

DRINKING WATER: AN OVERVIEW OF THE HUMAN RIGHT TO SAFE DRINKING WATER IN MEXICO

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ABSTRACT

Good management of the water resource to guarantee water security in terms of quantity, quality and protection against droughts and floods, is transversal to all aspects of economic development. Solutions must be adapted to the local conditions in each country, basin, city, project or management area, in order to ensure the fulfillment of the human right to safe drinking water, sanitation and healthy environment for water. Mexico has irregular human settlements in urban, rural, ejidal and communal areas, which demand an increase in potable water and sanitation services, which, adding the regularized population, generate a demand for water that the water operation system must meet. To safeguard society from this problem, it is necessary to have good planning, have control establishing priorities in drinking water services, such as: failures in water distribution networks for human consumption, redesign of infrastructure to react adequately in events such as earthquakes, droughts, floods, climate change, population growth (sample aqueducts, dams and treatment plants); quality control of drinking water, institutional capabilities, development of technology, etc. That is, water problems are not just hydraulics, hydrology, water quality, irrigation and drainage, economy problems, etc., but they are also social and human resource training issues. This paper addresses an approach that starts with water security to achieve the fulfillment of the human right to water. Mexico has several institutions working on this issue, through some indicators, it is expected that in the short term, there will be many advances in this issue.

Keywords: water, water security, human right to water and sanitation, water school.

1 INTRODUCTION

In Mexico there are irregular human settlements in urban, rural, ejido and communal areas, which demand an increase in potable water and sanitation services, which, adding them to the regularized population, generate a water demand that Drinking Water and Sanitation Operating Agencies (OOAyS by its acronym in Spanish) – main providers of these services at the municipal level – must attend. To safeguard society from this problem, it is necessary to have a good planning, have control establishing priorities in drinking water services, such as: Failures in water distribution networks for human consumption; redesign of infrastructure to react adequately in events such as earthquakes, droughts, floods, climate change, population growth: aqueducts, dams and treatment plants; registration of the population to attend; quality control of drinking water; action protocols; institutional capabilities; conduct research; develop technology; form necessary human resources for this change, etc., similar to what is observed in Fig. 1.

That is, water problems are not just theoretical and engineering issues on topics such as hydraulics, hydrology, water quality, irrigation and drainage, economy, etc., they are also social and human resource training issues. To the extent that from all these areas the human right to water is addressed, greater compliance will be achieved. The Mexican Institute of Water Technology (IMTA, by its acronym in Spanish), for the moment, apart from the hydrological-hydraulic aspect, addresses social, economic and professional capacity development issues. The purpose of this work is to visualize Mexico's efforts to implement



