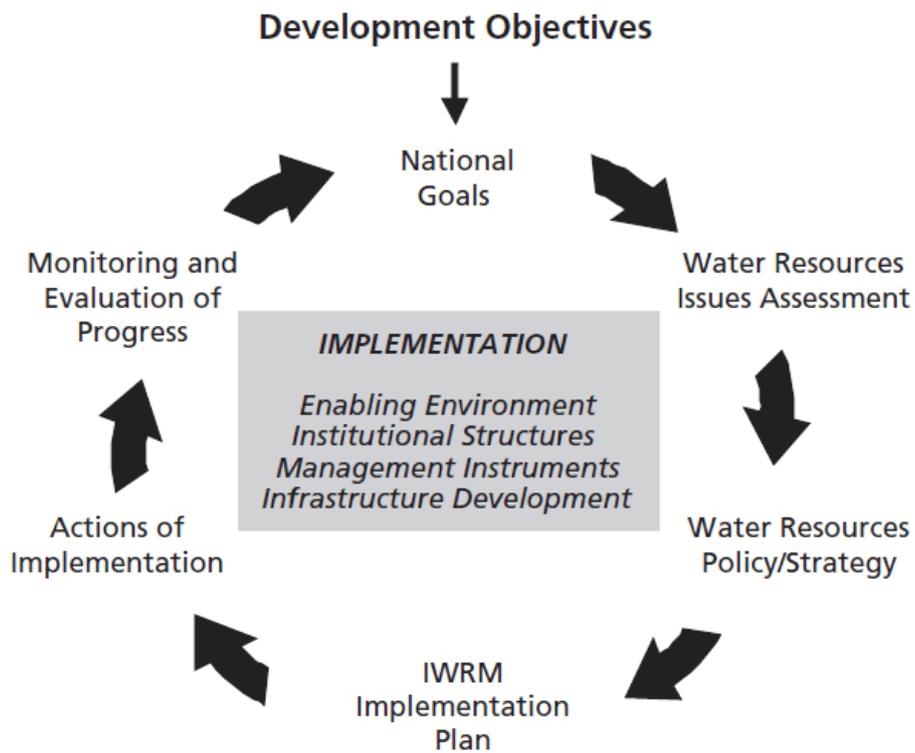




Capacity Building for Integrated Water Resource Management in Suriname



WaterForum Suriname
Paramaribo, July 2019

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COMPREHENSIVE REPORT FOR IMPLEMENTING INTEGRATED WATER RESOURCE MANAGEMENT IN SURINAME

WaterForum Suriname

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1. Introduction: background and context of IWRM in Suriname

In 2016 the Government of Suriname identified the need to develop a roadmap towards Integrated Water Resources Management (IWRM) for Suriname which should be developed under the lead of the Ministry of Natural Resources (NH). In that same year the implementation of IWRM proceeded with the foundation of the Interdepartmental Water Workgroup (IWW). The Ministry of Natural Resources and Water Forum Suriname (WFS) organized in 2016 and 2017 a series of seminars on Water Governance, Potable Water and Wastewater Management, aiming to raise awareness and consulting the main stakeholders. New laws on water are currently still in the concept phase and comprehensive policies and acts for water management are lacking. Therefore, action is needed.

In 2018 WFS has taken the initiative to start a project to develop capacity towards implementation of IWRM in Suriname, under the care of the GCCA+ project of UNDP, building further upon the progress made in 2016 and 2017. The project has been divided in two phases: a situation analysis, followed by development of an action plan and a monitoring plan. The situation analysis revealed the weaknesses in the water management system in Suriname, and pointed out the aspects that should be addressed in order to improve the situation. The weaknesses that were identified during the situation analysis were used as a basis to further develop an action plan on IWRM. The draft action plan was discussed at a stakeholder workshop on June 11, 2019, and inputs from the workshop were used to finalize the action plan.

This present comprehensive report summarizes the key results following from the IWRM project: the analysis of the water related problems; the identification of current gaps in water governance that need to be filled; the action plan towards implementing IWRM in Suriname; and the monitoring plan with key indicators to monitor progress on IWRM in Suriname. This report builds on three underlying project reports that contain more details: the Situation Analysis report (dated May 3, 2019), the Action Plan (dated June 24, 2019) and the Monitoring Plan (dated July 5, 2019). In addition, the reports on the stakeholder workshops that were held serve as additional information. All these reports form an integral part of this comprehensive report, and are attached as co-reports.

