



Best Practices

in the development of the National Water Policy and Action Plan for Integrated Water Resource Management (IWRM) Costa Rica



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Changes in the Development of the National Water Policy and Action Plan for IWRM



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Background

Since 2018/2019, Costa Rica has a National Water Policy and a National Plan for Integrated Water Resource Management, which have governed the work of the Water Directorate of the Ministry of Environment and Energy (DA-MINAE). This Ministry is in charge of water issues and of the institutions responsible for water management within the country. However, the country has a water law that dates back to 1942, which is obsolete considering the current challenges facing water resources and associated ecosystems.

The country has an abundant legal framework on water issues: more than 100 laws and regulations and about 20 institutions are related to the subject. This situation has not contributed to efficient governance, but has led to duplications, overlaps, and gaps that make it necessary to require unified management. This is further proof of the need for a new water law.

In Costa Rica, fees are common for drinking water supply, sanitation, and electricity. These are self-financed by charging for the services that are all public. In addition, a fee is paid for the use of water from natural sources by both public and private users, established by the Water Law of 1942, and for the discharge of wastewater. This is part of the financial resources that have allowed the management and investment of maintenance and repair works. 93.5% of the country's population has access to drinking water

and 99% has access to electricity. The main problem in the country is the limited wastewater treatment system. Here, a coverage of only 14% has been achieved. The individual septic tank system is still at 75%¹.

There is a calculated water supply from 1990 to 2020 of 120.5 km³ and an average availability of 23,666 m³/inhabitant/year, estimated with a base population of 5,094,000 inhabitants and an average annual rainfall of 3,177 mm. This volume is distributed in 34 river basins, organized in five Hydrological Units (HU) with very different characteristics. The largest in area and average rainfall is the Caribbean HU, although it is not the one with the highest runoff. The HU with the highest evapotranspiration is the Tempisque HU and the one with the highest population concentration (56%) and the highest pollution is the Tárcoles HU.

The flow concessioned for all uses at the national level as of 2022 is approximately 31.5 km³/year, which represents 28% of the available water capital, for a total increase of 28% in the last fourteen years, with an average annual growth rate of 1.8%. The largest water use in terms of volume is hydropower with 99.3% of surface water, although it is a non-consumptive use, while in consumptive uses the largest water use is for irrigation in agriculture with 81.3% of surface water, followed by human consumption with only 8.6%. It is these systems that generate the greatest impact on the resource, not only in terms of extraction but also in terms of altering water quality, due to physical aspects (increase in temperature as a result of deforestation of riparian forests, increase in turbidity caused by the contribution of sediments from soil erosion, among others), organic and inorganic pollution (food waste, residues from livestock and agricultural activities, etc.), and microbiological contamination (discharges of human faecal water and water from livestock activity). This reduces the availability of water for its general use, but also for the maintenance of aquatic ecosystems due to the loss of organisms that are sensitive to contamination.

The country has 58 aquifers, of which 34 are coastal, nine are continental volcanic and 15 are continental sedimentary. Progress has been made in studies, monitoring and water balances of the country's aquifers through the Real-Time Groundwater Monitoring System (SIMASTIR), as well as through specific studies and the development of the United States Geological Survey Project (USGS), with this the DA-MINAE can approve water concessions from these sources. The percentage of the total volume of groundwater concessioned in the country is only 0.73% considering all uses and 9.9% considering only consumptive uses, corresponding to 229.6 Hm³ this water source being the main one for human consumption with 73 Hm³, followed by agro-industrial activity with 57.7 Hm³ and then irrigation with 47.4 Hm³.

In the water balance calculations (precipitation, temperature, specific flows, and evapotranspiration) for all the country's river basins and in the analysis of percentage changes in future scenarios of these water balances obtained from the simulations of the climate models and the hydrological model used, there is a tendency towards an increase in precipitation on the Pacific slope in the future. In the Caribbean-north and north zone it tends to decrease. However, this increase is outweighed by the increase in real evapotranspiration (ET) across the country (because of future warming), leading to a significant decrease in future runoff in the North Pacific and the North-Caribbean zone. Water recharge has the same patterns of change as runoff. This will affect the availability of surface and groundwater in the Tempisque HU, being the driest region in the country. In the South Pacific, water availability could increase in the future, with a possible increase in water flows and the risk of an increase in the intensity and/or frequency of floods.

Relevance for Development

The updating of the National Water Policy and Action Plan, generated in a participatory manner, included the development of a diagnosis on the state of water resources and water management. The diagnosis highlights the achievements and progress made, but also the challenges, which were well identified in the research and in the data analysis. Many of them were pointed out by the participants in the activities carried out during the process. These tools recover what is relevant and translate it into a roadmap towards the continuous improvement of the country with interventions directed towards Integrated Water Resource Management

¹ AyA. 2021. Agua para Consumo Humano y Saneamiento en Costa Rica al 2020: Brechas en Tiempos de Pandemia. March, 2021.

requiring integrated solutions, established in axes, objectives, goals, and indicators, allowing for decision making and aligning regulations and institutions that support them, as well as measuring and evaluating progress. They are also integrated into the National Development Plan, with the aim of achieving the 2030 Agenda for Sustainable Development defined by the United Nations.

The Policy Axes and their operationalization through the Plan respond to and contribute to the achievement of the Sustainable Development Goals (SDGs), but more specifically in SDG 6, improving access to drinking water and (waste)water and sanitation services, improved water use efficiency, expanded operational cooperation in transboundary water basins, and the protection and restoration of freshwater ecosystems, with the reduction and control of pollution.

The Plan incorporates those responsible for implementing the actions, by identifying who leads the action, but also including the other institutions that participate, since water resource management is and should be multisectoral.

The challenge

Water, an essential source for all types of life, the health of species (including humans), and social and economic development, is seriously threatened by its reduction caused mainly by change in land use without technical consideration of surface and groundwater sources and the associated ecosystems present. This is generating losses due to evaporation, decreased infiltration for aquifer recharge, increased runoff and all kinds of physical, chemical, and organic pollution from diffuse sources, including soil particles caused by erosion and soil removal, agrochemicals used in agriculture, faecal matter from cattle grazing fields and cities with various types of contamination (faecal, chemical, and organic).

