



Towards a Water Information System in Paraguay

Main findings and recommendations

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Table of Contents

1. Introduction	1
2. Background	2
3. Objective	3
4. Exchange of experiences: Main elements	4
4.1. INDRHI and MEPyD The Dominican Republic	4
4.2. INEGI and CONAGUA Mexico	6
5. Issues to be considered for the WIS of Paraguay	8
6. Capacity assessment	12
7. Main recommendations	16
8. Next steps	18
9. Conclusions	19
References	20
ANNEX Workshop on Governance and Indicators Agenda	21

1. Introduction

This report is an overview of the information shared through the exchange of experiences and workshops organized as part of the Data for Now initiative in May 2020. Additionally, it includes a series of reflections and recommendations on the design and implementation of the future Water Information System (WIS) of Paraguay.

The program of events, carried out virtually due to the restrictions caused by the COVID-19 pandemic, was designed to cover the most relevant topics and themes in a series of four working sessions. One part of the program was an exchange of experiences with the Dominican Republic and Mexico. Additionally, a two-day workshop was organized. During the workshop, presentations by the United Nations Environment Programme (UNEP) and the Food and Agriculture Organization of the United Nations (FAO) were included. The aim was to obtain a comprehensive view based on the experiences of i) A country with a water information system that was still segmented and underdevelopment; ii) A country with an integral and well-established information system; iii) A United Nations program that is a benchmark from the environmental perspective, and iv) A UN agency specialized in the economic uses of water. The other part of the program was a governance and indicators workshop for the creation of the Paraguayan WIS, with practical exercises to inquire about the capacities and expectations of the participating organizations. The Mentimeter platform was used for practical exercises. This innovative tool helped streamline participant exchange.

These activities achieved the objectives of obtaining insights and providing the needed tools to meet the challenges posed by water information demands, especially those referring to the United Nations Sustainable Development Goals (SDGs) for the 2030 Agenda. SDG 6 (Clean Water and Sanitation) presents the water information requirements that countries are committed to develop and disseminate. This context provides an opportunity for data producers to strengthen their activities, due both to the greater access to financing and to the flow of international cooperation to fulfill the commitment of "leaving no one behind."

Also, the workshops gave rise to concrete action lines and a more precise view of where to focus efforts. In this way, a series of guidelines and interinstitutional agreements were established, in an initial approach to the constitutive elements of WIS governance and architecture, as well as a tentative road map and action plan.

This report contains different sections that address the background and goals of the activities undertaken by Cepei, together with the General Directorate of Statistics, Surveys and Censuses (DGEEC, for its Spanish acronym) and the Directorate of Drinking Water and Sanitation (DAPSAN, for its Spanish acronym) of Paraguay; The lessons learned by exchanging experiences; An initial capacity diagnosis; And a tentative structuring outline of the Paraguayan WIS, including a proposed action plan.

2. Background

In September 2019, Amina J. Mohammed, Deputy Secretary-General of the United Nations, launched the Data for Now initiative during the 74th UN General Assembly. Data for Now is a demand-driven independent initiative, led by countries and supported by the Global Partnership for Sustainable Development Data (GPSDD), the World Bank, the Thematic Research Network on Data and Statistics of the UN Sustainable Development Solutions Network (SDSN TReNDS) and the United Nations Statistics Division. Its main aim is to support National Statistical Offices (NSOs) in building strategic alliances and developing specific actions with internal and external partners to solidify access to timely data, as well as to promote sustainability in the impact of data-based policies. The first phase of the initiative includes eight pioneer countries from the three participating regions: Bangladesh, Colombia, Ghana, Mongolia, Nepal, Paraguay, Senegal, and Rwanda.

The Centro de Pensamiento Estratégico Internacional (Cepei) is the Technical Secretariat of the Global Partnership for Latin America and the Caribbean, and it carries out activities and initiatives of SDSN TReNDS. For this reason, Cepei was designated to advise, support, and conduct the activities developed by Latin American countries from January to May 2020.

In February 2020, Cepei met with different national stakeholders in Paraguay and determined that certain aspects of the development and availability of water data are good, but there is no articulation or centralization of information. On this basis,

Cepei, together with the DGEEC and DAPSAN, organized a series of virtual meetings in May to move forward with the establishment of the Paraguayan WIS. Two events were organized, on 13 and 22 May, with representatives of the Dominican Republic and Mexico, respectively. The countries presented their experiences in the structuring and consolidation of their water information systems, and possible lines of collaborative work.

On 28 and 29 May, there was a workshop focused on the indicators, governance, and architecture of the future Paraguayan WIS, including presentations from UNEP and FAO specialists. Twenty-four participants from national Paraguayan agencies attended the workshop. The agencies included the DGEEC, DAPSAN, the Ministry of the Environment, and Sustainable Development (MADES, for its Spanish acronym), the Ministry of Information and Communications Technology (MITIC, for its Spanish acronym), the Paraguay Space Agency and the Itaipú binational hydroelectric dam. Other actors outside the public sector were also invited, such as the Universidad Nacional de Asunción. The DGEEC and DAPSAN presented the challenges of harmonizing administrative records and implementing nomenclatures in the water system, respectively. Further, there was a presentation on the progress of the consultancy on indicators, carried out by Cepei with the support of a local consultant. Lastly, there was a presentation of general conclusions on the governance and architecture of the WIS and a practical exercise to address strategic issues determining the future structuring of the WIS.

