

Network for Cooperation in Integrated Water Resource Management for Sustainable Development in Latin America and the Caribbean



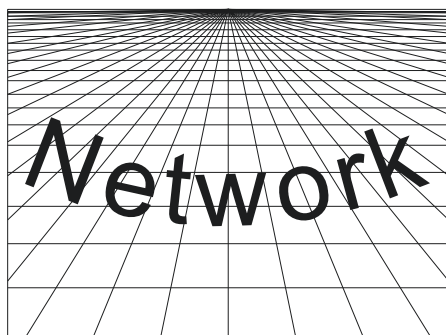
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The majority of proposals to improve water management consider integrated management of water resources as their main objective. However, this notion seems to confuse the means, i.e., integrated management, with the desired end-results, which are: access to drinking water, mitigation of drought effects or enjoyment of unpolluted rivers, among others. Integrated management has been touted as the universal solution to every water-related problem, which is why the concept needs to be clarified and made more accessible for water users and managers.



In the absence of human intervention, neither water as a usable resource nor river basins need to be managed or administered. Therefore, water management really refers to cases in which human intervention affects a shared, interconnected and integrated natural environment, such as a river basin or water system.

Accordingly, in river basins or water systems with little human presence, interventions normally do not have a great impact on users or the environment. In these types of conditions water is sufficiently abundant to satisfy everyone's needs. The environment is adequately resilient to absorb the impact of polluting processes and the reduction in river flows resulting from extractions, and inhabitants and users learn to adapt to flood and drought seasons. In this increasingly uncommon type of situation, nature itself takes care of integrated water management.

Current water-related problems are a consequence of the enormous pressure that

individuals, companies and society in general exert on the environment through multiple, repetitive and increasingly large and varied interventions in river basins and water resources. This exponential increase in human activity affecting river basins and water bodies has not been accompanied by an improvement in the necessary control, management and monitoring mechanisms.

Management of water resources and river basins consists in the control and management of these interventions, based on at least a minimum level of coordination and knowledge of their medium- and long-term effects. These activities are still being carried out without the necessary knowledge or management of their present and accumulated effects on the environment, the inhabitants of river basins and other water users. This has generated a great number of water-related conflicts, which in turn have been compounded by the effects of climate change.

Managing the impact of human intervention on water resources and river basins requires different types of instruments. These tools must help guide, coordinate and direct the different actions that have an impact on the water system. This requires having appropriate institutions and knowing about the environment subject to intervention, as well as being aware of the complex web of ensuing effects, inducing the desired behaviour in stakeholders, having access to engineering measures that allow modifying behaviours in the water system, regulating, overseeing, controlling and monitoring interventions, training users, financing management costs and drawing on all the necessary means to adequately steer actions so as to achieve society's goals in each river basin or water system.

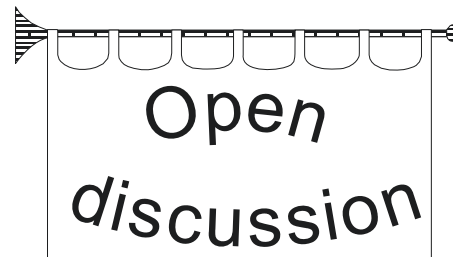
Integrated management is essentially an expression of the desire to know about, encompass and manage all the variables that come into play when a natural environment is modified in order to satisfy the needs of multiple and different users, whether they are inhabitants of the river basin or water system

in question, or not. The effects of these interventions will benefit and/or harm some more than others, which is why conflict is inevitable—and why we maintain that “water management is also conflict management”—as is the need for constant improvement of management and control mechanisms.

Axel Dourojeanni

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**Water security challenges
in Latin America
and the Caribbean**

As stated in a recent publication by the Natural Resources and Infrastructure Division

titled “*Desafíos de la seguridad hídrica en América Latina y el Caribe*” (*Water security challenges in Latin America and the Caribbean*) by Humberto Peña (see Circular No. 45), over the years water-related problems in Latin America and the Caribbean have been the subject of multiple declarations, diagnoses and analyses aimed at identifying strengths and weaknesses, and proposing reform initiatives for improved water resources management. These concerns acknowledge the importance of water resources management and use in order to improve standards of living of large parts of the population, and to promote the region’s socioeconomic development.

However, for water resource management in the region to be considered adequate, it still needs to reflect comprehensively on the strategic objectives it should strive for. In global terms, as from 2000 and in the framework of the second World Water Forum (The Hague, Netherlands, 17-22 March 2000), the concept of water security was identified as the paradigm that defined the requirements that humanity should focus on to achieve adequate water management. Thus, the pertinence of water security as the determining strategic objective of the regional debate on water needs to be examined.

