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Water Governance in Guadeloupe (France): Understanding the role of institutions in water crises

How has Guadeloupe's institutional framework contributed to the water crisis?

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Abstract

Guadeloupe possesses a considerable water supply, among the highest in the world, with a potential availability of 7000 m^3 per inhabitant per year (Baile et al., 2018). However, the archipelago has faced persistent water shortages for decades. This thesis aimed to analyze the institutional frameworks governing water resources in Guadeloupe and determine how they have contributed to the water crisis as limited research has been done on the subject. As such, this thesis uses institutional theory to define institutions and understand how to analyze them, and principles of good governance to determine how sustainable water resources management is implemented. Additionally, the analysis is carried by following IWRM tools (enabling environment, institutional framework, and finance) and principles (integration, participation, decentralization, economic and financial sustainability). Combining these frameworks, the research found that the institutional causes of the crisis include historical mismanagement and regulatory gaps, which have led to aging and failing infrastructures, financial mismanagement hindering the "water pays water" ” (Bassin Committee Guadeloupe, 2016) strategy, and a lack of social considerations and fair pricing.

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List of Abbreviations

AEP : Alimentation Eau Potable (ENG : Drinking Water Supply)

ARS: Agence Régional de Santé (ENG : Regional Health Agency)

BRGM : Bureau de Recherches Géologiques et Minières (ENG : Bureau of Geological and Mining Research)

CACE : CAP EXCELLENCE Agglomeration Community

CAGSC : Grand Sud Caraïbes Agglomeration Community

CANBT : Northern Basse-Terre Agglomeration Community

CCMG : Marie-Galante Community of Communes

DAAF: Direction de Alimentation, de Agriculture et de la Forêt (ENG : the Department of Alimentation, Agriculture, and Forestry)

DAF: Direction de l'Agriculture et de la Forêt (ENG : Department of Agriculture and Forestry)

DEAL : Direction de l'Environnent, de l'Aménagement et du Logement (ENG : Directorate of Environment, Planning, and Housing)

DOM: Département d'Outre Mer (ENG : Overseas department)

EPCI : Public Intercommunal Cooperation Establishment

GEMAPI : Gestion des Milieux Aquatiques et la Prévention des Inondations (ENG : Management of Aquatic Environments and Flood Prevention)

IPCC: Intergovernmental Panel on Climate Change

IWRM : Integrated Water Resources Management

LEMA: Loi sur l'Eau et les Milieux Aquatiques (ENG : Law on Water and the Aquatic Environments)

LOOM: Loi d'Orientation pour l'Outre-Mer (ENG : Law for Overseas Orientation)

NGO: Non-Governmental Organization

NOTRe (Law) : Nouvelle Organisation Territoriale de la République (ENG : New Territorial Organization of the Republic)

OECD: Organization for Economic Co-operation and Development

OHCHR : Office of the High Commissioner for Human Rights

PPP : Public-Private Partnership

PSAEP : Plan de Sécurisation de l'AEP (ENG : Securitization Plan of the AEP)

SDMEA : Schéma Départemental Mixte d'Eau et d'Assainissement (ENG : Mixed Departmental Water and Sanitation Plan)

SIAEAG: Syndicat Intercommunal d'Alimentation en Eau et d'Assainissement de la Guadeloupe (ENG : Intermunicipal Union for Water and Sanitation)

SMGEAG : Syndicat Mixte de Gestion de l'Eau et de l'Assainissement de la Guadeloupe (ENG : Joint Union for Water and Sanitation Management of Guadeloupe)

SPANC : Services Publics d'Assainissement Non Collectif (ENG : Public Services of Non-Collective Sanitation)

SOCLE: Stratégie d'Organisation des Compétences Locales de l'Eau (ENG : Strategy for Organizing Local Water Competencies)

UN : United Nations

UNDP : United Nations Development Program

UNICEF : United Nations of International Children's Emergency Fund

UWWTD : Urban Wastewater Treatment Directive

WASH : Water delivery, Sanitation, and Hygiene

WFD: European Water Framework Directive

WHO : World Health Organization

Introduction

« The Caribbean indigenous people once named this butterfly shaped island […] Karukera, the Island of Beautiful Waters, due to its abundant resources […]. Yet today, a quarter of the Guadeloupean population no longer has daily access to clean water »[1] (Gadault & Laimé, 2022 (a))[2]

"Guadeloupe possesses a considerable water supply, among the highest in the world, with a potential availability of 7000 m³ per inhabitant per year[3]" (Baile, Werner, Baguet, & Schmitt, 2018, p. 14). However, the archipelago has been facing persistent water shortages for the past decades. This thesis aims to analyse the institutional frameworks that govern water in Guadeloupe and determine how they have been, and are, contributing to the water crisis.

Water scarcity is a relative concept (United Nations, 2022), and although there is no singular definition, they all share a common characteristic: water scarcity occurs when the water demand exceeds the available water supply (Damkjaer & Taylor, 2017). Factors influencing water supply are varied (e.g., infrastructural, institutional, geographical…), therefore, not all countries are equals in terms of water and financial resources. Moreover, while Earth is made of approximately 70% of water, freshwater remains a rare resource as it only makes up for 2.5% of its content. With 69% of that water stored in ice form within glaciers and polar ice caps, and another 30% located under the surface as unreachable groundwater[4], only 1% of Earth's freshwater remains available for human use (National Geographic, 2024). Freshwater use encompasses its utilization for agriculture, industry, and municipal uses, and has increased from about 671 billion m³ in 1901 to about 4 trillion m³ each year since the 2000s. This increase in usage can be explained not only by the growing global population but also by the "economic shift towards more resource-intensive consumption patterns" (Ritchie & Roser, 2024). Furthermore, water demand is predicted to increase by 55% by 2050 while it is estimated that 40% of the population will be residing in water-stressed river basins by then.

[1] Translated from the French: « Les Amérindiens des Caraïbes avaient baptisé cette île en forme de papillon, Karukera, l'île aux Belles-Eaux, tant la ressource est abondante […] Pourtant, aujourd'hui, un quart de la population guadeloupéenne ne dispose plus d'un accès quotidien à l'eau potable. »

[2] The book has been purchased has an eBook, therefore it doesn't have page numbers.

[3] Translated from the French: « La Guadeloupe dispose d'une ressource en eau conséquente, parmi les plus élevées au monde, avec un potentiel disponible de 7 000 m³ par habitant et par an ».

[4] It was estimated that 20% of the global groundwater resources were either inaccessible or too costly to access (Reinecke, et al.)

Indeed, climate change has been impacting the water cycle, increasing the severity and occurrence rate of droughts and floods (Gurría, 2020). Thus, it diminishes terrestrial water storage and affects the daily life practices that rely on the availability and predictability of water resources (e.g., agriculture), disrupting economic and social development. Additionally, water scarcity affects most the poor and marginalized groups, impacting their health and ability to earn a living. Women and girls are particularly impacted as many are the ones collecting the water. Hence, they are put at greater risks of attacks, and are being kept away from education and/or work. Therefore, it has become more and more important to develop water monitoring systems and effectively manage water usage (United Nations, 2022).

Article I. 1 and 2 of the General Comment No.15, adopted by the UN Committee on Economic, Social and Cultural Rights in November 2002, state: "the human right to water is indispensable for leading a life in human dignity. It is a prerequisite for the realization of other human rights […]. [It] entitles everyone to sufficient, safe, acceptable, physically accessible and affordable water for personal and domestic uses" (UN Committee on Economic, Social and Cultural Rights, 2003, p. 1&2). The Comment was adopted as part of the third target of "Goal 7: Ensure environmental sustainability" of the Millennium Development Goals adopted in September 2000: "Halve, by 2015, the proportion of the population without sustainable access to safe drinking water and basic sanitation" (Lee, 2014). To have sufficient water supply, the World Health Organization (WHO) estimated that a person should have access to 50 to 100 litters of water per day. Moreover, to be safe water should meet the WHO Guidelines for drinking-water quality, and must be "free from micro-organisms, chemicals substances and radiological hazards that constitute a threat to a person's health" (United Nations, 2014). Water is acceptable if it meets standards of quality (acceptable colour, odour, and taste), and if its infrastructures are culturally appropriate, additionally to being "sensitive to gender, lifestyle and privacy requirement" (Ibid.). Furthermore, clean water should be physically accessible to everyone, meaning that it should be located within 1000 meters from the home, and should not take more than 30minutes to collect. And lastly, the United Nations Development Program (UNDP) recommended that to be affordable water expenses should not surpass 3% of household incomes (Ibid.). The right to access to clean drinking water and sanitation became a universal human right on July 28th, 2010, through Resolution 64/292 of the United Nations General Assembly. In 2015, the UN adopted the Sustainable Development

Goals for 2030 as a continuation of the MDGs for 2015. As such, the right to clean water and sanitation is currently being supported by "Goal 6: Ensure availability and sustainable management of water and sanitation for all" (United Nations, 2017).

Guadeloupe is an archipelago and overseas department (DOM) and region of France situated in the Caribbean. It encompasses five groups of islands: mainland Guadeloupe (Basse-Terre and Grande-Terre), Rivière Salée along with the neighbouring islands, the archipelago of Les Saintes, La Désirade, and Marie-Galante (Ministère de la Culture, s.d.). According to the 2023 rapport on water and sanitation produced by Guadeloupe Water Office, out of the 82.2 Mm3 of drinking water distributed in 2021, only 31.5 Mm3 were accounted for as consumed. Water losses have been attributed to leak in distribution system, unauthorized consumption, inaccurate metering, and inefficient management practices. While efforts to locate and repair leaks have led to an improvement in the efficiency of some of the communes'[5] networks (Water Observatory Guadeloupe, 2023 (a)) it is estimated that 100 000 inhabitants do not have daily access to drinking water (Gadault & Laimé, 2022 (a)). The south of Grande-Terre, where numerous hotel and paradisiac beaches are situated, and the eastern coast of Basse-Terre, where the main water catchment points are located, are the most affected by the defective water distribution system. Moreover, the lack of access to water does not only affects households but also public services. For instance, multiple schools had to close because of water related problems, and firefighters are often forced to draw water from swimming pools to extinguish fires due to empty fire hydrants (Ibid.). The water distribution crisis has been attributed to different actors. Some medias have pointed the mismanagement of the Intermunicipal Union for Water and Sanitation (SIAEAG[6]), that was responsible for ensuring the collaboration between the local authorities on the eastern part of the island where the water is located, and those in Grande-Terre (Gadault & Laimé, 2022 (b)). Additionally, local officials and the French government were accused of failing to control private actors involved in the water production and distribution systems, and the corruption and clientelism (Gadault & Laimé, 2022 (a)). To address the failures of the SIAEAG, a new organization, the Joint Union

[5] Smallest administrative division in France

[6] From the French: Syndicat Intercommunal d'Alimentation en Eau et d'Assainissement de la Guadeloupe

for Water and Sanitation Management of Guadeloupe (SMGEAG[7]), was created in September 2021 to replace it.

Problem statement, thesis outline and objective

In Guadeloupe, the paradox of high-water availability alongside the consequent lack of water access highlights a systemic challenge. Indeed, the water crisis, exacerbated by the persistent infrastructure decay and apparent management inefficiency, indicates issues withing the political and institutional structures in charge of water resources. While literature on water in Guadeloupe has been focusing on water policies and institutions from a legal perspective, environmental factors and climate change, water management, and on the soil contamination with chlordecone, there is relatively little research on water governance itself. Indeed, while a legal approach focuses on the analysis of regulations and rights, and a managerial approach focuses on implementing and optimizing operational tasks; water governance encompasses the processes behind decision making (Graham et al., 2003) through four dimensions - economic, political, social, and environmental) (Choukr-Allah & Hamdy, 2012) (Tropp, 2005). Therefore, this thesis aims at filling this gap by assessing the effectiveness of water governance in Guadeloupe through the analysis of its institutional framework.

How has Guadeloupe's institutional framework contributed to the water crisis?

The thesis will start with methodology, which includes the research design, method, theories, and data. The theories of 'good' governance (Graham, Amos, & Plumptre, 2003) (Zai, 2020) (OECD, 2015), and institution theory will serve as the theoretical lenses. Good water governance sets the general principles of a sustainable, effective and efficient water management system, while institutional theory provides the lens through which to analyse institutions. Additionally, Integrated Water Resources Management (De Oliveira Vieira et al., 2019) tools will be used as the analytical framework. They include tools from the Enabling Environment, Institutional Arrangements and Participation, and Finance pillars. Finally, the analysis will be conducted using mainly qualitative data, such as official audits and reports, grey literature, and media sources.

[7] From the French: Syndicat Mixte de Gestion de l'Eau et de l'Assainissement de la Guadeloupe

Methodology

Research Design

The thesis primarily uses qualitative data, including official audits and reports, grey literature, and media sources. Official audits, such as the *Audit of drinking water in Guadeloupe* (2018), or reports, such as the *French National Assembly's report made on behalf of the investigative committee regarding the control of water resources by private interests and its consequences* (Inquiry Commission, 2021), give insight on the transparency, accountability, efficiency and effectiveness of government operations. Moreover, grey literature help understand the broader context of water governance challenges and strategies in the region. And, media sources give an understanding of current discourses, stakeholders perspectives, the broader context surrounding water government issues, and the current state of the water crisis (Graham et al., 2003; Zai, 2020). Furthermore, relevant documents were found first by using general search streams, such as "Guadeloupe AND water crisis" (both in English and in French), and then specific ones for each part, such as "Guadeloupe AND water AND fundings" (also in both languages). Additionally, data was organized by directly adding quotes and notes to a Word document, which was divided in sections representing the IWRM Tools.