2. Why is action needed? Water related problems

Water is a primary and essential natural resource for supporting life on earth. While Suriname enjoys significant precipitation (with some seasonal and regional differences), water-related problems occur regularly and the people of Suriname face the same problems every year:

- Lack of access to safe and available drinking water in many regions in the country.
- In the rural area flooding of agricultural land due to excessive rainfall and/or high sea water levels causes losses of harvest and damage to public space, houses, transportation means; flooding occurs every year, more or less severe, depending on the location.

- Droughts in agricultural areas lead to loss of harvest, especially since irrigation is not present
- Flooding of urban areas due to excessive rainfall and/or high sea water levels causes damage to public space, houses, transportation means. Some streets are flooded every big rainfall event. Urban flooding increases the risk of waterborne diseases.
- In the interior high river levels cause flooding of villages.
- Droughts in the interior lead to limited availability of good quality water for domestic/drinking water use.

Furthermore, the quality of water in Suriname is threatened by:

- Inadequate waste disposal which compromises surface and groundwater.
- Inadequate waste water management: there are no wastewater treatment plants, and most of the septic tanks are not working properly, resulting in pollution of water resources.
- In the interior of Suriname most wastewater is discharged directly into rivers and creeks.
- Very few industries have some kind of wastewater treatment, most of the industrial waste water is discharged directly in surface water.
- Small scale (illegal) gold mining in the interior causes several water quality problems, especially use of mercury is a big problem, polluting the rivers and fish and making the surface water unsuitable for drinking water and eating fish.
- Increasing use of pesticides for agricultural use (but also within household and government) has serious health effects on people and other organisms.

In the near future, climate change may worsen these water-related problems. Sea level rise threatens the low-lying areas of the coastal region and enhances salt intrusion. Decreases in rainfall lead to a further decrease in the availability of fresh water for drinking purposes. Lower rainfall combined with rising temperatures lead to less availability of irrigation water for agriculture and food production.

All these water-related problems lead to limited access to drinking water for everyone, and to serious threats to public health and ecosystems. More so these water-related problems result in significant financial and economic losses, notably direct costs because of flood damages in urban and rural areas, losses in agricultural production because of droughts, as well as indirect costs such as increased costs for water transport, water purification, health issues etc. And these costs will only increase in the near future if unchecked.

3. Diagnosis: What is lacking at present?

Various measures can – and should – be taken to improve the situation. For example measures directed at reduction of the probability and impacts of flooding, prevention and reduction of losses in agriculture as a result of droughts, safeguarding the quality and quantity of groundwater resources, guaranteeing safe drinking water for all, etc. However, as experience demonstrates these measures do not happen by themselves, but require a concerted and coordinated effort and commitment from various parties, as well as the appropriate legal and institutional structures.

To guide the analysis of what needs to be done, Water Forum Suriname has adopted the internationally accepted principles of Integrated Water Resource Management (IWRM) as the leading vision. The ambition is: *“By 2030 Suriname will be a country with an abundance of water resources, which will be used in a sustainable manner, developed and managed based on IWRM principles”*.

The definition of IWRM which is used in Suriname reads: *“IWRM is the management of surface and subsurface water in quantitative and qualitative environmental sense with a multidisciplinary and participatory perspective and focus on the needs and requirements of the society at large, with regard to water for now and in the future”*. Conditions for successful implementation of IWRM have been formulated in the context of the United Nation’s Sustainable Development Goals (SDG’s). In the context of SDG 6 (Clean water and sanitation), a specific target SDG 6.5 has been formulated: *“By 2030, implement integrated water resources management at all levels, including through transboundary cooperation as appropriate”*. UNEP has developed an indicator framework (SDG 6.5.1) to assess the degree of integrated water resources management implementation in a nation.

Using this indicator framework, and based on analysis of literature, policy documents and a large number of interviews with key players in the water sector and beyond, the Situation Analysis Report concludes that implementation of the IWRM in Suriname has still a long way to go. While the Government of Suriname has, in its National Development Plan 2017 – 2021 (section IX.5.4), recognized water as an important natural resource, and emphasized the need for new legislation and data collection to support strategic plans and specific action plans, no strategic vision regarding IWRM has been formulated, let alone adopted into a national water policy.