3. Objective

Paraguay is a rich country in surface water and groundwater, especially from the rivers Paraná to the east and Paraguay to the west, and great aquifers, such as the Guaraní Aquifer, one of the largest water reserves in the world. Climate change has brought about great challenges for the country: Floods in Paraguay used to occur every ten years, but they now happen every year since 2014.

The human cost is high, but it is not the only one. Environmental issues are mostly caused by human beings. This is why the interrelations between environmental, social, and economic factors must be monitored. Only when the impacts of these actions on the environment are known, can the right answers be found.

This scenario shows the need to have more and better information on the quality, access to, and use of water, sanitation systems, and flood risks, among others. Thus, the Data for Now initiative supports the creation of a system that provides all of these information features. This project is in line with the proposals of the Cepei team in three main aspects:

- 1. WIS governance:** Identifying roles and responsibilities among the agencies involved, both within and outside the water committee, which carry out water measurements. Additionally, assessing the capacity to implement governance methods in terms of human and physical resources, but also technology and data needs.
- 2. Indicators System:** Defining the indicators and measurement parameters that will govern the Water Information System and their links with the SDG indicators

that national and local governments are committed to provide.

- 3. The architecture of the information system:** Information flows; Data storage, processing, and visualization; Users and administrators.

The workshops and exchange of experience that took place during May were aimed at identifying the elements, lessons learned, and best practices that can be applied to the local context and, on that basis, discuss the governance, architecture, and indicators system for the structuring of the Paraguayan WIS.

The agencies of the WIS must agree on their roles and institutional arrangements. Given the characteristics of information systems integrated by decentralized data sources, to design a successful model, the governance concept applied must be modern, based on interdependence and coordination, and agreed upon by the systems and organizations. The WIS must be sustained by the collaboration, consensus, and participation of different stakeholders to guarantee its feasibility and sustainability.

The notion of governance envisaged here involves a broad view of the complexities of the decision-making process, understood as an action performed by many actors involved who interact to formulate, promote and achieve common goals by sharing knowledge, resources, ideas, and guidelines.

Additionally, governance must adapt to a country's political and institutional context. This is why, although understanding and adapting to best practices is fundamental, we must avoid importing pre-made models that have not been legitimized

by all stakeholders. In the case of Paraguay, it is necessary to agree on the following definitions:

- Mission and vision
- The scope of the WIS in terms of the different dimensions of water quantity, quality, uses, and conservation
- Actors and networks involved

- Roles and responsibilities
- Architecture and resource sources
- Coordination instruments
- Scheduling of products to be delivered regularly

The next sections provide the elements to begin this journey.

4. Exchange of experiences: Main elements

4.1. INDRHI and MEPyD | The Dominican Republic

The screenshot shows a Zoom meeting interface. At the top, there are participant thumbnails for Margarita Vaca..., Freddy, Rafael Nuñez RD, Israel, and Teo. The main content is a presentation slide with the following text:

**INSTITUTO NACIONAL DE RECURSOS HIDRAULICOS
INDRHI**

**Sistema de Información del Agua
República Dominicana**

**Gobernanza del sistema de información de agua:
roles y responsabilidades - Lecciones aprendidas**

por: **Israel Acosta Lantigua**
Ingeniero Civil – Esp. Hidráulica y Sanitaria
Director del Departamento de Hidrología
Asesor Hidrológico del RP ante la UMM para RD

The Zoom interface includes a bottom toolbar with icons for Re-Iniciar Audio, Iniciar video, Seguridad, Participantes (21), Votaciones, Chatear, Compartir pantalla, Grabar, Reacciones, and Finalizar reunión.

The Dominican Republic shared its experience through representatives from the National Institute of Hydraulic Resources (INDRHI, for its Spanish acronym) and the Ministry of Economy, Planning, and Development (MEPyD, for its Spanish acronym). They presented the features of the existing Dominican Water Information System, which is still developing and significantly segmented but has good primary data collected by the INDRHI.

The INDRHI¹ is a decentralized department (with its budget) within the Ministry of Environment. It has a solid architecture of weather, hydrological and pluviometry stations, and support to infrastructure (servers). It has a broad network of automatic transmission stations, which was achieved by an agreement with the Suntroun company and financed by the World Bank. The ICT infrastructure allows real-time measurements. It has a hydrological monitoring and prevention room. Besides, it has an infrastructure of dams, hydrological balance, and water pressure maps. Irrigation is by far the main use of water. Seventy percent of water is used for food production. The INDRHI noted the support received by the Dominican NSO using its clarification of what, how, and when to measure.

In 2016, the Water Board was created by executive order. The Water Board has six groups. The INDRHI is the highest authority in all groups, except Sanitation. They hold regular monthly (and sometimes, biweekly) meetings to coordinate goals and indicators. In 2010, they began an exercise to create a link between actors in the public and private sectors, and so achieve a greater quantity and quality of information on the water and sewage systems. This initiative was developed after a severe drought. This is relevant in terms of how a crisis can be a catalyst for

capacity building. The Board is currently promoting a Water Law² to generate an interrelation between sanitation actors and the water authority.