The other reason for the loss of clean water is a pollution generated by urban residences and the high concentration of population, such as agricultural, industrial and tourist activities without adequate wastewater treatment.

In addition to the occasions mentioned above, climate variability and change are two important challenges. Along these lines, according to medium- and long-term scenarios, there will be an increase in temperature, generating greater evapotranspiration in some of the country's Hydrological Units, such as the Tempisque and San Juan Hydrological Units, and greater runoff in the Térraba Hydrological Unit. This will further reduce the availability of water for human consumption, irrigation, and other activities.

Therefore, it is urgent to improve and expand the monitoring of the various hydrometeorological variables, such as precipitation, evapotranspiration, radiation, wind, and flow in all the country's watersheds, as well as the monitoring of the physicochemical and biological quality of the water, in order to keep the water balance updated by watershed and aquifers and thus be able to know the status of water availability to authorize or limit water use.

The management of water resources led by MINAE's Water Directorate has improved with the introduction of technological tools for data management (SINIGIRH), groundwater monitoring (SIMASTIR), surface water quality in the watersheds, as well as revenues from the collection of water use fees and wastewater discharges, and decentralization with the opening of offices in each HU. However, the participation of so many institutions with jurisdiction over water resources makes cooperation complex and sometimes inefficient. It is the municipalities that authorize changes in land use and new constructions or other types of activities, without regulatory plans that consider the basin and water resources.

Water continues to be extracted without the proper authorization by the governing body, MINAE, and pollution continues to be generated by various activities and sources. Control for both is weak and there are no legal tools that allow the judiciary to convict for such causes. This generates distrust in state institutions, but also conflicts between users, as water availability for different uses decreases. Considering the trend, these conflicts could increase.

Investment in advanced wastewater sanitation is still not a priority, so its backlog continues to be a major challenge.

Currently, there is a legal vacuum, with a law which was introduced 80 years ago, and which does not respond to the current challenges of water loss in quality and quantity, increased demand but decreased supply, and serious damage to ecosystems.

It is necessary and urgent to strengthen the governance and governability of the country in terms of water resource management, creating a water sub-sector led by the Minister of MINAE to work in a more articulated, coordinated and analyzing needs, defining priorities, but also ensuring financial resources to strengthen management and continue investing in water infrastructure works. All this could be achieved more agilely with an updated Water Law.

The CReW+ Approach

Change processes supported by CReW+

In order to carry out a water resource management more in line with the needs of the population and more technically correct, with updated information, the DA-MINAE prioritizes **the updating of the National Water Policy (PHN) and the Action Plan for Integrated Water Resource Management (PAGIRH)**. This is financially supported by the GEF CReW+ project.

The GEF CReW+ is a collaborative project funded by the Global Environment Facility (GEF) that is being jointly implemented by the Inter-American Development Bank (IDB) and the United Nations Environment Program (UNEP) in 18 countries in the Wider Caribbean Region. This innovative project builds on the previous successful phase called "The Caribbean Regional Fund for Wastewater Management (CReW)" (2011-2017). GEF CReW+ is being executed by the Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH, the Organization of American States (OAS) and the Cartagena Convention Secretariat (UCR/CAR) on behalf of the IDB and UNEP respectively.

The Global Environment Facility has provided 22 million USD in financial assistance and financial resources and has mobilized nearly 120 billion USD in co-financing in over 5,200 projects and programs. The GEF is the largest trust fund focused on enabling developing countries to invest in nature and supports the implementation of international conventions on biodiversity, climate change, chemicals, and desertification. It brings together 184 governments, in addition to civil society, international organizations, the private sector and allies.

Within this framework, the process of updating the PHN and the PAGIRH, which will be 13 years old in 2021, has been developed. For the implementation of the activities involved in the process updating both products, a bridge of articulation and coordination was managed with the DA-MINAE and the platform of the National Water Governance Mechanism established by Executive Decree No. 41058-MINAE in 2018 which includes three instances: the National Forum (FN), the Regional Forums (FR), and the Water Governance Group (GGA).

There was also a Technical Advisory Group (TAG), in which the National Committee of Hydrology and Meteorology (CONAHYME) participated (Created by Executive Decree No. 39349-MINAE).

In the process of developing the update of both instruments, a mixed methodology was used, integrating quantitative and qualitative techniques, following a process of "triangulation" of the information analyzed from the data collected. This methodology involves: documentary and data research, as well as the collection of interpretations, interests, and meanings of different groups (representatives of society) located and distributed in the 5 Hydrological Units (HU).

Situational Diagnosis of Integrated Water Resource Management in Costa Rica

The first product produced, which served as a basis for identifying the current state of governance, institutional, financial, and technical capacity, and the status of water resources, was the "Situational Assessment of Integrated Water Resource Management in Costa Rica".

The Situational Assessment resulted in a comprehensive document with detailed, in-depth, and updated information, which incorporates the legal framework governing water management in the country, international treaties, laws, decrees, and other legal instruments.

The second chapter of this Diagnosis is the institutional framework for IWRM, which outlines who exercises the stewardship of this water resource and that of all the institutions involved in management, given the competencies designated by their constitutive laws. Therefore, they are part of a Water Subsector that has not yet been formally created in the country. Chapter 2 provides information on the status of the situation of each institution, the progress and limitations in their functions and work. The information was obtained from primary sources through interviews with officials of each of the institutions, but also from secondary sources, through documentary review and web consultations.

The third chapter deals with financing for IWRM, mentioning the economic instruments established as fees, a proposal for a financing model to improve capacity and access to funds for the sanitation sector: the Special Financing Fund for Sanitation (FEFSA) and the tariff model with its various tariffs for public drinking water supply, sanitation, irrigation and water resource protection services, as well as investment plans for these activities and a mapping of various sources of financing, including flood control and hydropower generation.

The fourth chapter treats water resources and associated ecosystems in the country, with details on surface water bodies (hydrological basins) and groundwater (aquifers), lotic and lentic ecosystems, as well as transboundary basins.

The fifth chapter refers to the country's water supply, which is obtained from the modeling for the calculation of natural water balances, based on precipitation, temperature, specific flows, and evapotranspiration calculated for each of the 34 hydrographic basins and by Hydrological Unit. This is the first time in Costa Rica that these balances have been carried out for all the watersheds, as they had previously been done only for 15 of them considered as the priority ones. It is through the balance that the current water supply is obtained, based on hydrological and meteorological data from 1990 to 2020 and the country's population of 5,094,000 inhabitants during that time.

