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Challenges surrounding Integrated Water Resources Management in Guatemala

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EN | Abstract:
Water has a fundamental role in all areas of life as it is a vital resource for the life and development of any country. Environmental analysts in Guatemala state that there is enough water, but they warn there is little capacity for its management. One of the Sustainable Development Goals, specifically the one related to ensuring access to water and sanitation for all, is to "implement integrated water resources management at all levels, including through transboundary cooperation as appropriate" by 2030. This research approaches an overview of the legal and institutional situation in Guatemala that shows the fragmentation of the legal framework and lack or overlaps of institutional functions to guarantee integrated and sustainable water resource management. In summary, in the context of Integrated Water Resources Management, it is necessary to generate reliable information systems on the sources and uses of water, develop public investments to make water accessible, a territorial approach of hydrographic basins entails Guatemala, conflict analysis to establish the dialogues to develop an integrated legal framework and consider the role of municipalities whose responsibility is to ensure the drinking water and sanitary services of their jurisdiction.

Keywords: *water, water management, Guatemala, IWRM, legal framework, public policies, government, institutions and Sustainable Development Goals, SDG 3, SDG 6, SDG 10, SDG 13, SDG 14.*

ES | Abstract:
El agua tiene un papel fundamental en todos los ámbitos de la vida, ya que es un recurso vital para la vida y el desarrollo de cualquier país. Analistas ambientales en Guatemala afirman que hay suficiente agua, pero advierten que hay poca capacidad para su gestión. Uno de los Objetivos de Desarrollo Sostenible, específicamente el relacionado con garantizar el acceso al agua y saneamiento para todos, es "implementar la gestión integrada de los recursos hídricos a todos los niveles, incluso mediante la cooperación transfronteriza, según proceda" para 2030. Esta investigación aborda un panorama de la situación legal e institucional en Guatemala que muestra la fragmentación del marco legal y la falta o superposición de funciones institucionales para garantizar una gestión integrada y sostenible de los recursos hídricos. En resumen, en el contexto de la Gestión Integrada de los Recursos Hídricos, es necesario generar sistemas de información confiables sobre las fuentes y usos del agua, desarrollar inversiones públicas para hacer accesible el agua, un enfoque territorial de las cuencas hidrográficas que conlleva Guatemala, el análisis de conflictos para establecer los diálogos para desarrollar un marco legal integrado y considerar el papel de las municipalidades cuya responsabilidad es garantizar el agua potable y los servicios sanitarios de su jurisdicción.

Palabras Clave: *Agua, gestión del agua, Guatemala, GIRH, marco legal, políticas públicas, gobierno, instituciones y Objetivos de Desarrollo Sostenible, ODS 3, ODS 6, ODS 10, ODS 13, ODS 14.*

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I.INTRODUCTION

This is how the first chapter of the Popol Vuh, the Mayan holy book, expresses the meaning of water from their own worldview.

> *Nothing was standing, only the calm water, the placid sea, alone and tranquil. Nothing existed. There was only immobility and silence in the darkness, in the night. Only the creator, the Maker, Tepeu, Gucumatz, and the Forefathers were in the water, surrounded by light. They were hidden under green and blue feathers and were, therefore, called Gucumatz. By nature, they were great sages and great thinkers. In this manner, the sky existed and also the Heart of Heaven, which is the name of God, and thus He is called.*
> *Then came the word. Tepeu and Gucumatz came together in the darkness and night, and Tepeu and Gucumatz talked together. They talked then, discussing and deliberating; they agreed and united their words and thoughts [...] Thus it was arranged in the darkness and in the night by the Heart of Heaven called Huracán.*
> *The first is called Caculhá Huracán. The second is Chipi-Caculhá. The third is Raxa-Caculhá. Furthermore, these three are the Heart of Heaven. Then Tepeu and Gucumatz came together; then they conferred about life and light, what they would do so that there would be light and dawn, which it would be who would provide food and sustenance.*

Water has a fundamental role in all areas of life as it is a vital resource for the life and development of any country. It must be managed to benefit the entire population, which implies assuming responsibilities related to its accounting, conservation, and control of adequate use and regulating the assignment of water and use rights.