The way in which the concept of water security has been used in different parts of the world demonstrates that insofar as a thematic construct, it has been subject to a range of interpretations. Accordingly, for it to be used in Latin America and the Caribbean it is imperative to review its different definitions, and to analyse its suitability considering the nature of water-related problems in the region. The sort of challenges faced by countries in the region warrant an understanding of what the water security concept entails, namely:

- Availability of adequate water, both in quantity and quality, for human supply, subsistence uses, protection of ecosystems and economic production.
- Institutional, financial and infrastructure capabilities to have access to and take advantage of water resources in a sustainable way and coherently manage the interrelations and externalities between different uses and sectors.
- Acceptable levels of water-related risks for the population, the environment and the economy.

This definition provides a broad perspective on the role of water in society. Not only does it emphasize the issue of water availability to meet different requirements, it also recognizes the limitations of countries in the region to satisfy them, as well as the need for different sectors to make commitments and agree on ways in which to fulfil them. Similarly, the definition acknowledges the

inherent risks and uncertainties of water-related issues, especially the fact that societies can only aspire to manage and limit risks down to acceptable and manageable levels, and that unfortunately these cannot be eliminated in their entirety.

Water security defined in these terms, and its use as an instrument for comprehensive analysis, diagnosis, definition and monitoring of targets is very attractive for Latin America and the Caribbean, for the following reasons:

- It focuses on the importance of water in the social and economic development of countries in the region instead of on its management processes. It allows for a better understanding of water’s role in society and emphasizes the need for governments to treat it as a matter of priority.
- It contributes, through a comprehensive perspective of society’s interests as a whole, to identify the most critical areas for adequate water management. It also considers the interdependence among sectors and other public policies, allowing countries to focus their efforts.
- It defines criteria to establish goals and assess the effectiveness of public policies by comparing actual risk levels and service quality with socially acceptable levels for each case.
- It allows, by emphasizing risk mitigation, to identify the threats and uncertainties that water management faces, and to review its ability to adapt to new scenarios.
- It favours performance comparisons and the exchange of experiences regarding specific topics and situations.

Current and future problems related to water management in Latin America and the Caribbean are affected by the huge social and economic transformations taking place in the region. Therefore, apart from analysing the characteristics of water resources, it is also important to look at the trends and forces shaping the requirements of the water sector, or conditioning the way it is managed.

Water security has become a key component of the region’s socioeconomic development in the following priority areas:

- ***Access by the population to adequate service quality levels for drinking water supply and sanitation.*** This dimension requires facing the following challenges: overcoming existing deficiencies in the access to these services, ensuring the availability of water resources at supply sources, and controlling water quality deterioration of said sources.
- ***Availability of water to guarantee productive and sustainable development, and to reduce associated conflicts.*** Humid

areas face challenges such as reducing the impact of droughts and climate change on hydroelectric power generation, and controlling erosion levels in river basins, as well as reservoir sedimentation. Arid and semi-arid areas face challenges such as adjusting the size of irrigation zones to water availability, fully assessing the impact of technological developments and land-use changes on water resources, controlling over-exploitation of aquifers, regulating the interactions between surface and groundwater, controlling salinization linked to the development of irrigation, including hydrological variability and climate change uncertainty in decision-making processes, and regulating the changing conditions in runoff and drainage in river basins.

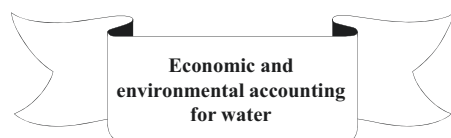
- ***Conservation of water bodies in a condition compatible with the protection of public health and the environment.*** The most important challenges in this dimension are: completing domestic wastewater treatment, regulating nitrate contamination, controlling industrial and mining pollution as well as salinization processes linked to irrigation development, and preserving ecosystems and biodiversity.
- ***Reduction of risks related to excess water and flooding,*** especially in urban areas and others affected by hurricanes, tropical storms and other major disruptions. The critical challenges that must be overcome in this area are: adapting urban drainage systems to city development, developing effective instruments for land-use planning and responding to new challenges brought about by climate change.

To meet these challenges the region must expand and improve its infrastructure, something governments have neglected in past decades. Also in need of improvement are the region’s institutional systems, which suffer from severe shortcomings, compounded in recent years by a greater degree of economic development and by the complexities of today’s society, as well as by the more intensive use of natural resources. The shortcomings of institutional management systems can be mainly attributed to inconsistencies in their design, the inability of the State to implement them adequately and effectively, half-hearted efforts by civil society and deficient market mechanisms.

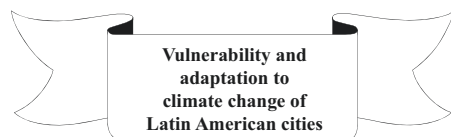
Advancing towards greater water security implies defining the acceptable and feasible risks and levels of service for society in each of the identified spheres, understanding that these acceptable levels can vary over time depending on a country’s degree of economic development, and on the changes in the aspirations, preferences and economic

possibilities of its different social groups. The implied costs of all of this must not be neglected, and neither should society's different options to satisfy its water security requirements, especially in a context of limited resources.