The Dominican experience shows the decisive role of international actors in capacity building. The INDRHI, supported by the World Bank, created the National Hydro-meteorological Information System (SNIH, for its Spanish acronym). This helped to link all information from the last decade and enabled a visualization tool, to view the georeferenced stations and a variable breakdown. Additionally, an agreement with Brigham Young University allowed the use of the Tethys platform, used to monitor reservoir data. The Dominican Republic also has a portal on SDG data, with (provisional) SDG 6 data. In 2017, there was a study, supported by the United Nations, to mainstream and expedite policies, which helped view which SDGs impacted on others. There was also a study on the feasibility of measuring the indicators. They maintain cooperation agreements with the FAO and the United Nations Development Programme (UNDP) and have also opened partnership relations with all other actors.

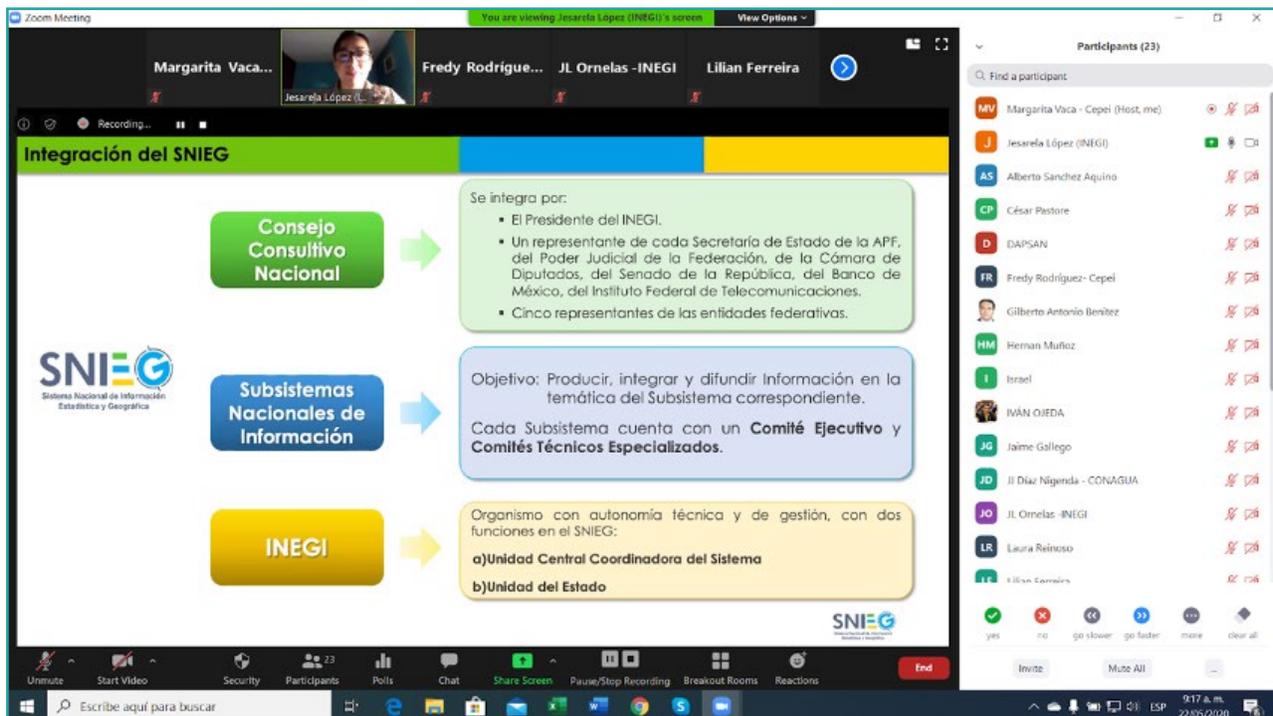
Lessons learned and recommendations

Lastly, they reported financing issues that restrict their capacity. Among the lessons learned, they recommend using the most visible agency to promote the Water Board. They also suggested relationships with hydroelectric companies who have the resources and capacity to collect data.

1. See <https://indrhi.gob.do>

2. See <http://www.senado.gov.do/masterlex/mlx/docs/1c/2/11/18/4581.pdf>

4.2. INEGI and CONAGUA | Mexico



Mexico has a National Water Information System³ (SINA, for its Spanish acronym) which is well-established and integral in terms of its information scope on water quantity, quality, use, and conservation. The SINA manages the whole cycle of the historical, documentary, statistical and geographical data, their dissemination, and prospects. To this end, it integrates the bases of other information subsystems, standardizes the data interoperability criteria, and is the single information point for the sector. It has an interinstitutional Technical Committee that contributes to the development of statistical and geographical information.

The SINA follows a conceptual model based on three thematic aspects (social, environmental, and economic) that group six areas (human development, regulation, atmospheric, land, water, and production). The SINA model also responds to a data cube with three dimensions: Time, variable, and jurisdiction.

Its legal framework is based on the Political Constitution of the United Mexican States⁴ (Article 26, Section B), the Law of the National System of Statistics and Geographic Information (SNIEG, for its Spanish acronym)⁵, the Law of National Waters⁶ (Article 9, Section XLVII) and the internal procedure of the National Water Commission⁷ (Conagua, for its Spanish acronym). Since 2009, the SINA is officially framed within the Geographical and Environmental component, one of the four National

3. Ver <http://sina.conagua.gob.mx/sina/>

4. Ver http://www.diputados.gob.mx/LeyesBiblio/pdf_mov/Constitucion_Politica.pdf

5. Ver <https://snieg.mx/contenidos/espanol/normatividad/marcojuridico/LSNIEG.pdf>

6. Ver https://www.gob.mx/cms/uploads/attachment/file/105137/Ley_Aguas_Nacionales.pdf

7. Ver <https://www.gob.mx/conagua/acciones-y-programas/reglamentos-66127>

Information Subsystems defined in the SNIEG. Each subsystem has an Executive Committee and Special Technical Committees that group the corresponding agencies according to the topic, such as Water.

