Regional Process for The Americas
South America Sub Region

Water Agenda for South America: challenges, vision and strategy

7th World Water Forum
Republic of Korea, 2015

Argentina / Bolivia / Ecuador / Colombia
Chile / Paraguay / Peru / Uruguay / Venezuela

CAF DEVELOPMENT BANK OF LATIN AMERICA

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José Carrera, Social Development, Corporate Vicepresident
Víctor Arroyo, Principal Executive, Social Development. Document coordinator

Reviewers:
Abel Mejía, CAF's Senior Water Consultant
Maureen Ballestero, CAF's Water Consultant

Autor:
Víctor Pochat

Graphic Design:
Estudio Bilder

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Foreword

The World Water Forum is the most important and visible water meeting worldwide. Every three years, since 1997, the World Water Council organizes a forum in close cooperation with authorities of the respective host country, as a platform for global cooperation to face water challenges.

The forums provide a unique opportunity for the global water community and policy and decision makers from all over the world to cooperate and find shared solutions. They also provide the opportunity to share information about good practices and learn from mistakes, as they search for solutions that can benefit society. Additionally, the forums are an opportunity to create an agenda for debating policies and following up on shared goals.

The **Seventh World Water Forum (VII WWF)** will take place in Daegu-Gyeongbuk, in the Republic of Korea, from 12th to 17th April, 2015 and will be feature the three processes that have typically also taken place in previous forums: the political, thematic and regional processes. Each topic will be developed in an environment of mutual cooperation among governments, industry, international and non-governmental organizations, and academe, against the backdrop of set objectives and concrete goals to be reached.

This time, in addition to such process, a fourth one on Science and Technology has been planned to focus on finding solutions to water challenges through technological innovation, particularly in the field of information technology applied to controlling water-related processes. In addition, a Citizens' Forum will be organized to enhance peoples' awareness of water issues, simultaneously with a Forum for Youth and Children.

The **Thematic process** will address four main issues, with a total 16 sub-issues, that provide the Forum's thematic framework. Such themes and sub-themes are, in turn, grouped in two large areas: i) Goals for action: the future we want and ii) Tools for action: change drivers. The figure below more clearly illustrates the thematic proposal.

SEVENTH WORLD WATER FORUM: THEMATIC PROCESS

I. I. Goals for action: The future we want

1. Safe water for all
   - 1.1 Safe water for all
   - 1.2 Enough safe water for all, comprehensive sanitation for all
   - 1.3 Adapting to change: Managing risk and uncertainty for resilience and disaster readiness
   - 1.4 Infrastructure for the sustainable management of water resources and services

2. Water for development and prosperity
   - 2.1 Water for food
   - 2.2 Water for energy
   - 2.3 Water and cities

3. Water for sustainability: harmonizing human beings and nature
   - 3.1 Green growth, water management and industry
   - 3.2 Managing and restoring ecosystems for water services and biodiversity
   - 3.3 Ensuring the quality of water from crests to reefs
   - 3.4 Implementing SMART for the Integrated Management of Water Resources (IMWR)

II. Tools for actions: Change drivers

4. Building mechanisms for feasible implementation
   - 4.1 The economics and financing of innovative investments
   - 4.2 Effective governance: Improved policy decisions, stakeholder involvement and technical information
   - 4.3 Cooperation for conflict mitigation and improving cross-border water management
   - 4.4 Water cultures, justice and equity
   - 4.5 Improving education and capacity building

In the **Regional Process** the key stakeholders from each of the world's regions will share their perspectives and positions about water resource management. For the VII WWF, the identified regions are Africa, the Americas, Asia-Pacific, Europe, the Mediterranean, the Arab region and a non-geographic region called the *Economically Water Insecure, EWI.*

Overall, the Americas have been significantly involved in the successive World Water Forums (WWF), excepting the First Forum held in Marrakech in 1997 attended only by some regional experts, principally in their individual capacities as specialists. The II WWF (The Hague, 2000) prepared the ''Vision for Water and Framework for Action'', based on national reports from South America (GWP, 2000) and Central America and the Caribbean. In the III WWF (Kyoto, 2003), participants from the Americas held a number of preparatory meetings and prepared a document including the region's various perspectives on the issues at hand (García et al. 2003).

Regional participation increased in the IV WWF (Mexico, 2006), partly because of the meeting's venue. The region's significant participation at the Mexico meeting was reflected in the quality of the preparatory Regional Document for the Americas that drew from the experience acquired in previous meetings (Mejía et al., 2006). At the V WWF, held in Istambul in 2009, the Americas Regional Consortium (ARC) was established. Among its main responsibility was the drafting of the ''Americas Regional Document'', prepared around the common thread of ''Global Changes'', a concept chosen as the main focus of the respective political process (ARC, 2009). The Americas Regional Process (ARP) took place during the VI WWF, involving over 40 organizations grouped around six thematic priorities and which concluded in the drafting of the ''Water Agenda for the Americas'' that built on a series of analytical documents prepared about each of those priorities (APR, 2012).

For the VII WWF, the Americas region has planned to draft a Regional Document based on sub-regional and country documents, including the present document., The document will cover the nine Spanish-speaking South American countries (Argentina, Bolivia, Chile, Colombia, Ecuador, Paraguay, Peru, Uruguay y Venezuela).

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Executive summary

The Spanish speaking South American region, comprised of nine countries, namely Argentina, Bolivia, Chile, Colombia, Ecuador, Paraguay, Peru, Uruguay and Venezuela, stretches over 8.8 million km^2 and features a wide range of climates due to the ample latitudes it straddles and temperature differentials between the Atlantic Ocean to the east of the continent and the Pacific to the west.

Average annual rainfall reaches 1 500 mm but varies significantly. The Andes Mountain Range, that runs from north to south of the sub-continent, acts as a barrier to the movement of humid air masses from both oceans. Some of the planet's most humid areas are located between the Andes and the Pacific, as in Colombia's Chocó. But also some of the driest, as Chile's Atacama Desert.

Large river watersheds irrigate the region, including the Amazon, Plata, Orinoco and Magdalena, as well as major lakes like lakes Maracaibo and Titicaca. The region has about 25,000 km^2 of glaciers and 3 million km^3 of ground water reserves, particularly the Guaraní aquifer.

Average annual water availability is approximately 43,800 m^3 per person, though this figure fluctuates dramatically in time and space. At country scale, this indicator does not reflect the imbalance between water availability and the location of demand for water-related services in vast areas of Argentina, Bolivia, Chile, Peru and Venezuela that is the consequence of the the extremely heterogeneous distribution of water resources, population and economic activities. For instance, 63% of Peruvians live on the South American Pacific coastal band that holds only 1.76% of the available water. A dramatic diversity of bio-geographic regions, including forests, rainy, temperate and sub-Antarctic forests, mangroves, tundras, savannahs and deserts also contributes to the imbalances.

The sub-region's extension and diverse physiographic characteristics and variability, and the influence of both oceans, results in extremely different temperature ranges and, consequently, evaporation and the water balance resulting from rising or falling rainfall are characteristic.

The El Niño and La Niña Southern Oscillations are two atmosphere and oceanic phenomena worth mentioning. These cyclical phenomena recur at periods between 2 and 7 years, and have a major impact in the sub-region. Their effect is felt particularly strong on the Pacific coast close to the Equator, but their impact is both regional and even global because these phenomena alter the weather almost all over the planet.

The frequency and seriousness of climate and water-related hazards and catastrophes have increased significantly, as has the vulnerability of communities, in particular those living in marginal conditions. These natural catastrophes degrade environments and pollute water. The problem is exacerbated when they combine with environmental degradation resulting from daily household (untreated effluents) and productive activities (inappropriate industrial processes, poor use of fertilizers and pesticides for agriculture, among others).

About 210 million people live in the sub-region, with over 81% of the total living in cities and counting. However, urbanization has not resulted in better living standards for most rural migrants who now live in marginal city areas, under extremely precarious home, sanitary and environmental conditions.

In recent years, all nine countries have made significant progress in improving their economic and political stability, and have played an increasingly important role in the continental and global stage.

Nevertheless, after a decade of economic prosperity, since 2013 growth has declined in most of these countries, as a consequence of slower world markets, sliding international commodity prices, volatile international financial markets and falling domestic demand. Still, in 2014, severalof these countries have grown faster than 4%.

A comparison of these countries' Human Development Index (IDH) shows extremely disparate figures, in a range from 0.667 to 0.822, that are typical in this region's countries. Although these nations exhibit a 34.6% Average Poverty Index, with only two countries showing poverty rates below 20%, in recent years all have shown a stronger commitment to tackle this persistent problem and some have significantly reduced poverty. Nevertheless, the rise of a new ''middle class'' that demands efficient quality public services poses a series of new challenges.

We can identify two different approaches to economic policies in these countries. On the one hand, Colombia, Chile and Peru are open economies where free markets allocate resources and drive development. On the other, Argentina, Bolivia, Ecuador, Paraguay, Uruguay and Venezuela follow a social market economic model with governments playing a strong role in the economy. These countries' diverse economic policy directions influence the way they manage water, in particular water rights and the supply of potable water and sanitation services.

The sub-region has made significant strides in preparing plans, policies, programs and strategies that ensure access to the fundamental human right to safe drinking water and sanitation and its various components. Also they have advanced in formally incorporating these rights in their respective national legal frameworks. However, certain processes are still needed to build a consensus that would standardize constitutional and legal precepts used around the region. As regards other components of this human right, including quality, access, accountability, citizen involvement, acceptance, as well as system environmental and financial sustainability, there exist large disparities among nations. These countries must come to agreements within their regional multilateral organizations to identify region-wide goals that can contribute to gradually set in the various components of the human right to water and sanitation.

Also the sub-region must rise to the **challenges** posed by the various issues the Americas have prioritized for the VII WWF, to witness:

Regarding **"Water and sanitation services for all"**, including preserving water to ensure supplies; assuring access to safe drinking water and sanitation services that are still indaquate; providing sufficient financing to close existing gaps and meet growing infrastructure needs; charging realistic service rates while simultaneously effectively subsidizing the neediest people; and building a wider and more accurate monitoring system for the various components of the human right to available, quality, accessible and affordable water.

Among the messages for Korea 2015, it is worthwhile underscoring that people living in cities larger than 500,000 people typically have access to better services than residents of intermediate and small cities and rural areas. In these latter cases, an issue to be taken into account is the insufficient economies of scale to provide efficient services, as well as insufficient financing and robust projects. Also to be taken into account is the fact few countries have created stable regulatory frameworks with independent entities that gather reliable and useful sector data.

Regarding **"Water and energy"**, sufficient water and energy supply must be assured to fuel economic growth and reduce poverty. The sub-region's natural advantages to generate hydroelectricity must be taken advantage of, while recognizing the effects of climate change and the environmental and social impacts of large dam building projects. This will require, in addition, developing complementary sources of energy, such as bio-fuels and wind energy, to ensure supplies and reduce the use of non-renewable energy sources, and launching comprehensive initiatives for the sustainable use and management of water and energy.

Other messages to be taken to the Korea 2015 Forum include the countries' continued dependence on hydroelectricity, the need for the electricity sector to internalize hydrological uncertainty, the requirement to negotiate environmental and social conflicts to develop hydroelectricity's potential, the importance of designing multipurpose impoundments to develop hydroelectricity, address mismatches between hydroelectricity generation and other uses of water and, in a separate context, the need to engage in informed debate to anticipate water-related conflicts when developing non-conventional hydrocarbons.

In regards of the **"Water for a food security"** thematic process, consideration must be given to the influence of globalization (including trade agreements, market forces, cross-border subsidies, technological development and

"virtual water") and the significant expansion of irrigation, the need to modernize irrigation techniques, and the role both government and industry must play in investment and subsidies, while also taking account of the importance of small scale subsistence agriculture as a source of food and economic security. We also need to acknowledge the environmental impact of agricultural production and the likely consequences of climate change upon it.

This theme's message to Korea 2015 underscores the key role of water productivity in agriculture and the need for interventions in all links of the "use chain", starting with water degradation through treatment plants -and how they use water- to international trade.

When considering the **"Adaptation to climate change and risk management"** theme, consideration should be given to the fact that since the sub-region's economy to a large extent depends on its natural resources, it is particularly vulnerable to climate change impacts, which will be felt by all societies and natural systems along the water value chain. Special attention should be paid to floods and droughts and desertification processes.

The sub-region will convey to the Korea 2015 Forum the key role played by efficient design and implementation of climate information and communication networks and channels to make possible easier knowledge sharing and public participation, as well as improved research, education and local development capacities, while also developing new sources of financing and better use of existing funds.

When considering the **"Management of ecosystems for men and nature"**, importance should be given to ecosystem´s services and to a better understanding of their functions and relationship with water's use and conservation. Also, consideration should be given to the impact of international markets for the sub-region's goods and natural resources, including from the agricultural, forestry and mining industries. Ecological flows should also be given appropriate consideration while recognizing ecosystems and their related environmental systems' management as an intrinsic component of IWRM.

Among the messages the sub-region will take to the Korea 2015 forum, we must highlight the fact that ecosystemic thinking is still applied to specific, isolated and unstructured sets of efforts. It is important to underscore the role of green infrastructure and its analysis in all development projects, encourage water funds, the need to set fair water charges that take account of ecosystems' protection and IWRM, and the Achi Goals for ecosystems. These are all coherent and mutually reinforcing approaches to be considered.