In order to reach acceptable levels of water security, public policies and institutional systems need to take into account the high level of uncertainty resulting from both water variability and climate change, and the profound social, economic and political changes of today. This implies the need to prioritize robust and flexible public policies, plans and programmes conducive to the effective advancement of water security, and looking at the broad spectrum of possible future scenarios.



The ECLAC office in Brazil, in the framework of its technical cooperation agreement with the Brazilian Ministry of the Environment (MMA), published a study titled *“As contas econômicas ambientais da água: lições aprendidas para sua implementação no Brasil”* (Economic and environmental accounting for water: lessons learned for implementation in Brazil) (Project document series, LC/TS.2017/8, February 2017) by Ricardo Martínez-Lagunes (only available in Portuguese). The publication summarizes the state-of-the-art on economic and environmental accounting for water, also known as water accounting, with an emphasis on its application in Latin America, and specifically in Brazil.



The study by Sergio Margulis, published by the Division of Sustainable Development and Human Settlements, entitled *“Vulnerabilidad y adaptación de las ciudades de América Latina al cambio climático”* (Vulnerability and adaptation to climate change of Latin American cities) (Project document series, LC/TS.2017/12, December 2016), proposes a macro framework for Latin American cities to establish their climate plans. Its four main postulates are:

- To develop a strategy whereby sustainable economic development takes into consideration the adequate use of renewable and non-renewable natural resources.
- To decouple the trajectory of income growth from that of the consumption of energy and other resources with

unsustainable long-term consumption patterns.

- To reduce social vulnerability by creating a universal social protection network.
- To continue making progress in the process of adapting to climate change.

At a more immediate level, the study proposes the following recommendations:

- All businesses, governments and persons must find the most profitable way to reduce greenhouse emissions.
- Countries need to move closer to the frontier of opportunities and begin to adapt as soon as possible, at the risk of costs becoming unsustainable.
- Decision makers need to be aware of the vulnerabilities to climate-induced crises in the cities of the region, as well their own contribution to climate change. Political willingness is a key component. Climate change demands that cities lead initiatives that may not always garner significant public support.
- Appropriate government capabilities are a necessary condition for the implementation of the climate agenda. This means developing not only traditional institutional capabilities but also regulatory frameworks, as well as achieving participation of political parties.
- Cities offer the best opportunities for solutions in terms of adaptation and mitigation.
- Cities will respond to climate change when they see clear collateral local benefits as well as cost savings opportunities which could benefit the entire population by way of improvements in efficiency. The best opportunity to adapt to climate change is offered by actions that respond to the causes of the underlying vulnerabilities, and which can address more than one problem at the time. Thus, linking-up with disaster reduction programmes could be an advantageous way of seizing existing initiatives and experiences.

- Cities are, on the other hand, the largest contributors to greenhouse gases. This situation will not be easily overcome insofar as it entails reducing transport, industrial, infrastructure and solid waste management emissions, in addition to controlling the density of urban expansion.
- Mitigation measures need to be considered within the broadest context of actions aimed at urban sustainability, integrating them with the sector and other regional initiatives.

- A key first step in the design of any mitigation strategy is to take into account current emissions as a reference point, establish future reduction objectives and follow-up, analyse and assess measures adopted by governments.

- A better balance between mitigation and adaptation is needed. The mitigation agenda is much more advanced; as such, it is essential to galvanize the adaptation agenda in the region.
- Cities need an integrated approach that considers mitigation, adaptation and urban development. Public works of grander scale and municipal systems need to take into account the possible impact of climate change in order to avoid unnecessary and expensive redesigns. Urban planning strategies need to be integrated with regional, national and even global plans.
- Urban design is an essential ingredient for cities to achieve their emissions reductions. Incentives for the use of public transport and the principle of the compact city are key mechanisms in this sense.
- Increasing density is desirable, but it should go hand in hand with ample knowledge of urban configuration and sustainability.
- Cities should analyse traditional financing mechanisms as well as other innovative modalities. Funding for climate action generally represents a small proportion of cities' budgets; on the other, international financing in this respect tends to be allocated to national governments. The inclusion of the adaptation agenda in the general development agenda is another important funding channel that should be increasingly adopted.
- Cities must: inform citizens and government officials about the need for mitigation and adaptation; design laws and regulations to include climate challenges in development programmes; look for the best technical information and scientific data available; avoid urban dispersion; promote efficient and clean forms of public transport; and develop new construction codes and planning frameworks for coastal areas that consider future climate risks.
- Climate policy needs to pay greater attention to the demand side of the equation. A cultural change is needed to promote new values, behaviours and attitudes from local governments, civil society and the private sector.
- Many of the public policy recommendations that are not specified in the climate agenda need to be taken into

account: integrating efforts between local governments, companies and civil society, as well as at every government level; trusting national experience and searching for the best available information and possible scientific evidence; clearly allocating responsibilities and mechanisms; integrating with strategies and programmes to overcome poverty; perfecting information and communication on cities and climate change; considering long-term planning horizons; developing local administration capabilities; and designing oversight and monitoring approaches for emissions, with a clear definition of institutional responsibilities and the establishment of baselines and targets.