The SINA has a full-time, exclusive staff of four employees, who coordinate the various agencies to receive data and manage the actions needed to strengthen the System. Additionally, the System's architecture is supported by Conagua's resources. For example, Conagua's ICT management is responsible for providing the infrastructure and technological developments for the SINA. In the past, there was an agreement with the Mexican Institute of Water Technology (IMTA, for its Spanish acronym), which used to carry out the tasks that have now been absorbed by Conagua.

The SINA has a series of periodical products, including a statistical yearbook, the Water Atlas, a compilation of sector information called Numeragua, and the SINA online portal and mobile apps. The portal integrates and displays information on 42 boards, based on three thematic areas: Economic, social, and environmental. It has datasheets for the indicators by jurisdiction and the GeoSINA, a map viewer. The portal also has a monitor showing 210 dams across the country.

Lessons learned and recommendations

One of the recommendations made to the Paraguayan WIS based on the Mexican experience was to seek contact points with the agencies to hold regular meetings on water, for example, by sharing experiences in statistical terms on the progress made in each area. Another suggestion was based on the challenge that Mexico faced when trying to break the "information is power" paradigm and open up the information held by agencies (and public officials) who felt that they owned the data. In this respect, the regulatory framework must support and empower the System. Harmonizing criteria and metadata has proven to be very useful for coordination. The methodology must be consistent and be replicated across different data sources. If there are changes, they must be justified and communicated.

According to the Mexican representatives, having a single source of official information was one of their greatest achievements. If all agencies were to release official data, there could be inconsistencies in the sources, which would lead to confusion among users. In this aspect, the System is a way to integrate the information, even if it does not necessarily generate the data. **This is why one of the main recommendations is that systems must communicate and achieve interoperability.**

5. Issues to be considered for the WIS of Paraguay

In the course of the activities carried out, issues such as the capacities and expectations of the participating organizations have been investigated regarding the future WIS of Paraguay. Within the Workshop framework, the responses were presented anonymously and in an aggregate form, to have a starting point for broader conversations on topics that, in particular, could be sensitive to inter-institutional relations. For its preparation, Cepei previously sent to the organizations involved a questionnaire with a series of questions and issues to consider. On this basis, in the following sections, the learning that can be incorporated into the project will be studied in-depth, as well as the most feasible roadmap.

Within the framework of the workshop, a first conversation was held on the governance elements that the system should have and, specifically, the Mission and Vision proposal for the WIS based on the following postulates was discussed:

- **Mission:** *"Systematize information on the water theme to support the design, implementation, and monitoring of public policies that promote the sustainability of the resource and the well-being of the population"*
- **Vision:** *"To be the body in charge of the governance and the management of water information in Paraguay"*

Results

The comments of the participating organizations were generally positive, highlighting that this mission meets institutional expectations, but could be more specific and refer to the functions of standardization, integration, and evaluation of information as key points of the system. Also, the need to refer to the unique character of the WIS, as the nucleus that centralizes Paraguay's official information on water was pointed out.

Scope

Furthermore, the scope that the WIS should have has been discussed. In this sense, three options were proposed that represented: i) A comprehensive scope (Mexican model), which has information on all water related dimensions; ii) A partial scope, but with a systemic perspective in data display and interoperability; iii) Adoption of a decentralized and autonomous model of information production in which each agency produces and disseminates on its platform the information that corresponds to it according to an agreed distribution of roles. The majority of responses were in favor of the comprehensive scope.

As regards to the dimensions that the system should cover in the first stage, there has been a conversation based on the following scheme:

Social Population - Living conditions - Wastewater - Treatment plants and purification plants	Environmental Water quality - Aquifers, Basins, Rivers, Lakes, and Wetlands - Meteorology
Economic Economic indicators - Declared uses and volumes - Power generation - Irrigation - Dams - Projects and budgets - Regulations and international treaties	

Roles and responsibilities

Also, the participating agencies have been asked about the roles and responsibilities that each agency is willing to assume, based on the following alternatives: i) The coordination and/or stewardship of the system; ii) The provision

and/or generation of technical capacities for information processing; iii) Primary data production; iv) The provision of conceptual content on the water theme; v) The provision of logistical or technological structure or geographic footprint for the information survey; vi) Another type of role.

Box 1. Governance Structure Diagram

Table 1 shows the governance structure diagram of the Specialized Technical Committee for Water Information in Mexico. According to the conclusions reached from the conversations held within the framework of the workshop, this scheme could be useful to take as a basis for the WIS of Paraguay.