In the field of **"Governance and financing for sustainability"**, although significant progress has been made to introduce better water management and conservation systems throughout the sub-region, the debate continues about the relationship between water and other socio-economic and socio-political issues. Legal frameworks and institutional arrangements are required to provide certainty to social players and also to lure financing to the water sector. Greater civil society involvement is needed, as well as addressing the various water-related conflicts, and ensuring ongoing and planned financing to provide continuity to cross-border water resource development projects. Consideration should also be given to the influence of international agreements for protecting investments andthereby enhance national capacities in water resource management, regulation of utility services and respect for human rights.

In this respect, the message from the sub-region to the Korea 2015 forum highlights the importance of governance to enhance water's contribution to national economies and the ability to create financial resources for water management. However, to create resources, both public and private projects must be profitable and, in turn, this requires robust policy, plan and project evaluation systems that ensure the independence of users and sector institutions. The need to have efficient water utilities is a principle that is already well entrenched in legal systems worldwide. Howver, the challenge remains to translate legal principles into effective and sustainable public policies.

The **Future we want** is reflected in the following **Vision** to year **2030**, related to the various themes above:

The entire region population receives potable water and sanitation services fitting international sanitary standards, on a continuous basis and affordable to low income people.

The region's countries have:

- Developed their water, thermal and non-conventional energy sources with due consideration for the affected communities and the environment, and use water efficiently to generate energy and the energy they need to produce water;
- eradicated hunger among their peoples and effectively contributed to the world's food security by building an economically viable and competitive agricultural industry that, moreover, conserves soils, water and plant and animal genetic resources;
- created and implemented robust weather services and integrated products in decision making by socio-economic sectors through effective dialog between suppliers and users;
- Recognized the fundamental role of ecosystems in ensuring water security and the supply of essential environmental services for sustaining life;
- availed themselves of an institutional framework for water management that ensures the latter's sustainable development and protection through integrated management of water resources. This approach further takes account of water's contribution to the productive economy and environmental stewardship.

To make this future come true, the following **strategies** are proposed:

As regards **of water supply and sanitation services**,

- Public policies should address large cities separately from intermediate and small cities and rural areas, to use resources more efficiently and results are more equally distributed as progress is accomplished gradually;
- The flow of funds to this sector must be maintained, together with innovations and greater efficiencies for each invested money unit;
- It will be important to enhance regulatory practices and increase the efficiency if service operators;
- The regulatory framework shall encourage efficiencies and act independently to reduce political influence in sector decisions;
- Public policies for service management require ongoing technical follow-up, based on accurate, complete, comparable and verifiable indicators that allow to adopt adequate strategies for each scenario.

A strategy that takes account of the connection between **water and sustainable energy** should include the following components:

- joint energy, environmental and water resources sectors environmental assessments to identify sites for generation plants;
- identification together with affected communities of potential environmental impacts resulting from generation and transmission projects;
- updating of existing inventories of hydroelectricity potential to match them with each country's environmental and social rules and regulations;
- building harmonious energy and water resource regulatory frameworks for multi-purpose projects:
- stronger long term indicative region-wide planning;
- a rational debate on the costs and benefits of non-conventional hydrocarbons throughout the region and the possible impacts of hydraulic cracking (fracking) and ways to mitigate them.

To ensure the sustainable use of **water for food production**, the following must be encouraged:

- reducing losses all along the production and consumption chain, including reducing global food waste and food styles with less water;
- safer and more efficient use of agrochemicals and other inputs and eliminating the use of toxic chemicals;
- valuing agricultural biodiversity and recognizing its role in ensuring the stability, resilience and nutritional quality of its production, and its importance in providing environmental services;
- applied research and development of techniques to create sustainable agricultures, and foster dissemination of sustainable technological and management innovations that are both adapted and accessible to all farmers.

To adapt water resource management to the foreseeable **impacts of climate change**, the following are needed:

- stronger legal and institutional settings responding to water and climate change issues;

– technologies for climate change and water resource monitoring intergrated into national emergency systems;
– technical assistance projects and investment opportunities that embrace IWRM practices and climate change adaptation measures;
– support to the design and implementation of local adaptation initiatives, together with the institutional support they require to accomplish their sustainability;
– region-wide knowledge, experience and activity sharing to improve services in countries, facilitate involvement of all water-related sectors, integrate adaptation to climate change in projects and increase the number of public-private and inter-institutional partnerships.

A general strategy for **ecosystems management** should contemplate the following:

– recognize the reduced value attached to natural resources in development policies, programs and projects, and therefore introduce ''green national accounts'' systems, and modify decision making processes taking account of environmental externalities;
– give due consideration to ''green infrastructure'' as a component of infrastructure investment projects in what concerns water resources.
– Introduce stronger legal protections and provide financial resources for ecosystem restoration as a national priority, while undertaking studies to quantify the benefits of ecosystems in terms of their ability to create services for the various economic sectors that use water and amplifying the scope of water funds, and replicating and disseminating lessons learned.
– take account of ecosystems management as a fundamental pillar of IWRM, harmonizing and creating synergic impacts with water-user sectors in their respective individual agendas.
– sensitize the population on the need to protect ecosystems and the relationship between water and biodiversity.

A water **governance and financing** strategy should:

– Internalize the IWRM concept in regulatory frameworks while recognizing the need to encourage coordinated water use and adopt watersheds as a planning unit for water management.
– Strengthen water administration agencies to build an institutional setting that can rise to the challenges created by managing a complex resource.
– Foster stable water rights and, as needs and economies evolve despite stable natural supplies, encourage flexible reallocation through the necessary regulatory frameworks that will prevent transferring negative externalities;
– Encourage users and polluters to pay for the cost of managing the resource, and provide compensation for the damage they cause;
– Encourage reforms in Bilateral Investment Treaties (BITs) so states are assured existing regulations encourage efficient use and supply of water from a legal standpoint and therefore may benefit from eventual economic and financial compensation, while simultaneously allowing to design and enforce public policies to promote and protect the common good.

Based on the above and after looking at the broad range of issues comprised in the conceptual framework for Integrated Water Resource Management, while also taking into account the inter-relationship between water, food and energy safety, 17 conclusions may be highlighted:

1. Safe water is one of the main issues to ensure water supplies in appropriate quantities and qualities to meet various uses; this will, in turn, require acting both on the supply and demand sides of the water resource balance and taking into account potential impacts of climate variability and change.

2. From the supply side, protecting ecosystems is paramount, as is recognizing their role in storing, mobilizing and buffering water flows, as well as the need to protect water sources and keep a check on pollution from residential, urban and productive activities. As regards infrastructure, impoundments and other infrastructures shmustall contribute to holding and storing water for a range of purposes, but appropriate recognition must be given to their environmental and social impacts. From the demand side, it is key to continue searching for greater efficiencies in all activities, with special attention paid to irrigated agriculture and improving water and energy efficiencies in providing potable water and sanitation services. Climate variability and change can have an impact on both supply and demand.

3. Although countries have made great efforts to defeat poverty, indicators reveal it is still significant. High and growing urbanization rates have not translated into enhanced living conditions for many migrants to cities. Although solving this problem transcends the water sphere, the water issues it entails are among the top priorities to be addressed.

4. Water safety means giving all the people access to potable water and sanitation services. Despite high levels of investment, there are still many unsatisfied needs. People living in intermediate and small cities face the most serious issues because water and sanitation services there are usually low quality due to insufficient economic scale of suppliers. Larger scale would allow them to provide more efficient and sustainable services. Services in rural areas are managed by community boards, They are not very sustainable and get only limited support from central government. Finding solutions to both situations will not be easy.

5. Poverty also related to food security. It is worthwhile underscoring agricultural lands throughout the sub-regions produce three times more food than is actually consumed by the region's people. In addition, land is used to grow inputs for biofuels and thus also contributes to energy security.

6. Irrigation has played an important role in improving the region's social and economic standards, together with significant investments in infrastructure. However, the productivity of water in agriculture must improve through interventions all along the "use chain", from the way plants use water through international trade.

7. Growing world food and biofuel demand is leading to more intensive cultivation and the expansion of the agricultural frontier. Both phenomena put increasing pressure on water resources and drive the change of land use changes, with a direct impact on the hydrological behavior pattern of watersheds and soils. Moreover, the increased use of fertilizers and pesticides has created pollution issues.

8. Economic growth also increased demand for energy. Energy security will require increasing energy supply. The sub-region has significant advantages in hydroelectricity generation but so far only a small percentage of such large potential has been developed. Attention must be paid to potential changes in climate patterns and their impacts on hydroelectricity infrastructures. Some of these countries also have a large non-conventional hydrocarbons potential but we must anticipate that such development might result in water-related conflicts.

9. Natural capital and the ecosystemic services are another area where investments are needed to develop the water sector's economy, so they will complement rather than replace investments in infrastructure projects. Those investments must be scrutinized not only for their economic returns but also in terms of water, energy and food security, their contribution to social equity and rural development, and their resilience to climate change.

10. Governance of water resources includes cultural, legal and institutional components, as well as those that will determine their contribution to the economy and their ability to create financial resources for water management.

11. The cultures of the countries under review is tincted by their Spanish colonial past, giving them common traits, like a common language and numerous traditions. These features facilitate dialogue and mutual understanding, principally for sharing management experiences. Additionally, their pre-Columbian ancestry, which I stronger in some of the sub-region's countries than in others, has resulted in a rich history that is deeply intertwined with the sub-region's natural resources.

12. Although diverse economic policy conceptions among the sub-region's countries have had a differential impact on the ways in which they manage their water resources, in particular as regards water rights and the supply of potable water and sanitation services, they have not been an obstacle to reach agreements on other basic principles such as the need and convenience of adopting the Integrated Water Resources Management (IWRM) paradigm to address the complex characteristics of water management.

13. Although substantial progress has been made towards improved management, development and conservation of the sub-region-s water resources, a debate lingers about the relationship of water and socio-economic and socio-political components same which require further study of the role played by water and public policy. One of the most daunting challenges is to

create legal frameworks and institutional arrangements for water that will provide certainty to social agents and promote financing for the water sector.

14. The sub-region has made major strides in preparing plans, policies, programs and strategies to enforce the human right to potable water and sanitation. It still requires to make progress as regards those rights' characteristics of quality, affordability, accountability, citizen participation, acceptance, as well as the system's environmental and financial sustainability.

15. It is also relevant to introduce better regulatory practices as instruments for state intervention, seeking to enhance people's living standards and improving access of lower income segments of the population to basic services. Additionally, defining public policies to manage potable water and sanitation services requires ongoing technical follow-up including accurate, complete, comparable and verifiable indicators.

16. Developing and putting into practice effective climate information systems poses another major challenge. An effective response to these challenges should take account of the need of weather service users and developing scientific, professional, management and policy design experts' capacities.

17. Finally, we must highlight the need for a firm commitment to allocate the necessary funding to close existing gaps and meet growing infrastructure needs to provide water for various uses, maintaining existing infrastructure, collecting and treating waste wate,r and modernizing irrigation systems, among other investment. A parallel challenge is the design and collection of realistic rates, together with effective systems to subsidize the neediest.

2

Introduction

As we move towards the VII WWF, the region of the Americas, coordinated by Mexico's National Water Commission (Comisión Nacional del Agua, CONAGUA) and the National Association of Water and Sanitation Utilities (Asociación Nacional de Empresas de Agua y Saneamiento, ANEAS) identified the following thematic priorities, among the 16 options included in the global thematic process that are of priority interest to the South American subcontinent:

i. Water and sanitation services for all
ii. Water and energy
iii. Water for food security
iv. Adaptation to change and risk management
v. Ecosystem management for men and nature
vi. Governance and financing for sustainability

Sub-regional and country-specific documents were prepared for the United States of America, Mexico, Central America and the Caribbean, the nine Spanish-speaking South American countries and Brazil, all of which contribute to the America's regional document. In addition, included is a special chapter on ''Implementing human rights to water''. If future forums are to be truly global, the American region should also include Canada, the many small Caribbean countries and Guyana, Surinam and French Guyana as well.

Table 2.1 shows the relative most representative indicators for the abovementioned countries and sub-regions.

Table 2.1. American countries and sub-region's main indicators

Sub-regions/ countries	Area (km^2)	Population (mill.inhab.) (3)	GDP 2013 (billion USD) (4)	Water ava. (1) (km^3/ year) (3)	Water Supply coverage (%) (5)	Sewerage coverage (%) (5)	Hydroelectric potential (GW) (6)
United States of America	9,831,510	320	16,800	3,069.0	99.2	100	280
Mexico	1,964,380	122.3	1,261	461.9	94.9	85.3	53
Central America and the Caribbean	729,070	85.1	388	775.8	84.1	70.4	28
Spanish speaking South America	8,813,040	204.7	2,112	8,969.7	92.5	84.2	342
Brazil	8,515,770	200.4	2,246	8,647.0	97.5	81.3	185
Rest of countries(2)	10,362,910	36.5	1,835	3,272.0	99.7	99.2	389
Americas	40,216,680	969	24,642	25,195.4	95.6	88.3	1,266

(1) Total renewable water resources
(2) Canadá, Guyana and Surinam.
Prepared by the author based on:
(3) FAO (2014)
(4) BIRF (2014)
(5) WHO/UNICEF (2014)
(6) CAF (2012)

Two groups of topics can be identified among the selected themes. The first ones, encompassing themes i, ii iii and v, are regarded as "sector-topics" since they reflect the various sectors linked to various water "uses", including ecosystem as a water "user". The second group is comprised of themes iv and v and are "cross-cutting", since they cut across and impact all the other themes.

As regards sector-related themes, although each has its own characteristics, reflecting their respective uses, they also share several elements, principally connecting resources, i.e. water, and their position in the chain, i.e. watersheds.

There are also, special "linkages" among them, such as between "water and energy", "water and food", and "energy and food".

Additionally, they all evolve in a specific social, economic and environmental setting, both national and regional, determined and influenced by "global changes" such as the impacts of globalization, population and urban sprawl, in addition to climate change which deserves special mention.