Water related legislation in Suriname is out of date and does not comply with current requirements. Some shortcomings in the current legislation are: the lack of rights and obligations of the water user, lack of control mechanisms, and unclear division of responsibilities and powers. Several governmental agencies and institutions are involved in the protection and monitoring of water resources, without clearly defined role, leading to fragmentation, sometimes duplication of efforts, and inefficiency in the water sector. Capacity of institutions is limited, in particular with respect to knowledge and capabilities of personnel.

There is a significant need for more knowledge to support water management actions, however structural data and information sharing arrangements are very limited and the existing data exchange water platform is rarely used by the stakeholders. Public awareness of and political attention for water related problems are low. There is insufficient budget for investments and recurrent costs, which lead to downsizing of recurrent activities. The tariffs paid for drinking water and charges for the use of bulk water are very low. Currently there is no income from ecosystem services, while the fees for acquiring monitoring or research data are by far too low to cover the costs.

4. A framework to support implementation of IWRM

4.1 Key components

Based on the gaps identified in the situation analysis, and in accordance with international literature, the following five components were identified as key in the framework to support the implementation of IWRM in Suriname:

1. **The enabling environment**, comprising political engagement and support, and awareness, engagement and participation of the general public and private stakeholders.
2. **The legal framework**, covering a variety of current and required future laws that structure the water governance system and provide regulatory tools for policy instrumentation and regulation.
3. **The institutions and capacity**, focusing on coordinating procedures and processes of public entities involved in (parts of) water management, as well as their capacity (in terms of numbers and qualifications of personnel and material supports).
4. **The knowledge and knowledge infrastructure**, covering data collection, exchange, research into different parts of water systems, development of knowledge-based tools for policy development, etc.
5. **The financial means**, required to support capacity development, knowledge development, and other actions, and in the end investments in water infrastructure as needed.

When adequately developed, these five components together provide the necessary inputs and conditions for successful comprehensive water policy development and integrated water management. The different components are not independent of each other. For example, public engagement and awareness stimulates or may even be needed for political support; political support is needed for allocating and attracting funding required for research and capacity development. Also, knowledge development helps create public and political awareness of (potential) water related problems, supports capacity building for policy development, and can help obtain funding for promising projects. And an appropriate legal framework and institutional capacity are needed to efficiently develop good and implementable policies, plans and projects leading to integrated and sustainable water management. Because of these mutual dependencies, parallel action, co-development and iterative learning are needed.

4.2 An iterative process requiring guidance

The process of change towards IWRM calls for a multisectoral and iterative, adaptive approach. It is a long process, which requires regular review, adaptation and possible reformulation, involving the main actors in water governance and water use. Therefore, the IWRM plan should be a revolving plan with features of evaluation and reformulation at periodic intervals¹. The current comprehensive IWRM plan proposed here intends to kick-start this process by

¹ Integrated Water Resources Management Plans, Training Manual and Operational Guide, March 2005, UNDP, GWP and Cap-Net

providing an overall framework, identifying key directions, initial priority actions, and indicators that can be used to monitor progress.

The following management framework is recommended to stimulate and oversee the IWRM process:

- On behalf of the Government of Suriname, the ministry of NH will have the lead role of the process, mobilizing funding and determining the policy framework.
- A national overseeing committee, comprised of stakeholder representatives will mobilise support across sectors and interest groups, guarantee quality input and monitor progress. The Committee should drive the plan through all stages of development, to ensure that the initiative is managed effectively and will provide maximum benefit. This committee should at least include representatives of the Ministries of NH, OWT&C, LVV, RO, VG, ROGB and NIMOS, as well as representatives from the private sector.
- For each of the identified activities, an implementation partner or collaborating partners are assigned.
- A facilitating institution or NGO to provide a neutral platform for dialogue, support the process by providing advice and sharing knowledge, and foster capacity building and training by providing key liaison and coordination with capacity building networks. Either the Water Forum Suriname or the Anton de Kom University could play this role.

5. Actions

The IWRM Action Plan identifies a large number of actions for the short, medium and long term, including indication of the collaborating partners that should be involved. Here, the focus will be on the short-term actions for each of the five components of the framework to support IWRM.

5.1 Enabling environment

The goal in this area is to raise and maintain public awareness on the need for IWRM and to create political support for IWRM. Public support can only be enhanced if the public is being educated and informed and if their interest is being considered. Similarly, private sector linkages need to be established.