TABLE 1

Members of the Specialized Technical Committee on Water Information		
Committee position	Institution	Title
President	National Water Commission	Deputy Director General for Water Administration
	National Institute of Ecology and Climate Change	General Coordinator of Climate Change Adaptation
Spokesperson	Ministry of Agriculture and Rural Development	General Director of Natural Fibers and Biofuels
		Director of Integration, Processing and Validation of the Agri-Food and Fisheries Information Service
	Marine Secretary	Deputy Director General of Oceanography and Meteorology
	Ministry of the Environment and Natural Resources	Director of Statistics and Environmental Information
	Health Secretary	Undersecretary of Integration and Development of the Health Sector
Technical secretary	National Institute of Statistic and Geography	Deputy General Directorate for Natural and Environmental Resources

Source: SNIEG Mexico (<https://snieg.mx>)

The DGEEC expressed its willingness to assume the Technical Secretariat, accompanying the process and providing leadership in those areas in which responsibilities are assigned. Then, DAPSAN expressed its will to exercise coordination roles due to its experience in other similar areas. Furthermore, MADES commented on the role of the governing body that is currently assigned by law and its experience in the creation of an information system on water resources. Other organizations such as MITIC and the Paraguayan Space Agency have made themselves available to provide technical abilities. The MITIC has an interoperability platform focused on citizen-generated data, which also includes information from the private sector. The space agency proposes to complement data and measurements through geo-referenced information. The Universidad Nacional de Asunción could also play a role in technical assistance. Finally, the Itaipú binational hydroelectric dam is an organization capable of contributing to its logistical structure and primary data.

Participating Actors

The practical exercises also inquired about the opinion on what other actors should be called to be part of the initiatives around the WIS. In this regard, the Directorate of Meteorology

and Hydrology and the Ministry of Agriculture and Livestock were mentioned. Additionally, cooperation networks should be created with the academy, civil society, United Nations agencies, private sector, multilateral credit organizations, and regional organizations, in that order of preference according to the participants.

Currently, the DGEEC and the DAPSAN are carrying out two related exercises, which were presented in the framework of the workshop, regarding the challenges in the harmonization of administrative records and the implementation of nomenclatures in the water system, respectively. These experiences set important precedents in terms of system coordination.

Coordination

The effective coordination of information can be carried out jointly through tools such as planning, communication and interoperability of databases, the balance of concepts, definitions and classifications, administration of sampling frames, and other measures with the purpose of system coherence and consistency. Actions aimed at the quality of information are identified with a series of quality attributes such as relevance, periodicity, opportunity, sustainability, known methodologies, and accessibility.

Box 2. Information Systems Coordination

The more decentralized an information system is, the more important the coordination function becomes. There are enough reasons to justify the need for coordination. First, the results from different collection sources need to be comparable. For that purpose, the harmonization of concepts, definitions, classifications, and sampling frames is required. Also, to represent the interests of a country at an international level, national actions in terms of information must be coordinated. Finally, it is desirable to minimize the burden on informants and the duplication of efforts in collecting these data.

However, coordination is an issue in which almost everyone agrees on its importance, but few want to be "coordinated". For this, there are a series of tools to take into account that include: i) The capacity to control or at least influence the budgetary and technical resources of the agencies involved; ii) The ability to make decisions on data collection activities; iii) The ability to decide on nomenclatures; iv) Participation in technical or executive committees v) The existence of common products within the system.

Also, it is useful to make the benefits of better coordination visible. Sharing information improves the ability of each agency to design its policies and provides access to different abilities available from other agencies. Furthermore, participating in joint activities can help to leverage budgets for information production in several ways.

Products

Finally, an aspect that must be considered for the creation of the WIS in Paraguay refers to the products that will be made available to users. The experience of the Mexican SINA is useful to think about actions in this sense, due to the quantity and quality of products that it currently has and the progression that its implementation had. Within the workshop framework, participants were

asked about which products they considered were the most possible to be produced during the first stage of the Paraguayan WIS, taking into account the following options: i) A statistical yearbook; ii) A water atlas, that is, a document with geographic information; iii) A web platform; iv) An analysis report on the water situation in Paraguay; v) Other products (e.g. specific studies on a particular topic). Participants positively weighted the first four options.

6. Capacity assessment

Another achieved result from interactions during the workshop was to obtain a first approximation to the technical and institutional capacities of the future WIS, based on the respective capacities of the organizations involved. The diagnosis does not necessarily refer to the availability of indicators or specific primary information (which caused another study that Cepei has undertaken), but rather to an overview of the possibilities of constructing and publishing those indicators. Therefore, although this analysis does not imply an exhaustive capacity assessment exercise, it does identify aspects to promote actions that aim to capitalize on strengths and turn weaknesses into capabilities. Also, the correct identification of opportunities and threats will define strategic measures to take advantage of the former and eventually mitigate the latter.

The first element to mention is that the Water Information System is still incipient. The information regarding water resources is in formation, with important advances, but still needs time to mature. Likewise, some agencies have expressed weaknesses in terms of financial, technical resources, and primary sources of information.

The production of water information today is considerably decentralized, involving at least 7 central and 10 peripheral agencies. In addition, some agencies claim to have high heterogeneity in their information sources, which makes it impossible to consolidate into a single database and motivate in-depth work on the subsystems that make up the water theme as a whole.

The empowerment of the DGEEC as a technical coordinator and quality auditor is therefore essential. Data quality can present problems when standardized methodologies are not followed. Also, data is often collected using "autonomous" definitions and classification. On the other hand, there may not be enough data available or there

is data being collected as a routine procedure because this has always been done this way, without clear reasons justifying it. In this line, international recommendations promote the strengthening of the coordinating role of Statistical offices, to achieve a homogeneous, consistent, and unique set of official data from the countries. Currently, Paraguay is working on a new statistical law that takes these aspects into account.