The research will be done through the lens of two theoretical and one analytical frameworks with complement each other. First, as this thesis aims at assessing Guadeloupe's institutional framework, it will use institutional theory to define first, what is an institution, and second, how to study institutions. Second, good governance theory will be used to identify the governance deficiencies contributing to the crisis. Indeed, governance looks at "who has influence, who decides, and how decision-makers are held accountable" (Plumptre & Graham, 1999). As such, 'good' governance sets general principles for sustainable development and can be used to evaluate governance systems. Those various principles offer tools to analyse Guadeloupe's water governance according to general global standards, offering a diverse perspective on water governance in the archipelago. Furthermore, the thesis will be structured around some key IWRM pillars, allowing for a flexible approach to the assessment of policies, legal and organizational frameworks, roles and responsibilities of stakeholders, water services and water funding strategies. Additionally, while good governance and IWRM both emphasize similar principles such as participation or sustainability, there would be limitation to only using

one of them. Indeed, on the one hand, while good governance can be applied to water governance, it lacks sector specific guidelines and tools to manage water resources. On the other hand, while IWRM implicitly includes good governance principles throughout its tools, the use of good governance as a theoretical framework provides more weight and legitimacy to IWRM guidelines though explicit principles. Therefore, good governance and IWRM are complementary, and provide a combined approach to address water challenges in Guadeloupe.

Theoretical Framework

I) Institutional Theory

Institutional arrangements shape water-related decision-making and policies, imposing constraints on water policies and driving the behaviors behind water sharing and use. Therefore, understanding institutions is crucial to assess water-related institutional arrangements (Hassenforder & Barone, 2018). In political science, three main trends of thoughts exist when studying institutions: old institutionalism, behavioralism, and neo-institutionalism. Old institutionalism emerged in the late 19th century and studies the evolution of formal institutions (e.g., parliament, courts of law or presidential system), considering that institutions are mainly a set of formalized decisions. In the 1930s, behavioralism appeared as a reaction to old institutionalism and from the belief that political behavior can be largely predicted by studying the acts and interests of agents and individuals (e.g., water users or local representatives). Finally, neo-institutionalists emerged in the 1970s and constitute the majority of modern political and social scientists and institutional economists. Neo-institutionalism studies the organization and functioning of political institutions, considering institutions as part of society. They consider that institutions provide the "rules of the game" (Ibid.; Jepperson 1991, cited in Bandaragoda 2000) in which actors operated, providing modes of cooperation, and allowing collective action. The term "rules of the game" is also found in IWRM, in which is refers to the elements that establish the enabling environment (policies, legislations, and plans) behind sustainable water resources management (WRM) (GWP, 2024 (a)). Moreover, neo-institutionalists believe that institutions influence and define identities of individuals (Hassenforder & Barone, 2018). Therefore,

institutions share four characteristics: they extend beyond individuals, they are relatively stable over time, they influence individual behaviors and impose limitations on actors, and they lead actors to adopt shared values and representations (Peters, 1999). According to this trend, institutions can be studied through different lenses (e.g., historically, through the actions and interests of actors, or sociologically) (Hassenforder & Barone, 2018). In order to understand how the water crisis happened, the thesis will take an historical approach, not only looking at the current institutional framework, but also at the ones that preceded them. Indeed, tracing how institutional arrangements were born, we can better understand what the roots of the water crisis are.

Following the neo-institutionalist thought, the word 'institution' has been used in various context and can be defined in multiple ways. Hassenforder and Barone (2018) define institution as the "normative and cognitive frames, formal or informal, which concern actors when they engaged in collective action" (Hassenforder & Barone, 2018, p. 14). While normative frames include the "rules, norms and procedures", cognitive frames refer to the "identity, culture, representations and beliefs" (Ibid.). Additionally, we must make a distinction from formal and informal institutions. On the one hand, formal institutions refer to the explicitly written rules and procedures established by governing authorities through legal processes (e.g., water regulations). On the other hand, informal institutions are constituted of the unwritten and implicit norms, customs, traditions, and practices that contribute to shaping behaviors and governance within society (Helmke & Levitsky, 2004) (e.g., traditional water practices in local communities).

> "*Formal institutions are the rules that are readily observable through written documents or rules that are determined and executed through formal position, such as authority or ownership. Formal institutions, thus, include explicit incentives, contractual terms, and firm boundaries as defined by equity positions. Informal institutions, in turn, are the rules based on implicit understandings, being in most part socially derived and therefore not accessible through written documents or necessarily sanctioned through formal position. Thus, informal institutions include social norms, routines, and political processes*." (Zenger, 2001, p. 2)

As such, this thesis will focus on normative frames and formal institutions, which are easier to identify and analyze. Indeed, as they are documented, they provide more accessible data for analysis.

Furthermore, Bandaragoda (2000) argues that institutions are made both of the 'rules of the game' and of the actors that play by them. Building on various definitions from the literature, he defines institution as:

> "*a combination of policies; laws, rules and regulations; organizations, their bylaws; operational plans and procedures; incentive and accountability mechanisms; and norms, traditions, and practices*" (Bandaragoda, 2000, p. 5)

Additionally, Bandaragoda (2000) identifies three main components of WRM institutions: water policies, water laws, and water administration. These components constitute three pillars of institutional framework and will be at the center of the analysis. Indeed, this definition will serve at this thesis's understanding of institutions as it encompasses various elements that can also be found in the IWRM approach (policies, legislations, regulations…).

Finally, while the terms 'institution' and 'organization' are commonly used interchangeably, it is important to make a difference between the two. Cernea describes organizations as "networks of roles […] articulated into hierarchies and obeying a system of rules, which elicit individual behaviour and coordinated actions." (Cernea, 1987). These hierarchies are usually referred to as "organizational structures" (Bandaragoda, 2000, p. 5). As such, organizations consist of groups of individuals, bound by shared purpose, rules, and procedures to accomplish set objectives. Similarly to institutions, organizations influence individuals' behaviors and contribute to institutional change (Bandaragoda, 2000).

In conclusion, to analyze water institutions one must look at both the actors and the institutional structures behind water governance. Indeed, institutions provide the structure in which WRM operates, as well as the roles and responsibilities of the various stakeholders in the water sector. Moreover, the thesis will mainly adopt an historical approach to neo-institutionalism and will use Bandaragoda's (2000) definition of institutions to study normative frames and formal water institutions.

II) *'Good' Water Governance*

Governance is "a process whereby societies or organizations make their important decisions, determine whom they involve in the process and how they render account" (Graham et al., 2003, p. 2). It can be studied in various context and broken down to multiple levels. The first level, global governance, looks at governance issues with a reach larger than individual governments. Then, national space governance aims to understand how various actors influence decision making within a country and look at the interaction between the different levels of government. Finally, organizational governance studies organizations which answer to a board of directors while community governance encompasses local level organizing bodies which operate without assuming a legal form or having a formal governing board in place (Ibid.).

At the national level, governance can be understood as the multiple entities that occupy the social and economic landscape such as businesses, institutions of civil society, the government and the media (Figure 1). However, this might vary depending on the context of the county, in which the military for example could take a more important role (Figure 2). Additionally, the role of the private sector seems to increase across countries, with some of the state functions being passed on businesses. Graham et al. (2003) illustrate theses spheres in the following figures:

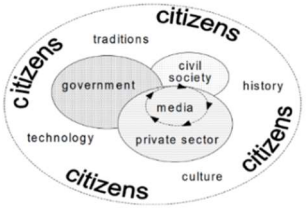

Figure 1

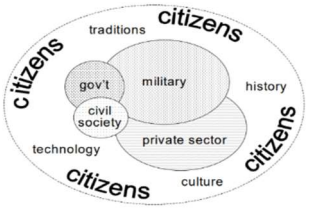

Figure 2

The modern concept of good governance emerged in the late 1980s following the government crisis of various African countries in which the World Bank and the International Monetary Fund's (IMF) economic aid programs were hindered by corruption and ineffectiveness (Zai, 2020). Good governance can serve as a means to achieve the desired outcomes (Ibid.), and is therefore, in our case, a prerequisite to achieve sustainable WRM (Jiménez, et al., 2020). Moreover, it can refer to both the mode (manner or method of implementation) and model (theoretical and conceptual framework) of governance that contribute to social, economic, and environmental goals desired by citizens (Graham et al., 2003). As such, there is no singular

definition of the concept, and good governance can be seen both as a means and a goal in itself. The World Bank offers the most thorough definition of the concept (Zai, 2020):

> Good governance *"is epitomized by predictable, open and enlightened policy making (that is, transparent processes), a bureaucracy imbued with professional ethos; an executive arm of government accountable for its actions; and a strong civil society participating in public affairs, and all behaving under the rule of law."* (Ibid., from World Bank 1994)

For the purpose of this thesis, I will define good governance as a goal, which is obtained through the application of a selected set of principles. Combining Zai's model on good governance at the EU level (Zai, 2020), and the United Nations Development Programme (UNDP)'s model which takes its roots in The Universal Declaration of Human Rights (UDHR) (Graham et al., 2003), a thorough list of principles can be established:

Good Governance Principles	**Description**
Openness / Transparency	Openness encompasses the principles of transparency and communication in the decision-making process (Zai, 2020). Processes, institutions, and data must be accessible to the relevant parties, with sufficient detail for understanding and monitoring (Graham et al., 2003).
Participation	Participation entails that of citizens must have their voice heard in the process of drafting and implementing policies (Zai, 2020). It can be achieved through a direct participation, or representation by a legitimate intermediate institution that reflects their intention (Graham et al., 2003). Additionally, participation required the need for consensus, to reach what is the best interest of the group.
Accountability	Accountability necessitates that the role of each actor of the decision-process is clearly defined to ensure that all actors fulfil their responsibilities and decision makers, the private section, and civil society organizations are held accountable (Graham et al., 2003; Zai, 2020).
Performance and Coherence	Performance and coherence encompass the sub-principles of efficiency and effectiveness. As such, decisions must be taken at the suitable level

	and time and meet the necessary requirements (Zai, 2020) while making the best use of resources (Graham et al., 2003). Additionally, the UNDP includes the principle of responsiveness in performance, stating that "institutions and process [must] try to serve all stakeholders" (Graham et al., 2003, p. 8). Finally, to be coherent, policies must follow the concept of policy integration, meaning that they must align with the various policies across different sectors and level of governance (Zai, 2020).
Direction	Actors should have a broad and long-term perspective on good governance and development, and on how to achieve such development. Additionally, the historical, cultural and social contexts should be taken into consideration in the decision-making process (Graham et al., 2003; Zai, 2020).
Fairness	Fairness follows the principles of equity ("all men and women have opportunities to improve or maintain their well being" (Graham et al., 2003, p. 8) and of the rule of law ("legal frameworks should be fair and enforced impartially, particularly the laws on human rights" (Ibid.)).

The non-application of good governance can be referred to as poor governance and can lead to "increased political and social risks, institutional failure and rigidity and a deterioration in the capacity to cope with shared problems" (Rogers & Hall, 2003, p. 9).

Furthermore, water governance has four dimensions: social (equitable use), economic (efficient use), political (equal democratic opportunities), and environmental (sustainable use) (Choukr-Allah & Hamdy, 2012; Tropp, 2005). The OECD defines the Principles on water governance as being "rooted in broader principles of good governance: transparency, accountability, human rights, rule of law and inclusiveness." (OECD, 2015, p. 5). Moreover, those principles aim to contribute to the development of a sustainable, integrated and inclusive WRM. Hence, 'good' water governance encompasses "the range of political, institutional and administrative rules, practices and processes (formal and informal) through which decision are taken and implemented" (Ibid.). This range is usually represented by an arrangement of three societal organizations models: hierarchical (State pre-eminence), communal, or market-driven (Molle, 2020). For instance, a town's water supply system could

be overseen by the commune, a private entity, community initiatives, or mix of these (Ibid.). Additionally, effectiveness is a crucial part of water governance. Rogers and Hall (2003) define effective water governance as "a structure of governance that is open and transparent, inclusive and communicative, consistent and unifying, fair and ethic." (as cited in Nion, 2012, p. 265). As we can see, those principles align with the other principles of 'good' governance. Finally, water governance can be considered 'good' and effective if it contributes to solving the water challenges of the area in which it is being implemented. Therefore, 'good' and effective water governance can only be achieved by adapting water governance to the local conditions while leaning from the success and mistakes that happened all around the world (Choukr-Allah & Hamdy, 2012).

In conclusion, 'good' water governance refers to the effective management and use of water resources through transparent, inclusive, accountable, and sustainable decision-making processes. As such, this thesis will look at the institutions that shape and shaped water policies, and either facilitated or hindered effective WRM.

Analytical Framework: Integrated Water Resources Management

Rogers and Hall (2003) encourage the use of IWRM tools to support the implementation of effective water governance. Indeed, IWRM addresses governance failures (e.g., inappropriate price regulation) through specific tools that emphasize a coherent policy and legal framework, a strong regulatory regime, a clear allocation roles and responsibilities, and a climate of trust. This section will first look at the reasons behind the emergence of IWRM, and then the principles guiding IWRM as well as the tools that will be used for the analysis.

I) The emergence of IWRM

The terms "water" management and "water resources" management are often used interchangeably in water (resources) management studies. However, it is important to note that some scholars differentiate the two notions. Edalat and Adby define water management as "the activities aimed at planning, developing, distributing and operating water resources,

surface water, drainage and sewage" (Edalat & Abdi, 2018, p. 11). Indeed, water management generally refers to the control and operation of water systems (practical aspects) and includes the activities necessary to deliver water, treat wastewater, and maintain water systems. On the contrary, water resources management can be defined as a more holistic approach that promotes a sustainable use and conservation of water.

> "Water Resources Management (WRM) is the process of planning, developing, and managing water resources, in terms of both water quantity and quality, across all water uses. It includes the institutions, infrastructure, incentives, and information systems that support and guide water management. Water resources management seeks to harness the benefits of water by ensuring there is sufficient water of adequate quality for drinking water and sanitation services, food production, energy generation, inland water transport, and water-based recreational, as well as sustaining healthy water-dependent ecosystems and protecting the aesthetic and spiritual values of lakes, rivers, and estuaries. Water resource management also entails managing water-related risks, including floods, drought, and contamination." (World Bank, 2022)

As the thesis encompasses both practical aspects of water management, and the management of water resources beyond drinking water services, it will make a distinction between the two concepts, for more clarity.