Resources related to water are under unprecedented pressure in most countries. The world's population is proliferating, and according to estimates, if current practices continue, the world will face a 40% deficit between projected demand and available water for 2030. Today, in 2023, 70% of water extracted globally goes to agriculture (World Bank, n.d.). In that sense, to feed 9 billion people in 2050, it will be necessary for agricultural production to increase by 60% and water extraction by 15%. More than half of the world's population now lives in urban areas. In 2025 around 1.8 billion people will live in regions or countries with absolute water scarcity. According to the United Nations Economic and Social Commission for Western Asia, absolute water scarcity is "an insufficiency of supply to satisfy total demand after all feasible options to enhance supply and manage demand have been implemented. This situation leads to widespread restrictions on water use." Water security is a major issue today and appears to be on the rise in many countries (Food and Agriculture Organization of the United Nations [FAO], 2009).

Currently, there is competition for the multiple uses of water, mainly due to population, energy, and agricultural demands. In some countries, mainly the disadvantaged ones, national policies for developing water resources are incipient, and more water legislation must be needed to

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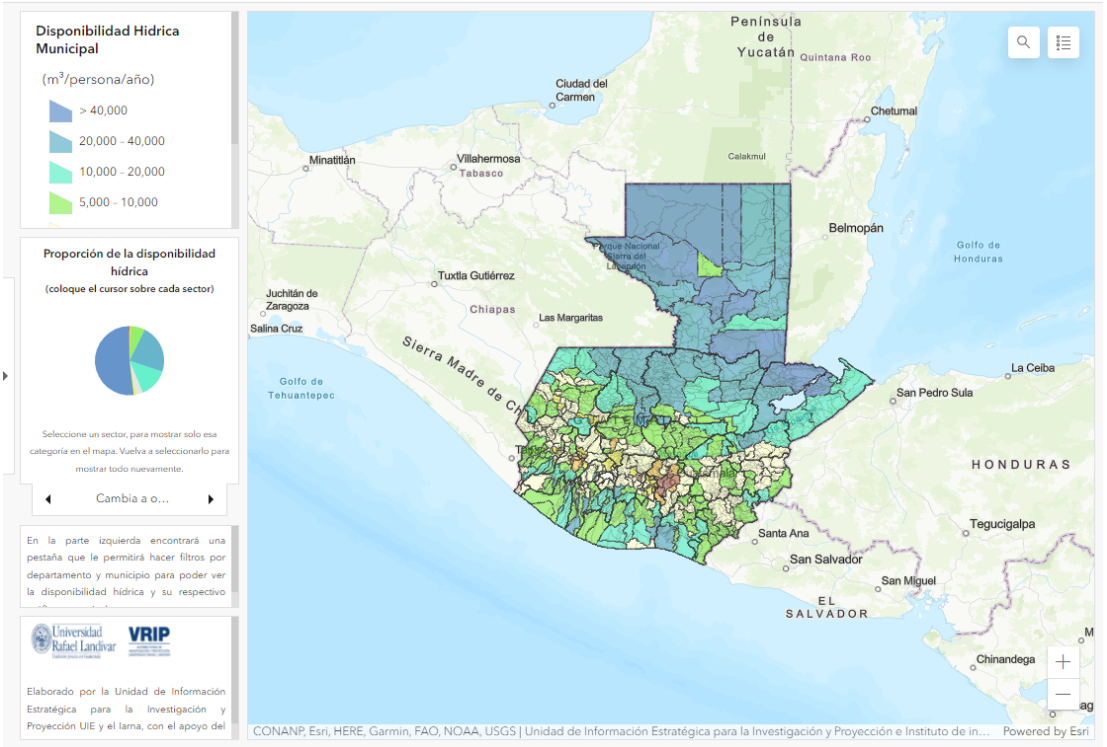
help establish new institutional frameworks for water management. Water constituted as a valuable resource, scarce in time and space, vulnerable to contamination, and sometimes without legal protection measures, requires comprehensive management that is often not included in the practice. Therefore, water handling is conflict management, which allows for addressing the various interests related to the quantity and quality of water. It involves designing and using practical and effective mechanisms to resolve conflicts that arise.