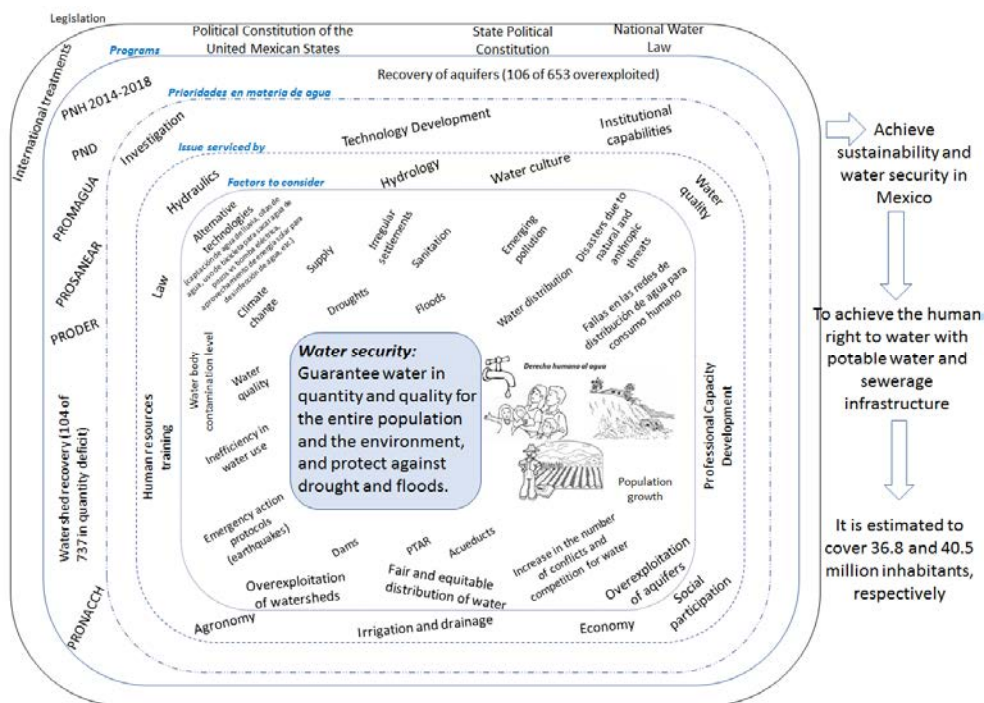


Figure 1: Conceptualization of the problem to set priorities and planning activities.

the Human Right to Water and Sanitation (HRW&S) through the premise that by ensuring water security and a good water culture, it would be easier to implement HRW&S.

2 METHODOLOGY

In order to reach our proposal, we established three aspects: 1) study a comprehensive vision of water security to guarantee the human right to water and sanitation; 2) analyze the recommendations by the special rapporteur on human rights to drinking water and sanitation of the United Nations; and 3) establish the challenges of OOAYs to comply with the human right to water and sanitation.

2.1 A comprehensive vision of water security to guarantee the human right to water and sanitation

Water security here is considered as guaranteeing water in quantity and quality for the entire population and the environment, and protecting them against drought and floods [1]. Fig. 1 shows a scheme of how, based on water security, the fulfillment of the human right to water is hoped to be achieved, considering five levels of priority grouping, where order one (or the most external level) is the legislation that includes international treaties, the political constitution of the United Mexican States, state political constitutions, and the National Waters Law.

Secondly, there are the programs designed by the Mexican government for the attention of the water issue that includes the National Development Plan (PND), the National Water Program (PNH), the Wastewater sanitation program (PROSANEAR), the Program of Return

of Rights (PRODER), the National Program against Hydraulic Contingencies (PRONACCH), studies for the recovery of watersheds (of which 104 of 737 are in deficit), and technical studies for the recovery of aquifers (of which 106 of 653 are overexploited), among others.

Thirdly, there are *water priorities* that include, among others, technology development, research, and a revaluation of institutional capacities. In the fourth level of nesting *the problem addressed from the point of view of the sciences* that study it such as hydrology, hydraulics, water quality, agronomy, irrigation and drainage, economics, law, water culture, social participation, development of professional skills, training of human resources, etc.; and finally, the *factors to consider* such as inefficiency in water use, overexploitation of watersheds, fair and equitable distribution of water, population growth, overexploitation of aquifers, increase in the number of conflicts and competition for water, emerging pollution, level of contamination of water bodies, climate change, droughts, floods, disasters due to natural and anthropic threats, irregular settlements, failures in water distribution networks for human consumption, supply, sanitation, water quality, wastewater treatment plants (PTAR), water treatment plants, dams, aqueducts, emergency action protocols (earthquakes), alternative technologies (rainwater harvesting, water pots, bicycle use to draw water from wells vs. electric pump, use of solar energy for water disinfection, etc.).

2.2 Analyze the recommendations by the special rapporteur on human right to drinking water to drinking water and sanitation of the United Nations

To this vision is added the series of recommendations on the fulfillment of the human right to water and sanitation issued by the special rapporteur on human rights to drinking water and sanitation of the United Nations [2], in his assessment of the situation in Mexico in May 2017 (Fig. 2), some of which are mentioned below.