Xie (2006) describes the failure of traditional water resource management approaches that lead to the emergence of IWRM. Traditional WRM approaches have not effectively addressed the growing global water challenges due to several key factors. First, the sectorial management approaches adopted in the 19th and 20th century and their limited inter-sectorial interactions caused a "fragmented and uncoordinated development of water resources" (Ibid., p.3). Indeed, water flows and usages often cross sectorial boundaries and impact one another (e.g., water development projects can have environmental consequences). Second, traditional WRM has been directed by central governments, focusing on supply management rather than demand management and sustainable use. This top-down approach has often been inefficient, with subsidies resulting in wasteful water use, and restrictions on water transfers resulting in ineffective distributions of water resources. Xie highlights that supply management alone cannot be sustainable, as it necessitates sourcing new water at increasingly higher costs, and with significant environmental and social repercussions. This can be seen especially in developing countries, where water service providers get trapped in a "vicious cycle" (Ibid., p.4)

where their inefficiency and low-quality services resulted in consumers refusing to pay, leading to more degradation of services and consumer discontentment. Finally, Xie reinforces that water issues are often crises of governance, with inefficient water allocations, decreases in water and service quality, and overall negative environmental and social consequences. The failure of traditional WRM approaches lead to the emergence of IWRM to palliate to the global water issues and work toward sustainable WRM.

In opposition to the traditional and fragmented WRM, IWRM takes a holistic approach to WRM. It is a "systemic and sustainable approach to water resources management that takes into consideration the limited nature of water resources and the effects of negative impacts on this resource" (SIWI, 2020, p. 14), such as the environmental damages caused by dams or reservoirs, or the impacts of polluted water consumption. It "emphasizes ecosystem sustainability, social equity and economic efficiency" (Ibid., p.14). Indeed, the Global Water Partnership (GWP) defined IWRM as "a process that promotes the coordinated development and management of water, land and related resources, in order to maximize the resultant economic and social welfare in an equitable manner without compromising the sustainability of vital ecosystems." (Global Water Parternship, 2000, p. 6). As such, the IWRM sets tools, principles, and guidelines to assess and evaluate programs that can be tailored to the specific context of the area studied (Xie, 2006). Furthermore, IWRM emerged from the four principles of the Dublin Statement on Water and Sustainable Development (Rodda, 1992):

- Principle 1: "Fresh water is a finite and vulnerable resource, essential to sustain life, development and the environment." (Ibid., p.4).
- Principle 2: "Water development and management should be based on a participatory approach, involving users, planners and policy-makers at all levels." (Ibid., p.4).
- Principle 3: "Women play a central part in the provision, management and safeguarding of water." (Ibid., p.4).
- Principle 4: "Water has an economic value in all its compering uses and should be recognized as an economic good." (Ibid., p.4).

Those principles were born as an attempt to define the main issues and purposes of WRM globally. While they're not all as relevant to our case study, they highlight the important of water governance principles, such as inclusivity, participation, sustainability and the finite

characteristic of water. Consequently, IWRM combines the key concepts of *Integration*, *Decentralization*, *Participation*, and *Economic and Financial Sustainability* (Xie, 2006).

Integration – Stemming from the first Dublin Principle and the inadequacies of previous sector specific WRM practices, IWRM seeks for a comprehensive and intersectoral approach. This strategy entails the horizontal integration of all water-related sectors (energy generation, agriculture, waste management, and other industrial use) ensuring that water resources are managed cohesively across these interconnected areas. Furthermore, IWRM also emphasizes the need for vertical integration to coordinate efforts between different water user groups and institutions at local, regional, national, and international levels. (Xie, 2006) (SIWI, 2020)

Decentralization – Building on the second Dublin Principle, decentralization entails in allocating WRM authority and responsibility to the lowest effective administrative level. For instance, management authority can be allocated to basin or sub-basin level through river basin organizations which can better palliate to the specificities of the local problems, and where institution accountability is greater. Moreover, the private sector can also take part in providing water services in places where central government are unable to provide sustainable water services (Xie, 2006).

Participation – Water is a common good, therefore water issues impact everyone. As such, additionally to decentralizing the decision-making process, it is important to ensure the cooperation, collaboration, and dialogue between all relevant stakeholders. Moreover, following Principle 3, the involvement and consideration of the needs of women (and other marginalized communities) is necessary (SIWI, 2020). Lastly, effective participation requires not only representation to address social welfare issues (Xie, 2006), but also transparency, accountability, and consensus (SIWI, 2020).

Economic and Financial Sustainability – With the increasing cost of water and degradation of services, it is crucial to consider the economic value of water. First, to ensure that water is allocated sustainably its pricing should reflect its true cost. This means that it should include its extraction and delivery cost, opportunity cost, and the cost of its social and environmental impact. Additionally, to ensure the financial sustainability of service provision, user fees should cover the operation and maintenance costs. Secondly, to optimize water allocation, regulatory frameworks should clearly define water usage and rights, and develop

markets that allow the buying, selling, and trading of water use rights among different entities. All these goals must be thought on the long-term (Xie, 2006).

In conclusion, IWRM diverges from traditional WRM by adopting a holistic, participatory, and sustainable approach. Furthermore, it provides a comprehensive framework for a sustainable governance of water resources by developing flexible, equitable, and efficient water resources management strategies to meet both present and future water needs.

II) IWRM Tools

The first version of the IWRM ToolBox was introduced in 2000 (Global Water Parternship, 2000) and was initially organized into three sub-categories (enabling environment, institutional roles, and management instruments), encompassing a total of 49 tools (Xie, 2006). Overtime, this ToolBox evolved to provide a more comprehensive set of tools for WRM. GWP's ToolBox is now made of 88 tools divided into four sub-categories: enabling environment, institutions and participation, management instruments, and financing (GWP, 2024 (a)). As it has been mentioned previously IWRM tools have been thought to be flexible and be adapted to the needs of their users. Therefore, as we are looking into the political and institutional frameworks affecting water governance in Guadeloupe, the thesis will use tools from the *Enabling Environment, Institutional Arrangements and Participation,* and *Finance* pillars.

The *enabling environment* pillar is made of the regulatory instruments that establish the "rules of the game" (GWP, 2024 (a)) of IWRM implementation. It is made of the policies, legislations, and plans that allow and enable all stakeholders to fulfil their roles in the "sustainable development and management of water resources" (Ibid.). As such, a strong enabling environment aids in improving water governance and achieve social, economic, and environmental sustainability. The tools that will be used for the analysis are the following:

- Policies: policies are "guidelines or a set of principles which serves as a guide to a concerned authority; in its course of action towards achieving a specific objective" (GWP, 2024 (b)). As such, they set the national objectives for water use, protection, and conservation, and for water resources management and distribution. Moreover,

they should follow the principles of integration, decentralization, participation, and economic and financial sustainability mentioned previously (Xie, 2006). Thus, evaluating the current policies helps analysing how policymaking has contributed to the water crisis in Guadeloupe.

- Legal Frameworks: the law "determines what is acceptable [and] provides a means of accountability when implementing IWRM" (GWP, 2024 (b)). Water legislation turns water policies into laws, defining who owns water, who possess the permits and rights to use water, and the legal framework for water user groups (Xie, 2006). Therefore, water legislation is a crucial instrument for monitoring and managing water distribution, as well as safeguarding water rights (GWP, 2024 (b)). Thus, this tool will help identifying legislative gaps that have contributed to the water crisis.

The *institutional arrangements and participation* pillar looks at the distribution of institutional responsibilities, sets up methods for improving stakeholder involvement, and develop comprehensive frameworks and strategies to enhance capacity development. Additionally, institutional arrangements need to be flexible and sustainable, foster the cooperation and collaboration of stakeholders, and facilitate the participation of national and subnational expertise (GWP, 2024 (c)). The tools which will be used for the analysis are the following:

- Regulation and Compliance: this tool looks at the role and responsibilities of actors responsible for controlling the enforcement of water and environmental policies, laws, and plans to guarantee the water integrity of the water sector (GWP, 2024 (d)). Therefore, it will help with identifying the gaps in regulation and evaluate the effectiveness of regulatory compliance in the water sector.
- Water Services: water services refer to the institutional arrangements in charge of WASH (delivering water, sanitation, and hygiene) services. To ensure the universal and fair access to safe and affordable drinking water, water services must be adapted to the local social, economic, political, and environmental circumstances (GWP, 2024 (e)). This tool will therefore assess if the water services in Guadeloupe are adapted to its specificities.
- Coordination: as the water sector monopolize various stakeholders across multiple sectors and levels, it is crucial to implement effective coordination between the actors of the water sector. Coordination is important not only to navigate the

diverging interests of the water sector actors, but also to prevent conflicts (GWP, 2024 (f)). Thus, we will assess if the bodies and instruments implemented in Guadeloupe facilitate the participation and coordination of the actors of the water sector.

Sustainable *finance* is a key to building a strong water governance system. Understanding where investments are needed is essential to ensure the sustainable funding and financing. Therefore, finance tools explore the strategies to determine the economic, social, environmental and technical arguments for investing in the water sector and assess their benefits. Additionally, they discuss how to build the structure and mechanisms to increase those investments, contributing to the enhancement of water supply, sanitation, water quality and water services. Investments are needed both in hard (e.g., pipelines, dams, distribution systems…) and soft (e.g., research and development, legislative consultation, administrative overheads…) infrastructures (GWP, 2024 (g)). Moreover, they can "be resources from the public sector, private finance, and joint public-private partnership" (Xie, 2006, p. 8). Thus, in this section, we will analyse the financial framework in Guadeloupe, to assess the allocation of funding and investments.

Limitations

This thesis presents a couple of limitations. First, as water governance in Guadeloupe remains an underexplored subject, the existing literature and documentation is limited. Additionally, some of the data is under restricted access, and therefore cannot be obtained. Secondly, as I am using existing documentation, those documents' perspectives can be tainted by the biases of their writers. Similarly, my own interpretation of the data and the following conclusions can be tainted by my biases.

Analysis

In 1946, the four 'old colonies', Guadeloupe, Martinique, French Guiana, and Réunion, officially gained the status of overseas departments of France (Mary & Maurice, 2020). Hence, in the 1950s, the French government undertook large-scale water supply projects aimed at lifting Guadeloupe out of poverty and reducing its reliance on sugarcane production (Gadault & Laimé, 2022 (a)). Consequently, in the 1950s and 1960s, the first water infrastructures for water production, conveyance, and distribution were established, including the Belle-Eau-Cadeau feeder in Basse-Terre, where most of the resource is situated. Through the 1970s, Belle-Eau-Cadeau feeder was then extended to supply both parts of the main island (Basse-Terre and Grande-Terre), transporting water to multiple communes. Later, an underwater pipeline was constructed to bring water to La Désirade in the early 1990s. These years mark the beginning of Guadeloupe's water planning and development (Morell & Jeremie, 1994). Using the IWRM tools and the theoretical frameworks of good governance and institution theory, I aim at demonstrating how Guadeloupe's institutional framework has contributed to the water crisis from the late 20th century to today.

Figure 3 : Map of Guadeloupe's Communes, retrieved from https://www.worldatlas.com/maps/guadeloupe

Enabling Environment

The first dimension of GWP's Integrated Water Resources Management approach, inquires into the environment in which the government implements water governance and water resources management structures. The enabling environment is composed of the multiple regulatory instruments which provide the foundation for the implementation of IWRM. As such, national, provincial and local policies and legislation define the "rules of the game", which make it possible for all stakeholders to play their specific roles in the development and management of water (GWP, 2024 (b)).

I) Policy Framework

Policies are "guidelines or a set of principles which serves as a guide to a concerned authority; in its course of action towards achieving a specific objective" (GWP, 2024 (b)). As such, adequate policies are a central aspect to creating an environment which supports sustainable water governance. This section will evaluate Guadeloupe's water policy framework in accordance with the principles for good governance and for Integrated Water Resource Management. To understand how the water policy framework has been shaped in Guadeloupe, I will take an historical approach to neo-institutionalism, analysing how its policy framework has been shaped by new challenges and assessments. Therefore, I will first trace the evolution of Guadeloupe's main water policy instruments, and then will assess Guadeloupe's water policy regarding the IWRM and good governance principles.

In 1986, the Water Use Plan (FR: "Schéma d'utilisation des eaux") was created by the Department of Agriculture and Forestry[8] (DAF) due to the socio-economic development in the archipelago, particularly in Grande-Terre (Morell & Jeremie, 1994). The plan was then revised in 1994 following the 1990 census. It was estimated that the population would grow by 16% from 1985 and 2000, and that the water demand would increase by 50%. As such, it was crucial to increase the efficiency of water production, from a yield of water of 50%, to a set goal of 65% by 2000. The Water Use Plan was meant to serve as a roadmap for WRM, guiding the

[8] The DAF has now become the Department of Alimentation, Agriculture, and Forestry (DAAF) (FR: Direction de Alimentation, de Agriculture et de la Forêt)

decision-making process related to water allocation, infrastructure investment, and conservation effort in Guadeloupe. As such, its measures included the construction of new boreholes, connecting pipes and water treatment facilities. It also included the storage of surplus water in regulation ponds to use during low-water periods, the implementation of education programs for the users and the creation of management plans to meet the growing needs for water use (domestic, agricultural, and industrial) (Ibid.). Moreover, to palliate to the low yield of water due to leakage on the water pipeline system, it aimed at improving the network efficiency through the centralized remote monitoring system already tracking leaks in need to be repaired or replaced. As such, while the original document could not be found online for more analysis, we can conclude from the short description by Morell and Jeremie (1994) that it emphasized the need for the evaluation of both surface and groundwater resources, population growth projections, and economic factors. Hence, it was already anticipating some of the growing needs and challenges of the 21st century.

Established by the Water Law of 1992 (Légifrance, s.d.) and the European Water Framework Directive (2000/60/EC) (WFD), the Master Water Development and Management Plan (SDAGE[9]) is a planning document which aim to meet set objectives for a "good status" of water by 2015, with the possibility of extending it to 2027 (Gest'Eau, 2022; Basin Committee Guadeloupe, 2013 (a&b)). It can be defined as "achieving good ecological and chemical status" for surface water (rivers and coastal waters), and "achieving good chemical status and a balance between withdrawals and the replenishment capacity of aquifers" for groundwater (Basin Committee Guadeloupe, 2013 (a)). Since policies are at the basis of law formulation, strategic planning, and operational management, it is crucial to continuously update them (African Development Bank & Fund, 2000). To ensure the continuous improvement of water resources management practices and the achievement of environmental goals, the SDAGE cycles are set for a six-year period. Twelve plans, one for each hydrographical basin, have been implemented across France to cater to the specificities of the regions (Gest'Eau, 2022; Basin Committee Guadeloupe, 2013 (a&b)).