Technical capacities

Regarding technical capacities, within the workshop framework, the agencies were asked if they had a specific area for generating information on water and if they had experienced personnel in various aspects of the production and dissemination of information. Although the main objective was to start a conversation about the importance of strengthening these technical capacities, the results of the exercise also led to some initial reflections.

Half of the agencies stated that they do not have a thematic area dedicated to water information. This may not be conclusive considering that some peripherals were among the participating organizations. Also, the responses showed deficits in human resource profiles oriented to conceptual design and the production of indicators based on administrative records, and strengths in terms of personnel trained in planning information surveys and data processing. Other skills such as water data analysis and evaluation, field operations, and data dissemination and communication showed optimal results, although they should be strengthened in some agencies.

Data dissemination and communication with the community

Regarding data dissemination, only half of the consulting agencies publish all the data they

produce on their website, and the majority stated that they did not have a publication calendar. On the other hand, most of the information producers follow some internationally recognized methodology, but the proportion of these methodological adaptations that are documented is a minority. The availability of statistical software licenses for data processing was also inquired. In this sense, all the agencies stated that they have insufficient licenses.

Institutional abilities

Regarding institutional abilities, below are some impressions regarding the system possibilities in terms of Strengths, Weaknesses, Opportunities, and Threats. A series of strengths of the future WIS to establish and be sustainable over time have been identified, including:

- **Existing incentives** within organizations to count on better information that contributes to improving their public policies and making visible the work they do.
- **Regulatory advances** that have been made in Paraguay regarding the creation of similar information systems.
- **The relevance** of the water theme in Paraguay, due to the abundance of surface and underground water resources, and the challenges that climate change implies for the living conditions of its population.
- **Actors involved** interested and committed to the initiative.

On the other hand, a series of weaknesses have been detected that must be taken into account to conduct strengthening actions, namely:

- **Lack of primary data** as a basis to generate relevant information.
- **Technical capacity** required for the generation of this information.
- **Financial resources** to strengthen the technical and operational abilities of the intervening organizations.

- **Interoperability** between the databases of the different organizations.

The aspects considered as most relevant by the workshop participants were, in the case of strengths, the incentives and regulatory advances, and the financial resources and interoperability in the case of weaknesses.

Moreover, around the future WIS are a series of opportunities and threats that must be correctly identified to implement strategic actions for its use or mitigation. In this sense, opportunities have been detected in the following aspects:

- **International experiences** on successful implementation cases of Water Information Systems that imply a learning and adaptation opportunity of the local context.
- **The United Nations Sustainable Development Goals**, which are a challenge for countries in terms of the necessary policies to achieve them, but also in terms of their measurement. To effectively report progress on the established goals, the Cape Town Global Action Plan presents guidelines to strengthen statistical systems.
- **Evidence-based public policies.** The widespread use of evidence, as a current paradigm in the design, implementation, and evaluation of public policies, implies a greater demand for quality data and an opportunity to improve information systems to meet that objective.
- **New technologies** for data collection and processing, which present opportunities to complement or replace traditional information sources. The use of data obtained through satellite images or big data can help to estimate phenomena that it was not possible to measure (at a lower cost). This is especially relevant in the environmental area.

On the other hand, among the threats that could arise in the implementation of the WIS, and, therefore, require actions to contain them, the following have been identified:

- **Failures in the coordination** of the system due to, among others, an insufficient definition in the elements that make up governance and architecture.
- **Other strategic priorities** of the intervening agencies that redirect their interest towards this initiative.
- **Silo mentality** among information producers.
- **Customs and practices** that represent obstacles for a change.

International speakers

Workshop participants highlighted international experiences and new technologies as the most relevant aspects in terms of opportunities and coordination failures among the main threats.

Box 3. United Nations Programs and Agencies

During the indicators and governance of the WIS workshop, presentations by experts from UNEP and FAO, focused on presenting the progress in the construction of the SDG 6 indicators in the custody of each agency, as well as good practices and recommendations in the creation of Water Information Systems. In this sense, they provided details about the state of the art and the use of new technologies in the construction of indicators, and the experiences of other countries. The energy, water, and food nucleus involves other agencies, but these organizations are two of the main references.

UNEP, unlike FAO, is not an implementing agency. Its main role is to generate catalytic actions and to provide advice from its experts. UNEP is working within the framework of the SDGs as the custodian agency for 26 global indicators, three of which are in SDG 6. Indicators 6.3.2 and 6.6.1 represent a major challenge for countries, due to the need to have a processing capacity that not all of them have. In the framework of the CEA-ECLAC working group on environmental statistics, they have received many requests for technical assistance from other NSOs for these indicators. Objective 6.5.1, which refers to the implementation of integrated management of water resources, is also very pertinent since it includes the creation of monitoring systems. In Paraguay, they have a project office, although they have not had the opportunity to have a direct conversation with the organizations linked to the WIS.

Result 1 During the workshop, UNEP proposed to support Paraguay in this process and offered the country to become a regional or sub-regional center on the Water subject, establishing an office of the GEMS Water initiative⁸. GEMS Water has developed measurement tools based on satellite images, which UNEP has made available to adapt to the needs of the WIS.