Environmental analysts from Instituto de Investigación en Ciencias Naturales y Tecnología (IARNA), Fundación para el Desarrollo (FUNDESA), and the Asociación de Investigación y Estudios Sociales (ASIES) state that in Guatemala there is enough water, but it warns that there is little capacity for its management. According to the World Resources Institute, Guatemala has a low Water Stress situation when the water demand exceeds the available amount during a specific period. That makes Guatemala not vulnerable at the national level but possibly at the local level, as shown in Figure 1. It estimates that Guatemala's water supply per year is double the world average (33,416 liters/per capita/day) (United Nations Development Program, 2021). However, according to UNPD (2021) and as shown in Figure 1, the spatial and temporal distribution means that in some areas of the country, there is a greater quantity than in others and that in the dry season, the volume of the resource is reduced (in the driest month it reaches up to 5% of the total).

Figure 1. Map of water availability per capita (2022)



Note: Screenshot taken from *Sistema de Información Estratégica (SIE)*, Universidad Rafael Landívar, last actualization April 2022.

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Regarding demand, Guatemala uses 3.32% of the water available, but this indicator does not include regional differences, seasonal variability, accessibility, and management (Plaza Pública, 2019). Additionally, only 5% of wastewater is treated, and when returned to rivers and other bodies of water, they contaminate them.

Suppose Guatemala does not have water stress and is characterized by high availability. Why does this not result in improving the hygiene and health situation of the people, as well as in improving crop yields to ensure food and equitable development? Specifically, why has Guatemala yet to advance in the sustainable development objective of implementing integrated water resources management at all levels?

Part of the answer to these questions is that no legal and institutional framework offers the elements to establish fluid and reliable dialogues around the integrated management of water resources. This research presents the approach to integrated water resources management. Also, the situation in Guatemala of the legal and institutional framework has yet to allow the implementation of this approach.

II. INTEGRATED WATER RESOURCES MANAGEMENT (IWRM)

The various interests related to the use of water pose essential and highly varied challenges that affect decision-making regarding the management of water resources, mainly when it is intended to satisfy, applying sustainability principles established by the Brundtlant Report of the United Nations in 1987, the needs and wishes of different users and interested parties.

The Global Water Partnership (GWP) has defined it as "a process that promotes the management and coordinated use of water resources, land, and related natural resources in order to maximize social and economic well-being equitably without compromising the sustainability of vital ecosystems" (GWP, 2000). This overall vision is called Integrated Water Resources Management (IWRM). As its name indicates, it gives coherence to the interests related to water systems' use, control, exploitation, preservation, and sustainability (GWP, 2000).

This approach seeks to guide the development of public policies on water resources through reconciliation between economic and social development and the protection of ecosystems (Martínez et al., VM., 2018).

IWRM as an acronym and term may have come from establishing the four Dublin Principles, defined at the 1st International Conference on Water and the Environment (CIAMA) held in Dublin, Ireland, in January 1992 (Soláns, 1998). These principles are:

1. Fresh water is a finite and vulnerable resource essential to sustain life, development, and the environment.

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2. Water development and management should be based on a participatory approach involving users, planners, and policy-makers at all levels.
3. Women play a central part in providing, managing, and safeguarding water.
4. Water has an economic value in all its competing uses and should be recognized as an economic good (United Nations, 1992).

Also, the IWRM is an essential target of the Sustainable Development Goals (SDGs). Water has been considered a specific goal in Goal 6: Clean water and sanitation. This goal seeks to guarantee universal coverage of the right to water and sanitation through a more integrated approach than in the Millennium Development Goals (MDG) when considering issues such as water quality, management of water ecosystems, watershed management cross-border, and IWRM. Specifically, target 6.5 states that: "By 2030, implement integrated water resources management at all levels, including through transboundary cooperation as appropriate" (United Nations, n.d.).