Adopted in June 2003 by its Bassin Committee, notably following the increased tourism and agricultural water needs, Guadeloupe's first SDAGE cycle ran from 2003 to 2009. SDAGE 2003-

[9] From the French : Schéma Directeur d'Aménagement et de Gestion des Eaux

2009 was built on the three fundamental principles enounced in the Water Law of 1992: the principles of safeguarding the common water heritage, of unity of the resource and comprehensive management, and of balanced management. The first principles underscore the need to leave a diverse and valuable heritage to future generations, putting public interests before public ones. The second principle highlights the important of managing water while taking into consideration all the aspects of the water cycle, and all various usages of water. Global water management must not have a negative impact on water and water cycles; therefore, knowledge of the resource is primordial. Lastly, the third principle emphasized treating ecosystems, the protection against pollution, and the restauration of water quality and aquatic environments as equally important as resource development, usage, and distribution. The protection of the environment can prove itself to be beneficial for economic growth, underpinning sustainable development. Furthermore, it lays six core priorities in water resources management in Guadeloupe (Basin Committee Guadeloupe, 2003):

- Ensuring sufficient water supply for drinking, irrigation, and industry by efficiently managing and storing water resources. This objective aims at satisfying the water needs of various industries, including tourism, industries, agriculture and relies on a sustainable management of water from an economic perspective. As such, it emphasizes the importance of the total billing of water consumption, a better use of water through, and of better infrastructures.
- Securing drinking water sources through, for instance, the expansion of network coverage, the improvement of treatment capacities, or the build of trust from the population.
- Combating point pollution and prioritizing sensitive sites (rivers, tourist sites, coral reefs).
- Restoring aquatic ecosystems' biological health through, for example, the construction of new infrastructure and reorganization of fishing activities.
- Protecting individuals and property against flooding, river floods, and cyclonic swells through educative measures, more regulations, and the maintenance of waterways.
- Establishing mechanisms for knowledge, consultation, and information dissemination to ensure sustainable water resources management.

Some of the core objectives of the SDAGE have stayed the same throughout the years (guaranteeing better water supply, usage, and sanitation, restoring, and protecting aquatic ecosystems, and palliate to the pollution of water). However, two main changes can be observed through the SDAGE cycles. First, the number of measures has been reduced throughout the year, through mergers, prioritization, and the elimination of existing provisions. With reduced provisions, the Basin Committee aims at not only facilitating the implementation of the SDAGE and focus of priority objectives specific to Guadeloupe, but also make it more accessible to the public. As such, the numbers of core priorities and their provisions went from 8 and 113 respectively in SDAGE 2010-1015, to 5 and 91 in SDAGE 2016-2021, to 5 and 22 in SDAGE 2022. Secondly, SDAGEs brought new concepts as new challenges arose. Indeed, the establishment of SDAGE 2010-2015 brought a new perspective to water management through the recognition of water governance as a core driver of effective water management. As such, SDAGE 2010-2015 added the improvement of water governance to its objective through various processes. First, it emphasized the role of the Water Office, created in 2006, in enhancing the overall water resource management practices (Basin Committee Guadeloupe, 2010). Indeed, the Water Office is a central piece to water governance in Guadeloupe, supporting water-related projects, implementing a redistribution system, allocating funds, and collaborating with other stakeholders (Bassin Committee Guadeloupe, 2016). Second, it recognized the inequalities in resource access and prices between Basse-Terre and Grande-Terre and aimed towards harmonizing water prices on all the territory. Thirdly, it highlighted the importance of developing more communication channels for the public, to educate on water issues and development (Basin Committee Guadeloupe, 2010). SDAGE 2010-2015 was also the first to mention climate change, specifically regarding its threat to coral reefs (Basin Committee Guadeloupe, 2010). However, the consideration of climate was only solidified in SDAGEs 2016-2021 and 2022-2027. Indeed, according to data collected from the Intergovernmental Panel on Climate Change (IPCC) and Météo France, climate change will lead to biodiversity loss, increased coastal vulnerability, and decreased resilience (Bassin Committee Guadeloupe, 2016) As such, the updates measures and goals were conceived taking into account the constraints of climate change in the quantitative management of water resources. Hence, 16 out of the 22 provisions (76%) of SDAGE 2022-2027 take into consideration climate change (Bassin Committee Guadeloupe, 2016). Concurrently, multiple policies have emerged from the different SDAGE cycles. For instance, the Mixed Departmental

Water and Sanitation Plan (SDMEA[10]) was created as a part of provisions 7 and 32 of Guadeloupe's SDAGE 2010-2015. These provisions required the creation of a comprehensive master plan for water resource usage, encompassing all uses of water such as drinking water supply, irrigation, and hydroelectricity, and of a comprehensive sanitation plan. As such, it includes various proposals including infrastructural development, upgrades, and maintenance to improve water supply systems and facilities, exploring innovative technologies, and implementing stakeholder collaboration (government agencies, local communities, NGOs, and private sector partners) (Water Office Guadeloupe, 2011). Another important document created through the SDAGE is the Strategy for Organizing Local Water Competencies (SOCLE[11]), established in June 2016 as a supporting document for the 2021 update of the SDAGE. SOCLE is both an educative and a methodological instrument. First, it aims at facilitating stakeholders' comprehension of the evolving landscape of water resource management by providing insight into regulatory changes, policy updates, and their potential impacts, thus enabling informed decision-making and strategic planning. Secondly, it provides practical frameworks and recommendations to facilitate the organization and consolidation of targeted competencies. Hence, SOCLE provides guidance for local initiatives and decisions in the domains related to the management of aquatic environments and flood prevention (GEMAPI[12]), drinking water supply, wastewater sanitation, and urban stormwater management (Water Office Guadeloupe, 2019).

Therefore, SDAGE aims at ensuring sustainable WRM by securing sufficient water supply not only for the population but also for the various industries, by reducing the pollution of bodies of water, protecting aquatic ecosystems, promoting climate change resilience, and enhancing governance through stakeholder participation and education.

To achieve effective water resources management, water policies should follow the principles of good governance and the guideline of the GWP regarding IWRM. The GWP advises that water resources policies should not be designed as response to crises but be designed proactively. Therefore, it is important to anticipate changes and take into consideration all the various aspects and sectors of water usage. Hence, "IWRM strives to achieve a balance

[10] From the French : Schéma Départemental Mixte d'Eau et d'Assainissement
[11] From the French : Stratégie d'Organisation des Compétences Locales de l'Eau
[12] From the French : Gestion des Milieux Aquatiques et la Prévention des Inondations

between economic efficiency, social equity, and environmental sustainability" (GWP, 2024 (h)) through integration, participation, decentralization, and economic and financial sustainability. Since its first creation in 2003, SDAGE has been emphasizing the interconnected nature of water and promoting the integration of the major sectors in Guadeloupe. Indeed, Guadeloupe's economy has historically revolved around agriculture and agri-food industry, fishing, and tourism (CCI, 2021). As such, SDAGE includes agriculture, fishing, and tourism in its measures and provision, especially from an environmental perspective. Then, it reflects the principle of decentralization through the allocation of WRM authority to lower administrative levels, such as the Basin Committee or the private sector. Furthermore, it highlights the important of sustainable pricing mechanisms and aims to optimize water allocation through clear regulatory frameworks. Additionally, it was formed consulting various water-related stakeholders, through workshops, meetings, or public hearings for example (Bassin Committee Guadeloupe, 2022).

Furthermore, SDAGE follows principles of good governance. First, it fosters openness, transparency, and participation through its public consultation process at various stages of development. For instance, the conception of SDAGE 2022-2027 included an online questionnaire for the population to give input on water usage. Additionally, drafts, summaries, and final versions of SDAGE are publicly available for consultation, giving all stakeholders the opportunity to access information. SDAGE also includes monitoring and reporting mechanisms that give updates on the implementation and results of water measures and goals. Moreover, through the different SDAGE, the different responsibilities have been defined more clearly, defining the roles and responsibilities of the relevant actors (e.g., Water Office), respecting the principle of accountability. Furthermore, we can see that throughout the cycles, SDAGE has remained coherent, with clear goals and a long-term perspective which are centered around better governance, water supply, and since 2016 a commitment to adapt its WRM framework to climate change.

However, some important aspects are missing from the policies. Indeed, they do not put enough emphasize on some of the social aspects of water management and governance. Indeed, while restoring public trust in water services and gaining support for a better understanding of water prices were part of SDAGE 2003-2009, those objectives were not included in the next cycles. Policies focus on educating the users, representing the problem as

a lack of knowledge on water issues. While education is always needed for new users, studies have shown that public trust in the actors in charge of water management has been decreasing (Espelia, 2024), not only because of the failing water network, but also because of historical mistreatment of DOMs. Gadault and Laimé (2022 (a)) retrace some of the major events which have contributed to the distrust of the population, notably the difference in rights and treatment between Metropolitan French people, and the ones from Guadeloupe. As such, from the poverty crisis and the higher cost of living due to the taxes on imported, to the authorization of chlordecone in Guadeloupe and Martinique from 1972 to 1993, despite being banned in the Metropole due to its toxicity and which is estimated to have contaminated 90% of the current population, multiple crisis and scandals have impacted the trust of the population (Gadault & Laimé, 2022 (a)). Therefore, policies must take into consideration the interconnectedness of all sectors and rebuild trust not only in the water sector but in all aspect governance. The Audit of Drinking Water in Guadeloupe (Baile, Werner, Baguet, & Schmitt, 2018) showed that nearly 40% of users have outstanding bill, contributing the financial hardship of a system founded on the principle that “water pays water” (Bassin Committee Guadeloupe, 2016).

In conclusion, Guadeloupe’s water policy framework was first developed to palliate to the increasing water demand due to tourism, economic development, and the growing population. Additionally, by retracing the historical development of the key water policy instruments, such as the Water Use Plan or the SDAGE, we can see that Guadeloupe’s water policy framework has continually adapted itself to emerging challenges. For instance, the SDAGE has undergone multiple changes over the years, clarifying its priority objectives by reducing their numbers, or taking into consideration the impact of climate change on aquatic environments. Moreover, the SDAGE plays a central role in aligning water management practices with good governance and IWRM principles, by emphasizing transparency, participation, accountability, participation, integration, and decentralization. However, the policy framework still needs to better address the social aspects of governance, such as equitable access and fair pricing, as well as the lack of public trust in the State, which impacts their trust in the water sector.

II) Legislative Framework

Legislative frameworks are essential to WRM as they define and identify the legal rights and obligations of users, set the guiding principles for WRM, provide mechanisms to uphold the system's integrity (e.g., through governance or monitoring), and allow for the existing system to change and adapt to the evolving challenges (Rieu-Clarke, 2012). Guadeloupe's water legislative framework is made of both national and international laws and directives. The most important ones are the following:

- The European Water Framework Directive (WFD) (2000/60/EC), incorporated into French legislation through Law No. 2004-338 of April 21, 2004.
- The Urban Wastewater Treatment Directive (UWWTD) (Council Directive 91/271/EEC), incorporated into French legislation through Decree No. 94-469 of June 3rd, 1994.
- Law No. 2000-1207 for Overseas Orientation (LOOM[13]) of December 13, 2000 (Article 51) and its Implementing Decree No. 2001-1324 of December 28, 2000.
- The Law on Water and the Aquatic Environments (LEMA[14]) of December 30th, 2006
- Law No. 2021-513 of April 29, 2021, reforming the governance of drinking water and sanitation public services in Guadeloupe.

WFD (2000) sets out the community guidelines for water and aquatic environments in order to achieve a "good status" of waters by 2015. Those guidelines are result-oriented, and are made of the following fundamental principles:

- "The establishment of river basin districts as the territorial units for water management,
- The development of management after an initial assessment of the environment,
- The development of an economic analysis that includes the cost associated with water use by different sectors (industrial, agricultural, and domestic),

[13] From the French : Loi d'Orientation pour l'Outre-Mer
[14] From the French : Loi sur l'Eau et les Milieux Aquatiques

- The promotion of cooperation among water stakeholders and public consultation as foundational elements for developing water management policies and aquatic environment management[15]" (Water Office Guadeloupe, 2023).

Additionally, smaller directives were implemented in complement throughout to contribute to the realization of those objectives, such as Directive No. 2008/105/CE which establishes environmental quality standards for assessing the chemical status of water. (Ibid.).

UWWTD, transposed into French law by Decree No. 94-469 on June 3, 1994, is another central European legislation. The Directive set specific regulations (e.g., regular inspections and audits of treatment plans) regarding water treatment and their deadlines depending on the size and location of the agglomeration. Hence, it introduced the concept of 'agglomeration for wastewater treatment'. Treatment facilities are linked with a designated collection area, ensuring all urban wastewater is directed to a single treatment system. Areas that are part of the same treatment network form 'agglomeration for wastewater treatment'. The directive was set in 1998 for the agglomerations made of more than 10000 PE[16] insensitive areas, then by 2000 for the ones over 15000 PE in non-sensitive areas, and by 2005 for those over 200 PE in non-sensitive areas. However, UWWTD is currently the cause of a legal dispute between France and the European Commission, as France has yet failed to meet the deadlines for its implementation. As such, the Water Office of Guadeloupe calls for bigger short-term investments to meet the long-due directive guidelines (Water Office Guadeloupe, 2023).