On the other hand, FAO presented its Global Information System on Water in Agriculture, within the framework of the Aquastat⁹ initiative, which has 85 variables of different dimensions related

8. See <https://gemstat.org>

9. See <http://www.fao.org/aquastat/es/>

to water. The Aquastat database has information on the countries since 1960. The information is divided into 5 major areas: Geography and population; State of water resources; Water uses, irrigation, and drainage; Environment; And health. The information is collected through questionnaires. In the case of Paraguay, the database has good information, although it requires an update, using data from recent years.

Result 2 FAO offered technical support to adapt its water reporting platform to the needs of Paraguay’s WIS. The main challenges that FAO faces in coordinating the water information system refer to:

- i. Fragmented, heterogeneous and incomplete databases;
- ii. Lack of coordination on definitions and methodologies;
- iii. Differences in data for the same variable from different institutions;
- iv. Metadata availability;
- v. Sustainability of the updating process (periodicity and time series);
- vi. Lack of primary data;
- vii. Resources;
- viii. Communication and dissemination.

Experts emphasized that political will is a key factor to consolidate the system.

7. Main recommendations

The following recommendations have a purposeful meaning for the authorities to consider and evaluate when creating a WIS. Likewise, the recommendations include the current challenges in terms of requests for information, as well as the current capacities and possibilities observed in each institution.

- I. Mexico's governance structure scheme is considered ideal to implement in the WIS. However, the Mexican legal framework can be too complex for the state of the art in Paraguay, especially due to the previous existence of a very exhaustive law such as the one that gave rise to the SNIEG. Likewise, the existence of a specific body like Conagua also marks a difference with the current water institutionality in Paraguay. However, we should not lose sight of the Mexican experience, as a good example to follow.
- II. In this sense, moving towards a specific decree that creates a water board, defines the scope, and includes the definitions that are taken as regards to the products, indicators, composition, and periodicity of the meetings is recommended. After this, efforts should focus on a legislative proposal that fits the new statistical law of Paraguay.
- III. Previously, it is necessary to formally establish a core group of organizations that lead the initiative, in charge of formally calling the rest of the organizations to join it through framework agreements. This group could be made up of MADES, DAPSAN, and DGEEC.
- IV. The DGEEC can contribute with technical capacities for the compilation of the information and prepare the dissemination instruments so that the products of the WIS have the status of official statistics. The thematic organizations can contribute with content for the preparation of the products.
- V. It is important that the organizations involved in the WIS formally designate their political and technical focal points (for example, with a note from the head of each agency). To start, meetings should be convened at least every three months to promote the initiative. From there on, semi-annual meetings may be considered. In this sense, planning must be established with clear and feasible objectives and goals that will have to be followed up at the beginning of each of the next meetings.
- VI. WIS members should discuss the first version of the Mission and Vision. The principles presented above and discussed during the Workshop can work as the basis for this conversation.
- VII. It is important to identify and share the incentives associated with the creation of the WIS (sharing information and technical capacity, budgetary leverage/support, joint actions, international integration, among others).
- VIII. The scope of the WIS should include all the dimensions involved with water issues. This work can be approached in phases. In the beginning, from a pragmatic approach, it could prioritize a set of indicators following the criteria of information availability and satisfaction of urgent demands.
- IX. The WIS should aim towards the creation of a single web platform where all the water data in Paraguay is collected and published. The customization of the FAO-AQUASTAT platform may be a good starting point.

- X. In this sense, working with international organizations can help to leverage the WIS, make it visible, and resolve coordination problems. Therefore, moving forward with the joint work with the UNEP in adapting its tools for the construction of indicators is also recommended.
- XI. It is important to work on the WIS brand. In other words, to move forward on strategic actions, such as accompanying country reports and making specific reports on water issues, which will give visibility to the initiative.
- XII. A technical committee should identify and agree on the measures needed to close those information gaps that do not allow to perceive demands to generate policies or international requirements.
- XIII. The WIS should intervene progressively in the information that is already produced in the different organizations, in order to bring the quality and quantity of information to the required standards and levels. The different coordination stages can be structured based on three questions:

1. What information is already produced?

For this, it will be necessary to consolidate a constant catalog of statistical operations and data available on the subject. Operations that the agencies have in the field can be surveyed, to check if modules can be included.

2. How is that information produced?

This question refers to the quality of

the information produced. A first step would be the creation of publication calendars in advance of the information in each organization, in order to have the necessary and timely data, in the appropriate manner, to carry out compilations and specific products of the WIS. Likewise, the publication of metadata and known methodologies of each source of information and the harmonization of classifiers and nomenclatures are other important steps.

3. Why is this information produced?

This last question refers to joint planning. The creation of an annual plan, with goals and objectives regarding information surveys for all the organizations' members of the WIS, is a desirable coordination instance to achieve a coherent, consistent and sustainable system in the long term.

- XIV. The creation of a set of specific products with established publication dates. A two-phase project can be designed, according to the complexity and information requirements in each case. Initially, the creation of on-demand indicators (such as the SDG indicators), specific studies and reports, a indicators catalog, and a statistical yearbook about water can be addressed. The second phase should contemplate the implementation of the web platform, a plan to expand the availability of primary data, and a report on the situation of water in Paraguay, together with a compendium of geographic information.

8. Next steps

The workshop discussed the objectives that the WIS should pursue in the first stage. Therefore, different objectives have been considered in terms of establishing priorities and drawing up an action plan on that basis, such as i) Establishing a series of specific products to be published jointly; ii) Progressing institutional consolidation and generating the required regulations to make the system sustainable

over time; iii) Agreeing on a set of indicators to be disseminated through a joint platform; iv) Managing financial and technical capacity sources; v) Other objectives.