Key actions include:

- Development of an awareness and communication program targeting the general population as well as specific target populations, such as women and vulnerable groups, and also considering local culture, language and circumstances.
- Start young: work on education at school!
- Creation of stakeholder forums for effective and efficient engagement.
- Briefing of politicians, policy makers and private sector, with the focus on conservation and sustainable use of water resources.

- Adoption of the IWRM action plan by the government (ministry of NH, cabinet of the President), by explicitly incorporating IWRM in the next national development plan (2022-2027).

5.2 Legal framework

Up to now, four draft laws on water management have been prepared. It is the intention to submit these laws to Parliament before the end of 2019, and the Ministry of NH is currently executing a process to formulate draft regulations to be implemented under the acts. Other legislation that is supportive to water management is the draft Environmental Act. In order to have an improved and integrated legal framework to support IWRM a comprehensive evaluation of existing water and other natural resources legislation must be undertaken. This evaluation must show which amendments and repeals will be necessary to harmonize existing water resources legislation, in order to give the Ministry of NH (or, if established, the national water coordinating agency, national water commission or national water authority) its jurisdiction as lead agency for IWRM.

Key actions include:

- Analyze existing water resources related legislation to identify necessary amendments and additions in light of IWRM requirements.
- Organize stakeholders meetings to present the outcomes of the legal analysis.
- Draft new legislation that includes a variety of necessary regulatory requirements, as well as clear determination of roles and responsibilities of different entities on different levels, including a national coordinating body.
- Enact and implement these new laws, including provisions for necessary means.

a. *Institutions and capacity*

For IWRM to be successful it is important to clarify the roles of NH and the different involved institutions, to provide mechanisms for coordination and cooperation, and to provide the relevant agencies and institutions with sufficient capacity to effectively execute their tasks.

Key actions include:

- Identify existing agencies with water related roles and responsibilities.
- Assess current performance of IWRM functions and identify gaps in mandates and capacities.
- Identify bodies on the local level than can play a significant role in IWRM.
- Set up a department within the ministry of NH, directly under the Permanent Secretary, to start up coordinating of IWRM process.
- Develop the operational plan for a coordination body, and establish this coordination body.
- Develop the strategy to retain and increase IWRM staff.
- Design and develop an IWRM capacity building program.
- Develop an institutional structure for transboundary water management.

5.3 Knowledge and knowledge infrastructure

Applied research in water resources management related issues is essential for the success of IWRM. Water related investments often require significant resources. Thus, costly mistakes in

investments in water projects could be avoided if they are based on careful research and analysis of information and data.

Knowledge is a key ingredient for effective IWRM. First, more data are needed to assess the urgency of the various water-related problems, and how these problems develop over time. Second, insight into the functioning and interactions of the different components of the water system is needed to understand the causes of problems, and to develop knowledge about their possible solutions. Third, knowledge is needed to assess the comparative effectiveness and costs and benefits of alternative policy measures, to support policy decision making.

Key actions include:

- Identify data and information gaps, and set up a system to collect the required data.
- Set up a data sharing platform, based on primary data sources.
- Design a research program for the different aspects of the water system (water quantity, water quality, water use efficiency, water related ecosystems, climate change, flooding, water pollution etc.).
- Identify national primary data resources, and set up a sharing platform.
- Support the rehabilitation and upgrade the hydro-meteorological monitoring networks.

5.4 Financing

Effective water resources management for both national and sub-national level requires financing for initial water investments (development) and recurrent costs (ongoing). The financing for initial investments relates to the financial resources needed for the preparation of an IWRM strategy, to be calculated in more detail. The recurrent costs relate to the resources required for implementation of both the changes in water governance and in the water infrastructure to implement IWRM. It includes both the 'hard' structures, such as dams, canals, pumping stations, flood control etc., as well as the 'soft/green' infrastructure, such as water treatment and nature-based solutions. Financing is also required for institutional strengthening for the development and implementation of IWRM.

Important activities include:

- Ensure adequate provision is made by the government for start-up activities of IWRM in the ministry of NH and the coordinating body.
- Develop a short and long term investment plan with alternative investment inputs.
- Explore and develop cost-recovery strategies for investments.
- Develop quality project proposals that suit a range of donor requirements.
- Generate local resources from government, private sector and local communities to implement IWRM.
- Identify other potential short and long term income sources for IWRM services.