LOOM (2000) and its Implementing Decree created the DOMs' Water Offices to provide monitoring and evaluation of water resources and aquatic environment, advice, technical assistance, training, and information on water and aquatic environment management, and program and finance projects based on the proposal of basin committees. Water Offices are local public administrative bodies affiliated with the Guadeloupe Department. Similarly to

[15] Translated from the French : « l'instauration des « districts hydrographiques » ou « bassins hydrographiques » comme élément de découpage des territoires, la réalisation de plans de gestion après l'analyse de l'état initial des milieux, La réalisation d'une analyse économique intégrant les coûts liés à l'utilisation de l'eau par les différents usagers en fonction de leurs secteurs (industriel, agricole et domestique), l'instauration de la coopération entre les différents acteurs de l'eau et de la consultation du public comme éléments de base de l'élaboration de la politique de gestion de l'eau et des milieux aquatiques. » (Water Office Guadeloupe, 2023)

[16] Population equivalent is an "Assessment unit of organic pollution found in water representing the quality of organic matter discharged per day per capita. This measurement unit can easily compare the flow of pollutants. Among the parameters * characterizing pollution, the pollution treated in wastewater treatment plants is quantified by the population equivalent." (Water France et al., 2018)

Water Agencies, they facilitate common interest actions in water and aquatic environment management. Each Water Office can be sponsored by a Water Agency in Metropolitan France in order to gain from their experience (e.g., the Guadeloupe Water Office is sponsored by the Adour-Garonne Water Agency). Hence, LOOM provided a comprehensive approach to resource management built on collaboration and participation. It enhanced decentralization, economic and financial sustainability, and performance and coherence, through the creation of Water Offices, and the support and guidance Water Agencies provide (Water Office Guadeloupe, 2023).

LEMA (2006) was established to reform France's water management framework by integrating the objectives set by the WFD to achieve a "good status" of waters by 2015. As such, it updated existing Water Laws of 1964, establishing the decentralization of WRM through water agencies and basin committees, and of 1992, declaring water as a "common heritage of the Nation" and introducing new management tools such as the SDAGE. By integrating the WFD objectives, it presents a holistic approach to WRM. It also proposed measures to balance water resources with demand (e.g., establish sustainable reserve flow rates), take climate change into consideration, and updates freshwater fishing regulations by reinforcing water policing and harmonizing fishing and water regulations. Additionally, it introduced measures to improve public water and sanitation services through more transparent and organized management. Thus, ensuring equitable access to water through affordable rates and considering the social aspects of WRM and pricing. Then, it decentralized WRM and re-formed some of the foundations of water policies in France, by creating the National Office for Water and Aquatic Environment (ONEMA[17]) and enhancing the role of the existing water agencies. Furthermore, LEMA restructured the fee system for water agencies and introduced similar fees for water offices in the DOMs, under the approval of basin committees. ONEMA is also financed by Metropolitan France water agencies to contribute to the construction and research in the DOMs and help the Water Offices bridging the gap between the DOMs and Metropolitan France in term of WRM. Finally, LEMA also promotes collaboration between the different national and international organizations, and participation through the basin committees, which include representatives from various water sectors (Water Office Guadeloupe, 2023).

[17] From the French : Office National de l'Eau et des Milieux aquatiques

Finally, Law No. 2021-513 (2021) has introduced the biggest change in water governance in Guadeloupe in recent years, reforming the governance of its drinking water and sanitation public services. The management of drinking water and wastewater services has changed significantly over the past decade. In 2016, the number of entities responsible for these services was consolidated from seven groups and five communes into five public intercommunal cooperation establishments (EPCI) (Water Office Guadeloupe, 2019):

- The Intercommunal Syndicate for Water Supply and Sanitation of Guadeloupe (SIAEAG[18]),
- The CAP EXCELLENCE Agglomeration Community (CACE),
- The Northern Basse-Terre Agglomeration Community (CANBT),
- The Grand Sud Caraïbes Agglomeration Community (CAGSC),
- The Marie-Galante Community of Communes (CCMG).

However, on September 1st, 2021, Law No. 2021-513 of April 29th, 2021, established the Mixed Syndicate for Water and Sanitation Management of Guadeloupe (SMGEAG[19]) to replace those EPCIs, incorporating the previously listed agglomeration communities as well as the region and department of Guadeloupe (National Assembly, 2021). As such, the SMGEAG oversees the water and wastewater management, which were the competency of the EPCI, as well as the management of urban stormwater, and outdoor fire control (City of Sainte-Anne, 2021).

In order to follow IWRM principles, legal frameworks should be broken down in different scales (international, national, regional) and be adapted to the local circumstances. Additionally, they should follow the various principles of good governance such as the principles of transparency and be flexible to evolve in accordance with the new challenges. Moreover, water laws should consider water as a finite and vulnerable resource, as an economic good, and as having cultural, social, and environmental values. Finally, they should be effective and equitable. As we have seen, Guadeloupe's legislative framework offers a comprehensive and holistic approach to WRM (GWP, 2024). Indeed, it promotes cross-sectorial policy integration (e.g., the harmonization of fishing and water regulations through LEMA, and a unified water treatment approach (UWWTD). Decentralization is also a central aspect of Guadeloupe's legal framework, notably through the creation of its Water Offices and of the SMGEAG. Additionally,

[18] From the French : Syndicat Intercommunal d'Alimentation en Eau et d'Assainissement de la Guadeloupe
[19] From the French : Syndicat Mixte de Gestion de l'Eau et de l'Assainissement de Guadeloupe

through its creation of the Basin Committees, it emphasizes the role of stakeholders and public consultation, as its representatives include actors from various water sectors who participated in multiple levels of decision-making. Moreover, users are included among the elected SMGEAG representatives, and transparency is ensured through the record and broadcast of syndicate meetings (LEMA). It also underscores the importance of coordination (SMGEAG) and collaboration (e.g., Water Agency sponsorship) of multiple stakeholders and actors, as well as inter-basin solidarity (ONEMA). Furthermore, the legal framework defines clear roles and responsibilities of the different offices and agencies, as well as regular monitoring and evaluation (LOOM). Environmental, social, and economic assessments (WFD) and quality standards (e.g., Directive No. 2008/105/EC) are also implemented. Finally, measures for economic and financial sustainability have been put in place (e.g., restructuring the fee system by LEMA).

However, multiple criticisms can be made. First, we can see from the legal challenged faced by France regarding the implementation of UWWTD, that the current financial strategy is not adapted to the needs of the situation and that more investments and financial plans need to be studied and implemented. Secondly, while the creation of the SMGEAG contributes to decentralization, and to the simplification of the role and responsibility of the actors, the Audit of drinking water in Guadeloupe (Baile, Werner, Baguet, & Schmitt, 2018) argued that a single entity for the management of drinking water would not solve the water problems as it might not effectively address the diverse and interconnected challenges present in the system. For instance, a single entity may struggle to coordinate and address all the technical and operational aspects (e.g., infrastructure maintenance), especially in term of financial sustainability. As mentioned previously, major investments and financial plans are required to update the water network up to EU standards.

In conclusion, Guadeloupe's legislative framework encompasses both national and European laws, due to France being part of the European Union. Its legislations aim to achieve sustainable WRM thought the implementation of stakeholder participation in the decision-making process, decentralization, transparency, and economic sustainability. However, several challenges persist. The current legal issues surrounding the implementation of the UWWTD show that Guadeloupe's financial strategy is inadequate to meet the infrastructural needs of

the archipelago in term of wastewater treatment. Additionally, while reforms were made in the water management framework through the creation of the SMGEAG, it does not seem to be effective in palliating to the crisis.

Institutional arrangements and Participation

I) Regulation and compliance

Regulation and compliance actors are responsible for the enforcement of water and environment related policies, laws, and plans. Four categories of regulatory and compliance bodies and agencies and defined by GWP's IWRM: regulatory bodies and enforcement agencies, local authorities, monitoring and evaluating bodies, and impact assessment committees (GWP, 2024 (d)). This section will analyse the effectiveness of Guadeloupe's regulatory compliance framework in accordance with the IWRM and the governance principles associated.

Building a strong and effective regulation and compliance framework requires a multi-faceted approach. As such, GWP's IWRM identifies key 'building blocks' (GWP, 2024 (d)) to ensure effective regulatory compliance. First, monitoring, evaluation, and data systems are crucial to measure and understand water resources. It contributes to an informed and effective decision-making process, to reach not only good performance, but also socio-economic objectives. Secondly, preventive measures, such as regular inspections by trained inspectors, can contribute to detecting and mitigating non-compliance before irreversible damages happen. Thirdly, institutions should foster an environment which promotes awareness and understanding of water and environmental challenges. Indeed, education has been linked to better economic, social, and environmental outcomes (Wasreb, 2010 and Wang et al. 2022, as cited in GWP, 2024 (d)). GWP (2024 (d)) characterises effective educational environment as creating awareness, sensitivity, knowledge and understanding toward environmental challenges to encourage water users and actors to care about the environment, providing professionals with the skills needed to face such challenges, and finally, promoting environmental related activities. Then, if educative and preventive measures fail, a coercive approach can be taken (e.g., sanctions). Furthermore, sustainable water development cannot

be implemented without implementing anti-corruption practices. Therefore, regulation and compliance bodies should build an environment build on transparency, accountability, participation, and anti-corruption, following some of the good governance practices. Finally, as regulatory agencies are responsible for setting and enforcing the norms, they should be independent from the government to stay objective and free from political influence (World Bank, 2020, as cited in GWP, 2024 (d)). Guadeloupe's regulatory and compliance framework can be separated in three categories: regulatory bodies and enforcement agencies, local and organizing authorities, and monitoring and evaluating bodies. Additionally, all those actors contribute to impact assessment in their respective jurisdictions.

First, the enforcement of water regulations and policies lies with the state and its various agencies (DEAL[20], DAAF[21], ARS[22]). The DEAL has two main regulatory functions: implementing water policies and acting as the water police (i.e., regulating the infrastructures, projects, or activities that may impact water and aquatic environments). Additionally, it contributes to the preserving and improving of water quality and biodiversity, and acts as the Water and Biodiversity Committee's secretariat (Water Office Guadeloupe et al., 2018). The DAAL oversees the implementation of agricultural and alimentation policies, and processes livestock farming files and the agricultural use of pesticides (Ibid.) (Prefect of the Guadeloupe Region, 2017). Finally, the ARS acts as the health authority, and as such implements public health policies and is the only entity authorized to state on water potability. Therefore, it oversees controlling the quality of the water destined to human consumption from its source to its distribution. It processes the requests for authorization to withdraw, produce, and distribute such water, monitors installations in collaboration with the prefecture, local authorities, and operators, and can start emergency measures in case of water quality degradation (Water Office Guadeloupe et al., 2018).

Secondly, Guadeloupe's regulatory and compliance framework also includes local and organizing authorities. In case of pollution or serious threat to public health, the mayor is responsible for notifying the population and post the results of the sanitary control (or its summary) at the town hall within two business days. Additionally, it also possesses a judicial

[20] Direction de l'Environnent, de l'Aménagement et du Logement (ENG : Directorate of Environment, Planning, and Housing)

[21] Direction de l'Alimentation, de l'Agriculture et de la Forêt (ENG : Directorate of Environment, Planning, and Housing)

[22] Agence Régional de Santé (ENG : Regional Health Agency)

police power, and can therefore establish violations of the environmental code (Water Office Guadeloupe et al., 2018). Lastly, the organizing authority framework has evolved multiple times throughout the years. The 1982 law on decentralization transferred the responsibility for water and sanitation from the State to the 32 communes through a series of legislative and regulatory texts which came into effect between 1982 and 1986. Additionally, communes could choose to exercise this responsibility themselves or to transfer all or part of it to an inter-municipal structure. As such, in 2011, 13 organizing authorities (4 Inter-municipal syndicates, including the SIAEAG, 3 EPCI, 6 communes) where in charge of water and sanitation services. In 2015, the NOTRe[23] Law strengthened the responsibilities of intermunicipal entities by transferring them water and sanitation competency, thereby leading to a forced consolidation of the organizing authorities. Hence, between 2016 to 2021, water and sanitation services were the responsibility of the SIAEAG, CACE, CANBT, CAGSC, and CCMG. Today, the SMGEAG, which was born out of the merge of those entities, is responsible for providing public services related to drinking water supply and sanitation across Guadeloupe (except for Marie-Galante). It manages water distribution and sanitation directly in 23 communes and through public service delegation in other communes, deserving 176 000 users (SMGEAG, s.d.).

Finally, monitoring and evaluating bodies are regulated by various UE and national legislations. As mentioned previously, ARS is responsible for conducting sanitary controls of the water used for human consumption (Ibid.). Additionally, DEAL is in charge of the quantitative monitoring of rivers by utilizing a network of hydrometric stations throughout Guadeloupe. Indeed, it oversees the production and use of hydrometric data to protect strategic resources of drinking water and balance the management of rivers and aquifers (Ibid.). Moreover, it also takes part in the drought management effort, in collaboration with other monitoring units (the Department, Météo France, the Water Office, BRGM[24], ARS, DAAF, and SMPE[25]) (Prefect of the Guadeloupe Region, 2021). Furthermore, the Water Office and BRGM monitor the qualitative and quantitative status of water bodies in Guadeloupe. As mentioned in previous parts, the Water office monitors the quality of rivers, lakes, groundwater, and coastal water, provides technical advice and assistance to water stakeholders, implements the UWWTD, and monitors the operators' self-monitoring devises as well as control the data they report. The BRGM is a

[23] Nouvelle Organisation Territoriale de la République (ENG : New Territorial Organization of the Republic)
[24] Bureau de Recherches Géologiques et Minières (ENG : Bureau of Geological and Mining Research)
[25] Service mixte des polices de l'environnement (ENG : Mixed Service of Environnemental Polices)

public institution that is in charge of managing soil and subsurface water resources and risks, and of conducting quantitative monitoring of groundwater. Moreover, it operates under a partnership agreement with the Agency of Biodiversity (AFG) (Water Office Guadeloupe et al., 2018). Finally, the SMGEAG possess monitoring and evaluating capacities through Guadeloupe (with the exception of Marie Galante, monitored by the CCMG). They monitor drinking water supplies, evaluate, and rehabilitate non-compliant collective sanitation systems, monitor and ensure the compliance of private installations with regulatory standards (SMGEAG, s.d.). Moreover, the monitoring of non-collective sanitation is ensured by the Public Services of Non-Collective Sanitation (SPANC[26]) of the SMGEAG, with the exception of Marie Galante, in which it is operated by the SPANC of the CCMG (Water Observatory Guadeloupe, 2023 (c)).