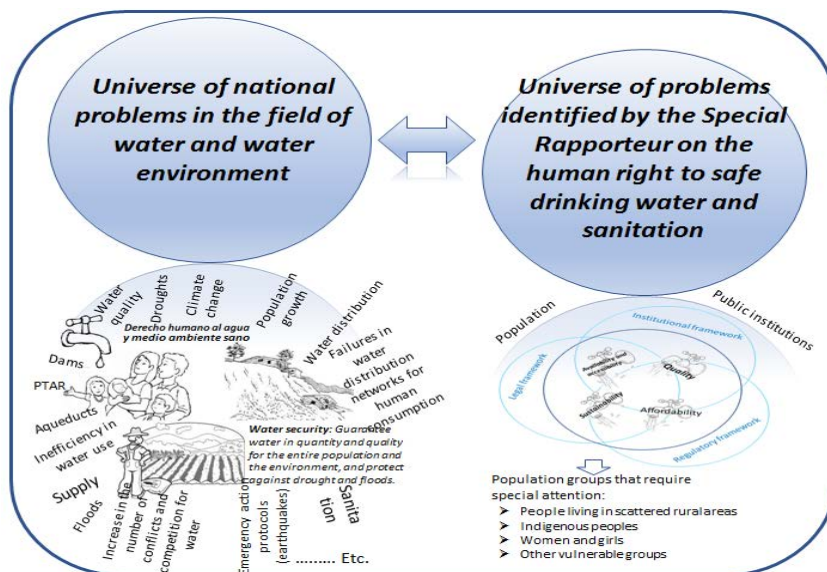


Figure 2: Problem identified regarding the management of the water resource, based on observations of the Special Rapporteur on human rights to drinking water and sanitation.

Availability and accessibility: (a) Avoid claiming official coverage figures that are misleading and may delay the application of essential measures to improve services and access to drinking water and sanitation; (b) An alleged good performance should not be used to justify the large reduction in the water and sanitation budget in 2017; (c) The human right to water and sanitation requires that the domestic needs of all people, families and communities be the first consideration and receive the highest priority among the various uses of water, as also explicitly required in the National Water Law (LAN); (d) The inequalities in the water supply in the city are related to the level of wealth. Human rights to water and sanitation (DHAYs by its acronym in Spanish) must be met, respected and protected for all members of society, regardless of their social and economic status and the situation of their home. Irregular settlements must be formalized and water and sanitation services delivered to these locations; (e) The human right to sanitation does not necessarily require collective solutions, but it establishes the obligation of governments to support individual solutions to meet the requirements in terms of hygiene, health and the environment; (f) There is a collapse of sewerage networks or insufficient funds: costly wastewater treatment plants that are not in operation due to lack of maintenance and resources for its operation.

Quality: (a) Update the current standard, in a rigorous, open and participatory manner, to allow more adequate monitoring and supervision of drinking water and aimed at health protection; (b) Relying on bottled water impairs accessibility and affordability of the water supply; (c) Ensure that the program of using the income obtained from the soft drink tax continues to be implemented, to support the installation of drinking water sources in public schools. Initiative with support of the General Law of Educational Physical Infrastructure; (d) Strengthen the quality control of the water supplied by the suppliers. More thorough quality monitoring. Water authorities and providers must guarantee the right to information and provide systematic information to users about the quality of the water they consume, regardless of the individual requests or complaints received. A national guideline on that issue would be very positive.

Affordability: (a) The financial sustainability of the water and sanitation system is essential and depends on an appropriate system of water rates, but it is essential to ensure the comprehensive maintenance of services for people with lower incomes or those living in poverty; (b) Often the poorest pay more for water and spend more time and energy to get it (they use alternative – expensive – ways to get water: bottled water, tank trucks and informal suppliers); (c) There is no definitive legal safeguard that prevents disconnection due to lack of economic capacity to pay; (d) The revised national legislation on water and sanitation services must include a provision that clearly prohibits the disconnection of users who do not have the financial capacity to pay the bills corresponding to those services; (e) In some places there is fraud, since houses are sold without having the necessary permits to access services and supplies, an unacceptable fact in the fulfillment of the human right to water and sanitation.