Consequently, themes cannot be addressed independently but, rather, in the framework of Integrated Water Resource Management (IWRM) that takes into account both their commonalities and inter-relationships in addition to their peculiarities.

An agreement also was reached to give a similar structure to the regional document and the sub-regional and country documents. Thus, after the opening chapters (Foreword, Executive Summary and Introduction), chapter 3 summarizes the General Characteristics of the Spanish-speaking South American sub-region to provide readers with the geographic, climate, hydrological, cultural, social and economic scenario in which the 9 countries manage their water resources, while chapter 4 focuses on the Human Right to Water.

Chapters 5, 6 and 7 show, respectively, a selection of the "Challenges" the region must face concerning the various themes. The "Future We Want" or our "Vision to 2030" with a 15 year horizon and the "Strategies" to follow if this vision is to be accomplished. Figure 2.1 shows the strategies to travel from the Challenges to the Vision.

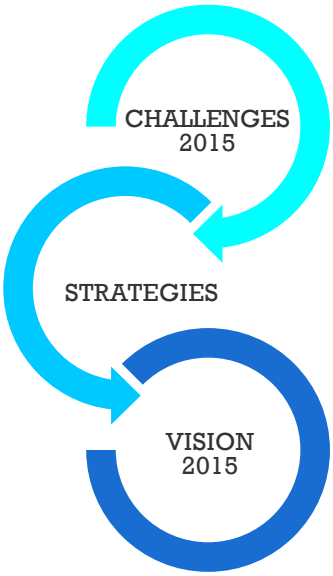

Figure 2.1. Relationship between Challenges, Strategies and Vision.

Chapter 8 shows some "Local Actions" that can be used as reference for similar activities by countries, while Chapter 9 has the "Conclusions".

Finally, the document includes a number of annexes, most importantly Annex 2, including the thematic documents prepared by the consultants and organizations listed below and which served as valuable inputs in preparing this report. It also lists a number of general information publications about the sub-region and the individual countries:

i. Maureen Ballestero, Consultant, CAF
ii. Jaime Millán, Consultant, CAF
iii. Gertjan Berkman, Inter-American Agricultural Cooperation Institution (Instituto Interamericano de Cooperación para la Agricultura, IICA)
iv. Fernando Miralles, Inter-American Development Bank (IDB)
v. Jaime Echeverría, Consultant, The Nature Conservancy and CAF
vi. Miguel Solanes, Consultant, CAF

The Latin American Development Bank (CAF) is charged with coordinating the preparatory process toward VII WWF for the 9 Spanish speaking South American countries. This document is a result of such general coordination process.

It should also be underscored that in addition to providing an input for the Regional Document, this document should provide the basis for a separate publication by CAF, subsequent to the Forum and which will summarize its conclusions with a special focus on the Latin American South continent and particularly, the group of nine countries. This summary document was prepared by an editorial team comprised of Abel Mejía, Maureen Ballestero and Víctor Arroyo, led by Víctor Pochat.

3

The Hispanic South-American Sub-region

The Spanish speaking South-American sub-region (Figure 3.1) is comprised of nine countries, namely Argentina, Bolivia, Chile, Colombia, Ecuador, Paraguay, Peru, Uruguay and Venezuela, spanning some 8.8 million km^2.

Figure 3.1. Spanish Speaking South-American Sub-region.

The sub-region shows a great diversity of climates given the wide differences in latitudes it spans. Most of the sub-region is in the tropical area. The terrestrial Equator runs across the sub-region's northern portion, and the Tropic of Capricorn runs across its middle latitude (Figure 3.2). A mild climate predominates in Uruguay, central Argentina and southern Chile, while central Chile has continental (Mediterranean) climate. Finally, Patagonia has cold weather. The clliamte is humid in the mountain area and the western portion, and dry on the east. To the south, the sub-region penetrates into the sub-Antarctic zone.

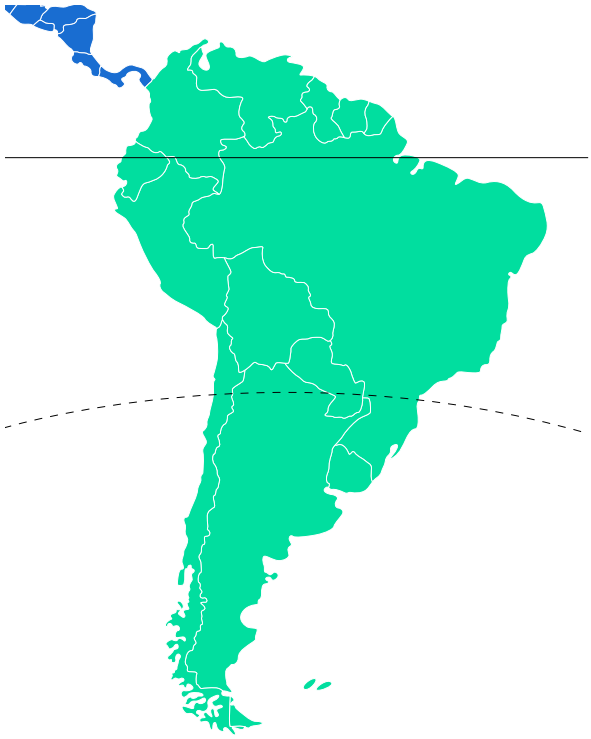

Figure 3.2. South America. Administrative and physical map

Climate is also influenced by the difference of temperature between the the Atlantic to the east and the Pacific to the west. Generally, the Atlantic coast is warmer while the Pacific coast is colder because of the Humboldt current running along it from the Antarctic continent. The temperatures in the Andes Mountain Range that covers a large part of this sub-region also vary considerably depending on altitude. Some portions of the Equatorial zone are covered by permanent ice. Along its almost nine thousand kilometers, mostly running in the north-south direction, the Andes act as a barrier to the movement of humidity from the Atlantic ocean and also stops the impact of currents from the Pacific, whose influence is limited to a narrow western coast band.

Along this band, between the Pacific Ocean and the Andes, we find some of the planet's most humid areas, including Chocó in Colombia, where rainfall exceeds 9,000 mm a year, but also some of the driest, like the Atacama desert in Chile, where it has not rained at all for more than 100 years. The average precipitation reaches 1,500 mm per year or 13,200 km^3, but rainfall follows a highly heterogeneous pattern, with a large part of this land mass getting rainfall above 3,000 mm because of its orographic characteristics. Annual evaporation fluctuates from 300-400 mm to 1,250-1,300 mm and an 850 mm total average, or a flow of 7,480 km^3 to the atmosphere, i.e. about 57 % of total annual average precipitation.

The sub-region stretches over large land pieces and major hydrographic watersheds such as those of the Magdalena, Orinoco, del Plata and Amazon rivers where average annual flows reach 8,200, 34,000, 22,000 and 209,000 m^3/s, respectively. The Magdalena watershed stretches over 24% of Colombia's land surface; the Orinoco watershed is shared by Colombia and Venezuela, while Argentina, Bolivia, Paraguay and Uruguay share with Brazil the River Plate watershed. Bolivia, Colombia, Ecuador, Peru and Venezuela share the Amazon river watershed with Brazil, Guyana and Surinam.

Several large water bodies are located in these South American countries, including Venezuela's Maracaibo Lake stretching over 13,000 km^2, and the Titicaca Lake, about 8,100 km^2 large and shared by Bolivia and Peru. Glaciers cover an estimated 25,000 km^2. This sub-region also boasts very large ground water reserves, estimated at about 3 million km^3, and to a depth of 2,000 m below sea level. Noteworthy among them is the Guarani aquifer, shared by Argentina, Brazil, Paraguay and Uruguay, stretching over approximately 1,000,000 km^2.

The average annual availability of fresh water to 2013 reached approximately 43,800m^3 per person with strong fluctuations over time and place in the nine countries reviewed here. For instance, Argentina has only 21,142m^3/person/year of water while Peru boasts 62,352 m^3/person/year (Table 4.1) (FAO, 2014).

However, this indicator at country-scale does not fully reflect the imbalances in water availability and location of demand for water related ser-

Table 3.1. Hispanic South American sub-region. Total renewable water resources (km^3) and average availability per person (m^3/person/year)

Country	Surface (000 km^2)	Population (million people)	Total renewable water resources (km^3/year)	Average availability per person (m^3/person/ year)
Argentina	2,780	41.4	876	21,141
Bolivia	1,099	10.7	574	53,791
Chile	756	17.6	923	52,389
Colombia	1,142	48.3	2,360	48,840
Ecuador	256	15.7	457	29,063
Paraguay	407	6.8	388	57,013
Peru	1,285	30.4	1,894	62,352
Uruguay	176	3.4	172	50,543
Venezuela	912	30.4	1,325	43,578
TOTAL	8,813	204.7	8,969	49,717

Source: (FAO, 2014)

vices typical of vast areas of Argentina, Bolivia, Chile, Peru and Venezuela and that is a consequence of the uneven distribution of their water resources, population and types of economic activities. Peru is a clear example because 63% of that nation's population, totaling approximately 30 million lives along the Pacific coast, which has only 1.76% of the country's available water, and therefore has only 1,764 m^3/person/year available water, i.e. barely 3% of the national average.

The region also spans a large variety of bio-geographic regions and it is noteworthy for its forests and rainforests due to its location between the tropics. The sub-region is widest near the Equator, a region of Amazon rainforests covering the territories of Bolivia, Colombia, Ecuador, Peru and Venezuela, together with Brazil and Guyana. Mangroves grow in the coastal swamps of low latitude regions. Savannahs are typical of the Colombian and Venezuelan ''llanos'' plains. And almost absolute desert conditions are typical of Atacama, on the Pacific coast, between 21 and 27 degrees south latitude.

The plant cover on the Andes cordillera varies depending on both altitude and latitude with a predominant tundra-type vegetation above 3,000 m of altitude in low latitude areas, as the South American High Plateau. The western slopes are covered by mild-climate forests and further south, on both sides of the range, thick mild and sub-Antarctic forests predominate.

As regards climate variability and change, given the extension and diversity of the sub-region physiographic characteristics and the influence of both the Pacific and Atlantic oceans, many different conditions arise, with regards to temperature and consequently evaporation, and the corresponding balances, including increase or reduction o precipitation and flow magnitudes. Many Andean glaciers are retreating as a result of rising global temperatures lower precipitation in the affected areas, on the one hand, but also because of an expanding agricultural frontier (in Central Argentina) on the other, and as a consequence of increased average precipitation.

Two atmospheric-oceanic phenomena known as El Niño and La Niña are worth noting. These appear in variable cyclical periods of 2 to 7 years and have a significant impact in the sub-region. Their greatest impact is felt on the Pacific coast and nearby areas, at the Equator but their overall effects are regional and even global because they modify climate conditions almost all around the globe.

During an El Niño weather oscillation, atmospheric pressures over the Pacific Ocean change, resulting in atmospheric and oceanic effects that reverse normal conditions. The El Niño Southern Oscillation is an interaction between the ocean and the atmosphere. The ENSO current is the oceanic component while the oceanic oscillation is the atmospheric component. Consequently, El Niño Southern Oscillation is the most appropriate denomination for this phenomenon.

El Niño events typically last between 12 and 18 months giving rise to major tropical storms resulting in landslides and flooding in several areas around the sub-region. During La Niña events climate anomalies are the opposite. The regions suffering the greatest precipitation during El Niño are typically affected by drought during La Niña and conversely. For instance, in Colombia while El Niño reduces rainfall, La Niña increases precipitation in most of the country in particular in the Caribbean and Andean regions.

Disasters caused by climate and water-related hazards are recurring more frequently and with greater severity, and jeopardizing increasoingly vulnerable communities, especially those living under marginal conditions. The greatest most recent disaster for the number of fatalities were the flash floods and landslides near Caracas (Venezuela) in December, 1999, which resulted in 30,000 fatalities as well as floods in Colombia in 2010-2011, which left 2,350,207 victims, 1,016 disappeared persons and 1,374 fatalities (ECLAC and BID, 2012). The Venezuelan catastrophe cost 4.4 billion dollars while the Colombian disaster cost the equivalent of 0.4 percent of that nation's 2010 GDP.

Environmental degradation and water pollution caused by natural disaster is compounded by municipal and industrial untreated waste water resulting from household use, inappropriate industrial and processes, inadequate use of fertilizers and pesticides for agriculture and others which altogether pose another major challenge.

These countries' culture is marked by their Spanish colonial past and the pre-Columbian legacy that to varius degrees combined with the contributions of later immigrants to the region. Also, a culture is emerging that is heavily influenced by globalization. Spain gave the

sub-region its common language, Spanish, its still predominant Catholic religion and many of its traditions. Pre-Columbian indigenous civilizations are still strongly present in Bolivia, Ecuador and Peru. Quechua, an official language of Peru and one of the 37 official languages of Bolivia, is also spoken in Ecuador, some Argentinean provinces, Chile's north and Colombia's southwest. In Paraguay, Guarani- the native language of the Guarani people – is widely used, in addition to Spanish and accepted as one of the country's official languages.

Since the mid-XIX century and during the first half of the past XX century, the region received massive European immigration, mostly to Argentina, Chile, Uruguay and Venezuela. The migrants came from Spain, Italy, Germany and Russia among other countries, but also significant migration flows came from Palestine, Armenia, Syria, Lebanon, as well as Japan, China and Korea.

A CELADE document (2014) shows urban population exceeds 81% and counting, due to magnet effect of more health and education services and jobs in cities, as well as the greater use capital-intensive technologies in agriculture, which, generally have reduced demand for rural labour. However, urbanization has not resulted in better standards of living for many of the people who moved to cities's peri-urban areas, under extremely dire housing, sanitation and environmental conditions.