In this context, the IWRM is mustered to become a benchmark for the design of public water management models and its institutions at an international level. While more than 80% of countries have laid a solid foundation for achieving at least medium-low levels of IWRM implementation, progress must now accelerate. The overall goal is to achieve "very high" levels of implementation. Table 1 details the level of implementation measures. Countries may need to set specific national targets to drive implementation towards 2030 (United Nations, 2018).

Table 1. Level of implementation of integrated water resources management (IWRM)

Level	Average percentage of implementation of IWRM
Very high	90% - 100%
High	70% - 89.9%
Medium high	50% - 69.9%
Medium low	30% - 49.9%
Low	10% - 29.9%
Very low	0% - 9.9%

The Sustainable Development Goals Report 2020 states that “of the 172 countries that reported in 2018, 60 percent stated very low, low or medium-low levels of implementation”. The report states these countries are unlikely to meet the goal by 2030 unless progress accelerates significantly (United Nations, 2022). The countries classified in the three lowest categories, such as Guatemala, face the challenge of establishing national goals, considering their context (United Nations, 2019).

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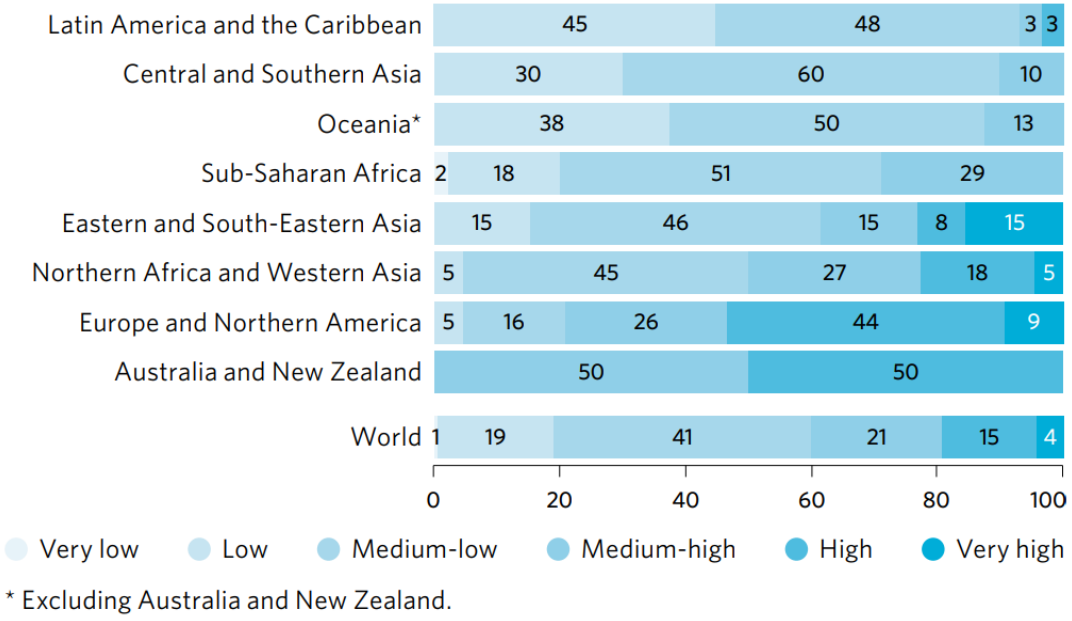
Figure 2. Regions of the World integrated water resources management implementation level, 2018 (percentage).



Note: Screenshot taken from United Nations, *The Sustainable Development Goals Report 2018* (2019, Goal 6: Ensure availability and sustainable management of water and sanitation for all).

In the 2023 report, Guatemala has been classified at a limited level of implementation. Compared to the rest of the Central America Region, Costa Rica has a substantial level of implementation, Honduras has been classified at a moderate level of implementation, and El Salvador shows a limited level like Guatemala. The 2023 report states, "The world must accelerate all aspects of water management, together with transboundary cooperation, to increase its resilience to crises – including climate, health, and poverty."

III. GUATEMALA: INTEGRATED AND SUSTAINABLE WATER RESOURCE MANAGEMENT

In Guatemala, the integrated management of water resources is still emerging. It has many aspects to improve, such as increasing the water supply, irrigation, flood control, and anticipating the unequal availability of this resource in time and space.