Sustainability: (a) There are cases of costly infrastructure projects for water supply, sewerage and wastewater treatment executed by federal and state authorities. They stop working quickly due to lack of maintenance and trained personnel, as well as the high costs required for energy and maintenance; (b) Several PTAR that are not in operation, causing a major problem of contamination of water sources. No appropriate solution is contemplated for residents, and local authorities expressed frustration and highlight their lack of ability to address the issue due to lack of financial and technical resources and not having sufficient support from state and federal governments.



Population groups that require special attention: (a) People living in scattered rural areas should be considered; indigenous peoples; women and girls; other vulnerable groups (homeless); (b) The amendment to article 4 of the Constitution added the sixth paragraph to recognize the human right to water [3], [4], recognizing that everyone has the right to access, dispose and sanitize drinking water for personal and domestic consumption, in a sufficient, healthy way, acceptable and affordable, as a human right to water, in said decree it was established that Mexico would have 360 days to issue a General Water Law, which is still pending today.

Fig. 3 shows the series of legislative review, which is necessary to be able to carry out a proposal for a General Law on Access, Disposal and Sanitation of Drinking Water, so that this proposal makes it easier to comply of the aforementioned human rights in the field of water.



Figure 3: Legislation by scope in the subject of human right to water and sanitation in Mexico.

The General Water Law that mandates the transitory article 3 of the decree that amended the Constitution refers only to the human right to water for domestic and personal consumption. The human right to water needs to establish public policies that organize its progressive realization. Its elements must correspond to dignity, life and human health, whose main factors are the following: (a) Availability, (b) Quality, (c) Accessibility (physical accessibility, economic accessibility, non-discrimination, access to information).

While Mexico determines the amount of water associated with the human right to water, it is suggested that the first 35 l/hab/day be charged so that they are available to any citizen – including those of the first decile of income – and, from that volume, the price of water includes not only the direct cost of providing a citizen service, but also the environmental cost and the opportunity cost of the water itself, as well as the direct or cross-subsidies necessary to support the families of less economic resources, the maintenance cost of the

hydraulic infrastructure and the financial cost to expand the coverage and improve the quality of the domestic public service of drinking water and sanitation [5].

2.3 Establishment of challenges of OOAYs to comply HRW&S

In Mexico, the Drinking Water and Sanitation Operating Agencies (OOAYs) are responsible for the distribution of the vital liquid to the inhabitants of a city, municipality or locality. This activity implies big challenges of OOAYs. This function requires trained personnel to operate the infrastructure to provide the corresponding services, as well as adequate infrastructure, tools and equipment. In Mexico, the National Water Commission (CONAGUA by its acronym in Spanish), with the support of IMTA, developed and implemented the concept of the Water School from 2016, an intensive program that seeks to professionalize the personnel of the subsector institutions, in order to improve the capacities of both OOAYs personnel, authorities in different fields (federal, state, municipal) and citizens, in aspects that we must improve in order to reach a balance that allows the flow of activities under full awareness of the consequences that will exist in case any of the entities involved does not comply with their share.

From the awareness that every citizen should have about the care for their water, that is, having the knowledge of water management from the source of origin to the tap in a house, through the operating part of the OOAYs, to the making of public policy decisions that authorities from their field must make for the benefit of all citizens, will therefore result in compliance of the human right to water and sanitation.

Initially the program was developed under six themes identified as priorities: (1) Analysis of costs and fees for services; (2) Energy efficiency; (3) Management and operation of wastewater treatment plants (PTAR); (4) Macro and micro measurement; (5) Commercial system; and (6) Operating system, drinking water supply subsystem.