Annex 1 shows some of the main social and economic indicators for the nine countries under review, and their specific characteristics but also their similarities and differences. It is worthwhile mentioning in recent years all these countries have made significant economic, political stability and reduction of poverty strides and are taking an increasingly important role in the continental and global scenes.

The largest economy, in GDP terms, is Argentina, followed by Venezuela and Colombia. As mentioned earlier, these first two countries have experienced growth issues in recent years. The most advanced countries measured for their per capita GDP are Uruguay (US$ 16,351), followed by Chile (US$ 15,732) and Argentina (US$ 14,715) while the least developed are Bolivia (US$ 2,868) and Paraguay (US$ 4,403) (IBRD, 2014).

Since 2004, the region has gone through a positive sequence of changes, desipite the global and financial crisis of 2008. It has shown itself to be highly resilient to such turmoil and experienced sustained high growth. The sub-region's countries grew at an average 4% rate since 2004, compared to 2.6% from 1995-2004 and 2% between 1980 and 2002.

However, after a decade of economic bonanza, since 2013, growth has slowed down in most of these countries. The most recent International Monetary Fund forecast shows growth in all sub regional countries has slowed down faster than expected, with projections of only 1.3% for 2014, the lowest in the most recent 12 year-period (Ballestero V., 2014).

Present low growth results from slower external demand, weaker prices for major commodities, higher financial volatility worldwide and sliding internal demand. This trend is not too strong in the nine countries under review. However, a certain economic slowdown is obvious and partially the consequence of slower growth in two of its largest economies, Argentina and Venezuela where negative growth has been forecast for 2014 and 2015.

Some of these countries grew in 2014 above 4%, including Bolivia (5.2%), Colombia (4.8%), Ecuador and Paraguay (4%), and Peru, that grew 3.6% in 2014 but which before had expanded above 5%. This landscape also reflects changes in development trends in all these countries because, excepting Colombia, the other four have typically ranked among the most backward South American economies (Ballestero V., 2014).

From the standpoint of the Human Development Index (HDI), the best ranking countries are Chile (0.822), ranked 41 worldwide and the best ranked Latin American and Caribbean country followed by Argentina (0.808) and Uruguay (0.790). Bolivia shows the lowest HDI (0.667), and ranks 113 among 187 countries. Paraguay fills position 111 with a 0.676 HDI (Ballestero V., 2014).

The Average Poverty Index in 2012 reached 34.6%. Between three and four out of every ten people in the region do not earn enough to cover their basic needs. Of all the countries under review, only Uruguay (13.7%) and Chile (14.4%) show poverty rates below 20%. Peru and Ecuador's rates are 27.8 % and 28.6 %, respectively, while Venezuela's is 31.6 % and in Bolivia, 45 % of the people live below the poverty line.

Is worthwhile underscoring these Hispanic South American countries have shown in recent years a greater commitment to address the persisting poverty and inequality issues and have substantially reduce poverty. An emerging "middle class" poses fresh challenges to the region's policy makers because they demand efficient and quality public services. This segment of the population will rise from 55% of the total number of people in 2010 to 78% in 2015 and therefore can become a crucial driver of deeper economic development.

Despite its economic progress and initiatives to defeat poverty and inequality, Latin America and the Caribbean (LAC) are still among the most inequitable regions in the world, with a 0.43 Gini Coefficient, second only to of Sub-Saharan Africa. However, it is also acknowledged LAC is the only region that has reduced inequality in most its countries. Out of the nine countries under review, Colombia, Paraguay and Chile show the lowest inequality gap. Moreover, these indicators have to be examined carefully and require taking account of other analysis variables. Outstanding among these cases is Venezuela's with a 39.0 Gini index, significantly lower than Chile's whose index exceeds 50.0. However, in relative terms there is twice as much poverty in Venezuela than in Chile (Ballestero V., 2014).

At present, generally speaking there are two different approaches to economic policies in the sub-region. On the one hand, Colombia, Chile and Peru, have open economies where market forces allocate resources and drive development. On the other, Argentina, Bolivia, Ecuador, Paraguay, Uruguay and Venezuela enforce social market economy models, where the State plays a leading economic role.

The economic models of these countries permeate the ways they manage water resources. For instance, in Chile water rights are tradable and potable water and sanitation utilities' services are private, under State regulation. Colombia and Peru also encourage active involvement of the private sector, as opposed, for instance, to Argentina and Bolivia, that recently cancelled utility franchises in major cities, including Buenos Aires and Cochabamba, respectively, while in Uruguay the Constitution mandates these services can be provided exclusively and directly by State-owned corporations.

4

Human right to water and sanitation

A discussion about "Human right to water and sanitation" is included under the thematic priority "Water and sanitation services for all", which in turn is one of the priorities established for the Americas by the VII WWF. During the process leading to the VI WWF (Marseille 2012) this issue was also addressed by the Americas region at a number of embracing and participatory sub-regional forums, national workshops and electronic debate sites that involve a wide range of institutional, academic and civil society players (Mora P. and Dubois C., 2014).

The process addressed the human right to water and sanitation in the framework of the United Nations resolution and its implications for national law. It also included an analysis of the way Latin American countries incorporated such recognition in their national law and policy frameworks. A number of recommendations were made for the following years. The document was also identified to become the baseline for the present process toward VII WWF (FANCA/FANMEX, 2011). A comparative analysis was performed between the present and 2012 situations to assess the progress made in formally incorporating recognition of such right in the regional countries' juridical and policy frameworks, simultaneously with an evaluation of the main challenges still faced to fully realize this right's various components.

As a starting premise, it is recognized that the formal recognition of the human right to water and sanitation in the national juridical framework is not enough. Countries must create the legal, policy, monitoring and evaluation frameworks and other instruments for their its acknowledgement.

Great progress has been made in the sub-region as regards coverage of water services. Official coverage rates exceed 95% in Uruguay, Chile and Argentina while other countries report coverage rates above 90% (Paraguay, Venezuela, Colombia).

However, this does not necessarily mean other concomitant elements of this human right are present. As has been recognized by the United Nations Human Rights Council "official figures do not fully reflect the dimensions of potable water's health, affordability, and safe management of excreta and waste water; consequently, the number of people who do not have access to healthy and affordable potable water and to safe and affordable sanitation is underestimated" (Mora P. and Dubois C., 2014).

Stricter compliance with all the components of such human right is required, particularly concerning supplier regulation, access to information, citizen involvement in direct resource management and decision making, non-discrimination, affordability and others. Therefore, assessments should not be limited to the degree of potable water coverage in these countries, but also take account of other considerations, described below, as indicators of compliance with this human rights.

Generally speaking the region has made significant strides in meeting the two mandates of the international human rights system as regards the human right to proper water and sanitation. In the first place, by preparing plans, policies, programs and strategies to enforce the various components of the human right to water and sanitation. The objectives of such processes can only be assessed over time, because generally, they are planned for a long term horizon that has not yet been reached. It is important for the region to prepare indicators and other compliance verification and accountability mechanisms, so national states, when complying with their duty to ensure the full realization of this human right, can monitor and evaluate progress and accomplishments made as well as the obstacles and deficiencies of their policies, strategies and implementation plans.

Progress is evident,it includes the formal recognition of the human right to water and sanitation in countrie´s national legal frameworks. The region must design processes to build consensus that will codify constitutional and legal precepts acknowledging the human right to water and sanitation in their domestic legal system. Secondly, the region must be able to determine the legal implications, obligations and responsibilities of government agencies, operators and communities in respect of this right. In the third place, the region must derive from the above the judicial and quasi judicial mechanisms and resources that will allow relevant entities to act in case of eventual violations to this human right (Mora P. and Dubois C., 2014).

5
Challenges

WATER AND SANITATION SERVICES FOR ALL

Water safety to ensure water supply.
Demand for water resulting from rapid urbanization and population concentration exceeds the available water in basins and aquifers and thus requires, in several instances, deriving water off one watershed to another. Reduced river flows and aquifer recharge is a matter of concern, in particular when taking into account water deprivation in various areas during dry years. The low priority government agencies attach to water treatment causes large amounts of liquid waste to be poured intowater bodies and the ground, creating serious environmental damage and high social costs. Growing demand from large cities oftentimes colllides with the need for water in rural areas in terms both volume and quality.

Insufficient access to potable water and sanitation services.
Despite large investments, unsatisfied needs are still many. Out of 210 million people living in the sub-region, over 14.4 million still lack potable water. As regards sanitation, the landscape is even more complex since 32.4 million people lack appropriate sanitation and less than 30% of waste water is treated, posing one of the most daunting challenges ahead. To these global figures we must add those reflecting major intra-regional disparities, such as the gaps between urban and rural areas, and rich and poor regions in one same country, and also those that reflect the varying standards of quality, sustainability and efficiency in service supply (Ballestero, 2014).

Investments, rates and subsidies.
One reason behind the inadequate water and sanitation services in many urban areas lies in the lack of appropriate programs to improve living conditions among lower income people when investing in water and sanitation services. Rates and connection costs are, oftentimes, formidable access barriers for poor people. A commitment is needed to allocate the necessary financial resources to close existing gaps and meet the growing demand for infrastructure to supply water and collect and treat waste that also takes into account "informal" settlements and thus provides quality services for all. Simultaneously, designing and enforcing realistic rates, simultaneously with subsidy schemes for the neediest, remain a challenge.

Service information.
Existing estimates and measurements of water and sanitation services focus almost exclusively on infrastructure. Other than the data collected by the Joint Monitoring Program (JMP) at regional level, census figures and household surveys at national level, there is only scattered data, typically collected by regulatory bodies, about the actual conditions in which such services are rendered and, mostly focusing on their quality. Generally, data are incomplete and inaccurate and exclude services provided by small-scale operators, cooperatives and associations, and neighbors' organizations. Therefore, the need to put in place a sector monitoring system that will be both wider and more accurate becomes obvious, and that such system should take account of the human right to water and its various availability, quality, access and affordability conditioning factors (Ballestero V., 2014).

MESSAGES FOR KOREA 2015

1.
Some better than others. Of the 210 million people living in the sub-region, 106 million (50%) live in cities of over 300,000 inhabitants, where coverage rates are high. Potable water and sanitation services are provided by State-owned or private corporations built around corporate structures and showing reasonable technical and management capacities. The largest service supplies issues are borne by 103 million (50%) of the people living in intermediate and small cities (64 million) and in both dense and dispersed rural areas (39 million) (Ballestero, 2014).

2.
Extreme operator fragmentation. Intermediate and small cities generally get low quality services that are typically managed by their local governments. The core issue for this people is low economic scale among suppliers who could otherwise provide efficient services. Nevertheless, this has proved to be financially non-sustainable. In rural areas, these services are managed by community boards, with low sustainability and limited support from national entitites (Ballestero, 2014).

3.
Lack of funding and appropriate projects. Funding is required to meet growing infrastructure needs while resources must be put to better use by introducing appropriate projects and technologies (Ballestero, 2014).

4.
Only some countries in the sub-region have stable regulatory frameworks and independent agencies. Although regulation, separate from service supply has been a significant step forward for most countries, for the benefit of users and sector operation, only in few countries is regulation strong, independent and clear, from the operational standpoint (Ballestero, 2014).

5.
Scant sector data in most countries. Only Chile, Colombia and Peru, who enjoy effective regulatory frameworks and Uruguay, where services are provided by a State-owned corporation, provide reliable and useful sector information (Ballestero, 2014).

WATER AND ENERGY

Demand for energy.
Economic growth in these countries has increased demand for energy. Between 2001 and 2010, electricity demand throughout the sub-region rose by 40% (IBRD, 2014). Since energy requirements are estimated to double or triple by 2050 and if oil prices continue to rise, ensuring sufficient water and energy supply should be crucial to support economic growth and reduce poverty. Against this backdrop, however, another challenge rises, that of ensuring access to electricity to all the people and thus accomplish more inclusive development.

Hydroelectricity.
Hydroelectricity allows using the sub-region's natural advantages. Hydroelectricity's share in total energy output throughout the sub-region and in the nine countries under review in particular is quite significant although only a small percentage of its huge potential is presently used. About 17% of the total 342 Gw economic hydroelectricity potential has been put to good use in these countries. However, reliance on these types of energy can lead to serious issues if climate patterns change or during dry seasons (GWP, 2000). In addition, although large dams play a major role in the sub-region's economic growth, their environmental and social impact must also be recognized.

Alternative sources.
Although hydroelectricity is an economic and environmentally efficient source of energy, a strong trend has emerged in various countries to develop complementary energy sources, in particular biofuels and wind energy, not only to increase reliability of supply but also to reduce the use of

non-renewable energies. In some regions, both wind and biomass energy complement hydroelectricity seasonally. The dry and windy seasons are usually harvest time, as for instance happens with sugar cane. In those regions, synergies must be identified between hydroelectricity, wind and biomass energy generation (PRA, 2012).

Water-energy connection.
The complex relationship between energy and water has drawn growing attention in recent years. Significant linkages exist between water and energy and, in the long term, the sustainable use of such resources will require comprehensive management schemes. The energy industry has a major impact on the availability and quality of water resources in the sub-region's countries. All kinds of energy generation depend on the availability of water resources. The challenges in this field range from gathering more data and doing research on the expected impacts on water resources, to accelerating improvements so water and energy can be used more efficiently to meet growing demand, reduce or cancel the need for capital-intensive infrastructure projects, and provide environmental benefits (PRA, 2012).

MESSAGES FOR KOREA 2015

1.
Countries will continue to rely on hydroelectricity. Non-conventional, non-continuous sources of energy, such as wind and solar energy, will require hydroelectricity generation on a complementary basis; however, limited water in impoundments will require technical management during the dry season.