Index-based insurance schemes against drought and flood risks

We present a study titled “*Análisis de factibilidad técnica para la implementación de seguros indexados contra las amenazas de sequía e inundación para los cultivos de arroz y maíz en Panamá*” (*Technical feasibility analysis for the implementation of index-based insurance schemes against drought and flood risks for rice and maize crops in Panama*) (LC/MEX/TS.2017/4, March 2017) by Héctor Rolando Marroquín Osorio and José Manuel Iraheta Bonilla, published by the Agricultural Development and Climate Change Unit (UDACC) of the subregional headquarters of ECLAC in Mexico.

This study consists of a feasibility analysis and the design of a parametric (or indexed to climate variables) agricultural insurance scheme against drought and flood risks for rice and maize crops, conducted at the request of the Agricultural Insurance Institute (ISA) of Panama. Work was carried out in three stages. The first comprised a technical analysis of different options for catastrophic agricultural insurance schemes based on climate indices. It also highlighted the necessary conditions for its launch, as well as information requirements, lessons learned and best practices. Additionally, the study identified the strengths and weaknesses for Panama, with a view to benefit micro and small rural farmers.

The second stage of the study involved the compilation and processing of available information in Panama for the development of a parametric insurance scheme. Agricultural and climate information obtained through geographical data systems of the Ministry of Agricultural Development and the power transmission company (ETESA) was evaluated, as well as the climate risks identified by the National Civil Protection System (SINAPROC). These were then

crossed with the yields of the main agricultural products at a subnational level. Findings were documented in order to determine the insurance needs of micro and small rural farmers so they could be adapted to the agricultural catastrophic insurance provided by ISA.

The third and last stage of the study consisted in determining the feasibility of developing agricultural catastrophic insurance products. This entailed developing prospective policies for drought and flood risks by considering target population, start and end dates, level of premiums, assets to be insured, associated climate indices, indemnity trigger levels and other requirements set out in the ISA regulation.

Finally, the study specifies the feasibility and development of an insurance product against the risk of drought for maize and rice crops based on the Standardized Precipitation Index (SPI) for three months, as recommended by the World Meteorological Organization (WMO) when measuring agricultural drought. It was not feasible for the study to model flood risks or to correlate them with climate parameters, or to associate them with the El Niño Southern Oscillation (ENSO) index.

Apart from the study’s research efforts a tariff tool was designed for the proposed indexed insurance product against drought. It was developed on Microsoft Excel spreadsheets and contains information on rainfall from 1983 to 2015 (33 years of monthly data), three-month SPI readings, automatic measurements of baseline risks, technical premiums, commercial premiums, maximum probable loss figures, parameter adjustments including trigger levels and insurance disbursement parameters, coverage periods and claims estimates for the study’s 33-year period, as if the insurance product had been available during this time.

Meetings



Governance of the water, energy and food Nexus

The Experts meeting on “*Governance of the water, energy and food Nexus: challenges of the 2030 Agenda in water and sanitation*” was held at the Centro de Formación de la Cooperación Española (CFCE) in La Antigua,

Guatemala, 6-7 September 2016. The event had the support of the Spanish International Development Cooperation Agency (AECID) and the German Agency for International Cooperation (GIZ). Its main objectives were:

- To identify best practices, strengths, learning opportunities and trends, as well as the limitations and challenges in fulfilling the Sustainable Development Goals (SDG) for the governance of the urban drinking water and sanitation services sector in the countries of the region.
- To discuss the best and most coordinated way in which to manage the interrelations and interdependencies —taking full advantage of synergies and minimizing or avoiding conflicts and negative externalities— between the water, energy and agricultural sectors in order to strengthen their Nexus, emphasizing energy efficiency in the provision of drinking water and sanitation services.

With regard to the Nexus between the three sectors, there was consensus that a growing number of interdependencies and interrelations could be observed between them, namely:

- Modernization of irrigation —the change to drip and sprinkler irrigation— which can translate into water savings and availability for other uses, but also carries the risk of increasing energy consumption and expanding the consumptive use of water, hence threatening the sustainability of supply sources.
- Biofuel production growth can reduce national dependence on oil and natural gas imports, but it also entails risks in the form of greater competition for water and land-use between biofuel production and food, making production of the latter more expensive. Another concern is that the dependence on single-crop farming and the increase in biofuel production could become an obstacle for the coordination between the three sectors.
- The implementation of public policies that subsidize energy prices for agriculture (mostly for pumping groundwater) can increase crop production and expand cultivated land, but it can also mean over-exploitation of aquifers and inequitable transfers. In the drinking water and sanitation sector, these policies can reduce rates and make services more affordable for the population, but they can also disincentivize efforts to achieve greater energy efficiency in the provision of services.
- Conflicts between different water-using sectors (irrigation agriculture, hydroelectric

generation and maintenance of environmental flows) that rely on the release of water stored in reservoirs for allocations of annual streamflow over time. In some cases problems in one sector (for example electric power outages) can affect others whose operations (equipment and works) rely on power supply.