As of 2017, the program was reinforced with more topics contributed by IMTA, allowing different actors to have a greater spectrum of possibilities to meet their professionalization needs.

Fig. 4 shows in a schematic way, the integration of the benefits of the dissemination of knowledge that the Water School offers, with the challenges that OOAYs face in fulfilling the human right to water and sanitation, through quality services. Listed below are the issues that at the Water School has addressed and offered to OOAYs personnel and the objective they pursue [6].

Water and Education: Oriented to raise awareness and teach various aspects of water and its importance for the maintenance of life, health, food production and for all economic activities, emphasizing the need to take care of it and use it responsibly. It covers teaching strategies, physical and chemical properties of water, importance of water for life and terrestrial systems.

Analysis of costs and fees for services: Oriented to identify, calculate, project and design, cost structures and tariff structures (with accounting, financial and consumption information), to establish strategies and actions that increase physical and commercial efficiencies, with a tendency to achieve a survival financial coverage (rates/costs).

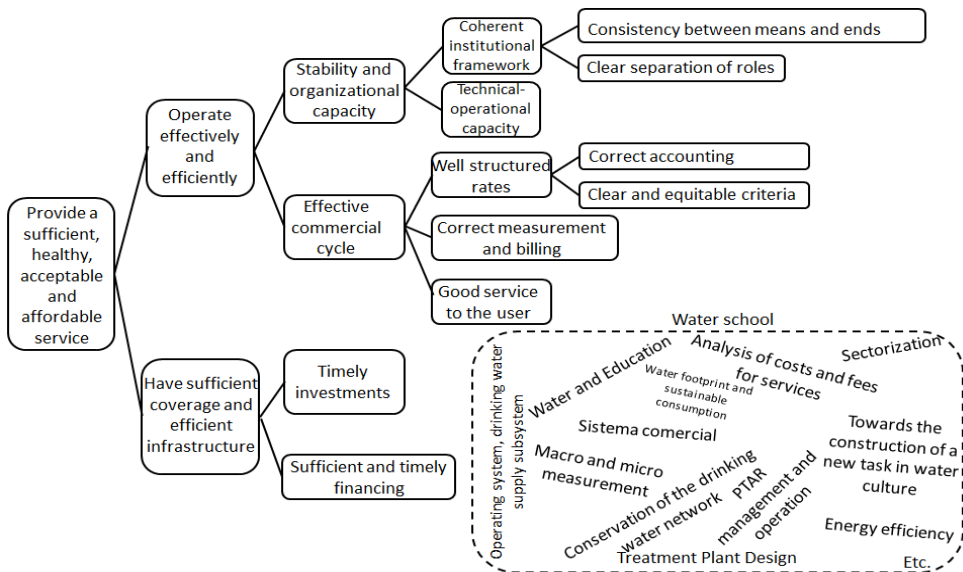


Figure 4: Challenges of the drinking water and sanitation operating agencies to meet DHAS and courses aimed at addressing them. (Source: Generated from [7].)

Attention to users in the request for services: in water management entities: know and apply the techniques and procedures for the detection of the needs and attention of a user of drinking water services, as well as for the collection and administration of information Documentary generated during the attention of the services offered, which allows to offer a quality service, with the aim of obtaining the certification in the Competition Standard EC0153.

Conservation of the drinking water network: Know the main components of a drinking water network, have the elements to prepare the workplace for the maintenance of the drinking water network and apply the necessary techniques to repair and install pipes and fittings of the drinking water network. The lack or failure of organizations in the maintenance of the water supply and distribution infrastructure, increases the OOAYS activities and has a strong impact on the quality of services and prices offered to the public, in addition to shortening the useful life of the infrastructure, with the aim of obtaining certification in the Competition Standard EC0141.

Quantification of drinking water consumption with measurement: reinforce knowledge to prepare documentation and equipment for the determination of drinking water consumption with measurement and to record the reading for the determination of drinking water consumption with measurement, in order to obtain the Certification in the Competition Standard EC0140.