Based on simulations of the climate models and the hydrological model used, the percentage changes of future scenarios obtained from daily values of precipitation, temperature, evapotranspiration and flow of the basins, obtained from the CMIP6 models from 1985 to 2065 were calculated to generate four scenarios: historical (1986-2014), near future (2015-2045), medium-term future (2025-2055) and far future (2035-2065), with future estimates of runoff, current evapotranspiration (ET) and future recharge (R). The historical, near, medium, and future scenarios are centered on the years 1990, 2030, 2040 and 2050 respectively.

Similarly, based on the DA-MINAE water concession database, water demand was calculated by river basin and by water use, detailing the water source according to whether it is surface- or groundwater. This made it possible to determine water uses according to the type of source used.

The sixth chapter deals with water quality and the sources of contamination that affect water sources used for human consumption and those that affect natural water bodies. It also includes the quality monitoring carried out in the country's watersheds and the results based on physical-chemical and biological indicators and all the efforts to protect and recover the diverse quality of rivers, including: the Ecological Blue Flag Program, the Sanitary Quality Seal Programme, the National Strategy for the Recovery of Urban Watersheds - Clean Rivers, the Pact for the María Aguilar, and the protection of water recharge areas and aquifers.

In accordance with the proposed methodology, the diagnosis was carried out through a documentary review, bilateral meetings with delegates appointed by the heads of each of the public institutions responsible for the various water resource management functions, and information received from the institutions. Meetings were also held with the private agricultural and livestock sectors, seeking information on their future projections for crop growth or expansion and in which areas of the country. These inputs were analyzed from different professional perspectives, with the interdisciplinary team of experts of the Consulting Team, from hydraulic civil engineering with expertise in climate change, civil engineering with experience in public works projects, environmental economics, political science, sociology, and biology specialized in water resources, which allowed for a comprehensive understanding of the state of water resource management in the country.

Construction Process of the National Water Policy

The construction of the National Water Policy was based on a participatory process, incorporating the different sectors of society, i.e., public, municipal, academic, civil society and private sectors from all the country's Hydrographic Units. The consultants relied on a preliminary list of stakeholders that the Water Directorate had, which was revised and expanded through stakeholder mapping, including new representatives elected in the Regional Forums, as part of the Governance Group of the National Water Governance Mechanism (MNGA), mayors of municipalities, community water organizations, academic representatives, among others. A total of 668 people were identified prior to the call, 27.4% from the public sector, 36.2% from the civil society sector, 15.6% from the municipal sector, 8% from academia and 12.7% from the private sector. An effort was made to contact all these people to update the contact database with their telephone numbers and e-mail addresses and thus ensure a good call, whose invitations were made with the Woodpecker tool.

This list of stakeholders distributed almost uniformly by each of the five Hydrological Units was made in order to invite them to participate in the Regional Forums in each HU.

The definition of the mapping of stakeholders for the National Forum considered those representatives of all sectors of society whose functions had a national scope of work. However, also included were those appointed in each Forum of each Hydrological Unit as representatives of the Governance Group and some actors that were identified and stood out for their participation and contributions in the regional workshops.

The total number of participants in the Forums was 486, which are 73% of the total number of stakeholders identified before, with the public sector having the highest participation with 33.1%, followed by the civil society sector with 29.6% and the municipal sector with 20.6%. The academia and the private sector had a lower number of representatives.

An effort was made to ensure that all participants contributed with their perception, knowledge, and experience on the state of water resources and their management in each HU, in the joint analysis and in the search for possible solutions to the causes of the problems. The last Forum provided a space for prioritization and reflection from the national perspective.

Organization of the Forums

Due to the COVID-19 pandemic, the first five Regional Forums and the National Forum were held virtually in two sessions of approximately 150 minutes each. The objective of this first cycle of Forums was to obtain inputs from the participants based on their perception of the problems they have with water resources and the analysis of the state of water management. In the first session, the participants were organized into subgroups according to their location in the watershed (upper, middle, and lower part) and in the second session they were organized according to the sector they represent and were also asked to analyze the causes identified for the problems exposed and the possible solutions with emphasis on each Hydrological Unit.

The contributions received in the working groups were recorded in previously prepared matrices, which were then shared with the rest of the participants. All Forums were recorded and transcribed using the **SONIX**® automated transcription service (www.sonix.ai).

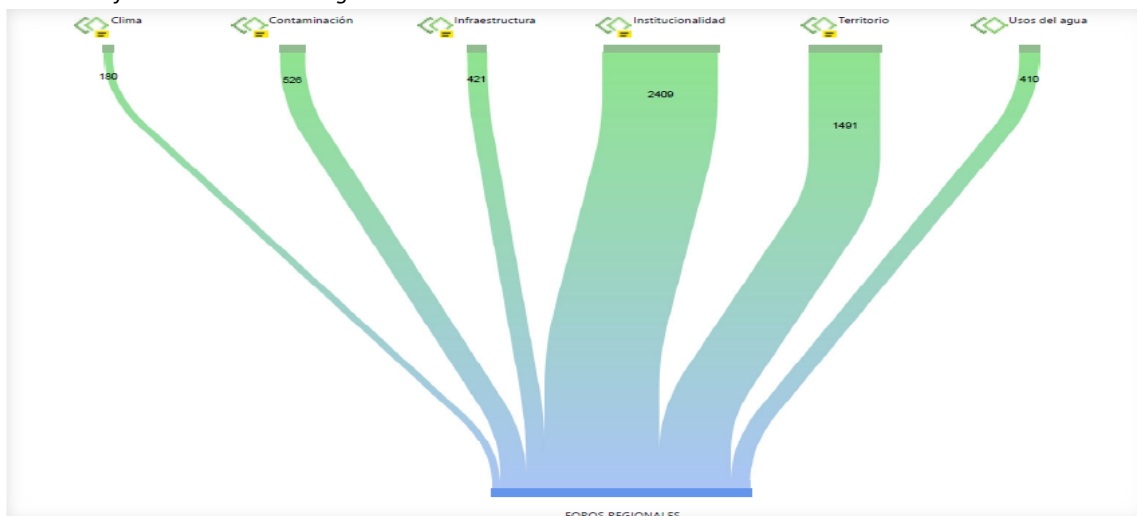
Information processing

The documents generated from the transcriptions of all the sessions were subjected to a coding process, based on 180 guiding codes and seven families of codes (grouping of related codes). It was established by the Consulting Team, using the Atlas TI® program (www.atlasti.com).