2.
The electricity sector must internalize hydrological uncertainty. In a combined hydro-thermal system, operating at low cost depends on the reliability of supply, a condition that is compounded by climate change which affects the availability of water flows from hydroelectricity generation.

3.
Developing the existing hydroelectricity potential requires addressing environmental and social conflicts. Developing the sub-region's hydroelectricity potential requires a social negotiation of its environmental and social impacts, both at the use sites as well as along transmission lines (Millán, 2014).

4.
Hydroelectricity development relies on multipurpose impoundments. Hydroelectricity generation does not prevent using water for other purposes, neither in time or space, nor is it an obstacle for ensurng flood control, irrigation and environmental demands, which must be internalized in the impoundments' operation rules.

5.
Anticipating water conflicts to develop non-conventional hydrocarbons. Argentina, Chile and Colombia have major reserves of non-conventional hydrocarbons. Their impacts on water resources may prevent developing this potential. Given these resources' critical importance, in particular natural gas, an informed debate should start around this issue (Millán, 2014).

WATER FOR FOOD SECURITY

Globalization.
Trade agreements, market forces and international subsidies to farm products that create barriers to international trade (García et.al, 2003), as well as technological developments and applying the "virtual water" principle. In addition, irrigated agriculture is influenced by government and industry's investments and subsidies.

Irrigation.
About 7.4 million hectares are irrigated throughout the sub-region and account for 11% of the total crop area (FAO, 2014). The economic importance of irrigated agriculture is demonstrated by its growth at an average rate of 250,000 hectares per year over the last five decades throughout Latin America. Three times more food than is actually consumed by the region's people is grown on its farm land. The land is also used for growing inputs for biofuels. Thanks to significant investments in this field, irrigation has played a major role in the region's societies and economies (PRA, 2012).

Subsistence agriculture.
Small scale subsistence agriculture is still important in many areas, as it provides food and economic security. In Andean countries, medium and small scale irrigation has been encouraged together with rural development programs (Mejía et al., 2006).

Irrigation efficiencies.
Irrigated agriculture operates under low water conduction conditions. Efficiency is generally low. Factors influencing such pattern include infrastructure works that are used without building complementary facilities, insufficient maintenance, poor peasant farmer training and widespread subsidies included in water rights (GWP, 2000). New technologies and devolution of irrigation district management to growers' associations have resulted in significant improvements in food production (PRA, 2012). Modernizing irrigation systems and, consequently, agriculture throughout the region, requires however appropriate financial sustainability to maintain and properly manage existing infrastructures.

Environmental impact.
Driven by rising world demand for and prices of agricultural products, crops have intensified and the agricultural frontier has moved forward, putting additional pressure on water resources and land use, and also with a direct impact on the ways water behaves in many watersheds and on soils. Additioanlly, the greater use of fertilizers and pesticides in some countries has exacerbated pollution issues (CRA, 2009).

Climate change.
Agriculture is expected to suffer "the worst consequences" of climate change. In some regions, changing rainfall patterns and

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1.
Water productivity is key for agriculture. Improving agricultural productivity requires interventions in all links of the "use chain", from the way plants use water to international trade (IICA, 2014).

2.
Plant efficiencies in water utilization. Water productivity is ultimately, determined by the efficiency with which plants use this resource in absorption, metabolization and evapo-transpiration physiological plant processes. Significant progress has been made in improving plant's efficiency in water use (IICA, 2014).

3.
Productivity increases thanks to various technologies and techniques. Techniques and technologies are available to improve productivity of all resources available to producers as well as for soil, input and water (IICA, 2014).

4.
Water conduction and use. Appropriate building and maintenance of water conduction infrastructure together with peasant farmer training for using those facilities properly will contribute to increase irrigation efficiencies (IICA, 2014).

increasing water deprivation will reduce agricultural yields by one fourth or more by 2050. Assuring sustainable water use appears as the most daunting challenge faced by agriculture throughout the region (PRA, 2012).

ADAPTATION TO CLIMATE CHANGE AND RISK MANAGEMENT

Water is the main channel through which societies and natural systems will feel the impacts of climate change.
These impacts will result in more acute space and time fluctuations of rainfall and runoff patterns, which in turn, will translate into excess or lack of water. Climate change impacts will also result in more intense and frequent extreme hydro-meteorological events. Another cause of concern is the diminishing flow of water in rivers and aquifer recharge. For their part, increasing temperatures are already dramatically affecting glaciers and impacting their role as water sources and runoff regulators in fragile ecosystems (CRA, 2009).

Economic and social impacts.
Because their economies depend to a large extent on natural resources, the sub-region is regarded as particularly vulnerable to climate change (PRA, 2012). Estimations point to changes in impoundments that will in turn reduce hydroelectricity generation and water available for irrigation, domestic, industrial and other uses for water, and affect water quality. A source of additional concern is the rise of sea levels due to climate change and the subsequent intrusion of brackish water in coastal aquifers.

Catastrophes arising from extreme natural phenomena have a lethal and destructive impact throughout the sub-region.
This sub-region is particularly vulnerable to disasters caused by extreme natural phenomena, the impacts of which are exacerbated by high population concentration in cities. Therefore, special attention should be paid to floods and droughts' volume, frequency and duration, as well as to desertification. Floods and landslides can hit several metropolitan and peri-urban areas throughout the region, while persistent drought has affected arid and semi-arid zones (Mejía et al., 2006).

MESSAGES FOR KOREA 2015

1.
Effective development and implementation of climate information systems is a major challenge for the region's water sector. An effective response to this challenge should take account of the needs of weather service users and building capacities in the present and coming generations of scientists, professionals, managers and policy makers (Miralles, 2014).

2.
Developing and fostering communication networks and channels is key to facilitate transfer of knowledge and active citizen involvement. An appropriate means to accomplish these goals is by promoting effective associations endowed with the human, knowledge and financial resources they require at local and world scales (Miralles, 2014).

3.
Improved research, education and local development through joint development of applications, tools and decision making processes. Hardware (infrastructure) as well as software (policies and institutional support) together with an environment where local players will partner to imagine, jointly produce and implement climate services must be developed and implemented so they can significantly contribute to development in each stage (Miralles, 2014).

4.
Raising funds from new sources and using existing funds to expand the resource base for developing and putting into practice appropriate weather services throughout the sub-region (Miralles, 2014).

ECOSYSTEM MANAGEMENT FOR MAN AND NATURE

Importance of ecosystems.
Although the importance of ecosystems is occasionally recognized by managers and planners, actually little is known about the relationship between the use of water resources and the ecosystems they feed upon. Water resource conservation for the future does not appear as a fundamental consideration in planning and executing water use projects. Given the economic and financial insecurity of low development economies, environmental concerns and priorities are often left behind, to prioritize advances in economic development (García et al., 2003).

Impact on ecosystems.
World market rules and requirements may result in impacts on the sub-region's natural reserves. Growing urban sprawl, increasing demand for agricultural and forestry products may result in deforestation of natural forests, introduction of exotic species and impacts on soils, water runoffs and biodiversity (CRA, 2009).Inappropriate water use and poor land management are already altering hydrological seasons and consequently, water availability, quality and seasonality in various watersheds. Infrastructure building to increasingly regulate flows is the consequence of diverse visions of the future, particularly in areas where competition for water is intense, or where local populations resist such projects, as well as by environmental concerns (PRA, 2012).

Mining and industrial impact.
Growing world demand for metals has created increased concern because of the water requirements for minerals' development and processing. Some projects may impact highly sensitive sources, such as glaciers and as a consequence of manufacturing processes, pollute them. Water needed for mineral development and processing must be coordinate with other uses for water, in particular for irrigation. In addition, if no appropriate controls are in place, industry might not meet appropriate environmental standards (CRA, 2009).

Ecological flows.
Although in recent years water has been given notionally a new use in ecosystem and biodiversity protection, some countries still authorize water use based on total equivalents available in certain water courses without due consideration for preservation. A source of conflict is therefore the notion of ecological flows or the water regime provided by rivers, wetlands or certain coastal areas that allow preserving other ecosystems.

Ecosystemic services.
Ecosystem management based on associated environmental services provide the foundation for human security and are increasingly regarded as an intrinsic component of Integrated Water Resource Management (IWRM), where nature plays a major role in storing, mobilizing and buffering water flows. Acknowledging the value of ecosystems has become a key factor in ensuring sustainable development of water resources. Natural capital and the ecosystemic services it provides open an area for investing in the water sector's economic development and operate as a complement to investments in infrastructure, rather than as their replacement. Returns for such investments should be regarded both in terms of economic returns but also as water, energy and food security returns, together with social equity, rural development and climate change resilience returns (PRA, 2012).

MESSAGES FOR KOREA 2015

1.
Limited progress towards accomplishing the goals set for 2012. Little attention is given to ecosystems at national level. So far, only specific, isolated and poorly organized efforts are found throughout the region.

2.
The role of green infrastructure must be highlighted and analyzed in all development projects. Ecosystems must be identified for their water-related contribution and investment projects including "green" options must be encouraged rather than large "grey" infrastructure projects (Echeverría, 2014).

3.
Water Funds and other initiatives providing encouraging experiences, and their scope could be expanded. Partnerships among non-governmental local and foreign organizations, industry and multilateral agencies should be encouraged.

4.
Fair charges for water should include ecosystem protection in all countries. Different types of water users should cover the total cost of infrastructure building and management including ecosystems management.

5.
IWRM and the Aichi Goals for ecosystems are coherent and mutually reinforcing. While IWRM provides a framework where ecosystems are given a significant value, the Aichi Goals allow to follow up progress in ecosystems management (Echeverría, 2014).

GOVERNANCE AND FINANCING FOR SUSTAINABILITY

Significant progress has been made in improving management and conservation of the sub-region's valuables water resources.
The relationship between water and socio-economic and socio-political elements is still debated. More studies are required on the role of water in public policy, the types of water organizations needed, the role of hydraulic infrastructure for irrigation and hydroelectricity, the role of watershed-based organization, including cross border agencies, the practical utilization of integrating water resource management, effective pollution control measures from a cost approach, options to close water supply and sanitation gaps, more effective government and private involvement and enhanced risk management (Mejía et.al., 2006).

Legal frameworks and institutional arrangements for water are still one of the sector's most daunting challenges.
They should provide certainty to social agents and encourage financing for the water sector. The criteria for setting up those arrangements should aime at building an institutional structure and regulatory and operating frameworks that create trust among institutions (law, organizations, authorities) and that will lead to consensus and transparent decisions. The institutional setting must be strengthened (in its governing, operating and regulatory roles) with active and organized participation of sector bodies, while always establishing relationships with other sectors to facilitate planning of resource supply and demand.

People's involvement.
Since the end of the 1990s and as a consequence of the sub-region's return to democracy, civil society has been increasingly involved in national concerns, with significant impacts on water resource management. For instance, civil society organizations provided momentum for adopting six principles for the IV Water World Forum (Mexico, 2006), namely water as a fundamental human right; water as a priority in public policies; mandatory involvement of civil society in decision making; equity in water use and distribution; ensuring water supply for rural communities and conservation of water and forests, wetlands and other types of natural vegetation (Mejía *et al.*, 2006).

Water conflicts.
Water deprivation in some specific areas around the sub-region is generally the source of conflict among water sectors and users, particularly in the dryer watersheds or those impacted by water pollution and highly geographically-concentrated economic development. Conflicts appear relating to water allocation, concessions to given sectors, planning and building of large scale hydraulic works, pollution control issues, flood protection and estimates of ecological flows. Generally, growing demand for water particularly in cities and mining areas has led to conflicts with agriculture, involving in some cases first nations, since water for other uses comes from that sector.

Cross -border water bodies.
Bilateral and multilateral agreements to manage the main cross-border water bodies, cooperation among them, and the strength of their institutional settings vary significantly. Existing cross-border

agreements show that, generally, governments are reluctant to delegate their sovereign powers upon an international body that is not fully subordinated to them. Cross-border entities are typically only empowered to decide on strictly technical issues. The use and development of cross-border water resources require constant and planned financing to ensure the project's continuity. Only together with real and effective coordination among national policies of the involved countries, will it be possible for bilateral and multilateral policies for cross-border systems to translate into broader region-wide cooperation.

International agreements for investment protection.
International agreements for investment protection have a significant influence on local water resource management, utility regulation and human rights, all of which are connected with water and water services' governance. With such treaties, sitting above national provisions, national and local government roles and functions have been significantly restricted, thus weakening the countries' ability to design and put in place public policies in strategic economic sectors, including public services and water resources. Simultaneously, stresses have emerged between foreign investment protection systems and economic, social and cultural rights, many of which are regarded as human rights in international law. This landscape requires greater analysis, not only from the legal standpoint, but also from the political, social and economic viewpoint if such conflicts are to be solved (Solanes, 2014).

MESSAGED FOR KOREA 2015

1.
Water governance, its foundation and relationship to economy and finance. Governance of water resources includes certain considerations about their contribution to the overall economy and their ability to attract financial resources for resource management, whether indirectly (through fiscal budgets) or through earmarked payments to the resource management entity.

2.
Profitable public and private projects to create resources. Generally, unless there are any perverse incentives, the private sector will conduct careful assessments. However, in public projects, it is a well known fact *ex post* assessments oftentimes do not reflect *ex – ante* projections.

3.
Robust policy, plan and project evaluation systems are needed that are bindependent from sector users and institutions. Partial political clientelism may alter objective and holistic cost-benefit balances. This same reasoning applies to bodies charged with water management, allocation and control.