The contribution of water to the country's economy is direct. The *Secretaría de Planificación y Programación de la Presidencia (SEGEPLAN)* (2006) estimated that its use participates in 70% of the activities that make up the gross domestic product (GDP).

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The country has public and governmental, global, transversal, sectoral, and institutional policies that address specific aspects related to water, specifically in 2013 the *Política Nacional del Sector de Agua Potable y Saneamiento (Acuerdo gubernativo 418-2013)*. This public policy is the reference framework that establishes the priorities, strategies, and objectives to ensure the Guatemalan population has access to adequate water and sanitation services. It has four axes of execution:

- Services coverage
- Governance
- Integrated and sustainable management of water and sanitation
- Technical, scientific, and technological training

Its main objective is to increase the coverage of drinking water, sanitation, and hygiene services sustainably at the national level. In April 2023, the Ministry of Health and Social Assistance proposed a modernization/update plan for this policy, with which it is expected to have multisectoral support to regulate, legislate, and validate procedures that help improve the sustainability of good water quality and environmental sanitation. However, the documentation about the modernization/update plan of the public policy does not use or mention the IRWH or the SDG as a reference. Instead, it uses the Plan Nacional de Desarrollo K'atun, Guatemala's long-term public policy planning reference.

Furthermore, throughout the country's legal history, the State's response to the legal issue of water has evolved in response to specific needs (laws and sectoral institutions). However, the country has changed, and the legal framework has remained short and inappropriate. It has regulated certain aspects of property, easements, use, development, and water protection without incorporating a special law into the national legal system, as provided in the Constitution (1985).

The legislation related to water needs to be more cohesive and presents numerous overlaps, gaps, and contradictions that make it difficult to govern it adequately. Therefore, for some experts, a general law is necessary that provides legal certainty and allows progress toward IWRM. Since the 1950s, numerous water law initiatives have been presented, but they have yet to pass.

The current Political Constitution of the Republic of Guatemala (Legislative Agreement 18-93, 1993) defines water as a good in the public domain. It also makes an express mandate (Article 127) on creating a water law. This continues to be a pending task (GWP Central America, 2016). A general water law is necessary for the ordering of the resources in the country. It is causing it to become a constraint and a source of conflict instead of being an element of social and economic progress. Without an adequate legal framework, planning and implementing actions to reduce the vulnerability associated with water is challenging, which is an element that concerns all sectors of society. Managing water resources is essential to take adaptation measures to address climate change (Castellanos y Guerra, 2009).

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However, it should be noted that in Guatemala, there are many laws and regulations that a single legal framework will not be able to strengthen the weaknesses of environmental institutions and solve the complexity of current problems. This situation should be considered an opportunity to rethink the ecological model and establish a new social and environmental pact.

An essential element to achieve SDG goals, specifically the one related to the IWRM 6.5, is a proper regulatory framework for the use and management of water. None of the law proposals in the Guatemala Congress about water includes the IWRM approach.

In 2016, *Acuerdo Ministerial 335-2016* was approved under the title: *Normas para Promover la Gestión Integrada de Cuencas a través de la Creación y Operación del Inventario de Usuarios del Recurso Hídrico en las Cuencas Hidrográficas de la República de Guatemala*, which is the most recent ruling, that links to the IWRM of the country. This norm aims to dictate the general provisions to organize and maintain the inventory of individual and legal persons, whether public or private, that use water resources in the different basins in Guatemala. This norm creates a board to coordinate the activities of the integrated basin management. Nevertheless, there is no information about the implementation progress.

To appreciate the fragmentation and overlap indicated, table 1 exposes the current water use regulations in Guatemala.

Table 1. Guatemalan national regulation of water uses.