The results generated with the Atlas TI® programme show the frequency distribution of the mentions of each code within the documents, using the tools "code-document table" and "Sankey Diagramme" in which the width of the lines indicates the frequency of the codes by groups of documents.

A significant tendency of mentions was found for different factors related to institutionalism, with 2,409 mentions, and territory, with 1,491 mentions, over other code families (pollution, infrastructure, water use and climate), as shown in Figure 1.

Figure 1: Sankey Diagram of the most frequent codes that appeared in the Tárcoles, Tempisque, San Juan, Caribe, and Térraba Regional Forums to analyze the situation of water resource management in Costa Rica.



The resulting factors are in themselves the problems and causes that the participants in the Forums mentioned as the most important and worrying in water resource management, in order from most to least cited: Governance, Territory, Pollution, Infrastructure, Water Uses and Climate.

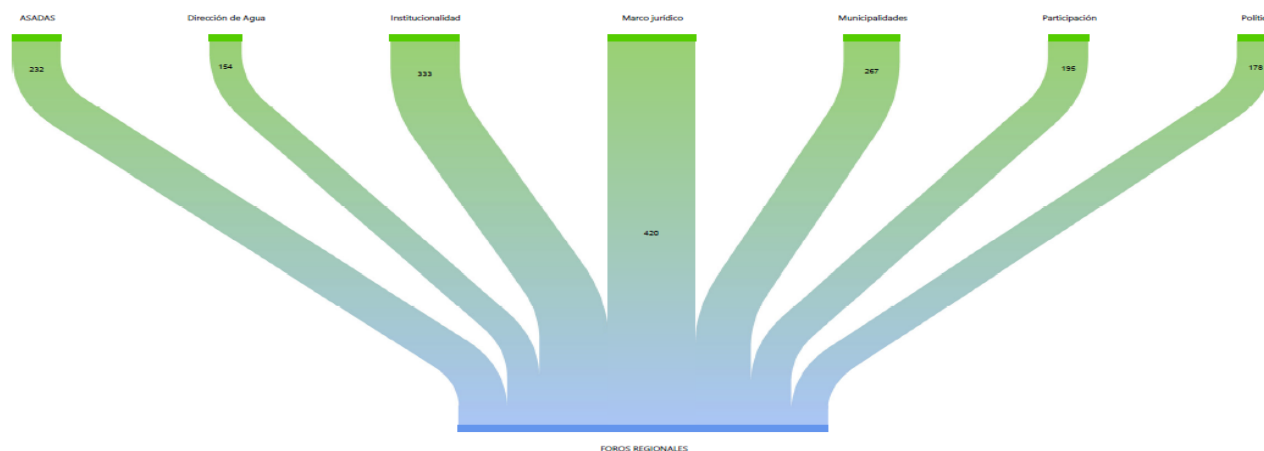
a) Codes in relation to GOVERNANCE

Regarding the **INSTITUTIONALITY** family of codes, 7 codes were found with major references within the texts: Legal Framework, Institutionalism, Municipalities, ASADAS, Participation, Policy, and Water Directorate, which were grouped under **GOVERNANCE**.

Going deeper into the analysis of the Governance code (See Figure 2), the legal framework is mentioned as a problem and as a cause of the problems, in which the water law is detailed as an outdated law and therefore, there is need for a new law that responds to the Integrated Water Resource Management. Next, the issue of institutionalism was mentioned, highlighting the need for inter-institutional coordination for effective management and the lack of involvement and response on the part of the Municipalities and

the strengthening of the Associations of Communal Aqueducts (ASADAS) and the Water Directorate. In all the Forums, participation was emphasized as a way of contributing to the problems of water resource management, but also in decision making. The need for an updated Public Water Policy was also mentioned.

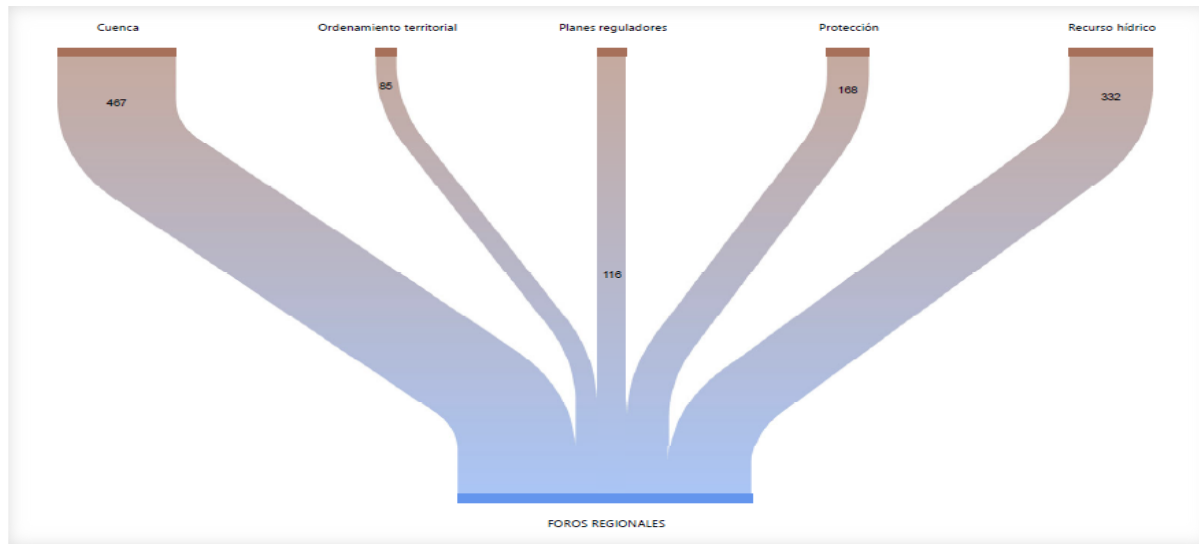
Figure 2: Sub-Topics of GOVERNANCE importance arising from the Regional Forums for the Updating of the National Water Policy and Action Plan for IWRM.



b) Codes in relation to TERRITORY

The second most frequently mentioned topic is the group of **TERRITORY** codes. The bulk of references is concentrated in the codes Watershed, Water Resources, Protection, Regulatory Plans and Land Use Planning (see Figure 3). The main cause of several of the problems identified in the current situation of water resources, which affects management, is the lack of land use planning based on the hydrographic basin unit. For this reason, the management and administration of water resources in accordance with this geographic region determined by water was mentioned in various Forums and by various stakeholders. Many of the affectations and violations in the water protection areas are attributed to the lack of land use planning in the basin.