4.
Potable water and sanitation utilities' regulation. The requirement for water utilities' efficiency is a principle enshrined in the world's main legal systems, to the extent it should be regarded as a general principle of utility economic regulation. However, translating this juridical principle into effective and sustainable public policy remains a major challenge.

6
The future

WATER AND SANITATION SERVICES FOR ALL

People all the region are supplied ininterupted international standard health-quality potable water and sanitation services that is affordable to low income people.

WATER AND ENERGY

The region's countries develop their hydraulic, thermal and non-conventional energy sources with due consideration for affected communities and the environment, and use water efficiently for energy generation and the energy they need to deliver water services.

WATER FOR FOOD SECURITY

The region's countries have eradicated hunger among their people and effectively contributed to the world's food security by developing an economically viable and competitive agriculture that conserves soils, water and plant and animal genetic resources.

ADAPTATION TO CLIMATE CHANGE AND RISK MANAGEMENT

The region's countries have developed and put in place robust weather services and integrated their products into decision making by all socio-economic sectors through effective dialog between suppliers and users.

ECOSYSTEMS' MANAGEMENT FOR MEN AND NATURE

The region's countries recognize the fundamental role of ecosystems in ensuring water security and the supply of essential environmental services for sustaining life.

GOVERNANCE AND SUSTAINABILITY FINANCING

The region's countries have built an institutional setting for water management that ensures its sustainable development and protection through integrated management of water resources that also takes account of water's contribution to the productive economy and environmental stewardship.

7

Strategies

WATER AND SANITATION SERVICES FOR ALL

The largest concentration of peoples are found in large cities, with over 500,000 inhabitants but most issues relating to service supply arise in intermediate and small cities and in rural areas, that typically lag behind in terms of coverage, quality and continuity, particularly in sanitation. Public policies should take account of these areas independently to make progress and have greater impacts, use resources more efficiently and accomplish more equitable outcomes (Ballestero, 2014).

A permanent flow of funding is required and, to accomplish this goal, greater innovation and more efficiency per dollar invested in water projects is required. CAF estimates (Mejía, 2012), show the investments needed to reach full-scale potable water and sanitation coverage throughout Latin America in 2030 are in the order of 0.3% of annual GDP during a period of 20 years (2010-2030), an amount the region's countries can very well attain.

It is paramount to recognize the relevance of government regulation to improve the quality of living of the people and access of lower income populations to basic services. Moreover, the efficiency of service operators must be critically improved (Ballestero, 2014).

The regulatory framework must promote efficiency and act independently to reduce political influence in sector decisions (Ballestero, 2014). In some countries, including Chile, Colombia and Peru, good regulatory frameworks have been introduced and may be used for benchmarking the frameworks that best fit the water and sanitation sector in a given country.

Decision making and oversight of service supply require support from adequate information systems. Defining public management systems for potable water and sanitation systems requires ongoing technical and regulatory monitoring. For this reason, it is crucial to identify accurate, comprehensive, comparable and verifiable indicators that will allow adopting the most appropriate strategies in each scenario[1] (Ballestero, 2014).

WATER AND ENERGY

Any strategy should rest on dialog between industry, government, users and communities, so as to lay down the procedures that, within reasonable delays and without detracting from quality analysis, will allow reaching an executable work program. This in turn implies:

Identifying situations of conflict between future development of energy sources through joined work with energy, environmental and water resource authorities and carry out the necessary environmental studies to identify the location of generation plants (Millán, 2014).

Anticipate, through contact with affected communities, the possible environmental impacts of generation and transmission projects. This task can be carried out by either or both industry and environmental and energy authorities (Millán, 2014).

Updating existing inventories of hydroelectric potential to match with each country's environmental and social regulations, same which must evolve as result of dialogue with authorities.

Harmonize energy and water resource regulation for multipurpose projects.

1. Several systems have been used for many years already in Latin America. The most advanced and well-known is Brazil's National Sanitation Information System. Also widely used is the International Benchmarking System, sponsored by the World Bank, to compare operator's level indicators. More recently, the AquaRating System has been introduced, sponsored by the InterAmerican Development Bank, which closely follows the International Water Association System and the Rural Water and Sanitation System sponsored by the World Bank in Central America. Each country must conduct a detailed study of these systems to determine which could be better adapted to specific country conditions and propose the corresponding implementation and development plan.

Strengthen indicative long term planning, including regional participation and potential conflict identification.

Move towards a rational debate on the costs and benefits involved in developing non-conventional hydrocarbons throughout the region (Millán, 2014). Seek support from multilateral banks to engage in transparent debates on the potential effects of hydrolic fracturing (*fracking*) and the ways to mitigate them. Disseminate the best practices in this respect and identify ways to transform the institutional setting to permit their enforcement.

WATER FOR FOOD SECURITY

To ensure the sustainable use of water and food production, and thus ensure the region's food security, the following is:

Reduce losses along the production and demand chain, including reduced global food waste and adoption of healthy diets that consume and waste less water (IICA, 2014).

Ensure the safe and efficient use of agrochemicals and another land plot external inputs and eliminate use of toxic chemicals, as set forth in international conventions (IICA, 2014).

Value economic diversity and recognize its roles in ensuring the stability, resilience and nutritional quality of farm production in addition to its importance in providing environmental services (IICA, 2014).

Apply research and development of technologies conducive to sustainable agriculture, foster dissemination of sustainable, well adapted and affordable technical and management innovation in particular for family, peasant farmer and indigenous agriculture (IICA, 2014).

ADAPTATION TO CHANGE AND RISK MANAGEMENT

To adapt water research management to the foreseeable impacts of climate change, the following is needed:

Encourage legal and institutional strengthening in water and climate change issues, in line with the United Nations Framework Convention on Climate Change (UNFCCC).

Include in national energy systems the technologies needed for climate change and water resource monitoring.

Prepare technical assistance projects and identify investment opportunities to make room for climate change-adapted IWRM practices.

Support the design and implementation of local adaptation initiatives together with providing institutional support that will make such initiatives sustainable in the long term.

Integrate and facilitate knowledge, experience and activity sharing throughout the region to provide countries with better services, facilitate involvement of all water sector stakeholders, include climate change adaptation considerations in their projects and expand the number of public private and inter-institutional alliances.

ECOSYSTEMS MANAGEMENT FOR MEN AND NATURE

An overall strategy for managing water ecosystems should take account of the following:

Recognize the little value given to the role of natural resources in development policies, programs, and projects, and carry out studies to assess the value of green capital in the region's countries and the environmental impacts of various activities through a system of ''green national accounting'' and modify decision making processes so they will take account of environmental externalities.

View ''green infrastructure'' as a component of water infrastructure investment projects, and amend permitting regulations so they will take account of options where ecosystems or their remediation can provide the desired environmental services.

Create the legal protection framework and financial resources for remediating ecosystems as a national priority that will be funded in part from water rates. This will require studies to quantify the ecosystems' benefits in terms to their ability to provide services to a range of water-using economic sectors. Also required will be changes in rate-setting services that will include the cost of protecting hydrographic watersheds as a legitimate cost. Other measures include building consensus among players (users, authorities,

industry and government) and expanding the scope of water funds, through their replication and dissemination of lessons learned.

Take account of ecosystem management as a fundamental pillar of IWRM, harmonizing and creating synergic impacts with water-using sectors, jointly build capacities and initiatives and conducting research in areas of shared concern.

Sensitize the population on the importance of protecting ecosystems and the relationship between water and biodiversity.

GOVERNANCE AND FINANCING FOR SUSTAINABILITY

The need to internalize the principle of IWRM in regulatory frameworks, when recognizing the need to encourage coordinated use of water and leave behind sector-specific management for specific users, and also adopt the ''watershed'' as the planning unit for water management.

Strengthen water management to create an institutional setting able of addressing the challenges of managing a complex resource.

Foster stability of water rights and, to the extent needs and economiesevolve while natural supplies remain stable, encourage flexible reallocation through private, public or combined schemes by introducing the required regulations that prevent transferring negative externalities to communities, third parties and the environment.

Promote the ''water pays for water'' principle, meaning users and polluters must pay the cost of managing the water resource and providing compensation for the damage they may cause, respectively.

Encourage reforms in Bilateral Investment Treaties to include operative policing powers so regulations aiming at the efficient use of supply of water will be regarded as law and consequently subject to economic and financial institution and that will also allow to design and enforce public policies to promote and protect the common good in the water sector (Solanes, 2014).

8

Local actions

ENVIRONMENTAL PROTECTION AND SUSTAINABLE DEVELOPMENT OF THE GUARANI AQUIFER SYSTEM (SAG). A PROJECT[2]

The Guarani Aquifer System (SAG) is one of the world's largest ground water reservoirs. It stores approximately 37,000 km^3 of water and gets a natural recharge of 166 km^3 a year. The 1,190,000 km^2 area straddlies Argentina, Brazil, Paraguay and Uruguay.

Approximately 24 million people live in the aquifer's area and a total 70 million people live in areas that have a direct or indirect influence on the aquifer. The main use of the aquifer is providing fresh water (70%). Other uses include by industry (20%), agriculture (5%), tourism and hydroelectricity generation. Total extraction is 40 m^3/s, or approximately 25% of the minimum recharge.

As in the rest of South America, in SAG also the use of water has increased gradually, through uncontrolled well drilling, resulting in pollution issues in the recharge and extractive areas. The project for the Environmental Protection and Sustainable Development of the Guarani Aquifer System was designed by the governments of the 4 involved countries. The purpose of this project is to support these countries in jointly preparing and implementing a coordinated institutional framework that will allow managing and preserving SAG for present and future generation.

The project was co-financed by the Global Environmental Facility (GEF), with the World Bank acting as implementing agency and the Organization of American States (OAS) as executing agency. The national counterparts received services, infrastructure and staffing in all four countries.

2. Source: OAS, in Echeverría (2014)

Figure 8.1. Guarani aquifer.

The project originated in research programs by several universities of the involved countries and after a period of negotiations, GEF approved the project in November 2001 and started executing it in 2003. Financing for the project totals 26.7 million dollars over four years. GEF contributed 13.4 million dollars, with 12.1 million from national counterparts and 1.2 million provided by other agencies.

The projects was organized in inter-related components, for a better understanding of the morphology and the behavior of the Guarani aquifer, its use and conservation as well as its relationship with communities and institutions:

1 Expansion of consolidation of scientific and technical understanding of SAG.
2 Development and implementation of a management framework for SAG.
3 Promotion of public involvement, social communication and environmental training.
4 Building of ground water management and mitigation capacities for critical areas.

5 Monitoring and dissemination and findings.
6 Assessment of the potential for using SAG's geotermal energy.

Although the project was not prepared following ecosystemic management principles, they were indirectly adopted. The amount and quality of SAG water reserves were acknowledged as being a strategic resource for future generations. If used sustainably, they constitute an invaluable resource for local and regional development. It is, consequently acknowledged, that failure to regulate present interventions might result in future degradation and consequently political, social and environmental conflicts.

Because this is a cross-border aquifer, all development actions are subject to the political priorities of the involved countries. However, the will existed to put in place institutional mechanisms for involving local actors, and strengthen their commitments and decisions. The project also feels SAG will also need an effective government scheme. In consequence, it emphasized the need of building a consensus-based institutional, legal and technical management framework.

The need to understand aquifers' dynamics is evident when preparing a strategy to minimize their ecological degradation. Also this is required for transfer to other connected aquifers. The project used some of its resources to create this knowledge, for the required ongoing monitoring and particularly, for dissemination of the resulting information.

The environmental training, dissemination and education program was implemented locally and at the regional level. It involved many government, non-government and university organizations. Proposing from the onset communication and participation strategy at all levels was a key factor in preventing institutional or social unnecessary wear out. In addition, it allowed interested players to become involved in the project and gave them an opportunity to put forward their contributions.

POTABLE WATER AND SANITATION PLANS AT DEPARTMENT LEVEL, COLOMBIA[3]

In 2006, it was decided that the business reengineering of Colombia's potable water and sanitation sector was not yet complete, as 676 municipalities still provided direct services. This resulted in high dispersal that was reflected in wasted economies of scale opportunities and fragmented resource use. In addition, significant deficiencies existed in distributing and using resources from the General Participation System (SGP is the Spanish acronym)[4] and in demand-side subsidy targeting.

As a strategy of the National Development Plan 2006-10, it was decided to encourage department-level water and sanitation plans which included opening the system to specialized operators, consolidating existing ones or setting up and strengthening efficient community organizations coordinated by each department's government with technical support from the national government.

The new structures provided regional schemes for service supply (department level utilities) that will allow clustering markets and building a more compact industrial structure that could take better advantage of economies of scale and reduce fragmentation of resources while effectively coordinating initiatives among different levels of government, improve control over resources and ensure regulatory compliance. The central government's support to the department governments would be conditioned to progress in honoring local commitments to utilize resources and in modernizing local systems' business operations.

The central government's contribution to finance department level water and sanitation plans was distributed among departments based on equity criteria. Each department would prepare comprehensive investment plans from a regional perspective and the vari-

3. Sources: Contraloría General de la República de Colombia (2011) and Salinas R. (2011). Example taken from Ballestero V. (2014).
4. The General Participation System (Sistema General de Participaciones) reflects central government's transfers to departments, municipalities and districts to fund education, health, potable water and basic sanitation services.

ous sources of public funding (rates, SGP, contribution from regional independent corporations and Central government contributions). Consequently, PDA is a set of strategies and activities aimed at supporting municipal level management with a view at accomplishing comprehensive harmonization of resources and putting into practice efficient and equitable schemes for providing household fresh water and sanitation services.

To 2013, PDAs have benefitted close to 3.6 million people. Budget execution has increased and by that year it reached a total 305 million dollars. Administrative costs were reduced by over 30 million dollars giving departments more funding to invest in sector infrastructure.