Therefore, Guadeloupe's regulation and compliance framework is mostly based on a sectoral distribution of the responsibility. Indeed, multiple actors are responsible not only for enforcing water related policies, plans, and laws in their respective sectors, but also collect data and monitor water quality (e.g., ARS, DEAL). Additionally, while it shows clear responsibility sharing in terms of sectors, there is not enough emphasis on the regulation of public-private partnerships and delegated management of water services. Indeed, the report regarding the control of water resources by private interests and its consequences (Inquiry Commission, 2021) advocates for more regulation and accountability for those actors, as defining responsibilities between authorities and service providers can often be unclear. Moreover, monitoring and evaluating bodies are responsible for both the quantitative and qualitative assessment of water resources (ensuring informed decision-making and effective water management) and for the on-going control of the resources. Additionally, the regulatory and compliance framework emphasizes transparency and participation through public reporting and notification in case of pollution of serious threats to public health, publication of collected data accessible online by the public, and the collaboration between regulatory compliance bodies and communities. Furthermore, the regulation and compliance frameworks are made of multiple local and organizing authorities which have evolve throughout the years to try to adapt to the challenges they faced. The decentralization law of 1982 led to the creation of numerous water and sanitation services, which have now fused into a single entity (with the exemption of Marie-Galante). While the reduction of the number of organizing authorities was

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meant to produce a more effective water distribution system, the “Water Services” section will show how the improper transition strategy contributed to the water crisis.

In conclusion, Guadeloupe’s regulation and compliance framework is characterized by a sectoral distribution of responsibilities among various state agencies, local authorities, and monitoring bodies. As such, agencies such as DEAL, DAAF, and ARS are responsible for the implementation of regulations, the preservation of water quality, and for overseeing public health. Then, local authorities contribute to the effective management of water and sanitation services. Finally, monitoring and evaluation assessments are conducted through a coordinated effort involving the several actors (e.g., ARS, DEAL, Water Office, BRGM) that ensure both the qualitative and quantitative assessments of water resources. Furthermore, while the framework emphasizes transparency, accountability and participation, the regulation of PPP and the delegation of water services require further clarity and accountability.

II) Water services

The right to water was first adopted in November 2002 by the UN Committee on Economic, Social, and Cultural Rights (UN Committee on Economic, Social and Cultural Rights, 2003). Subsequently, on July 28th, 2010, the UN explicitly recognized the human right to water and sanitation, acknowledging that access to clean drinking water and sanitation is essential (United Nations, 2014). Water services are the institutional arrangements in charge of water delivery, sanitation, and hygiene (WASH) services. Therefore, water networks usually include the following: source and collection point, purification facilities, reservoir facilities, pressurizing installations, pipe or channel networks, sewage, and reuse systems (GWP, 2024 (e)). Additionally, in developing countries, it is not uncommon for people to rely on multiple sources of water (e.g., bottled water, wells, boreholes…) (Elliott et al., 2019, as cited in GWP, 2024 (e)). Different models of water services exist, including public, private, or community-managed water utilities. Moreover, those entities are often led to collaborate with one another in order to reach universal and equitable access to safe and affordable drinking water. Consequently, water services need to be tailored to the local socio-economic, political, and environmental context in which they’re being implemented. Furthermore, the Office of the

High Commissioner for Human Rights (OHCHR), United Nations Human Settlements Programme (UN-HABITAT), and World Health Organization (WHO) (2010, as cited in GWP, 2024 (e)), declared that water and sanitation services should provide water which is:

- Adequate: adequate quantities satisfy users while taking into account the resource's ecosystem.
- Of quality: water services should be in adequation with not only national and international health standards, but also in respect of environmental standards regarding release and reuse of wastewater.
- Affordable: water prices should be accessible to the ones with the lowest incomes
- Accessible: water should be available on premises, or, with a collection time shorter than 30min (including waiting time).
- Acceptable: water should have acceptable physical characteristics (clarity, colour, taste, temperature), and sanitation services should be designed and implemented with consideration for vulnerable and marginalised groups to ensure equitable access.

As such, GWP's strategy on water and sanitation services for IWRM is built on five principles. First, water and sanitation services need to be part of broader institutional frameworks, considering economic, social and political factors. Second, participation needs to be implemented at all levels, from price regulation to the distribution networks. Third, integrated water supply and sanitation cannot be fulfilled without the reuse of grey and treated water. Then, water should be "provided in adequate, quality and affordable supplies for all" (GWP, 2024 (e)), considering social, economic, and environmental needs. And lastly, water and sanitation services should be adapted to the different local settings, including the differences between rural and urban areas (Ibid.). Furthermore, different models of service delivery and institutional roles (public water utilities, private sector service providers, and community-based organisations) can collaborate. Public water service providers can be locally, regionally, and nationally administered, either by the government or by a state-owned company (Joffe et al., 2008, as cited in GWP, 2024 (e)). Private sector service providers encompass both full privatizations or public-private partnerships and follow commercial law. Finally, community-based water supply and management are particularly present in developing countries,

especially in rural area, and often operate as an informal sector (Van Ittersum & Van Steenbergen, 2003, as cited in GWP, 2024 (e)).

In 2021, 88.4 Mm3 of water were collected in Guadeloupe for drinking water production. Out of those 88.4 Mm3 of water, 80% were taken from Basse-Terre's surface water, 12% from its groundwater, and 8% from groundwater (wells and boreholes) in Grande-Terre and Marie-Galante. As such, surface water is the main source of drinking water in the archipelago and Basse-Terre's water is highly mobilized. Most of the water is abstracted on the Côte au Vent, notably in Petit-Bourg and Capesterre-Belle-Eau and distributed through feeders to the entire archipelago. Moreover, the Department's and SMGEAG's untreated water pipelines deliver water to treatment water facilities far from collecting points. In order to compensate for the important leakages, water collection has been increased across the islands (Water Observatory Guadeloupe, 2023 (b)). The evaluation of water and sanitation services quality is conducted by the System of Information on Water and Sanitation Public Services (SISPEA[27]), notably through the indicator on drinking water network knowledge and management. The indicator is attributed on a 120-point scale, evaluating how much is known about the network, and the territories renewal strategies. In 2021, most of Guadeloupe was scoring between 25 and 50, with the exception of the communes of Marie-Galante and Lamentin scoring between 50 and 75, Deshaies and of Pointe-Noire, Bouillante, Vieux-Habitants and Vieux-Fort scoring over 100. On average, communes in the archipelago score at 39, while the national average is of 102 according to the SISPEA (Water Observatory Guadeloupe, 2023 (a)). Indeed, water supplies face several challenges. First, the high number of leakages across the network leads to low water yields. Out of the 88.4 Mm3 of collected water, 82.2 were treated and distributed across Guadeloupe's pipeline network, however, only 31.5 Mm3 (38%) was consumed by the population. This represents a percentage of 62% of losses across the network, which can be explained by the high amount of leakage points, inaccurate evaluations of water volumes from old water meters, and illegal water catchments throughout the network. Additionally, 20% of leakages are located in user's households, after water meters, thus not being taken into consideration in the loss numbers. To palliate to those issues, the Regional Council ordered in 2019 a preliminary assessment to define the highest priority areas in term of water losses. Their assessment is now used to better identify the area's most prone to leakages (Water

[27] From the French : Système d'Information sur les Services Publics d'Eau et d'Assainissement

Observatory Guadeloupe, 2023 (b)). In 2022, approximately 77%, thus about 2695, of the 3500 leakages detected were repaired (Vandewoestyne, 2023), while in 2023, approximately 6500 leakages were repaired, with a goal of at least 30 per day (Peter, 2024).

To understand the role of water services in the water crisis, it is important to first take an historical approach, starting from the creation of the first water infrastructures, to the current WRM framework. The first major infrastructural projects were established in the 1950s as an attempt to lift Guadeloupe out of poverty and reduce its dependence on sugar cane production (Gadault & Laimé, 2021). As such, Eau et Assainissement (now Générale des Eaux[28]), a subsidiary of the steel group Pont-à-Mousson, established in Guadeloupe since 1947, was chosen to execute the water supply projects. In 1963, the Intercommunal Water Syndicate of the Pointe-à-Pitre region was created to operate the feeder and the water distribution in the Pointe-à-Pitre commune, as well as the city Les Abymes. Following the merging of other local authorities it eventually became the SIAEAG in 1977, which moving forward managed most of the water sources, treatment facilities, and distribution network (Ibid.). Additionally, it was not only responsible for providing water to almost all the communes in Grande-Terre and several in Basse-Terre but was also in charge of the agricultural water operations in the north of Grande-Terre. However, since 1968, SIAEAG had granted public service delegation to Socea to manage both water production and distribution, and agricultural water operations. As such, SIAEAG did not directly handle the daily operations, which were the responsibility of Socea, then sold to Générale des Eaux in 1988. From 1988 onwards, the company faced critics regarding its neglecting of necessary infrastructure updates. Furthermore, the original delegation contract from 1968 was extended multiple times without competitive bidding until 2008, and its details were withheld from members of the SIAEAG (Ibid., Inquiry Commission, 2021). Consequently, the SIAEAG decided to terminate the Générale des Eaux's delegation contract and sign a new contract limiting its role to drinking water management, in order to diversify service providers and foster competition. Nevertheless, the continuation of the crisis highlighted the existence of underlying infrastructural and financial issues (Gadault & Laimé, 2021). Indeed, since the creation of the first major water infrastructures, water networks have not been properly maintained and

[28] Eaux et Assainissement became Socea, then Sobea, and then Sogea, before was then transferred to another subsidiary: Générale des Eaux (Gadault & Laimé, 2021)

renewed (Baile, Werner, Baguet, & Schmitt, 2018). These aging infrastructures are more prone to leaks, breaks, and failures, contributing to the significant leakage rates and water shortages. Furthermore, the audit report on drinking water in Guadeloupe (2018) and Gadault and Laimé (2022 (a)) highlighted the use of materials which were not adapted to the local geographical conditions during the construction of the network. Besides, Générale des Eaux was facing financial difficulties, with high numbers of unpaid bills due to refusals to pay as well as malfunctions in the billing software's causing delays and errors in billing. Investments in infrastructures were also insufficient, resulting in widespread service disruptions. Hence, Générale des eaux (and its previous entities) operated in Guadeloupe from 1948 to 2015[29] and was responsible for the majority[30] of the water infrastructures on the island. For instance, in 2014, it oversaw water distribution in the communes of Pointe-à-Pitre, Les Abymes, Baie-Mahault, au Moule, in Grande-Terre's northern communes, Le Gosier, Sainte-Anne, Saint-François, La Désirade, Lamentin, Deshaies, Goyave, Petit-Bourg, Capesterre-Belle-Eau, and Les Saintes (France-Antilles Guadeloupe S.B., 2017). Following the end of its delegation contract in 2015, citing financial deficits and contractual disputes, its competencies were gradually given back to the SIAEAG and EPCIs from 2015 to 2017.

Between 2016 and 2021, 9 water and sanitation operators (6 "régies" or public operators, and 3 private operators) were responsible of the daily management of water and sanitation services (Figure 4). After the creation of the SMGEAG, 4 water operators, of which 3 are also sanitation operators, were left (Figure 5). Water and sanitation operators are designated by the organizing authorities and can either be public or private entities. As seen on Figure 5, the SMGEAG is directly responsible for the majority of the territory, while the rest of the territory is under delegation. Additionally, these water operators are also responsible for collective sanitation in their communes, with the exception of Eaux'Nodis (SMGEAG is directly in charge of the sanitation in Deshaies, while Karuker'ô operates the sanitation in Lamentin). Moreover, Public Services of Non-Collective Sanitation (SPANC) are responsible for the monitoring of non-collective sanitation, and as such, the SPANC of the SMGEAG controls non collective sanitation, with the exception of Marie Galante which is operated by the SPANC of CCMG.

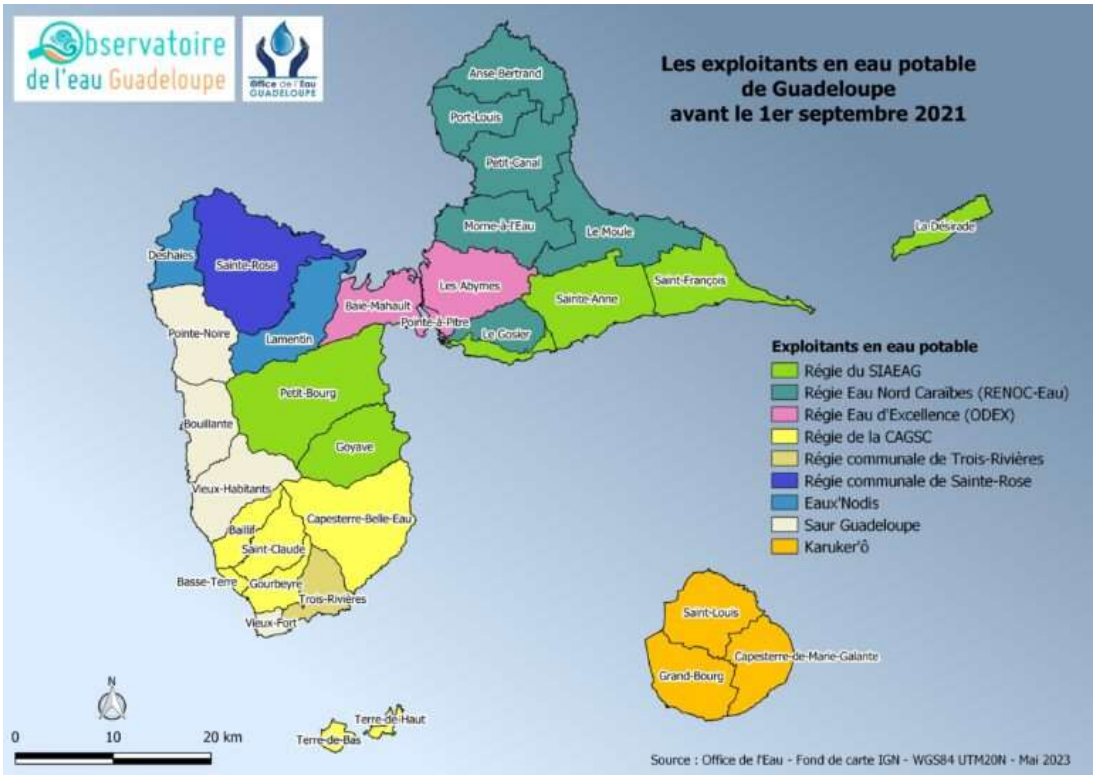

Figure 4: Drinking water operators before September 1st, 2021 (Water Observatory Guadeloupe, 2023 (a))

