Nations Fund for Children: Joint Monitoring Programme for Water Supply and Sanitation.

By 2004 an estimated 28% of collected wastewater in the region, on average, was treated. In Latin America the highest rates of coverage is for drinking water service, then sewerage services and, finally, treatment of effluents. This suggests an evolutionary process whereby provider industry (private or state) first extends coverage of fresh water, then of sewage and finally, it advances in the treatment of effluents.

SOME PROBLEMS ON WATER AND WASTEWATER SERVICES

1-Quality of water supply. Lack of effective control systems.

2-Continuity of services: limited to hours a day or seasonal.

3-Network losses: in Latinamerican and Caribbean countries not losses including illegal connections, are around 44%.

4-Participation and conformity of the population.

A water supply and sanitation project without community involvement in determining the need for and nature of the system, or without an effort to train some community members to do maintenance or repair, is very likely to fail.

WATER AND HUMAN HEALTH

“Water supply and sanitation systems are major elements of the public health measures that drastically cut death rates and improve health levels. Though it is not generally appreciated, these measures have been considerably more important than curative medicine in contributing to good health, long life expectancy and low infant mortality. Infant diarrhea, the largest killer in developing countries, is closely related to poor water quality”.

WATER AND HUMAN HEALTH

UNESCO estimates that 80% of illness in developing or under developed countries are due to the consumption of unsafe water and poor sanitary conditions (“Water, a Shared Responsibility”, U.N. Report 2006).

Some 60% of child mortality is caused world-wide by infections and parasitic diseases related to water.

Diarrheal diseases and malaria killed about 3,100.000 persons in 2002.

WATER AND HUMAN HEALTH

Argentina is subject to those health evils previously mentioned, and has many areas with sanitary deficits. Also we must say that moreover than the problems linked with the irregular or difficult access to safe water, some areas of Argentina must face the presence of nitrates, nitrites and arsenic in the water. This last is a geological contaminant, very dangerous being under its exposition during long periods of time. The two first are originated by agrochemical treatments of soil, mainly in the humid Pampas. As conclusions of recent studies the arsenical areas cover near 435.000 sq.km, affecting more than 2.5 millions persons (7% of Argentina population) in the center and north of the country, with some presence in isolated districts of the Province of Buenos Aires.

WATER AND ECONOMY

Investments to provide water and sanitation in Latinamerica and Caribbean countries, instead their confusing definitions (including or not maintenance, improvement, renewal, etc) are estimated in 0,2% of GDP or 1% of total investments. Argentina is from below these figures.

An average estimation of cost of system installation (UNDP, 2005, at a 6% discount rate) for North America standards can be expressed by the following table:

Cost component	US\$ per m3	% of total
Opportunity cost of raw water supply	.05	3
Storage and transmission to treatment plant	,10	5
Treatment to drinking water standards	,10	5
Distribution of water to households (including house connections)	,60	30
Collection of wastewater from home and conveyance to Wastewater treatment plant	,80	40
Wastewater treatment	,30	15
Damage associated with discharge of treated wastewater	,05	3
TOTAL	2	100

WATER AND ECONOMY

The provision and maintenance of water and sanitation systems need special considerations. The price for the payment of the service is generally under the costs, all over the world. The differences are covered by the governments. Nevertheless, to obtain the financial sustainability and continuity of services, it is recognized that the income provide by tariffs must cover, as minimum, the operative costs and the expenditures for infrastructure maintenance to assure the quality of the services and their state of conservation and functioning.

WATER AND ECONOMY

Of course we must accept that water is an essential service that all families must receive, no matter their level of income and their poverty situation. Social solidarity and general interest require that tariffs should adapt, reducing them for people with low level income and increasing them for people and societies or institutions with higher capacity of payment, or considering the different qualities of respective neighborhoods or districts, accomplishing in all cases the technical minimum requirements proposed in the previous paragraph.

In general, without applying discounts, UNDP (2006) estimated that for 20% of the poorest households the cost of water represents 10% of total expenses.

WATER AND ECONOMY

In Argentina it is difficult to establish the tariff per cubic meter of water without having a meter system and usually invoicing by household units. For the Metropolitan Area of Buenos Aires City the state society AySA that offers the service estimates that the relation between the total income and the total water registered in its invoices reaches a value of us\$ 0,17 per cubic meter of consumed water, paying services of water and sanitation (in North America the same is estimated on us\$ 0.5/m³). In 2007 the incomes of AySA covered the 92% of the operative costs, proportion reduced to 75% in 2008 and 58% in 2009. AySA has since 2002 a Program of Social Tariff for water and sanitation; it covers those socially vulnerable people, in number of 101.154 (2006), representing some 3,6% of the total clients and receiving an average discount of 40%.

PROVIDERS OF WATER AND SEWER SERVICES IN ARGENTINA

1 - Till 1980 services were provided by federal government through a state federal company (OSN – National Sanitary Works), mainly for urban areas. More over, since 1964, was introduce SNAP a cooperative system for rural areas and small villages.