However, various assessments reveal that certain policies need improving so PDAs can meet their objectives. The Ministry for the Environment, Housing and Land Use (MAVDT is the Spanish acronym), in its role as governing agency for potable water and sanitation policy, has not yet prepared the required strategies and instruments that will allow to determine the sector's performance, link water supply and demand, and even less, audit PDAs, following agreements made with individual departments.

In addition, PDA implementation without having previously strengthened the department's MAVDT technical capacities did not allow to move forward effectively and efficiently in building the facilities that would ensure water supplies with the quality, quantity and continuity characteristics needed to ensure the human right to potable water and basic sanitation, and thereby provide a better service to the people.

TOWARD MORE EFFICIENT USE OF WATER IN AGRICULTURE[5]

Among the measures to improve the efficiency in water use in rural environments, the following are worth mentioning:

Improving traditional irrigation systems as a way to use water more efficiently

It is acknowledged worldwide gravity water use systems are at most 38% efficient. Under such conditions, over half of the water drawn from sources is lost along the chain, including catchment, conduction, distribution and mostly, when used in plots. Most traditionally irrigation systems are small scale and managed by the communities themselves, with efficiencies not exceeding 25%.

Improving irrigation systems can no longer be tackled from a sector perspective. A comprehensive approach must be adopted that takes account of a hydrographic watershed perspective, as a way to create convergence among various types of users (as for human consumption, irrigation, industry, tourism, etc.) and thereby accomplish the sustainable use of water.

Water use consensus among watersheds' various players

Irrigation systems are a set of inter-related elements (infrastructure, irrigation areas and people) that capture, use and move water from the source to plots. The efficient use of water in a watershed system implies not only improving catchment but also all the system's components. The sustainable use of water in a watershed will only be possible when all local players or water users reconcile their interest in create agreements to use water, while adopting new planning approaches that direct the use of water towards preserving environmental balances and health.

Consequently, social consensus about water use is the first step toward more efficient water use in a watershed. It can contribute to improve the efficiency needed to meet each sector's actual needs (potable water, mining, energy, etc.) and improve water distribution.

5. Source: Montaño (2010)

Strengthening independent peasant farmer management of irrigation systems

In coordinating the various components of an irrigation system, the human element is, without a doubt, the main driver of irrigation management. Consequently, directing initiatives towards capacity building require laying down robust foundations not only so that managing water more efficiently will be carried out with a sense of responsibility but also to bring new technologies that respond to a specific social and environmental contexts. Training irrigation organizations should build on the users own experience (habits, customs and traditions), which can be taken advantage of to lever change.

Organizational strengthening, updated water rights, reorganized distribution and maintenance styles can also be key elements in improving water use efficiencies and the sustainability of self-managed irrigation systems.

Improving infrastructure in traditional irrigation systems

Dams, impoundments, conduction canals, intakes, distribution and flow measuring structures are all physical components of irrigation systems. Every piece of infrastructure will have its own operation and maintenance requirements and their performance also will depend on the skills of those charged with running such facilities.

So far, projects to improve irrigation systems were mainly aimed at improving water catchment, conduction and distribution efficiencies and increase the efficiency in water use up to 38%. However, water use at plot level has not received institutional attention.

Improving water use at plot level

Irrigation projects should include measures to improve water use within plots when designing infrastructure and providing technical assistance. For this purpose, two possible scenarios must be taken into account:

– *Improving plot-level surface irrigation*

The main issues regarding water loss at plot level in peasant farmer communities relate to differences in water use (losses stemming from surface runoff and percolation), irrigation methods poorly adapted to the cultivation area's topography, use of large flows over short periods of time exceeding management capacities, and night irrigation.

Appropriate responses to these issues are needed through a process that will improve irrigation water users' capacities. Such measures can result in significant increases in water availability from irrigation systems of up to 44% greater efficiency.

– *Better technologies to improve water use at plot level*

Municipal operative plans increasingly include requirements for spray irrigation projects. Apparently, based on experiences in this field, introducing greater technology in water use can lead to major water savings. However, it is fundamental to take account the implications of technological changes, transition from surface to pressure (spraying or drip irrigation) in peasant farmer communities. Using water carried through closed conducts, in smaller amounts and for longer time periods will require deep changes in water management rules based on transparent and socially fair collective decisions. Greater use of technology can improve the efficiency of using water for irrigation up to 61% for spraying techniques and as much as 80% when drip technologies are used.

Including agronomical practices to improve the availability water in soils

A better use of water at plot level also requires well prepared soils to facilitate water infiltration through the soil's profile and water retention so plants can absorb the amount of water they use for growing. Adding organic matter to the soil, such as manure, green fertilizers and stubble improve water infiltration into the soil and results in greater retention, thus reducing crop losses and increasing yields. Agro forestry practices and planting crops with lower water requirements can also contribute to improve efficiencies at water use at plot level.

A strategy to introduce efficient water initiatives

Introducing ways of using water more efficiently requires institutional policies that support community-based irrigation systems that in turn, respond to identified issues.

Issue	Strategic initiative
Low efficiency community-based irrigation systems	Immediate impact projects. Improved infrastructure and capacity building for better water utilization in small-scale traditional irrigation systems
Low coverage of irrigation systems vis-à-vis existing requirements particularly in water-scarce irrigation areas	New irrigation projects with an emphasis on technical systems.
Sector-restricted use of water.	Model projects for multiple-purpose water projects.
Poor operation and maintenance.	Improve local capacities for system O&M
Low application efficiencies and productivity.	Improve agricultural productivity.
Weak governance resulting in sector inefficiencies, corruption and low watershed-wide efficiencies	Improve water governance as part of comprehensive water management systems
Water source, soil pollution and use of waste water for farming.	Projects for reutilization of water in agriculture.

IMPACTS OF CLIMATE CHANGE IN TRUJILLO, PERU[6]

The Moche civilization, who lived in the dry northern Pacific coast of Peru in the VII century, were well aware of climate change challenges. Archeological research has found 30 years of flood followed by 30 years drought shook these people's faith in their authorities' ability to predict and control climate. The central authority crumbled and, a century later, the Moche civilization had disappeared.

Today, climate forecasts in the Moche valley are left to scientists and citizens are responsible for decisions relating to adaptation measures in Trujillo, the provincial capital. Although the city presently has a large water reserve, both in the aquifer where it extracts water for domestic use and the network of river canals that feed its large agricultural industry, both could be jeopardized in future.

The risks are complex and hard to predict but must not be overlooked. An action plan prepared jointly by IDB and the city of Trujillo is using an IDB-sponsored study's recommendations to chart the course towards future sustainability. ''This study will help us make science-based decisions, with less political considerations,'' said the Action Plan Coordinator. This plan is prepared as part of the IDB's emerging and sustainable cities initiative.

Hypothetical case of compounded risks. The study shows the likely direct impacts of climate change, both on the Moche river valley aquifer and the Chavimochic canal that carries water from the Santa River, fed by glaciers further south. It also evaluates the way future climate conditions could impact availability of irrigation and domestic consumption water, in addition to examining the risks resulting from interruptions between the aquifer and the irrigation system.

Before the canal was built, the Moche aquifer was used for both irrigation and household consumption in Trujillo. Nowadays, the canal allows famers to irrigate vast desert areas and grow high value export crops. It also supplies close to two thirds of the water used by 300.000 people living in Trujillo. The remaining third of city water is pumped from the aquifer.

A safe flow of water for irrigation is fundamental for Trujillo's economy, which relies to a large extent on agriculture. However, percolation from the irrigation system raises ground water

6. Source: Grupo DHI (2012). Example by Fernando Miralles.

levels in the Moche valley, resulting in drainage that damages the foundations under buildings and roads.

The study reviews the consequences of two hypothetical climate change scenarios. One is the dry scenario, where temperatures increase 1. 2°C and rainfall drops by 10%. In the humid scenario, temperatute increases 0.4°C and rainfall also raises 10%.

In both scenarios, the study concludes population growth, estimated at 10% through 2030, could make this city vulnerable to changes in water availability. In the dry scenario, increased pumping from the aquifer to meet the city's needs, as proposed, may be possible only through 2018. Beyond that date, the city could likely increase the water it gets from the canal, as residential use would have a priority over agriculture. Nevertheless, this would reduce the amount of water for agriculture, a fundamental economic activity in this region. In the humid scenario, water would not be scarce and, on the contrary, it may be needed to pump water out to alleviate increasing drainage issues.

According to the study, Trujillo's main vulnerability to climate change would be the impacts on its agricultural industry. However, national data used in creating climate models for the 2030 to 2039 period show the Santa River's flow would increase every month, and would be even 15% higher during the driest months, compared to the 1969-1989 period. River lows during that period would include run off from glacier melting in high altitude areas, resulting from increased temperatures. Once glaciers totally retreat, the river would be fed only by rainfall, thus leading to smaller flows. Moreover, higher temperatures would increase theevapo-transpiration rate, further reducing the amount of water available for irrigation. The study concludes that, once taking account of all these considerations, demand of water for irrigation would increase by 6% in the Trujillo area through 2039.

Need of intensive follow up. Although climate change does not pose any ''alarming vulnerability'' for Trujillo, according to the study, the city's ability to respond to future uncertainties requires intensive follow up and analysis. In particular, the study recommends carrying detailed assessments of climate change impacts in Moche River, to the same level of detail as those already performed in the Santa river watershed. It also recommends setting up a team to follow up ground waters evolution and track interactions between the Moche aquifer and irrigation system percolation, to ensure the right amount of pumping aimed at checking the city's percolation issues.

In the dryer climate scenario, adaptation measures would include water pricing policies and restrictions on use to reduce demand, as well as measures aimed at reducing distribution losses. If the dry scenario proposed in the study is exceedingly prudent, negotiations should begin to bring more water to the city through the Chavimochic canal.

If humid conditions prevail, the study recommends taking adaptation measures mainly aimed at reducing drainage issues resulting from inflow of irrigation water into the Moche aquifer. Such measures would include detailed studies on the interactions between ground and surface water, based on which measures could be adopted to reduce drainage bottlenecks. The study also recommends increasing aquifer pumping and using that water for irrigation or exporting it outside the valley.

WATER FUNDS: GREEN INFRASTRUCTURE[7]

Latin-American's Water Funds Partnership was created by The Nature Conservancy (TMC), FEMSA Foundation, the Inter-American Development Bank (IDB) and the World Environmental Fund (GEF) in 2011. The purpose of this joint effort is to set up a mechanism that would take responsibility for preserving and recovering hydrographic watersheds and contribute to protect the region's major water sources, particularly in the member countries' cities. It is worthwhile mentioning Latin America is the most urbanized region in the developing world.

The Partnership is a mechanism that provides technical and financial assistance to set up and strengthen Water Funds. Additionally, it supports local actors in implementing such funds, and helps to create a management structure for each fund. It also provides recommendations and technical knowledge to strengthen the funds'

7. Sources: Alianza Latinoamericana de Fondos de Agua and The Nature Conservancy (2012), example taken from Echeverría (2014)

operations, in addition to facilitating experience and best practice sharing among the Water Funds and also with other actors.

The Partnership permanently supports existing funds, structures new funds, leverages resources, creates strategic partnerships, implements technical guidelines and creates tools to consolidate Water Funds initiatives throughout Latin-America and the Caribbean. Its objective is to create, implement and capitalize a total 32 Water Funds in the entire Latin-American region.

The Water Funds are an innovative way to fund the protection and remediation of natural habitats involved in hydrological cycles through direct initiatives at community level. Funds lure mayor contribution from large users, such as public or private water and sewerage utilities, hydroelectricity corporations and beverage manufacturers. Profits from these investments are allocated to protecting ecosystems of mayor importance from the hydrological cycle view point, as they help filter and regulate water supplies. They also create the incentives and finance sustainable economic development opportunities for the benefit of local communities.

In 2000, TNC joined efforts with public and private sector partners to create the first Water Protection Fund in Quito, Ecuador. The project started with a US$21.000 investments that had increased to 10 million dollars ten years later. At present, approximately one million dollars from the Quito Water Fund are invested annually in forests, prairies and plains protection in watersheds supplying potable water to this city's two million people.

Other Water Funds have been set up in cities including Bogota, Sao Paulo and Lima, all of which are home to over 10 million people and therefore put large pressure on water sources to supply water services.

A review of the results accomplished by Water Funds 15 years down the road demonstrate their quite reasonable success. Some of their more concrete accomplishments include the following:

i. 17 Funds operating in 6 countries. In addition, 10 Water Funds under evaluation and 17 more in the design stage for a total 44 Water Funds in Latin America. At least 32 Water Funds should have been created, implemented and capitalized by 2015.
ii. This initiative is already replicated in other continents, including Asia and Africa.
iii. Over 1.5 million hectares have been set aside as priority areas for conservation activities and are already under intervention.
iv. To 2013, 6,050 families had directly benefited; 126,089 hectares of public land were under conservation; 83,214 hectares of private land were comprised in conservation agreements and/or projects; 2,847 hectares of land were intervened for a better resource management, and over 100 civil society organizations were involved, demonstrating a strong social support for these funds.
v. 5 awareness raising, education and training programs had concluded.
vi. 38 studies have been finalized to demonstrate the Funds' viability and sustainability.
vii. A software tool, RIOS, was designed to plan cost-effective investments.

WATER MANAGEMENT IN MENDOZA PROVINCE, ARGENTINA[8]

Argentina is a federal representative republic comprised of twenty-three provinces and the autonomous city of Buenos Aires. The Argentinian constitution gives provinces control over natural resources within their territory. Consequently, they can regulate the use and conservation of water resources.