Design of treatment plants: Know the elements to consider in the design of wastewater treatment plants, taken at the start of the design expense. Currently, due to population growth, as well as changes in lifestyle, the wastewater produced is of a very diverse type and demands more complex processes for its treatment.

Energy efficiency: Know, analyze and evaluate the most common problems related to energy saving and efficient use of resources that a pumping station has to reduce bill payments with excessive costs for consumed electricity. The technical specifications,

measurement methods, test requirements, pumps and motors selection, efficiency prediction, factors that affect efficiency and those that increase it are described.

Management and operation of wastewater treatment plants (PTAR): Know the legal framework (NOM 01 SEMARNAT 1996, NOM 02 SEMARNAT 1996, NOM 03 SEMARNAT 1996, NOM 04 SEMARNAT 1997, NOM 14 SEMARNAT 2003 and NOM 15 SEMARNAT 2007), the quality parameters, the importance of wastewater sanitation, the reuse alternatives of these and the generated sludge; as well as the most adequate and efficient operating conditions of a treatment plant.

Towards the construction of a new task in water culture: Reflect on the work of the institution regarding the promotion of water culture, exploring conceptual and methodological tools to strengthen its work in the field. Environmental education concepts. Institutional and citizen practices on water culture, sustainable practices of water management, guiding principles on environmental education and water culture, such as: The earth charter; pillars of education; education for world citizenship and new water culture; the human right to water; techniques for evaluating the impact of water culture programs.

Water footprint and sustainable consumption: Understand the concepts and importance of “virtual water” and the “water footprint” (green, blue and gray) of a product, of the consumer, of a company, etc., as well as the global dimension of water management, derived from the trade of products with high water requirements; and the need and importance of sustainable consumption and reflect on the actions to be taken to achieve it.

Installation of the household drinking water: Strengthen the knowledge to perform the installation of household drinking water supply, which includes preparing the documentation, materials, tools of the household outlet, placing the household outlet, testing and delivering the household outlet, with the objective of obtaining certification in the Competence Standard EC0237.

Macro and micro measurement: Know the different measurement systems, the instruments used and their applicability according to the physical conditions of the water, the users and the conditions of the environment, as well as know the national process of certification of meters (national meter standard NOM-012-SCFI-1994 and complementary standards NMX) and its comparison with international standards (international meter standard ISO-4064-1 fourth edition 2014-06-01).

Promotion of water culture: Have knowledge and theoretical–practical elements that will apply in water culture actions, with the aim of obtaining certification in the EC0180 Competence Standard.

Sectorization: Apply the tools to develop a sectorization program for drinking water distribution networks. Criteria for tracing hydraulic sectors; Field actions to sectorize; Water outlets to another sector; Flow, pressure and residual chlorine measurement; Know the volume injected into the sector; Calculate the efficiency of the sector and compare with the theoretical; Determine the actions to be taken to improve efficiency.

Commercial system: Provide knowledge for the promotion, sale and collection of services and the expansion of the user market. Obtain the optimum economic performance of the services, by selling and charging as many users as possible. The above includes the subsystems of marketing, user registration, determination of consumption, and billing and collection.

Operating system, drinking water supply subsystem: Know the main elements of an efficient supply system, detect anomalies and propose your infrastructure operation improvement plan, highlighting the immediate, medium and long-term actions, with their corresponding investments.

All this training or improvement of the competences to the personnel, is focused to standardize the capacities of the technical and operative personnel of the institutions that provide the drinking water and sanitation services of the country.

3 DISCUSSION

All those findings, the complex point of view of water security, the precisions of the ONU's rapporteur, and the water culture that OOAYS has implemented inside their offices, allow us to notice and recognize the benefits of public websites on evaluation of the Human right to water and sanitation and healthy environment in Mexico, which has been increasing the number of indicators to evaluate this human right.