6. Monitoring of the actions

The IWRM actions mentioned above should lead to:

1. Increased awareness and engagement of relevant stakeholders and the general population, and increased political support for and commitment to implementation of IWRM.
2. Improved legal framework to support IWRM in Suriname.
3. Increased institutional capacity for IWRM at the ministry of NH, the coordinating body and other relevant agencies of the government.
4. Increased knowledge and tools to support effective policy making on IWRM, including the associated data and knowledge infrastructure.
5. Adequate financial and material resources for implementation of IWRM.
6. A national monitoring and evaluation system to track progress in IWRM implementation.

Monitoring of the IWRM actions should be done at three levels: (1) whether the actions are, indeed, performed; (2) to what extent the target objectives are reached; (3) whether the policies, plans and projects developed display the characteristic features of the integrated approach. In the end, of course, the proof of successful IWRM is in the improvement of the overall water situation in terms of ecological, social and economic benefits, and in the sustainability of the actions.

7. A dual strategy for change

The list of IWRM actions is impressive, and the expected outputs are challenging. As indicated above, none of the five components can be left behind, as there are many mutual dependencies. The ambition should be to achieve a co-development over time. Yet, some of the actions seem more urgent than others, as, without them, it will be difficult or impossible to get the system as a whole moving in the desired direction.

From this perspective, the most critical actions are:

- Collect data and information to underpin the urgency of the current situation, e.g., the costs and other implications of not taking action. These data are critical to create public awareness and broad political support for IWRM.
- Secure political commitment and government support to initiate the change process. Back this by stimulating clear leadership, identifying a champion and developing an appealing vision.
- Implement and enact a minimum of required legislation (e.g., where no legislation exists no water management is possible).

These critical actions characterize a so-called top-down strategy of change. The success of this strategy critically depends on a minimum of political commitment and bold leading figures in the government. Experience shows this strategy is uncertain, particularly for the short to medium term. Therefore, it is proposed to adopt a companion strategy that has more 'bottom-up' characteristics.

Bottom-up in this case means:

- Develop and support so-called 'niches' where innovation takes place. Use small-scale successes as an example, and spread the word. Developments in the Nickerie region might be a good candidate. Other candidates might be found in other local initiatives, and/or in small groups of workers in different departments connecting to each other to share data, experiences, etc.
- Intensify and develop the water network. As demonstrated by the well-attended workshops held, WFS is connected to a fairly wide network of motivated people working in different institutions related to water management. Continued efforts to develop and expand the network (e.g. with private stakeholder representatives and active participation and inputs by knowledge institutes) will help spread the notion of IWRM, increase awareness, help develop capacity, and hopefully also stimulate entrepreneurship among the group of people who will be critical in the implementation of IWRM.

8. Closing remarks

This comprehensive report provides insights in the background of IWRM in Suriname, the identified gaps, the framework for change and the priority actions. Implementing IWRM in Suriname to its fullest extent requires lots of motivation, perseverance and hard work. WFS is privileged with this opportunity to contribute to a better understanding of IWRM principles and to develop the implementation strategy of IWRM in Suriname. The results coming out of this assignment require immediate follow up by the relevant authorities, especially at the ministry of NH. It is recommended that national policy makers and politicians take good notice of this comprehensive report on IWRM in Suriname. In order to fundamentally address the water related problems of Suriname IWRM should be placed high on the political agenda of Suriname. WFS is more than willing to lend its technical expertise in this process. The way forward is a step-by-step approach. Together we will take the steps to get there.