2 - From 1980 the OSN services were discentralized and transferred to provinces (states).

3 -1889/90 started a process of transference to private companies, mainly in large cities.

4 - During two last decades many services were returned to state societies

In this context, on March 21, 2006 the company “Argentine Water and Sanitation” (AySA) was established by the national government to cover an area of 18,000 km², a densely populated urban area with 10 million inhabitants, including the city of Buenos Aires metropolitan area and matches (municipalities) of Buenos Aires Province. The population supplied with drinking water is 7,850,000 inhabitants, with more than 4,000,000 m³ of surface water daily from three treatment plants and more than 200,000 m³ of groundwater from more than 250 wells. The length of the network of water distribution is on the order of 17,000 km. With regard to sewage, 5,700,000 inhabitants are served with four treatment plants, 89 pumping stations and a nearly 10,000 km long network.

Website: www.aysa.com.ar

PROVIDERS OF WATER AND SEWER SERVICES IN ARGENTINA

Nowadays it is estimated that currently there are 1,830 providers of water services, of which 365 provide sewer services. The table below shows the classification by legal nature of the providers and the level of decision of jurisdiction.

Type of provider	National level	Provincial	Municipal	TOTAL
Anonymous Society	1	8	0	9
State Society	0	3	2	5
Autartic Entity	0	1	10	11
Centralized Entity	0	4	377	381
SA Private	0	7	10	17
Cooperative	0	0	639	639
Neighborhood Association	0	0	768	768
TOTAL	1	23	1806	1830

Source: Lentini's calculations based on Spider-ENOHSA and Zorrilla

PROVIDERS OF WATER AND SEWER SERVICES IN ARGENTINA

AySA has launched a greater Buenos Aires master plan for 2007-2020 to meet the needs of drinking water and sewer within the entire area of its concession, which involves an investment of about us\$ 6,000 million. This includes a water treatment plant in Tigre (North of Buenos Aires City), for two million, the expansion of water treatment facilities, scrubbers and pumping stations and a program of renovation and rehabilitation of existing networks and facilities. Launch stage is the construction of a sewage treatment plant on the river Plate, in Berazategui (South of Buenos Aires City) for four million people, and a sewage system Matanza/Riachuelo, which involves the construction of two interceptor-collecting ducts that allows flexible operation of the drainage sewer for future expansion, and the construction of a pretreatment plant and outfall for the river Plate. These investments will reasonably meet the Millennium Goals, reaching 90% covering of drinking water.

IMPROVING ACCESS TO SAFE WATER

A general plan for improving access to safe water should include the following points:

- 1 - Obtain the necessary political support and practical decision to cooperate with its formulation and application.
 - 2 - Achieve the appropriate knowledge about the availability and natural quality of water and understand the meaning and the essential importance that safe water has to protect health, hygiene, assistance to schools or labor places, and family and productive life.
 - 3 - Organize a permanent dissemination of information to reach governmental decision-making officers and planners as well as educational, research, professional and productive institutions and the population in general.
 - 4 - Include the theme in the three levels of educational programs and promote the development of scientific and technological capabilities.
- (...)

5 – Improve the governmental technical offices related to water and sanitation services, particularly at municipal levels, complementing those of state or national jurisdiction.

6 - Establish a wide and reliable system of data bases and evaluation of needs and priorities, balancing the technical and economic criteria with the human and social aspects of feasibility assessments.

7 - Ensure the financial support for the provision of safe water for all people, in two levels: a) for investments in new services or renewal or improvement of those already existing: in charge of governments with the cooperation of banks or agencies; b) for operation and maintenance of existing systems: with expenses covered by the payment from the users, with balanced tariffs between different payment groups.

8 - In extreme cases of lack of safe water in marginal areas or slums, without enough financial support, consider the cooperation between the municipal government and technical offices with the association and individual work of the future users.

PLAN “WATER / SEWER + LABOR”

This Plan has been organized by AySA (www.aysa.com)

Objective: To expand water/sewer services in areas of low level income population from Big Buenos Aires (Metropolitan Area), and generate genuine labor through the constitution of Cooperatives of Work, integrated by unoccupied or informal workers.

Management: Construction by Modules: 5000 metres of pipelines and 500 household connections for water; 3000 m of pipelines and 300 household connections for sewer.

Outcome: From March 2006 to March 2010:
Were executed 400 modules
Were installed 1727 km of pipelines for water
Were benefited near 960.000 persons.

PLAN “WATER / SEWER + LABOR”

There are three main actors:

AySA: The water and sewer enterprise AySA design the projects, provide the needed financial resources and materials, train people of the Cooperatives of Work, supervise technically the construction and the connections of the net with the households.

Cooperatives of Work: They execute the Modules and receive a salary accord to the advance of works. Each working group is integrated by 16 members, trained specially.

Municipalities: Propose the area to expand the services, are the responsible for the execution of works, manage the financial resources transferred by AySA and hire and conduct the labor of the Cooperatives of Work.

Thank You!