Use	Regulation	Articles
Human consumption	Código Municipal	Article 68: The municipality's own responsibilities. The powers of the municipality shall be performed by the municipality, by two or more municipalities under agreement, or by a commonwealth of municipalities, and are as follows: a) Household supply of potable water duly chlorinated; sewage; public lighting; markets; slaughterhouses; administration of cemeteries and the authorization and control of private cemeteries; collection, treatment and disposal of solid waste; cleanliness and ornamentation;
	Código de Salud	Section II: Drinking Water (Articles 78 - 91) Obliges municipalities to supply drinking water for human consumption; provides regulations on the protection of water sources and obliges MSPAS, Municipalities and NGOs to establish priorities to attend the regions where drinking water is needed.
Agriculture	Constitución Política de la República de Guatemala	Article 128. Use of waters, lakes and rivers. The use of the waters of lakes and rivers for agricultural, farming, tourism or any other purposes [...].
	Acuerdos Gubernativos	4-72: Irrigation Regulations 18-72: Regulations for the operation, conservation and administration of irrigation districts.

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Use	Regulation	Articles
	Acuerdos Ministeriales	209-89: Creation of the Alto Mongoy, Caballo Blanco and Cuyuta irrigation systems. 183-92: Regulations for the construction, operation, and administration of mini-irrigation systems with surface and subway water use, hydraulic rams, irrigation waters, and multipurpose water reservoirs.
Mining	Código Civil	Article 587. Mining Concession Holders. The mining concessionaires of mining properties, tunnels, and general mine drainage galleries have the ownership of the waters found in their workings, as long as they keep the concession of their respective mines.
	Ley de minería (Decreto 48-97)	Article 71. Use and exploitation of waters. The holder of a mining right may rationally use and exploit the waters as long as it does not affect the permanent exercise of other rights. The use and exploitation of waters that flow within their natural channels or are found in lagoons, which are not of the public domain or of common use, shall be governed in accordance with the provisions of the Civil Code and the laws of the matter. Whoever makes use of the water in his mining operations, when reverting it, must carry out the appropriate treatment to avoid environmental pollution. Chapter II: Legal easements. Articles 77-80. It indicates the legal specifications for the construction of, among others, excavations and water drilling, aqueduct and all those that are necessary based on the corresponding technical studies, including the right of inspection and permanent maintenance. It also specifies the compensation to be paid in advance by the holder of the mining right, to the owner or possessor of the property that must bear the easement, the compensation for damages that are expected to be caused.
Aquaculture and fishing	Ley General de Pesca y Acuicultura (Decreto 80-2002)	It regulates fishing and aquaculture activities in order to harmonize them with the advances of science, adjusting them with appropriate methods and procedures for the rational use and exploitation of hydrobiological resources in public waters.
Transportation	Constitución Política de la República de Guatemala	Article 131. Commercial Transportation Service. It states that all commercial services are of public utility and therefore enjoy the protection of the State. It includes commercial and tourist transportation, whether by land, sea or air.
Wastewater	Código de Salud	Section III: Excreta and wastewater disposal and disposal (Articles 92 -101). Establishes the guidelines for the provision of services and wastewater treatment.
	Reglamento de las descargas y reuso de aguas residuales y de la disposición de lodos (Acuerdo Gubernativo No. 236-2006)	Its objective is to define the criteria and requirements that must be met for the discharge and reuse of wastewater, as well as for the disposal of sludge, in order to establish a continuous process. Specifically: Establishes the maximum permissible pollution limits for the discharge of wastewater Seeks to monitor and control wastewater from sludge treatment and management plants Obliges the country's municipalities and industries to establish their wastewater treatment system or plant

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IV. INSTITUTIONAL FRAMEWORK MANAGEMENT OF WATER RESOURCES IN GUATEMALA

There are several institutions that have competencies in water management, such as:

- *Ministerio de Energía y Minas* [Ministry of energy and mining] (MEM) that authorizes the right to use water sources for hydroelectric and mining.
- *Ministerio de Agricultura, Ganadería y Alimentación* [Ministry of agriculture livestock and alimentation] *(MAGA)*, that authorizes and controls the rights of use for agricultural and livestock irrigation.
- *Instituto Nacional de Fomento Municipal* [Institute of municipalities promotion] *(INFOM)*; municipalities, non-governmental organizations and international aid, that develop water and sanitation projects.
- *Ministerio de Salud Pública y Asistencia Social* [Ministry of Public Health and Social Assistance] *(MSPAS)*, which is in charge of formulating policies aimed at increasing coverage and improving the quality of domestic water services.
- *Ministerio de Ambiente y Recursos Naturales* [Ministry of Environment and Natural Resources] *(MARN)*, with *Consejo Nacional de Áreas Protegidas (CONAP)* and *Instituto Nacional de Bosques* [National Institute of Forest] *(INAB)*, that conserve and protect the resource in bodies of water and water recharge areas, each with different purposes and with very low impact.
- Five (5) basin authorities: Petén Itzá e Izabal (attached to MARN), Amatitlán y Atitlán (attached to vice-presidential) and subasin of río Pensativo (attached to the departmental Government of Sacatepéquez).