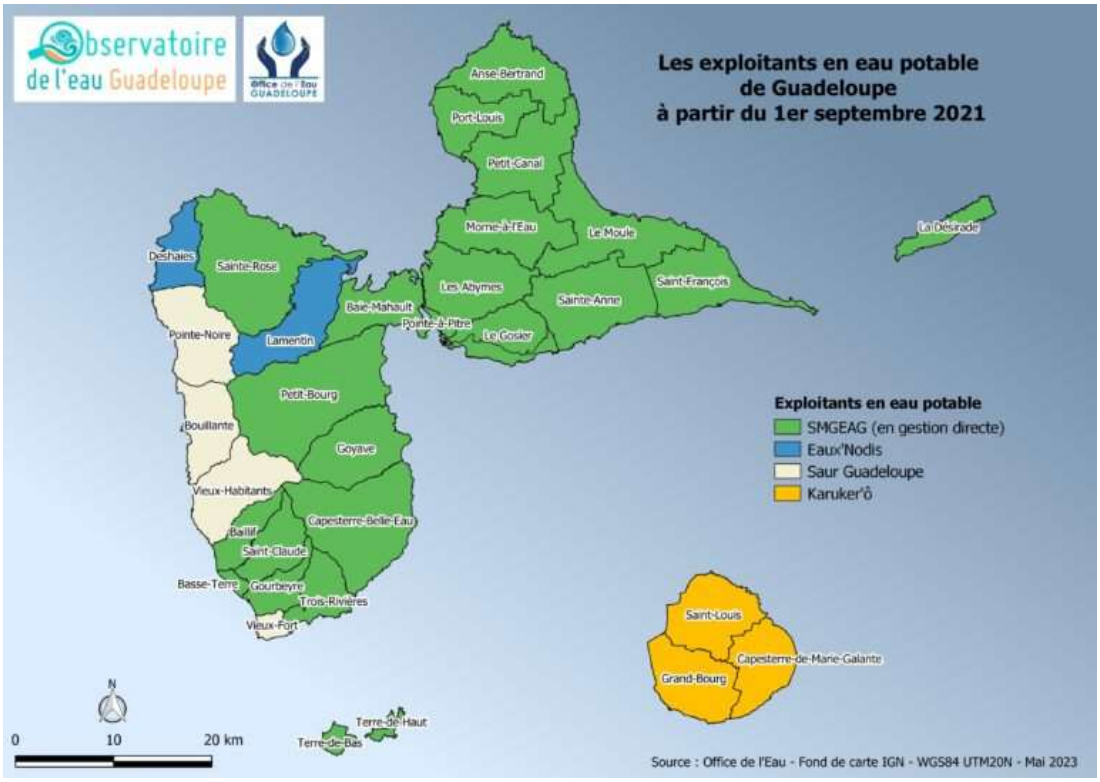

Figure 5 : Drinking water operators after September 1st, 2021 (Water Observatory, 2023 (a))

Nevertheless, the changes in institutional arrangements have not been able to palliate to the crisis. Indeed, despite the changes in water operators, the renewal rate has remained low in the past ten years, with an average of 0,5%, whereas it was recommended to increase it to 1,5-2% per year. With such a low rate it was estimated that it would take hundreds of years to renew the entire water network, exceeding the lifespan of the network's pipelines (Inquiry Commission, 2021). Additionally, water services are in a negative savings rate, meaning that they cannot save or set aside funds for investments or in case of emergencies. Instead, they are operating on a deficit, spending more than they are earning (Ibid.). Moreover, when the SMGEAG was implemented, it inherited the debts of the previous EPCIs, contributing to its financial challenges (Landot, 2024). As such, organizing authorities struggle to fund infrastructure projects, such as network upgrades, and need more funding from the state and European funds to repair the water network. Moreover, there is a skill mismatch between the skills and competencies available, and the specific needs and requirements of the water sector in Guadeloupe. Indeed, the archipelago lacks technical experts, hindering the implementation of best practices in water management and address the challenges and demands of the water sector (Inquiry Commission, 2021; Baile et al., 2018). Therefore, more investment is needed in capacity building, to create training programs and offer more opportunities for the water sector workforce. Collaboration and partnership with education institutions, training providers, water experts, and international partners can also support the efforts to address this issue (Ibid.). Then, water management is hindered by issues related to the ownership of water facilities the access to water infrastructures. With the many institutional changes in the water sector and the various uses of water, ambiguities and disputes emerge regarding ownership of facilities and infrastructures. For instance, negotiating access to water infrastructures involved many stakeholders (e.g., private landowners or agricultural enterprises), and formal and informal agreements are not always clear or sustainable, leading to conflicts or disruption in the water service. Indeed, access restriction to certain water facilities interferes with daily maintenances, inspections, and upgrades (Ibid.). Furthermore, report regarding the control of water resources by private interests (Inquiry Commission, 2021) showed that stronger regulation and governance mechanisms needed to be implemented to ensure that private entities in the water sector adhere to standards of accountability, transparency, and service quality. Indeed, the private sector involvement in the water sector through concessions or delegated management has led to unclear cost structures

and responsibilities for infrastructure maintenance and renewal. Additionally, it raised concerns about the increased of water prices, which have been increasing faster than the general inflation and putting financial pressure on the users. As such the report highlighted the importance of maintaining public control and oversight in water management to prevent private entities from pursuing profit-driven approaches which do not align with the interests of the users, and lead to disparities in access, affordability, and service quality. Lastly, water services have also been hindered by corruption. For instance, in 2019, Amélius Hernandez, former president of the SIAEAG, was convicted of three years in prison, including two suspended, and fined 150 000 euros for embezzlement and favouritism in the allocation of public contracts (E. L., 2019). Such corruption has not only impacted the operational ability of the SIAEAG, but also the trust of the population.

In conclusion, water services show significant shortcomings in following GWP's principles for IWRM, and good governance principles as they struggle to provide adequate, affordable and accessible water as defined by international standards. The primary cause of management failure can be found in the neglecting of water infrastructures. Indeed, the successive water and sanitation operators have failed to first, construct lasting infrastructures, and secondly, maintain and renew such infrastructures when infrastructure breakages persisted. Additionally, water services were hindered by the mismanagement of finances and insufficient transparency and accountability. For instance, the historical reliance on public service delegation without the proper regulation has significantly contributed to the degradation of the WRM system. As such, SIAEAG's lack of direct operational control further exacerbated the crisis by failing to ensure consistent and effective water management. Lastly, corruption has also impacted the allocation of funds and operators, contributing not only to operational inefficiencies, but also to the public trusts.

III) Coordination

The UN-Water (2014, as cited in GWP, 2024 (f)) defines coordination as the collaborative effort of multiple stakeholders working together to mobilise aid resources, with the aim to align policies, programs, procedures, and practices to optimize the use and development of these resources effectively. Similarly to water management decision-making, coordination happens at multiple levels – sectoral, sub-national, national, regional, and international – and can serve different goals, such as policy development, strategy planning, or resource mobilisation. As water is used by multiple stakeholders and various sectors, and on different scales, coordination is crucial to balance the usage of water and palliate to the conflicts stemming from the various interests. Indeed, governance and decision-making in the water sector not only involve the government, but also water stakeholders such as households, communities, farmers, businesses. Moreover, it is crucial to coordinate between the different needs in water quantity, quality, and time and frequency usage across sectors (Lieberherr and Ingold, 2019, as cited in GWP, 2024 (f)).

As seen throughout previous parts, coordination in Guadeloupe's water sector involves multiple stakeholders and is regulated and implemented by various actors. This section will look at the some of the coordinating bodies working towards a more effective water management system. First, Guadeloupe's Water Observatory, implemented in 2014, is a service of the Water Office created to connect water stakeholders by promoting better data and knowledge exchange and facilitating access to information. As such, it centralizes and give access to data and studies on water, sanitation, and aquatic environments in Guadeloupe, notably through its website "www.observatoire-eau-guadeloupe.fr" (Water Observatory Guadeloupe, s.d.). Moreover, it also produces report in collaboration with other water actors, such as annual reports on key water and sanitation numbers, in collaboration with the Water Office, the Region, the Department, the Prefecture, the DEAL, the ARS, the SMGEAG, and the CCMG (Observatoire de l'Eau et al., 2022). Eventually, the Water Observatory aims to be a central mechanism for strategic planning and decision-making on water related issues in the archipelago. Additionally, the Water Office plays a central role in facilitating coordination. Indeed, it provides technical support and expertise to communes and other stakeholders through assisting in water and sanitation projects and guiding the implementation of water management plans (e.g., SDAGE) (Bassin Committee Guadeloupe, 2022). The Water Office also

coordinates with national and international bodies for international projects, such as the CARIBSAN project, which is a research and training project in the Caribbeans (Cuba, Dominica, Guadeloupe, Martinique, and Saint Lucia) to develop treatment wetlands technology (CARIBSAN, s.d.),. Secondly, the Inter-Services Mission for Water and Nature (MISEN[31]) is the coordinating body overseeing the implementation of water and environmental policies in the region. Initially focused on water-related issues, it has expended its competencies to nature and biodiversity issues since 2011. Under the authority of the Prefect it "brings together the state services and public establishments responsible for policies related to water and nature in the department[32]" (Présentation de la MISEN et activités 2020, 2022): DEAL, DAAF, ARS, Directorate of the Sea, Departmental Service of the French Office for Biodiversity, National Park of Guadeloupe, National Forestry Office, Coastal Conservatory, Water Office, Directorate of General Administration and Regulation of the Prefecture, and Delegated Prefecture of Saint-Martin. Hence, the responsibilities of the MISEN include the implementation of state policies related to water and nature, the coordination of various state services and public establishments activities, and the enforcement of the effective management of water resources and aquatic environments. Additionally, MISEN oversees the monitoring and evaluation of environmental conditions, and the development and execution of action plans. Furthermore, MISEN's strategic committee, chaired by the Prefect, sets strategic directions for environmental policy and ensures their alignment with national strategies.

In conclusion, Guadeloupe's coordination framework involves various stakeholders and extends beyond regional borders and highlight the importance of multi-level coordination. Additionally, it promotes openness through accessible data exchange, and integration by not only addressing water issues, but also nature and biodiversity. Moreover, cooperation can also happen through the allocation of funds by international bodies.

[31] From the French : Mission Inter-Services de l'Eau et de la Nature

[32] Translated from the French: « La Mission Inter-Services de l'Eau et de la Nature (MISEN) est l'instance regroupant, sous l'autorité du Préfet, les services de l'État et les établissements publics en charge des politiques liées à l'eau et à la nature dans le département »

Finance

Sustainable funding and financing are essential to meet the investment needs of water supply. Water investments include both hard (pipelines, pumps, treatment works…) and soft (research and development, monitoring, and evaluation…) infrastructures. As such, the IWRM approach recommends a balanced investment strategy that differentiates the funds allocated to hard infrastructures, to the ones allocated to soft infrastructures (GWP, 2024 (g)). Hence, the OECD (2011, as cited in GWP, 2024 (g)) highlights the importance of not only providing access to WASH, but also of upstream investments to increase and protect water resources (i.e., building storage capacities, abstraction systems, and efficient transport networks to minimize leakage) and downstream investments in wastewater treatment and safe sludge disposal (e.g., development of natural treatment systems and wastewater treatment plants).

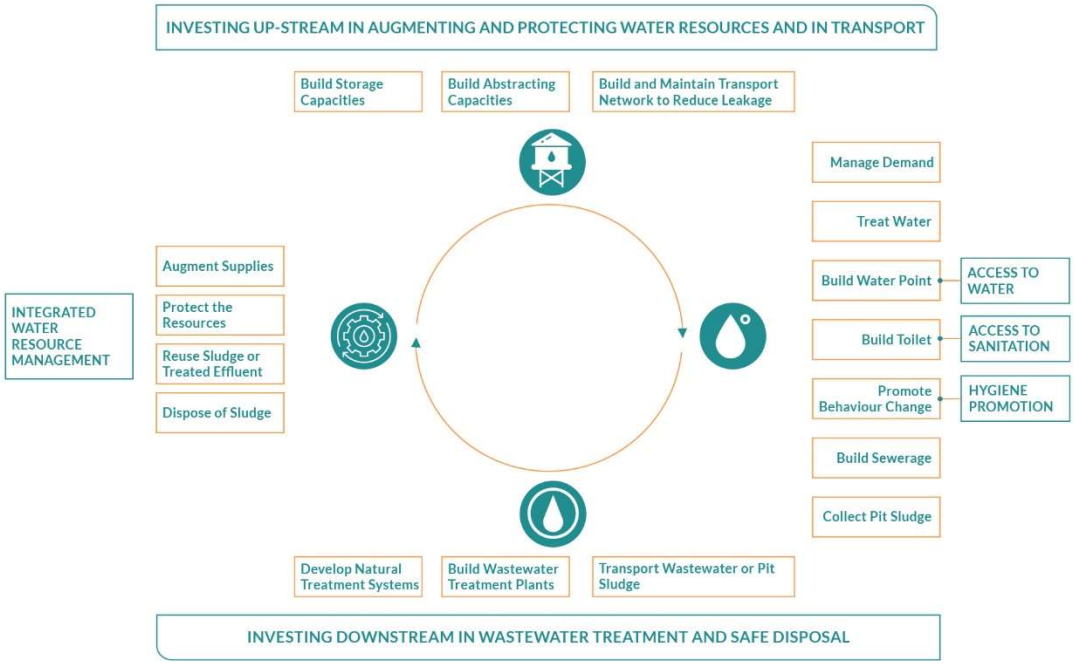

Figure 6 : The WASH Value Chain (Adapted from OECD, 2011, retrieved from GWP, 2024 (g))

Therefore, financial resources are central to operate in an efficient manner and meeting the economic, social, and environmental goals of sustainable water development (GWP, 2024 (g)).