The growing economic, social and environmental pressures on water, energy and food systems highlight the interdependencies—and at the same time the opportunities for synergies—between the three sectors. These interrelationships and interdependencies, which many times appear in the form of conflicts, are evident and easily observable. However, it is important to effectively convey to political decision-makers the need for and benefit of better coordination and integration between them. Debates on the design or reform of legislation on water, and drinking water and sanitation services offer an excellent opportunity to include the Nexus approach in the regulatory framework conversation.

Experts discussed about the ways in which the Nexus approach could be progressively implemented considering the enormous difficulties at the sector level to advance towards more coordinated or integrated approaches. Sectors continue working as isolated silos, with hardly any coordination or intersectoral compatibilization, which has led to rivalries and conflict between them. Also mentioned were the difficulties and problems for integrated river basin management with regard to the Nexus approach and promoting multiple uses for existing infrastructure works.

Experts commented on the importance of planning as a key component for the implementation of the Nexus approach, for its inclusion in existing sectoral planning—especially water planning at the river basin level—and in development planning, with which it shares elements of the intersectoral, multi-scale and multi-temporal dimensions. Another recurring concern among countries is the need to know more about adequate institutional arrangements and mechanisms, as well as the available organizational structures, to move forward, especially considering the reluctance of sectors to act cooperatively and in coordinated manner.

In order to achieve optimum integration of the Nexus approach with the sector's issues, countries must work on the following aspects: update legislation and redefine the roles of sector stakeholders; perfect their interinstitutional coordination systems (joint working groups, memorandums of understanding and mandatory joint assessments of topics of common interest); improve the availability and quality of information for better decision-making;

incorporate the Nexus approach in public project evaluation mechanisms and environmental impact assessments; and emphasize policies, demand management, supply security and efficient use of resources.



Costa Rica has made great progress in the expansion of its drinking water services. However, sewerage system coverage is low and most wastewater is released into rivers and seas with little or no treatment. To meet this challenge, Costa Rica established its first long-term **National Wastewater Sanitation Policy (PNSAR)** in 2016, which is linked to important infrastructure investments.

The general objective of PNSAR is to achieve safe management of all wastewater generated by the country by 2045, striving for a situation in which wastewater will not affect the environment or the population's health, through the use of individual or collective treatment systems. Considering its 30-year target, the policy includes a series of key pillars, each of which have their own specific objectives to be fulfilled during the timeframe:

- **“Strengthening institutions and regulation for water sanitation”**. Specific objective: to achieve coordination within the wastewater sanitation and treatment sector in accordance with the revision of regulation and the coordination and strengthening of institutions.
- **“Integrated management for wastewater sanitation”**. Specific objective: to strengthen sanitation management of ordinary and special wastewater by taking advantage of current instruments and creating new ones, if needed.
- **“Sanitation infrastructure and investment”**. Specific objective: to improve coverage of sewerage systems and wastewater treatment through planning, prioritization and execution of safe physical infrastructure, with universal design criteria.

- **“Financial stability and tariffs model”**. Specific objective: to improve the sanitation sector's financial sustainability through a comprehensive financing model based on a permanent social participation approach.
- **“Citizenship participation”**. Specific objective: to stimulate citizenship participation with information and knowledge conducive to the development of a national structure that allows for adequate wastewater sanitation management.



The Ministry of Environment and Energy (MINAE), in charge of the water supply and sanitation sector in Costa Rica, approved the tariffs policy for drinking water supply and sanitation systems operators (by Executive Decree N° 39757, of 25 April 2016) called **“Universalization of drinking water and sanitation public services (collection and treatment of wastewater)”**. According to this policy, tariffs for drinking water and related services, as well as collection and treatment of wastewater, must promote the efficient use of resources (labour, capital, environmental management of water resources, among others), in a way in which tariffs can recover all the economic costs associated with the provision of services, be it those directly related to the operation of systems, or other social or external costs beyond the control of operators. Tariffs must ensure the necessary resources for operators to be able to operate and maintain systems in an efficient and sustainable way, generating resources for investments needed for the improvement, expansion and replacement of infrastructure.

The structure and level of tariffs must satisfy simplicity and transparency conditions to facilitate their use and comprehension by users, and public and private institutions. The simplicity and transparency of the structure and level of tariffs must be incorporated into the way rates are set in order to send clear signals to users about the costs of services, thus paving the way for society to accept the tariffs system. Regulation of services must ensure a balance between rights and obligations of users and operators, preventing on the one hand the transfer of inefficient costs to users, and ensuring on the other that the financial equilibrium and sustainability of operators is not threatened by tariff levels.