Specifically, the institutional framework of MARN has the newly created *"Viceministerio del Agua"*, which is the unit responsible for conducting policies and strategies for the protection, conservation and improvement of the country's water resources (MARN, 2021). This Viceministerio has three (3) dependencies:

- Water Quality Laboratory
- Basin Directorate
- Water Monitoring and Surveillance Directorate.

The current management of water resources reflects, on the one hand, an institutional crisis evidenced by the dispersion of actions across government sectors, institutional gaps, the constant creation of temporary instances, and a lack of programmatic and budgetary coordination. On the other hand, social expressions contrary to government measures adopted under the current sectoral regime related to specific water uses and various conflicts over access to water sources in different parts of the country. The reality of the participation of the different actors in managing water resources is varied, both from the legal and functional perspective, but never inclusive.

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Water management is complex because it is a mobile, spatially, and temporally non-uniform valuable resource for the most varied social needs. Also, this complexity requires certain general activities to be carried out. For example, it requires an institutional framework from which the current water administration needs effective coordination mechanisms. The situation becomes more dramatic when severe overlaps and critical gaps are identified in the contents of multiple government policies, reproducing sectoral visions without including coordination mechanisms.

V. CONCLUSION

In summary, there are some strategic elements that condition the actions to follow regarding the safe supply of the quantity and quality of water for the different users in the context of Integrated Water Resources Management:

- Knowledge of the resource implies the development of reliable information systems on the sources and uses of water.
- Development of public investments to make water accessible signifies, according to ECLAC data for the 2008-2019 period, investment in sources of access to drinking water and sanitation sources in Guatemala has been heterogeneous. In the period, it went from 0.20% of GDP in 2008 to 0.17% of GDP in 2019 (Instituto Centroamericano de Estudios Fiscales [ICEFI], 2021).
- The territorial approach of hydrographic basins entails Guatemala being the country in Central America with a greater proportion of its territory in shared basins, where 25 of its 35 water resources are shared between Mexico, Belize, El Salvador and Honduras. In this context, it has recently been applied the "*Estrategia y plan centroamericano para la gestión integrada de recursos hídricos*" of the Environmental and Development Central America Commission (GWP, 2017).
- Conflict analysis and resolution involves the abuse of power and legal loopholes allowing individuals and communities to dispute control of water sources. The most recurring causes of confrontations are the lack of distribution, the diversion of rivers or the absence of territorial limits due to the lack of a cadastre (Prensa Libre, 2015). For example, Marlin Mine, a gold mine in Guatemala owned by Montana Exploradora de Guatemala, S.A. obtained the extraction license in San Marcos. Also began drilling work to extract water. According to Prensa Libre (2015), the mine operation requires 1.36 million liters of water per day. The company extracts water and has limited the wells in the neighboring communities of Sipacapa and San Andrés Ixchiguán. For this reason, a trial was held in the Latin American Water Court (TLA) and a moral conviction was achieved in 2006. In addition, sugarcane and African palm plantations require constant irrigation, so landowners build containment dams and divert rivers to capture the liquid and irrigate their plantations.

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- Other important elements to consider for IWRM in Guatemala give a hint to the role of municipalities whose responsibility is to ensure the drinking water and sanitary services of their jurisdiction, according to the municipal code. But also they have to work together in the IWRM.

Lastly, "The water market in Guatemala" raises other unaddressed questions for future research matters to deepen, three of them are disclosed: Does the water market already exist? Who controls it? Whose service does it work for?

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