In the proposal of the National Water Program (PNH 2019-2024), the first objective was to progressively guarantee the human right to water and sanitation, especially to the most vulnerable populations. Measuring the degree of compliance with the human right to water, sanitation and healthy environment in Mexico, is an issue of which at least three institutions have carried out actions in regard to and published their information on public websites, and correspond to: (1) The citizen initiative and social development (INCIDE social AC); (2) The Ministry of Governance; and (3) The National Human Rights Commission (CNDH).

The social INCIDE A.C. publishes the Observatory of social policy and human rights, and in the field of water includes the indicators called the human right to water and the human right to a healthy environment, on its website <http://observatoriopoliticasocial.org/derecho-a-la-agua/>, both are grouped into indicators of accessibility, availability, quality and affordability, although not all groups of indicators are developed, as seen in [8]. In addition, in the right to a healthy environment, such as quality indicators include air pollution issues. INCIDE A.C. publishes the next indicators:

Accessibility (right to water): (a) Population coverage with drinking water (%); (b) Origin of drinking water supply in housing 2016 (%); (c) Origin of drinking water supply in housing by federative entity 2016 (%); and (d) Provision of rooftop tank 2016 (%).

Availability (right to water): (a) Periodicity with which homes receive drinking water 2016 (%); (b) Frequency with which homes receive drinking water by state 2016 (%); (c) Concession volume of water for consumptive use (%).

Accessibility (right to a healthy environment): (a) Population coverage with drinking water (%) and (b) Forest and forest area (hectares).

Availability (right to a healthy environment): (a) Average natural water availability per capita; (b) Frequency with which homes receive drinking.

Quality (right to a healthy environment): (a) Daily per capita generation of urban solid waste; and (b) Mexico's position within Organization for Economic Cooperation and Development (OCDE) countries on the environment issue of the OCDE Index for a Better Life.

The Ministry of Governance publishes the National System for the Evaluation of the level of compliance with Human Rights (SNEDH), on its website <https://snedh.segob.gob.mx/>, where one of the five rights groups is Law to the Environment, as seen in [9], addressed in five categories: Receipt of the right, financial and budgetary context, state capabilities, equality and non-discrimination, access to public information and participation, and, access to justice. In each category it classifies in structural, process and result indicators. Grossly, its matrix of indicators includes areas such as: (a) Population with piped water; (b) Population with improved sanitation service; (c) Ecological risk; (d) Sustainability of protected areas; (e) Environmental budget; (f) Energy production and renewable sources; (g) energy service, etc.



For its part, the National Human Rights Commission publishes the National Human Rights Violation Alert System, on the website <http://appweb2.cndh.org.mx/SNA/> [10], however, it is in the process of generation and publication of indicators for the evaluation of compliance with the Human Right to Water, Sanitation and Healthy Environment in the field of water.

4 CONCLUSIONS

In this study, an approach that begins with the water security is approached to achieve the fulfillment of the human right to water, passing through elements of improving the capacities of the personnel of the institutions that provide drinking water and sanitation services, through the “Water School”, that has come to strengthen the knowledge of water administration from the source of origin to the faucet in a dwelling, through the operative part of the operating agency until making large public policy decisions that the authorities from their field must take for the benefit of all citizens and as a result of, comply with the human right to water and sanitation.

Mexico has several institutions working on this issue, through some indicators that focus directly on the issue of the human right to water and sanitation, these being structural, process or results, as seen at Public websites on evaluation of Human right to water and sanitation and healthy environment in Mexico; Given the objective one of the PNH 2019–2024, it is expected that, in the short term, there will be many advances in this issue.

It is important to focus on the information hidden, implicitly, inside an indicator published by those institutions, that data could help us build new indicators.

There is a lot of work to be done, the efforts identified are still insufficient if we look at the universe of actors and institutions involved, the operating time that some programs carry, their scope often limited in terms of the amount of resources or the capacity of some institutions to join the programs.

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