Participants answers pointed towards institutional consolidation, establishing an indicators platform, and managing resources as the main action lines that should be addressed shortly.



Following this scheme, the first proposal for an Action Plan was discussed, including an **initial stage** during 2020 and 2021. During this years, progress should be made in the first phase of institutional consolidation, which includes the first regulatory documents for the WIS, such as a memorandum of understanding, which serves as the basis for the presidential decree or constitutive act. Also, several actions must be carried out at this stage, such as a primary data survey, the definition of the first set of indicators, some specific studies or international reports using the WIS brand, the designation of political and technical focal points, and the design of the defined products.

In the second **consolidation stage**, covering the period between 2021 and 2022, a new phase of institutional consolidation should be planned, as well

as the expansion of the primary data infrastructure and the set of indicators, the launch of the web platform, the design of new products, and the creation of a permanent Technical Committee.

Finally, at a **development stage** during the period 2022-2025, progress made should be assessed, and a new Strategic Plan should be structured for the year 2030.

To carry out the action plan, a program of specific activities to be made between 2020 and 2021 is proposed, to progress in each of the stated objectives. In this sense, the need to define the governance elements by the agencies and to move towards the creation of a regulatory framework containing the WIS is highlighted. The following is a proposal for the activities program:

1. Indicators Survey
(July-2020)
2. Governance elements
(July-2020)
3. Designation of technical and political links
(July-2020)
4. Definition of objectives and goals
(September-2020)
5. Diagnosis requirements
(September-2020)
6. Set of prioritized indicators
(December-2020)
7. Resources allocation
(December-2020)
8. Products design
(March-2021)
9. Products dissemination
(December-2021)

9. Conclusions

The work regarding the WIS still require progress in the construction of relevant elements for its operation and sustainability. For this, a greater interaction and involvement of key organisms in the matter will be necessary. Likewise, the support of local and international actors can help political and technical leverage.

The activities carried out within the framework of the Data for Now initiative, were an important milestone to consider next steps. The analysis and recommendations set out in this document

are intended to be a starting point on the different aspects that must be covered and that require political definitions to move forward.

WIS possibilities are determined by their current and future capabilities. Therefore, it will be necessary to strengthen technical and institutional aspects and think strategically about the ideal roadmap.

Overall, there are favorable conditions for the creation of a strong and sustainable WIS. The next steps will be crucial for this to happen.

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Annex | Governance and Indicators Workshop Agenda

Governance and indicators Workshop "Towards a Water Information System in Paraguay"

May 28th and 29th, 2020 | 10:00 a.m. - 1:00 p.m. (Paraguay) | Zoom Platform

Objective

- Discussing the governance, architecture, and the indicators system for structuring the Water Information System in Paraguay.
- Identifying the standard elements in the international experiences on the implementation of Water Information Systems.
- Exchanging experiences in the design of water SDGs indicators.

Agenda

Thursday, May 28	
Time	Topics
10:00 a.m. - 10:15 a.m.	Welcome and introduction of the participants <i>Fredy Rodríguez, Cepei</i>
10:15 a.m. - 11:15 a.m.	International Experiences Presentation of the United Nations Environment Program <ul style="list-style-type: none"> • SDG indicators under UNEP’s custody. State of the art and experiences • 6.3.2 and 6.6.1 indicators. Non-traditional data sources <i>Francesco Gaetani, Regional Coordinator, "Environment Under Review" Program, UNEP</i> Q&A session <i>Hernán Muñoz, D4N Paraguay Consultant</i>
11:15 a.m. - 12:00 p.m.	Progress and challenges at the local level Challenges in harmonizing administrative records on water <i>Iván Ojeda, DGEEC Director</i> Implementation of nomenclatures in the water system <i>Bethania Tellechea, DAPSAN</i>

<p>12:00 p.m. – 1:00 p.m.</p>	<p>Diagnosis of availability of information for SIASAR <i>César Pastore, D4N Paraguay Consultant</i></p> <p>Practical exercise with the members of CICOSAPS and the Strategic Committee for the Implementation of SIASAR</p> <ul style="list-style-type: none"> • Data collection. Information availability and present challenges.
<p>Friday, May 29</p>	
Time	Topics
<p>10:00 a.m. – 11:00 a.m.</p>	<p>International Experiences</p> <p>Presentation of AQUASTAT - FAO</p> <ul style="list-style-type: none"> • SDG indicators under AQUASTAT’s custody . State of the art and experiences. • Water Information Systems. Good practices and recommendations <p><i>Patricia Mejías, Land and Water Division, FAO</i> <i>Riccardo Biancalani, Coordinator of the Integrated Monitoring Project (GEMI) for SDG 6, FAO</i></p> <p>Q&A session</p>
<p>11:00 a.m. - 12:45 p.m.</p>	<p>Discussion: “Towards a sustainable and modern water Information System” <i>Hernán Muñoz, D4N Paraguay Consultant</i></p> <p>Governance: Scope, roles, and responsibilities</p> <p>Practical exercise with the members of CICOSAPS and the Strategic Committee for the Implementation of SIASAR</p> <ul style="list-style-type: none"> • WIS Architecture
<p>12:45 p.m. - 1:00 p.m.</p>	<p>Conclusions and closure <i>Fredy Rodríguez, Cepei</i></p>

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