The policy emphasizes that the State must ensure access of the entire population, without socioeconomic discrimination, to the drinking water and sanitation services which are indispensable for life and health, striving for adequate quality, quantity and continuity of

services. Also, wastewater must be collected and treated safely from a sanitation perspective. To this effect, a national system of cross-subsidies will be put in place targeting the supply of drinking water and related services for users in conditions of poverty or extreme poverty —guaranteeing their access to these services— which will be financed through operators' tariff structures, with contributions from users not classified as being in a condition of poverty or extreme poverty.

This system of targeted subsidies must comply with the following requirements:

- Average tariffs for each service provided must be able to recover all the variable and financial costs, leaving a positive cash flow that in the short-, medium- and long-term allows for the financing of required investments for the improvement, expansion and replacement of infrastructure.
- Consumption by beneficiary users must be metered as from their first cubic meter of consumption.
- Subsidies should be limited, so a maximum level of subsidized consumption must be established. To achieve this, operators will be responsible for determining the maximum level of consumption necessary to cover basic necessities and minimize the risks associated with the service. Excess consumption —above the maximum subsidized level— must be paid by the beneficiary user at full rates.
- Eligibility criteria for potential beneficiaries must be technically and clearly defined by the corresponding State entities responsible for social policies and programmes.
- Contributions to the system of targeted cross-subsidies by users not classified as being in a condition of poverty or extreme poverty will consist of an additional charge to the average tariff for services used. It should be a fixed amount charged to contributing users, regardless of their level of consumption.
- For the sake of transparency and clarity regarding the funding of these subsidies, billing of services provided must clearly show the amounts subsidized for beneficiary users, as well as the additional charges levied on the average tariffs paid by contributing users.

The use of drones to inform public policy decisions on water quality

The article “*El uso de drones para informar decisiones de política pública sobre la calidad del agua*” (*The use of drones to inform*

public policy decisions on water quality) by Anna Berti Suman of the Tilburg Institute for Law, Technology and Society of Tilburg University, Netherlands, is presented below.

The effects of climate change have made governance of coastal urban spaces an increasingly difficult task. Population growth and expanding urban areas have become a permanent concern for public policy-makers. In the past, urban delta areas have used floating structures for human settlements in territorial areas that were not typically inhabitable. Thanks to their flexibility and multi-functionality these structures represent an adaptive solution for urban development and population growth; they are flood-proof and enable water storage and management, as well as sustainable production of food and energy.

However, there has been limited research on the impact of these structures on the environment, partly because it has been hard to monitor their effect on the quality of water and the environment given the difficulty to gain access to them under water. This lack of knowledge has become an obstacle, not only to formulate new regulatory frameworks but also for authorities to support new projects.

One of the solutions proposed in the Netherlands has been to use remote-controlled underwater drones equipped with sensors to measure water quality and other indicators, as well as video cameras to monitor ecosystems in the surrounding areas and underneath the floating structures. These devices have already been used in coastal cities like Amsterdam and Rotterdam, providing information related to the impact of floating structures on water bodies.

Data gathered by underwater drones indicate that the majority of water quality parameters have remained at acceptable levels, meaning that floating structures have not had a negative impact on the quality of water. Apart from data collected by sensors, underwater drones have also captured images of marine wildlife, providing measurements that have allowed researchers to make diagnoses and assessments on the environment at depth, underneath the floating structures. Data has revealed the existence of a dynamic and diverse aquatic habitat in the neighbouring areas of these structures, proving that they may even have a positive effect on the aquatic environment.

Information collected by drones on the impact of these floating structures in the Netherlands can be accessed on a public web platform, created to promote the exchange of information between stakeholders and researchers.

Underwater drones have been proven to be potentially effective in monitoring water

quality, especially considering their ability to gather data from hard-to-reach areas, which would otherwise be extremely expensive or risky. Challenges still remain, such as the difficulty to determine the exact location of these drones under water, insofar as GPS tracking is not possible in these conditions.

Considering that those in charge of designing and implementing public policies are not always up to date with new technological advances and capabilities, it is advisable for them to cooperate and maintain close ties with the scientific community in order to promote the most appropriate policies for technological development. The joint action of policy-makers and technologists can improve society's resilience when facing issues such as climate change, the scarcity of land and water, urban expansion and demographic growth.

Social Advancement Fund in Peru

The *Social Advancement Fund* (FAS) was established in Peru, through Legislative Decree No. 1334, published on 6 January 2017, under the chairmanship of the Council of Ministers, with an aim to finance public investment projects through programmes, projects and activities related to water and sanitation, environment, transport and communications, rural electrification, agriculture and irrigation, health infrastructure and educational infrastructure, in order to address the social gaps affecting the population living in priority zones. The criteria of the FAS for establishing social intervention and care priority zones will be determined by a supreme decree endorsed by the Ministry of Economics and Finance, the Ministry of Energy and Mines and the chairmanship of the Council of Ministers.