The guiding principles for funding water policy in Guadeloupe is that “water pays water” ” (Bassin Committee Guadeloupe, 2016). As such, the Water Office collects fees and reallocates

them as grants. Then, subsidies from European funds, the State, the French Biodiversity Agency (AFB), the Region, and the Department are added (DEAL, 2020). Therefore, multiple funds and plans have been implemented including the following:

The 2014-2020 and 2021-2027 ERDF-ESF programs[33] : The European Regional Development Fund (ERDF) aims to "strengthen economic, social and territorial cohesion in the European Union" (European Commission, s.d.) by promoting more sustainable investments to address regional disparities (Ibid.). Additionally, the ESF in the main European instrument to support social inclusion, employment, and skills development across European states. By investing in human capital, it aims to achieve sustainable and inclusive growth in the EU (French Ministery of Employment, Health, and Solidarities, s.d.). Through the ERDF-ESF programs, Guadeloupe received a total of 608M euros, divided into ten priority areas (Guadeloupe Region, s.d.). As part of the fifth priority area "Environment and Natural Heritage" of the 2014-2020 ERDF-ESF program, Guadeloupe received 60M euros from the ERDF equally distributed between water and sanitation (DEAL, 2020) and meant to "modernize drinking water supply infrastructures, modernize wastewater treatment infrastructures, and strengthen recycling sectors and improve waste management" (Guadeloupe Region, s.d.). Moreover, as part of the 2021-2027 ERDF-ESF program, Guadeloupe received 80M euros from the ERDF toward water supply destined to human consumption and energy efficiency, water management and conservation, and wastewater collection and treatment. These funds aim to improve the infrastructures destined for water extraction, treatment, storage, and distribution, ensure rational and energy-efficient use of potable water, enhance water resource management, and develop energy-efficient systems for wastewater collection and treatment.

The convergence and transformation contract[34]: Through this contract, the State and local authorities have committed to financing projects aimed at the convergence of Guadeloupe. In total, an investment of 680M euros was made over four years (2019-2022). As part of the contract, 69.7M euros were allocated to the DOM Water Plan (€19.2M from the National Biodiversity Office, €9.73M from the Region, €9.73M from the Department, €9.73M from EPCIs, €10.32M from the State, and €11M from Europe) (DEAL, 2020) (Prefect de la Région Guadeloupe, 2019). The DOM Water Plan was launched in 2016, with the goal of "move away

[33] In French: Programme FEDER-FSE 2014-2020 / 2021-2027
[34] In French : Contrat de convergence et de transformation

from emergency policies and work with organizing authorities to strengthen their financial and technical capacities, focusing on operation and maintenance as top priorities[35]" (Water Observatory Guadeloupe, 2024).

2008-2012 / 2013-2018 / 2019-2024 / 2024-2027 Multiannual Intervention Program (PPI[36]): The 2019-2024 PPI is the third cycle of PPI and was implemented by the Water Office in 2019 to better address the challenges of water resource preservation, aquatic environment protection, and sanitation improvement in Guadeloupe. It is structured around the Water Office main missions, and the five orientations of the SDAGE 2016-2021 and aims to enhance the effectiveness and sustainability of water management in the archipelago (DEAL, 2020). As such, it finances water related projects using funds from the Water Office.

The various operational plans implemented in Guadeloupe: The Emergency Drinking Water Supply Plan[37] (PSAEP[38]) was implemented in 2014 to improve water infrastructure and optimize drinking water supplies while preserving the resource. Coordinated by the DEAL and other water stakeholders, it funded 68 operations for a total of 93.7M euros (excluding VAT). Following this plan, the Emergency Drinking Water Plan (PSEP[39]) funded a total of 21 operations for a total of 44.9M euros (excluding VAT) from 2014 to 2018. Funds were allocated throughout Guadeloupe, notably in Saint-Anne (more than 10M euros), les Abymes and Petit-Bourg (between 5M and 7M euros). The plan was meant to prioritize operations identified in the PSAEP. Subsequently, the DOM Water Plan was launched in 2016, in coordination with various ministries and local authorities such as the CCMG. The Priority Action Plan (PAP[40]) was adopted by the State, the Region, the Department, and local collectivities in 2018. Its priority goal is to sustainably end water rotations and shortages. As such, 38 operations were scheduled, representing a total of 71.4M euros, with an emphasis on Les Abymes (more than 12.5M euros), Capesterre-Belle-Eau (more than 12.5M euros), Baie-Mahaut (10M to 12.5M euros), and Le Gosier (7.5M to 10M euros). As the PAP is still on-going, some operations are still either at the evaluation phase, or currently in progress. Finally, a shared roadmap[41] was

[35] Translated from the French : « sortir de la politique d'urgence et d'engager, avec les autorités organisatrices, un travail de renforcement de leurs capacités financières et techniques »
[36] From the French : Programme Pluriannuel d'Interventions
[37] In French: Plan de Secours en Eau Potable
[38] From the French : Plan de Sécurisation de l'AEP (ENG : Securitization Plan of the AEP)
[39] From the French : Plan de Secours Eau Potable
[40] In French : Plan d'Actions PRIORITAIRES
[41] In French : feuille de route partagée

co-signed in 2022 by the Prefect, the President of the Regional Council, the President of the Department Committee, and by the President of the SMGEAG, for a period of three years. It outlines the specific needs and priority actions necessary for strengthening the SMGEAG's operating capacity and ensuring long-term structural support. As such, it aims at providing financial support, technical assistance, and the execution of urgent infrastructure renewal projects. The urgent infrastructure renewal projects have been estimated to cost approximately 25M euros, which will be funded equally by the Regional and Departmental Councils, and the SMGEAG.

Therefore, Guadeloupe's financial framework for its water sector involves a diverse arrangement of funding strategies and operational plans. First, short-term emergency and action plans (e.g., PSAEP, PSEP, PAP) aim to address the immediate infrastructure needs and operational challenges. As such, they focus on addressing priority issues such as water shortages and rotations by renewing water infrastructures and address operational inefficiencies. It also includes long-term plans (e.g., ERDF-ESF, DOM Water Plan, PPI…) which look at a more sustainable development and resilience over an extended period. These initiatives emphasize financial and technical capacities, promote energy-efficient and sustainable infrastructure, and support comprehensive water resource management. Furthermore, Guadeloupe's finance framework shows a commitment to IWRM and good governance principles. Long-term plans part of fundings which do not only address water issues but also economic, social, and environmental challenges (e.g., ERDF and ESF), and are integrated into a broader European context advocating for cohesion between European countries and regions. Additionally, funds from the ERDF-ESF Programs require detailed project proposals and are managed through a cooperation between the local authorities and the EU, fostering cooperation, transparency, and accountability (EU Social Economy Gateway, s.d.). Multiple funds also require the cooperation of multiple entities, such as the PAP or the DOM Water Plan, including various stakeholders in the implementation of investment projects. However, while the funds are various and illustrate a commitment to sustainable, inclusive, and efficient water governance, they are still lacking in term of participation, and in the amounts invested. Indeed, the UN have declared that while the current water funding plans were important, they were still lacking participation from the population (UN, 2024).

Moreover, it was established previously that organizing authorities operate on a deficit, the current strategy that "water pays water" is not sustainable. Additionally, it was estimated that an additional 2.5 to 3M euros of investment per year would be necessary to renew the entire water network (Inquiry Commission, 2021). As such, the current water strategy and the numerous funds cannot be enough to palliate to the crisis, and more financing is needed.

Conclusion

Guadeloupe's persistent water crisis despite an abundance of water resources highlights a systemic issue within the institutional framework governing its water resources. Therefore, stemming from Bandaragoda's definition of formal institutions which encompass "policies; laws, rules and regulations; organizations, their bylaws; operational plans and procedures; incentive and accountability mechanisms" (2000, p. 5), I aimed throughout my thesis at showing how institutions contributed to the water crisis. Good governance was chosen as the second theoretical lens for the framework it provides in term of effective and sustainable water resource management. Indeed, while good governance can be seen both as a mean and a goal, I decided to consider good governance as an ideal to be reached. As such, good governance principles (openness/transparency, participation, accountability, performance and coherence, direction, and fairness) provide objectives to meet. Additionally, IWRM was chosen as an analytical framework for its alignment with good governance principles, its holistic approach emphasizing interconnectedness and sustainability, and the comprehensive assessment tools it provides to study institutions.

First, the thesis looked at Guadeloupe's enabling environment, made of its policies (and master plans) and its legislative framework. As such, I showed how water policies and laws stemmed from European and national directives and were consistent with IWRM and good governance principles. For instance, the SDAGE, Guadeloupe's main policy instrument, promotes sustainable water management through securing sufficient water supplies, reducing pollution, protecting aquatic environments, promoting climate change resilience, stakeholder participation, and education. Additionally, both policies and laws strive for a balance between economic efficiency, social equity, and environmental sustainability through integration, participation, decentralization, and economic sustainability. Indeed, Guadeloupe's major

sectors (agriculture, fishing, and tourism) were taken into account when developing the enabling environment for water resources management. Additionally, the creation of policies involves participation from various stakeholders, including the public and fosters openness and transparency through easy information access and reviews. Finally, policies and legislation provide clear goals and objectives, notably through European directives. For instance, the UWWTD set specific goals regarding urban wastewater treatment, such as the submission of regular reports on the implementation of its directives (WARED - European Water Regulators, 2023). However, more emphasis needs to be placed on building public trusts, which has been hindered by several scandals both inside and outside the water sector. In the context of water management, lack of public trust and unwillingness to pay for water bills has hindered the capacity of water operators to function sustainably. Additionally, outside the water sector, the lack of public trusts has made it difficult to palliate to other crises, such as the Covid-19, where the population's distrust in vaccines caused lower vaccination rates (Gadault & Laimé, 2022 (a), Ouest-France, 2021). Furthermore, with water prices increasing faster than inflation due to private operators (Inquiry Commission, 2021), the policy and legislative framework needs to implement new regulatory frameworks to ensure equitable access and fair pricing. Indeed, it is crucial for all socio-economic groups to be able to afford water services without financial strain. And finally, while the enabling environment has emphasized decentralization, it may not effectively address the current challenges in term of technical and operational aspects, especially in terms of financial sustainability.

Indeed, in a second part I analyzed the institutional framework, consisting of the regulatory and compliance bodies, water services operators, and coordination bodies. Coordination in the water sector involved multiple stakeholders and levels. Guadeloupe's regulatory and compliance framework is made of several state agencies (DEAL, DAAF, ARS) which enforce water policies, laws, and plans, ensuring the implementation of regulations and the preservation of water quality. Additionally, the DEAL does not only have regulatory competencies but is also responsible for the monitoring of water quality and biodiversity. Similarly, the ARS oversees public health, and is therefore also responsible for the monitoring of drinking and swimming water quality. The Water Office and the BRGM also contribute to water monitoring by respectively monitoring water bodies and groundwater. Finally local authorities (mayor) possess judicial police power, while organizing authorities (SMGEAG and

CCMG) oversee policy implementation and coordination through the management or delegation of water services (Water Office Guadeloupe et al., 2018). It was found that while the framework emphasizes principles such as transparency, accountability and participation, the regulation of PPP and the delegation of water services require further clarity and accountability. This point was consequently highlighted by studying water services. The institutional framework for water services has been through several changes since its first major infrastructure projects. Throughout the water service, several key challenges were identified. First, the role of the Générale des Eaux and of the SIAEAG cannot be overlooked. Indeed, the Générale des Eaux (and its previous entities) neglected the construction, maintenance, and renewal of the water infrastructure from 1948 until its departure from the island in 2015, creating long lasting malfunctions and leakages throughout the network. Additionally, the SIAEAG failed to monitor and enforce proper water management practices (Gadault & Laimé, 2022 (c)). Therefore, it highlighted the need to create and implement stricter regulations for delegated water management, and better clarity and accountability. However, since the departure of the Générale des Eaux and the transfer of competencies to the SIAEAG and EPCIs, and then to the SMGEAG, the renewable rate of the network has remained low (Inquiry Commission, 2021). Therefore, the SIAEAG and Générale des Eaux cannot be the only factors behind the water crisis.

Indeed, the thesis highlighted the improper financial strategy and lack of fundings in water resources management. Nealy 40% of users have outstanding bills and water services operate on a deficit. Thus, the strategy that “water pays water” cannot be sustainable and is inadequate to the meet the consequent infrastructure needs (Inquiry Commission, 2021. Baile et al., 2018. Bassin Committee Guadeloupe, 2016). Additionally, while the financial framework is made of both national and European funds (e.g., ERDF-ESF programs) and financial plans, it was estimated that an additional 2.5 to 3M euros of investment per year would be necessary to renew the entire water network (Inquiry Commission, 2021). Therefore, more investments and financial plans are required to update the water network to EU and international standards.

Furthermore, Guadeloupe’s water crisis underscores a broader issue of inequality between the Metropole and the overseas departments (DOMs). Indeed, significant economic and social disparities persist not only within Guadeloupe but also across other overseas territories. Data

from INSEE (2022, as citied in Vie Publique – La Rédaction, 2022) reveals a significant contrast in GDP per capita, with figures such as 9,700 euros in Mayotte and 23,200 euros in Guadeloupe, compared to 34,500 euros in the Metropole in 2020. This disparity is exacerbated by a higher cost of living in the DOMs, particularly for essential goods, with food prices in Guadeloupe being 42% higher than in the Metropole (INSEE, 2015, as cited in Vie Publique - La Rédaction, 2022). Additionally, school dropout and unemployment rates are substantially higher in the DOMs, especially among young people (- 25years old), contributing to social instability (e.g., unemployment rate of 24% in La Réunion, compared to 9% in the Metropole). The health sector is also impacted, with rates of infant mortality in the DOMs twice as high as the ones in the Metropole (Insee, 2018, as cited in Vie Publique - La Rédaction, 2022). Furthermore, the water sector is not the only sector underfinanced. For instance, disparities have been observed in social housings, which represent 13% of substandard housing in France despite only accounting for only 4% of the population. Inequalities also exist in transport, or electricity access. Additionally, while policies and legislations have been created, to palliate to the general social crisis, such as the 2017 law on real equality for the overseas territories, many recommended measures remain unimplemented challenges. Moreover, the Covid-19 pandemic further aggravated inequalities. (Vie Publique – La Rédaction, 2022). As such, better regulatory and implementation frameworks are needed to bridge the gap between the Metropole and the DOMs.

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