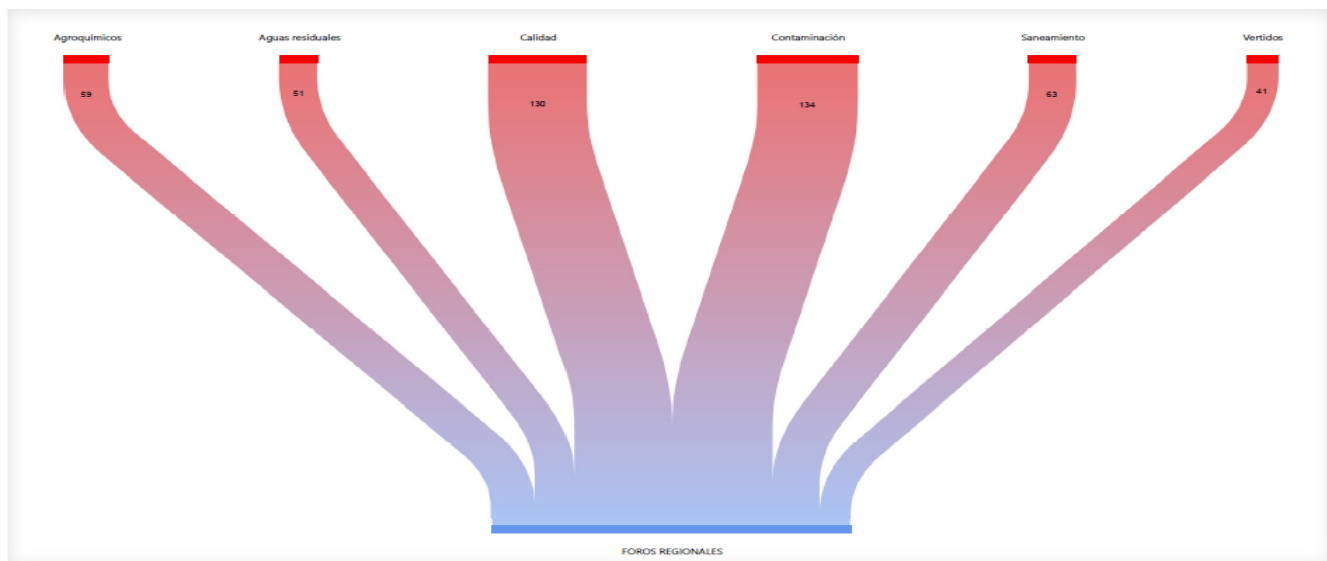
Figure 3: Sub-themes of importance of TERRITORY arising from the Regional Forums for the Updating of the National Water Policy and Action Plan for IWRM.



c) Codes in relation to **CONTAMINATION**

CONTAMINATION was the third most important group of codes. Its analysis reveals that the most mentioned topics were Pollution (general), Quality, Sanitation, Agrochemicals, Wastewater, and Discharges. This means, the concern of the participants in relation to the loss of water quality (with 130 mentions), both from surface and subway sources, mainly due to the lack of safe sanitation (63 mentions), contamination by agrochemicals generated by agricultural activity (59 mentions), untreated wastewater (51 mentions) and discharges (41 mentions) from various industrial, agricultural, and domestic sources.

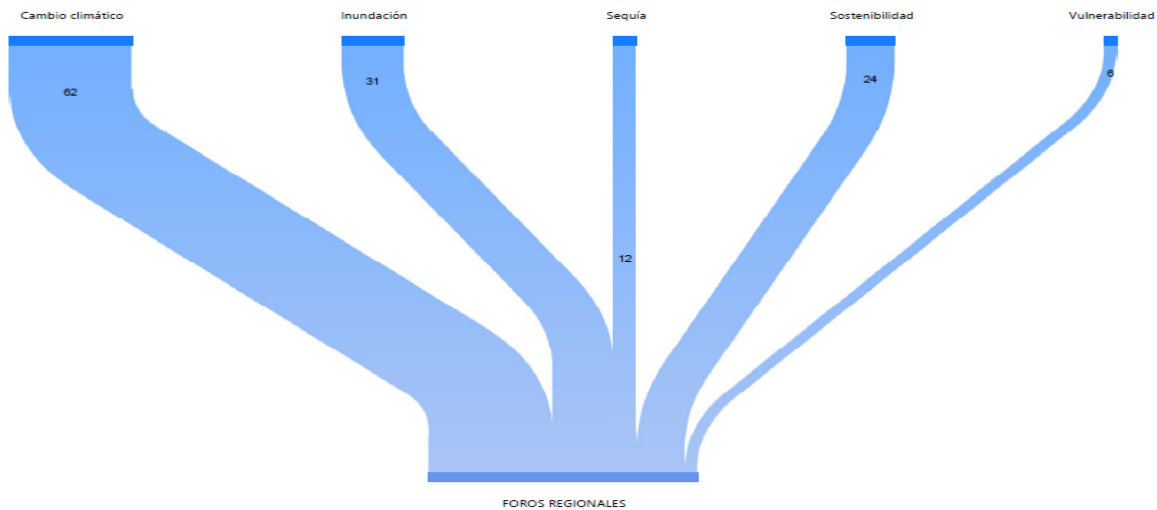
Figure 4: Sub-themes of importance of **POLLUTION** arising from the Regional Forums for the Updating of the National Water Policy and Action Plan for IWRM.



d) Codes in relation to **CLIMATE**

Regarding the **CLIMATE** code group (see Figure 5), most of the references are concentrated in the Climate Change code (61 mentions) followed by Flooding (31 mentions), Sustainability (24 mentions), Drought (12 mentions) and Vulnerability. There is a feeling of the impact of climate change on water resources, mainly generated by the intensity of rainfall in very short periods of time, generating floods.