National Water Security Plan in Panama

In Panama, the *National Water Security Plan* (PNSH) 2015-2050 “*Agua para Todos*” (*Water for All*) and the National Water Commission (CONAGUA) were established through Resolution of the Cabinet of Ministers No. 114 of 23 August 2016. PNSH is defined as the instrument of interinstitutional coordination of sectors involved with the use of water, through the planning of actions at a national scale, including strategic structural interventions, which in a rational and integrated fashion will guarantee the supply of water for human consumption and satisfy the demand of the productive sector, and reduce the risks associated with extreme climate events, such

as droughts or floods. CONAGUA is the entity responsible for promoting, guiding, coordinating and guaranteeing the development and implementation of PNSH. As such, it replaces the High Level Committee on Water Security created in August 2015.

Panama faces the following challenges with regard to water security:

- Reaching sustained 100% coverage of quality water and basic services.
- Guaranteeing water security in a context of climate change.
- Restoring and maintaining the health of the country's 52 river basins.
- Maintaining the functioning condition of the growing national water and sanitation infrastructure.
- Evolving towards a culture of responsible and shared use of water.

From this starting point, the country has set the following goals:

- To provide universal access to quality water supply and basic sanitation services.
- To make water supply available for all sectors of the economy.
- To preventatively manage water-related risks.
- To consolidate the health of the country's 52 river basins.
- To achieve water sustainability.



Websites worth visiting in relation to water issues include the following:

- The website of the Peruvian National Superintendence of Sanitation Services (SUNASS) published its **annual report on regulatory benchmarking** which includes the performance assessment results for the fifty drinking water and sanitation companies operating in Peru (<http://www.sunass.gob.pe>).
- **H2O Gestión del agua** is a journal for experts in the water sector (https://issuu.com/helios_comunicacion).
- The Mexican Institute of Water Technology (IMTA) recently published a book titled "**Huella Hídrica en México: análisis y perspectivas**" (*Water Footprint in Mexico: analysis and perspectives*) which addresses the general components of

the water footprint and its global implications, especially its impact on specific regions and products of Mexico (<https://www.imta.gob.mx>).

- Issue 241 of Revista ACODAL, the journal of the Colombian Association of Sanitary and Environmental Engineering, includes an interesting article on "**SDG 6, water and sanitation ... ¿how to measure it in Colombia?**" (<http://www.acodal.org.co>).
- The **Agua-Andes Programme** is an initiative that seeks to generate methodologies and results stemming from the study of the headwaters of the watersheds in the Peruvian Andes, where water availability has fallen and drought risks have increased (<http://agua-andes.com>).
- The Drinking Water and Basic Sanitation Regulation Commission (CRA) of Colombia approved Resolution No. 781, of 22 December 2016, in which **efficiency indicators and criteria are determined, the non-compliance of which will be grounds for CRA to order municipalities to transfer the provision of services to a third party**, according to risk ratings published by the Superintendence of Public Utilities (<http://www.cra.gov.co>).
- As part of the United Nations Harmonization Project, the **UN-Water website** has a new look, functions and updated content (<http://www.unwater.org>).
- The **Argentine Institute of Snow and Glacier Research and Environmental Sciences** (IANIGLA) is responsible for the inventory and monitoring of the state of glaciers and the periglacial environment (<http://www.mendoza-conicet.gob.ar>).
- In Peru, the **National Strategy for the Improvement Water Resources Quality** was approved as an instrument to promote and guide structural and non-structural actions required for the recovery and protection of water resource quality (<http://www.ana.gob.pe>).
- The Global Water Initiative (GWI) West Africa has released an animation explaining how policymakers can work with local communities to **protect the rights of people affected by large dams** in West Africa (<https://www.iied.org>).
- The objective of **The Foundation International Groundwater Resources Centre** (FCIHS) (<http://www.fcih.org>) is to promote and advise on every type of activity in the field of hydrology and specifically with regard to groundwater hydrology. Research and development lines within FCIHS range from hydrogeological exploration, conducting inventories and hydrochemical and isotopic studies, to conducting numerical transport and flow models, and their implementation in the protection, management and planning of water resources.
- **Agualimpia** is a non-governmental organization that facilitates the coordination between local and regional governments, the private sector and communities for the implementation of sustainable drinking water and sanitation systems in vulnerable areas in Peru. Its main lines of action are: training local governments; generating awareness among the population, teaching community and social organizations hygiene practices; conducting technical studies; strengthening communal organizations that provide water services; facilitating access to microcredit for drinking water and sanitation services; and managing the water footprint (<http://agualimpia.org>).
- According to the **UN-Water Global Analysis and Assessment of Sanitation and Drinking-Water** (GLAAS) 2017 report, countries have increased their budgets for water, sanitation and hygiene at an annual average rate of almost 5% over the last three years. Yet, 80% of countries report that water, sanitation and hygiene financing is still insufficient to meet nationally-defined targets for these services (<http://www.unwater.org>).
- The study "**Retos de las empresas públicas de agua en América Latina para el financiamiento de infraestructuras eficientes y resilientes**" (*Challenges of public water utilities in Latin America in financing efficient and resilient infrastructure*) of the United Nations Development Programme (UNDP) and the United Nations Environment Programme (UNEP), focuses on the obstacles that could prevent investment in energy efficiency and resilience measures. It also includes an analysis of the financing mechanisms for these measures (<http://www.latinamerica.undp.org>).
- The Dominican Republic established the **Water Coordination Group** as a body responsible for intersectoral coordination mandated to design and approve a comprehensive strategy for water management, with an aim to preserving the quality and quantity of water resources required for sustainable development. It is chaired by the Ministry of Economics, Planning and Development (MEPyD) (<http://economia.gob.do>).
- Issue No. 71 of **Revista Agua y Saneamiento**, the journal of the National