Mendoza province is in the dry central-western portion of Argentina, where average annual rainfall is only 250 mm. The province includes five watersheds fed by melt water from the Andes Mountain Range. Appropriate management and care of water is crucial to niurturing life in the oases throughout the province since out of almost 150,000 km^2 of total surface area, only 2.5% are available for residential, agricultural and industrial purposes. The remaining surface area is a desert.

Water management in Mendoza is characterized by its robust structure, experience and independence, built on a decentralized two-layer system where the water authority, the General Irrigation Department (DGI is the Spanish acronym), is independent from the provincial central executive, and User Organizations (OU in Spanish) are likewise independent from the water authority.

8. Sources: DGI (2014) and Martín (2010)

The need for a stable water policy has resulted in a particularly autonomous system characterized by a hierarchical structure created by constitutional mandate, reflected in the following main elements.

a Financial autarchy. The Irrigation Department establishes and manages its expenditure budget and revenue collection independently form any other authorities.
b Exclusive jurisdiction over all issues concerning water management which do not fall within the competencies of regular justice. DGI is comprised of three bodies, performing separate functions, and a system of checks and balances. These bodies are the administrative tribunal (HTA) the Appeals Council (HCA) and the Office of the Superintendent.
c Authorities, appointment, removal and term in office. DGI's top officials are appointed and removed like judges, to ensure their maximum Independence. The Superintendent and HCA members are appointed by the Executive, and ratified by the Senate and may be removed by a trial jury. All are appointed for 5 years term, longer than the Provincial Governor's 4 years period in office.
d Stable, balanced and independent DGI and water policy making through partial overlap of water authorities and executive power's terms in office.

Water levies are established independently by HDA, the DGI's deliberation body.

OUs (or river flow inspectors) are autonomous bodies who can perform their roles in the public and private fields. This is the final body in the two-layered decentralized system where operative management and distribution is also decentralized down to user consortia. These are all independent bodies with competence over the administration, use, control, conservation, canal maintenance and preservation of irrigation canals, ditches and overflows.

Users are directly responsible for managing riverbeds through their UserAssemblies, the OUs' main body, and authorize the operating budget for the Inspectors, whom they hold accountable. They may also decide on mayor issues regarding the inspectors' daily business.

DGI is in charge of OUs' control and oversight which typically involves only legal matters, though not their timeliness, merit or convenience.

The main financial characteristic of these institutional setting and water infrastructure is its ''self-financing'' nature. Both DGI and OUs must collect enough taxes from users to cover their operating needs. Regular resources include royalties from use of surface and ground water and pollution controls, for use in water-snow and weather measurements and from fees for administrative services, such as distribution to private intakes and canal dredging. Exceptional resources are provided by the ''Minor Works'' plan. Large projects (''Obras Mayores'' in Spanish) fall under a separate regime requiring legislative authorization.

Among the systems constraints are its lack of relationship with actual resource utilization. As a result, there is no way to put in place benefits for users who enforce, for instance, rational and efficient resource use techniques. Rates are still levied based on cadaster areas, for all main taxes. In addition, planned taxes are relatively small compared to the volume of other inputs used in productive activities and therefore fail to reflect the true economic value of water, and are consequently insufficient to raise users' awareness about the water resource's opportunity cost.

Finally, despite this institutional arrangement's independent, decentralized and two-layer structure, there is continued state intervention in issues that, in principle, are beyond its jurisdiction and more appropriately fall within the users' jurisdiction, thus distorting the independence between state authorities and OUs. Due to this marked interventionist state attitude, to which must be added the prevalence of agricultural users, these bodies' role has weakened gradually. It is expected such situation may be reverted gradually so the system's positive traits shall prevail.

9
Conclusions

The following main conclusions are based on the arguments provided in previous chapters and the diverse issues arising in the **conceptual framework** for **Integrated Water Resource Management** and the relationship between **water, food** and **energy security.**

Water security is one of the main issues that should be faced by the nine countries studied here to ensure water supplies in sufficient quantity and quality for a wide range of uses. To address this issue, they will have to act both on the **supply** and the **demand** sides and take account of likely impacts of climate fluctuations and change.

From the **supply** side, it seems crucial to **protect ecosystems** and recognize their role in storing, mobilizing and buffering water flows. Water Funds and other similar initiatives are encouraging experiences in this regard.

Likewise, is important to protect water sources, control pollution from household and city activities (untreated waste, poor disposal of solid waste) and production processes (inappropriate industrial processes, poor use of fertilizers and pesticides in agriculture, among others). Technologies must be put to use to reduce water waste, improve productive processes and treat residential and industrial effluents.

From the standpoint of facilities, dams and impoundments will continue contributing to water holding and storage for a number of uses, but their environmental and social impacts must be recognized, leading to measures for their mitigation.

From the **demand** side, the search of greater **efficiencies** in all activities is of paramount importance. Irrigated agriculture must be paid special attention because of its role as the largest water consumer but also because of low efficiencies in water conduction and use. Studies on the ways plants use water, infrastructure and maintenance and introduction of new irrigation technologies, among other measures, can contribute to improve efficiencies. Similarly, improvements are required in water and energy efficiencies when providing potable water and sanitation services, in view of the connection between water and energy.

Climate variability and change can affect both supply and demand. From the supply side, lower flows from impoundments will result in less hydroelectricity and generation and availability of irrigation water, reduce supply for residential, industrial and other types of use, and impacts on the quality of water. From the demand side, higher temperatures will result in increased demand for water for agriculture and for residential water and energy use.

Although the regions have shown a stronger commitment to reducing persisting **poverty**, rural and urban poverty indicators are still high. Fast **urbanization** has not always improved the living standards of many rural migrants who live in the cities' marginal areas under extremely precarious home, sanitation and environmental conditions.

Although solving such a complex problem goes beyond the field of water, issues arising from the use of water are among the most important including supplying potable water and sanitation services preventing flooding of cities. These problems must be addressed to improve the quality of living of the people who suffer those problems.

Water security is linked to providing **access** to **potable water** and **sanitation** for all. Despite significant capital expenditures, many needs remain unsatisfied. Global figures do not reveal the significant intra-regional disparities, gaps between urban and rural areas, as well as differences between one single country's welfare and poor areas. They also fell to reveal significant differences in quality, sustainability and service efficiency. People living in medium-size and small cities, in concentrated or disperse rural populations, and in marginal areas in large cities

are the greatest victims of inadequate water and sanitation services.

For people living in **intermediate** and **small cities**, where potable water and sanitation are generally poor quality, the main issue is the **insufficient economic scale** of suppliers that does not allow them to provide efficient services and results in the utilities' financial unsustainability. In **rural areas**, services are managed by community boards that are typically **little sustainable** and which get limited support from national agencies. In both cases, special effots are required to find solutions that will not be easy to put into practice.

Poverty is also related to **food security**. In this regard, it should be underscored farm land in the sub-region is used to grow three times more food than actually consumed by the population. Crops are also grown for biofuels that thereby contribute to energy security. In consequence, if existing distribution issues are addressed, food security in the countries under review could be accomplished over a relatively short period of time. Moreover, the sub-region enjoys natural comparative advantages that could allow it to make a significant contribution to the world's food security.

Irrigation has played a mayor role in improving the region's social and economic conditions, supported by significant infrastructure investments. However, irrigation water's **productivity** needs to be **improved** through interventions in all the stages of the "use chain," from the way plants use water through international trade. Technologies and techniques are available to improve productivity of all resources used by producers, including soil, inputs and water.

More **intensive cropping** and an expanded agricultural frontier as a result of increasing world demand for food and biofuels is putting **pressure** on **water resources** and resulting in **land** use changes, all of which have a direct impact on the hydrological behaviors in many watersheds and soils. Increased use of fertilizers and pesticides in some countries have created pollution issues, therefore the need for paying special attention to such severe environmental impact.

Economic growth in these nations has expanded **demand** for **energy**. **Energy security** requires sufficient supply to support economic growth and reduce poverty.

Hydroelectricity is a way to benefit from the sub-region's natural advantages. So far, only a small percentage of the region's high potential has been developed. However, the likely change in weather patterns or longer dry seasons, in addition to the environmental and social impact of impoundments, should be taken into account as was mentioned earlier.

Hydroelectricity typically does not adjust to the seasonal and space characteristics of water use for alternative purposes, such as flood control, irrigation and environmental demands, which should all be internalized in the impoundments' operating rules. A growing trend in the region's countries is to develop complementary sources, including biofuels and wind energy, not only to increase supply reliability, but also to reduce the use of non-renewable sources.

Some countries' significant potential to develop **non-conventional hydrocarbons** requires anticipating potential water-related conflicts, stemming from increased demand and potential pollution.

We must underscore the role of green infrastructure and take it into account in all development projects. Nature's capital and **ecosystemic services** are an area where investments are needed to propel the water sector's economic development, and should complement investments in infrastructure, rather than substitute for them. The outcomes of such investments must be examined in terms of their economic returns but also from the view point of the contribution to water, energy and food security, social equity, rural development and climate change resilience.

Governance of water resources includes taking in consideration cultural, legal and institutional components, in addition to their contribution to the economy and capacity to create financial resources for water management.

Culture in the countries under review is a legacy of their Spanish colonial past, which gives all these nations common traits, including their language and customs. This paves the way for dialog and mutual understanding, a fundamental requisite for sharing management experiences. In addition, their pre-Columbian legacy, which is stronger in some countries than in others, strongly links their history to natural resources.

Although various **types** of **economic policy** in the region's countries have had a differential impact in the ways they managedtheir water resources, particularly as regards water rights and supply of potable water and sanitation services, they have not been an obstacle to agree on other basic principles, such as the need and convenience of adopting Integrated Water Resource Management (IWRM) as a paradigm to address the complexities of water management, in particular taking into account the diversity of actors and sectors involved, their peculiarities but also their shared objectives, as can be drawn from the above arguments.

Although significant progress has been made in managing, developing and conserving the sub-region's water resources, the **relationship** between **water** and other **socio-economic** and **socio-political** issues lingers. A deeper study of water's role in public policies is needed.

One of the greatest challenges is to put in place legal frameworks and institutional arrangements for water that will give social agents the certainty they need and help direct funds to the water sector. The criteria to lay down such arrangements must be aimed at developing an institutional structure, and a regulatory and operative framework that will build trust in institutions (the law, organizations and authorities) and that will result in consensus and transparent decision making.

In regards of the **human right** to **potable water** and **sanitation**, the sub-region has made significant strides in developing plans, policies, programs and strategies to enforce such right. In most countries more progress is needed in ensuring the components of such human right, including water quality, affordability, accountability, citizen involvement, acceptance and the systems' environmental and financial sustainability are also guaranteed.

We must acknowledge the importance of having better **regulatory practices** as a tool for state interventions seeking to improve the people's quality of living and access of low income populations to basic services. Moreover, it is of utmost importance to improve the efficiency of service operators. An independent regulatory agent can reduce political noise in sector decisions.

Defining public management policies for potable water and sanitation services requires ongoing **technical monitoring**. Therefore, it is fundamental to identify accurate, complete, comparable and verifiable indicators that will allow adopting the most appropriate strategies in each scenario.

In addition, developing and effectively implementing **climate information** systems rises as another major challenge. An effective response should take account of the needs of all users of weather services, and develop capacities among scientist, experts, managers and policy makers.

Finally, it is worthwhile underscoring the need for a firm commitment to allocate the necessary **funding** that will permit to close existing gaps and satisfy the growing infrastructure needs to provide water for a variety of uses, maintain existing infrastructure, collect and treat waste water and modernize irrigation systems, among other investments needed. Simultaneously, the challenge remains to design and inforce realistic **rates**, while at the same time introducing effective **subsidies** for the neediest..

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Annex

ANNEX 1. SELECTED SUB-REGIONAL INDICATORS

Socio economic indicators for nine countries

Indicator	Year(s)	Argentina	Uruguay	Paraguay	Chile	Bolivia	Peru	Ecuador	Colombia	Venezuela
Area (000 km)		2,780	176	407	756	1,099	1,285	256	1,142	912
Expected lige at birth	2012	76	76.9	72.2	79.6	66.9	74.5	76.2	73.8	74.5
Mortality of under 5s per 000/births	2013	13.3	11.1	21.9	8,2	39.1	16.7	22.5	16.9	14.9
Child mortality per 000 births	2010-2015	12.3	5.9	12.3	6.8	12.4	8.9	9.3	16.7	8.4
Poverty rate (%)	2011	ND	13.7	32.4	14.4	45	27.8	28.6	34.1	31.6
Humam Development Index	2014	0.81	0.79	0.68	0.82	0.67	0.74	0.71	0.71	0.76
Literacy rate %	2011	97.9	98.1*	93.9*	98.6**	91.2**	89.6***	91.6	93.6	95.5**
Gini Coefficient (%)	2011	43.6	43.4	52.6	50.8	46.3	45.7	46.2	54.2	39
GDP per capita US$/ person	2013	14,715	16,351	4,403	15,732	2,868	6,660	5,720	7,826	14,415
Competitiveness index	2005-2014	4.02	3.9	3.4	4.8	3.5	3.98	3.62	4.1	3.8
Doing Business ranking	2013	126	88	109	34	162	42	135	43	181
CO2 emissions (kt)	2010	180,512	6,645	5,075	72,258	15,456	57,579	32,636	75,680	201,747
Consumo de electricidad en kWh per capita	2011	120,858	9,508	8,073	61,758	6,436	36,950	18,178	52,857	97,726
Hydroelectricity generation %	2012	22	56	100	31	30	52	54	75	64

Note: Literacy rate: * data for 2010; ** for 2009; and *** for 2007.

Sources: Ballestero V. (2014) and Millán (2014)

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