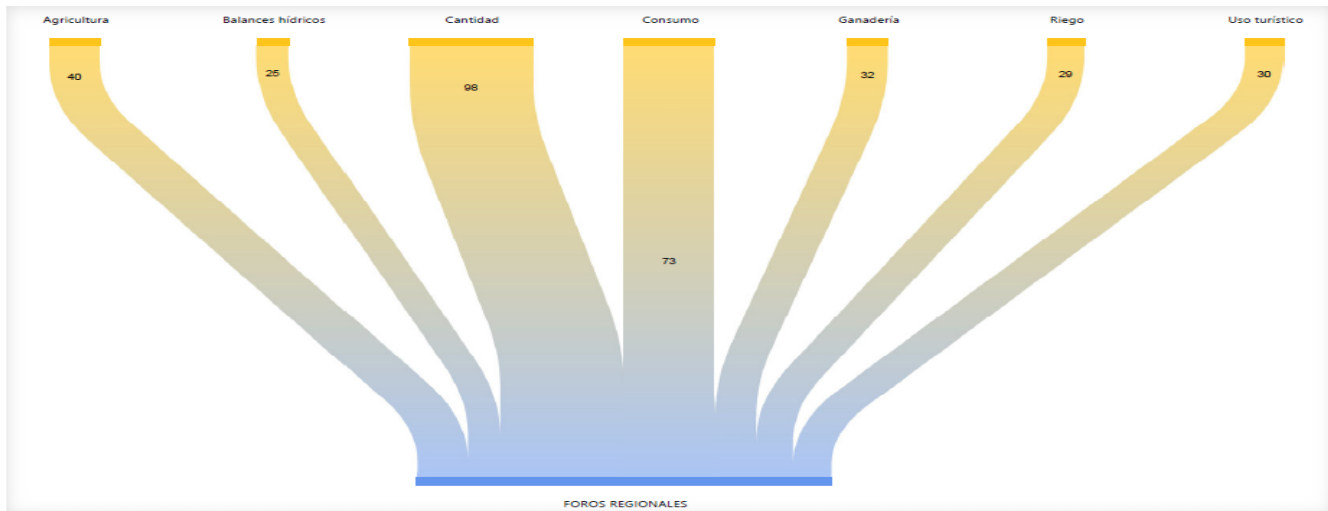
Figure 5: Sub-themes of importance of CLIMATE arising from the Regional Forums for the Updating of the National Water Policy and Action Plan for IWRM.



e) Codes in relation to WATER USE

The codes related to **WATER USE** (see Figure 6) included Quantity, Consumption and Agriculture, followed by Irrigation, Livestock, Tourism and Water Balances.

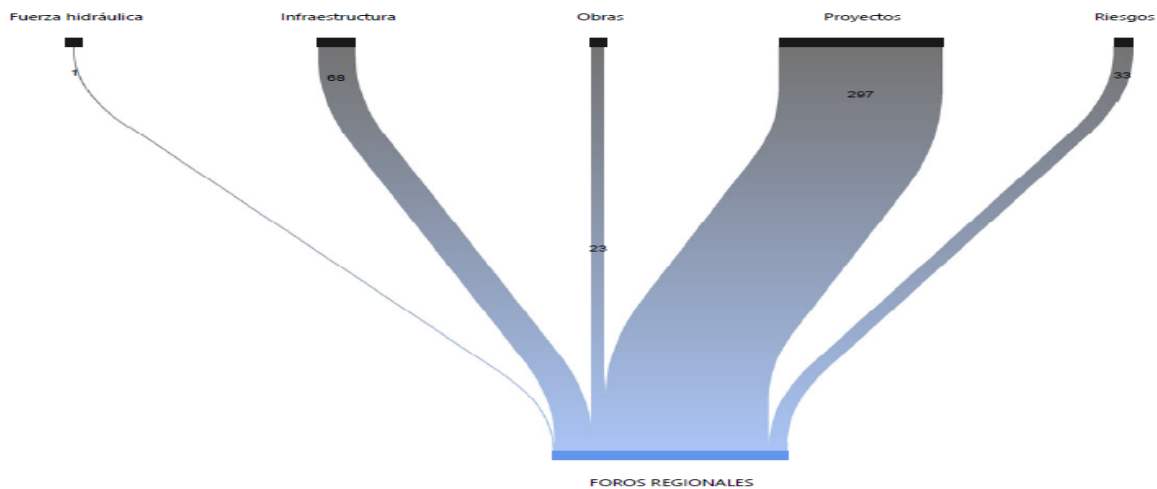
Figure 6: Sub-themes of importance of WATER USE emerging from the Regional Forums for the Updating of the National Water Policy and Action Plan for IWRM.



f) Codes in relation to **INFRASTRUCTURE**

The last family of codes, referring to **INFRASTRUCTURE**, concentrates in the code projects most of the references and to a lesser extent, mentions to Infraestructure (general), Risks, Works and Hydraulics were found. Given that the projects code generated doubts in the consulting team, a co-occurrence analysis of this code was carried out, resulting in the Sankey Diagram shown in Figure 7.

Figure 7: Sub-Topics of importance of **INFRASTRUCTURE** arising from the Regional Forums for the Updating of the National Water Policy and IWRM Action Plan.



National Forum

The National Forum was organized with the purpose of prioritizing the problems that emerged most frequently in the Sankey Diagrams of the Regional Forums and to work in groups for the definition of Lines of Action and Strategic Actions for the National Water Policy and Action Plan for IWRM.