Association of Water and Sanitation Companies of Mexico (ANEAS), includes three articles that we highlight: “*Reflexiones en torno al tratamiento de aguas residuales en el país*” (*Reflections on wastewater treatment in Mexico*), “*Impulso a la regulación y mejores servicios públicos de agua en EDOMEX*” (*Driving regulation and improved public services in EDOMEX*) and “*Aguas residuales desde la óptica del Programa Hidrológico Internacional*” (*Wastewater: the view from the International Hydrological Programme*) (<http://www.aguaysaneamiento.com>).

- The **Office of the Ombudsman** in Peru (<http://www.defensoria.gob.pe>) issued its recommendations for improving actions by drinking water and sewage services companies when facing natural disasters and extreme weather events.

United Nations World Water Development Report

As in previous years, our division collaborated in the elaboration of the United Nations **World Water Development Report, 2017 “Wastewater: the Untapped Resource”** (<http://www.unesco.org>). The report demonstrates how improved wastewater management generates social, environmental and economic benefits essential for sustainable development and is crucial for the achievement of the 2030 Agenda for Sustainable Development. In particular, it seeks to inform decision-makers, governments, civil society and private sector, about the importance of managing wastewater as an undervalued and sustainable source of water, energy, nutrients and other recoverable by-products, rather than something to be disposed of or a nuisance to be ignored. The

report’s title reflects the critical role that wastewater is poised to play in the context of a circular economy, whereby economic development is balanced with the protection of natural resources and environmental sustainability, and where a cleaner and more sustainable economy has a positive effect on the water quality.

Publications



Recent publications of the Natural Resources and Infrastructure Division on water resources management and provision of drinking water supply and sanitation services:

- “*El Nexo entre el agua, la energía y la alimentación en América Latina y el Caribe: planificación, marco normativo e identificación de interconexiones prioritarias*” (*The water, energy and food Nexus in Latin America and the Caribbean: planning, regulatory framework and identification of priority interconnections*) (*Natural Resources and Infrastructure Series No. 179, LC/TS.2017/16, March 2017*) by Antonio Embid and Liber Martín. This document analyses the water, energy and food Nexus in Latin America and the Caribbean, focusing on the current state of affairs, planning for its implementation, the coordination of the regulatory framework and the identification of priority interconnections in the region. Starting with a revision of background information on the Nexus concept and its global

configuration, the study considers the main aspects of the current state of affairs in the region. Other important elements are taken into account, such as the connection of the Nexus approach and the SDGs, as well as the financial aspects related to its components and their importance in the risk society. The document later analyses the features of the Nexus approach in the region, identifying the main difficulties for its implementation, its insertion in the human rights legal framework and the definition of legal priorities for the use of water. Looking at the different interconnections (between water and energy, water and food, food and energy, and between water, energy and food), the study identifies the interrelations considered critical or a matter of priority for the region, especially: hydroelectric power generation, mining and oil, expansion and modernization of irrigation, overexploitation of aquifers, agriculture and food, drinking water and sanitation services, and biofuels. The document’s conclusions include a series of institutional, organizational and sectoral proposals to be considered and possibly implemented by the countries of the region. It identifies a select group of public policy instruments as important for the implementation of the Nexus approach in Latin America and the Caribbean.

The publications of the Natural Resources and Infrastructure Division are available in two formats: (i) electronic files (PDF) which can be downloaded from <http://www.eclac.org/drni> or requested from andrei.jouravlev@cepal.org; and (ii) printed (hard) copies which should be requested from the ECLAC Distribution Unit (either by e-mail to publications@cepal.org, or by mail to ECLAC Publications, Casilla 179-D, Santiago, Chile).

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