From the Regional Forums, 17 individual codes were obtained with the highest frequency. They are shown in the Sankey Diagrams, which are: Governance, Policy and Legal Framework for Water Resource Management, Institutionality and Participation, Financing and Economic Instruments, Water Uses and Competencies between Uses, Protection of Water Sources, Regulatory Plans - Land Use Planning, Pollution, Lack of Control and Monitoring, Climate Change, River Basin Unit, ASADAS, Municipality, Water Directorate, Risks, Infrastructure Works: insufficient, deficient, and necessary, Water Supply Problems, Illegal Use of the Resource and Inadequate Groundwater Management. After having submitted them to the prioritization of the participants in the National Forum, the following were obtained from highest to lowest priority: Governance: 68.8%, Regulatory Plans: 54.7%, Source Protection: 46.9%, Climate Change: 46.9%, Water Resources Protection: 46.9%, Climate Change: 40.6%, Lack of Control and Monitoring: 32.8%, Infrastructure Activities: 26.6% and Pollution: 25%.

The topics chosen as priorities were integrated and defined in five working groups with the participants as follows:

1. Governance: Integrated with the topic of Lack of Control and Monitoring. This is due to the fact that control and monitoring are part of governance, since it must be carried out by competent institutions and many of the problems were related to the lack of capacity and financial resources.
2. Regulatory Plans: Integrated with Source Protection. Regulatory plans and land use planning should always incorporate the most vulnerable zones and water protection areas.
3. Climate Change
4. Pollution
5. Infrastructure Activities

Each group had the systematization of the contributions received by the participants in each topic in the previous Forums. This was presented by the facilitator as an introduction at the beginning of the work to contribute to help position the topic and allow for discussion and analysis. Each group was asked to work on the following topics: Lines of Action, Strategic Actions and additionally, if possible, Operational Actions for the IWRM Policy Plan, seeking consensus. After working in groups for more than an hour, the inputs were shared with all participants.

The inputs agreed upon in this session became, in a very respectful and clear way, the axes of the Policy, the cross-cutting issues and were also the inputs for the objectives, expected results and goals of the National Water Policy and strategic actions for the IWRM Action Plan.

National Water Policy Proposal

Public policies are instruments that allow us to plan and execute actions to realize a vision that a country intends to achieve. The vision of what we want, in terms of water resources, acts as an unequivocal orientation for the plans, projects and actions to be developed, allowing all the actors involved, including the public and private sectors, academia, municipalities and civil society, to execute in a harmonious manner.

The definition of the vision and mission of the Policy responds to the demands of the participants in the process but was taken in agreement with the Water Directorate of the Ministry of Environment and Energy as the governing body. Thus, the agreed **vision** of the National Water Policy is the following:

A Costa Rica in 2050 where water is a pillar of social, cultural, economic, and environmental well-being, through integrated and participatory management, ensuring adaptation to climate change and water security.

And the **mission**:

To guide the integrated, comprehensive, prospective, and sustainable management of water resources for different uses and territories, through coordinated governance based on research processes, participatory promotion of conservation, adaptation to climate change and the new water culture.

Seven Policy Axes were defined, each with its corresponding objectives, expected results from 2022 to 2050, indicators and targets. The agreed Axes are as follows:

1. Effective and efficient water governance: six objectives, with thirteen expected results.
2. Strengthened and modern institutions for Integrated Water Resources Management (IWRM): two objectives, with six expected results.
3. Sustainable financing and investment for Integrated Water Resources Management: four objectives, with fourteen expected results.
4. Territorial and water resource planning based on the River Basin Unit: one objective, with four expected results.
5. Efficiency in water use and allocation: two objectives, with nine expected results.
6. Development of water resource knowledge based on research, data generation and innovative technology: three objectives, with four expected results.
7. Recovery of water quality and conservation of water ecosystems: four objectives, with twelve expected results.

The cross-cutting issues represent core topics in the implementation of the policy, which must be considered in the diagnosis, planning and execution of all the initiatives proposed. Due to their importance and the magnitude of their scope, these cross-cutting issues or approaches are basic to the guidelines of each axis of the policy:

- **Gender:** Include the vision of gender equality and equity in the actions developed in the area of water resources;
- **Interculturality:** Public intervention should take into account that, according to the Political Constitution, "Costa Rica is a democratic, free, independent, multiethnic and multicultural Republic";
- **Participation:** The basis for policy development and implementation of action plans shall be participatory processes of consultation and decision-making, in an inclusive manner;
- **Climate action:** Inclusion of the climate change component for decision-making;
- **Transparency and access to information:** Allow transparency in data, information, and broad access to citizens on each of the components of the policy and its implementation.

Socialization of the National Water Policy proposal

To continue with the participatory process for the approval of the National Water Policy, a face-to-face Forum was organized in each Hydrological Unit and another one at the national level virtually, with the purpose of presenting the qualitative analysis of the inputs received in the Forums by means of the Atlas Ti® tool and the Sankey Diagrams generated, the topics defined as priorities in the National Forum, an advance of the diagnosis including the water balance and the medium and long term projections according to Climate Change, the Vision of the National Water Policy, the Principles, the Axes with their respective objectives and expected results. The presentation of the Policy proposal had been previously sent to the participants. It was submitted for discussion to receive inputs and to be able to endorse it. This was done prior to the public consultation that DA-MINAE carried out with the rest of the public institutions participating in the Inter-Institutional Committee and CONAHYME. In addition to collecting written comments, all the Forums were recorded to preserve and respect in the most reliable way the inputs provided.

Elaboration and approval of the IWRM Action Plan

After approving the National Water Policy and taking the IWRM situational diagnosis into account, intensive work was carried out with the director and officials of the Water Directorate to develop the Strategic Actions for each objective with the estimated deadlines to be met and the bodies responsible for their execution.

Indigenous consultation

Despite the participation of representatives of the indigenous communities in the Regional Forums and in the National Forum, the Indigenous Law (No. 6172) requires the presentation of the Policy and Action Plan for IWRM in the 24 indigenous territories, based on the General Mechanism for Consultation with indigenous people, which regulates the obligation of the Executive Branch to consult these people in a free, prior, and informed manner, through appropriate procedures.



Figure 2: Participation workshop at the UH Tárcoles Forum (Photo: ©GIZ/ Yamileth Astorga).

Expected long-term impact of the change process initiated with the partner country

The process of participatory construction of the National Water Policy and the IWRM Action Plan showed a higher level of knowledge of the participants from all the country's water units, with greater clarity on the causes leading to the problems of both water resources and their management. Hence, the contributions received considering that the policy is a guiding framework for the future management. There was a greater understanding of Integrated Water Resource Management and the need to strengthen governance with a strengthened MINAE leadership, leading a constituted water sub-sector, with updated laws, with an integrating vision, and with spaces that involve citizen participation.

There was much discussion about the need to strengthen the institutions to ensure compliance with the functions assigned to each one of them by law. This aspect that was highlighted due to the lack of control in the respect for water protection areas, in the non-execution of cantonal regulatory plans with the knowledge and therefore, the limitation of land use in water recharge areas and protection of sources used for human consumption or potential sources for its use. Likewise, the lack of control in the water flows extracted by the different users, with or without concession, as well as the diffuse and punctual contamination by the different sources of pollutants. Therefore, the Water Policy includes a specific axis for this purpose, with various objectives and expected results for its strengthening, including the regional offices of the DA-MINAE.

Another aspect that was emphasized in the Forums and, therefore, remained as an Axis in the Policy is the strengthening of financing and the efficient use of resources, from water use and discharge fees, such as service fees, to reinvest it in water resource management, such as hydro-meteorological stations to ensure permanent data collection, monitoring of the quantity and quality of surface and groundwater bodies, institutional technological platforms, construction of more infrastructure such as aqueducts, sewage systems with wastewater treatment plants, responsible irrigation with volume-based charges, land purchases to protect sources, payment for environmental services, and new incentive-type initiatives.

Watershed management is another relevant aspect analyzed in the process, which should be considered in land use planning to ensure the sustainability of water sources and to mitigate the effects of hydrometeorological events.

One way to involve citizens is through education initiatives such as the Ecological Blue Flag and as volunteers in water management, both in controlling water use and pollution, but hopefully also by forming organizations at the watershed level.

One of the causes of water loss is attributed to climate variability and climate change, mainly in the dry season with prolonged periods of drought. In addition, there are many natural disasters mainly with recurrent rainfall periods and extreme events, due to floods, and landslides. Therefore, it is important to implement nature-based adaptation and mitigation measures, such as updating the water balances of each river basin.

The country requires the active involvement of public universities, mainly through research, technological development, and the contribution of models for water resource management. But also, with support in education and social action, at the watershed level.

Since the quality of river waters in our country generally is contaminated by fecal, organic, and chemical pollutants which alter the aquatic ecosystems, it is recommended to promote decontamination processes involving the various sectors of society, and with greater institutional and public control.

All this contributes to an efficient administration allowing water security and the use of water for all uses, always prioritizing the availability of water for human consumption.

Lessons learned from context-specific strategy development

Which ideas were abandoned?

- Any policy must be built based on the principles of reality that allow both real and formal power actors to reconcile or at least reach minimum agreements on issues where there is tension and divergence. In this sense, an attempt was made to avoid positions that did not generate consensus among the various actors.

What worked?

- The formation of a multidisciplinary team from the DA-MINAE with the support of the consultant team with diverse but complementary visions on the topic addressed integrated water resource management, provides a wealth of inputs for analyzing the various aspects of the subject.
- The involvement of professional researchers from public universities contributes to the incorporation of updated methodologies, techniques and models adapted to the country's conditions.
- The mapping of actors with principles of inclusiveness as part of the baseline contributes to the success of the participatory process.

- A good invitation is key to ensure participation, for which it is effective to have a technological tool to follow up on the sending of the invitation and confirmation.
- One way to ensure the participation of those invited (academia, government, civil society, among others) to the Forums is to ensure sufficient time and group work, thus allowing them to present their arguments, so that others can listen, react, and agree.
- Recording and taking notes of the contributions certifies that the presentations are transcribed without any alteration and, therefore, are considered in the Policy and Action Plan.
- The use of the Atlas Ti® tool facilitates the systematization of the qualitative inputs received in the Forums, which, together with the Sankey Diagrams derived from the frequency of mention of the codes, allows for a more precise identification of the Policy Axes.
- The mixed methodology for the preparation of the National Water Policy and Strategy, using qualitative and quantitative techniques, provides information which, when triangulated, allows for a better interpretation of the reality under study.
- All public policy proposals should be returned to the stakeholders so that they receive inputs for their improvement and subsequent validation, ensuring the participation of indigenous people.
- Public policies should be built with a frame of reference of the criteria of all the stakeholders involved in water resource management and of the governing body in the matter.

Potential challenges for policy implementation: sustainability, financing, policy change

A policy constructed in a participatory manner and with the presence of all the stakeholders involved facilitates the capacity of the governing body and other public institutions to have a strategic impact on IWRM, even if the actors who temporarily represent the government's interests change during democratic periods.

Policy formulation must duly involve of the various regions of the country, as well as the public, private, academic, non-governmental and civil society bodies that make up the country, so that the various criteria, perceptions, and experiences regarding the problems of integrated water resource management are taken into account.

A properly formulated policy allows for greater assurance of its implementation. In this sense, it is important to bear in mind that the expression of the National Water Policy should have sufficient institutional and technical support so that it can be put into operation through specific projects, plans and programs. Thus, the approval and declaration of the Policy should dictate guidelines to the other institutions so that it can be incorporated into the Institutional Strategic Plans and the National Development Plan. By doing so the progress can be evaluated and monitored. These actions should be complemented by a determined institutional strengthening with sufficient human, financial, and technological resources to ensure efficient and effective management.

The Policy must be translated into updated laws, regulations, and decrees, which were recognized in the participatory development process of its formulation, hence the need to update the Water Law that has been in force for 80 years in the country.

Financing should be permanent, which means that the income from water charges to the DA-MINAE should be proportionally reintegrated in the basin where it was collected. The Public Services Regulatory Authority should always act responsibly and cautiously, authorizing rate increases that ensure the sustainability of the institutions that provide public services and investments in necessary infrastructure works, both in water supply and wastewater sanitation and irrigation.

It is necessary to maintain operation new financial initiatives, such as the Environmental Water Tariff which is integrated into the charge for water supply services, the payment of environmental services for the recovery and protection of the forest and protected areas, Agua Tica, among others, that contribute to water security.

Finally, raising citizen awareness through education contributes to the responsible and sustainable use of water, so efforts should be made with academic institutions in coordination with government agencies.

Published by:	Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH
Author:	Yamileth Astorga Espeleta
Design:	Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH
Date:	September 2022
On behalf of:	Inter-American Development Bank (IDB) with funding from the Global Environment Facility (GEF)