Situational Analysis

IWRM in Suriname

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List of Abbreviations

ABS	General Bureau of Statistics in Suriname
ACT	Amazon Conservation Team
ACTO	Amazon Cooperation Treaty Organization
ADEK	Anton De Kom University of Suriname
ANA	Agencia Nacional de Aguas (Brasil)
ATM	(Former) Ministry of Labour, Technological Development and Environment
BOG	Public Health Office
BUZA	Ministry of Foreign Affairs
CCCCC	Caribbean Community Climate Change Centre
CI	Conservation International
CSNR	Central Suriname Nature Reserve
CVR	Committee of Rapporteurs
GCCA+	Global Climate Change Alliance+
GDP	Gross Domestic Product
GWP	Global Water Partnership
ICZM	Integrated Coastal Zone management
IWRM	Integrated Water Resource management
IWW	Interdepartmental Water Workgroup
LVV	Ministry of Agriculture, Livestock and Fisheries
MAS	Maritime Authority Suriname
MDS	Meteorological Service Suriname
MUMA	Multiple Use Management Area
NBS	National Biodiversity Strategy
NCCR	National Coordination Centre for Disaster Management
NGO	Non-Governmental Organization
NH	Ministry of Natural Resources
NIMOS	National Institute for Environment and Development in Suriname
NP	Nature Park
NR	Nature Reserve
OW	Ministry of Public Works
OWMCP	Overlying Water Board Multi-Purpose Corantijn Project
PAHO	Pan American Health Organization
PPP	Public Private Partnership
PTC	Polytechnic College

REDD+	Reducing Emissions from Deforestation and forest Degradation
RGB	Ministry of Spatial Planning, Land and Forest Management
RO	Ministry of Regional Development
SAP	Strategic Action Plan
SBB	Forest Management Foundation
SDG	Sustainable Development Goal
SFOB	Interior Development Foundation
SMNR	Master study on Sustainable Management of Natural Resources
SWM	Suriname Water Supply Company
SWRIS	Suriname Water Resources Information System
UNDP	United Nations Development Programme
UNEP	United Nations Environment Programme
UNICEF	United Nations International Children's Emergency Fund
VG	Ministry of Public Health
WFS	Water Forum Suriname
WHO	World Health Organization
WLA	Hydraulic Engineering Department
WUE	Water Use Efficiency
WWF	World Wildlife Fund

1. Introduction

1.1 Background

Suriname is a country in South America, neighboring French Guyana in the east, Guyana in the west and Brazil in the south. The coast of Suriname is flat and enclosed by the Marowijne River in the east and the Corantijn River in the west. In total Suriname has over 500.000 inhabitants, the coastline is relatively densely populated as 80% of the population lives in this area (FAO stats, 2015).

Suriname is facing several challenges regarding sustainable and integrated water resource management, such as lack of drinking water in some regions of the country, flood risks during heavy rainfall and shortages of irrigation water in dry seasons. Water pollution due to inadequate wastewater treatment, the use of pesticides and pollution from the mining sector, challenge water quality in the whole country (Abeleven, 2017). Another challenge is the lack of awareness among the general population on the importance to address the country's water issues in an integrated manner. Increasing human activities, such as mining, urban development, industries, fishing, tourism, wood logging and agriculture, together with climate change effects such as changing precipitation patterns and rising sea levels, increase the urgency to act. But acting is especially difficult as water management is fragmented at a national level.

Suriname is aiming to improve the situation by implementing Integrated Water Resource Management (IWRM), but due to this fragmentation the implementation of IWRM is progressing slowly. Technical staff and key institutions involved in water management lack technical and institutional capacity to develop and implement robust integrated water management plans. The different institutions within the government have a different understanding of IWRM while some are not yet familiar with the concept.

In 2016 the Government of Suriname (Cabinet of the Vice-President and the Ministry of Natural Resources) identified the need to develop a Roadmap for Integrated Water Resources Management for Suriname which should be developed under the lead of the Ministry of Natural Resources (NH). In that same year the implementation of IWRM proceeded with the foundation of the Interdepartmental Water Workgroup (IWW). The IWW was created to become a committee pushing for IWRM, but the working group fell apart after organizing the seminars in 2016 and 2017, due to lack of political commitment and mandate.

The Ministry of Natural Resources and Water Forum Suriname (WFS) organized in 2016 and 2017 a series of seminars on Water Governance, Potable Water and Wastewater Management, aiming to raise awareness and consulting the main stakeholders .

The new laws on water are currently still in the concept phase and policies and acts for water management in both boundary rivers are lacking. Therefore, action is needed.

WFS has taken the initiative to start a project to compile an IWRM plan for Suriname, under the care of the GCCA+ project of UNDP. This project will build further upon the progress made in 2016 and 2017.

1.2 Project goal and results

The ultimate goal of the project is to develop an Integrated Water Management Plan for Suriname through a participatory and consultative process. The expected results of the project are:

- Analysis report on the current situation/status of implementation of IWRM in Suriname
- Identification and endorsement of national IWRM priorities
- IWRM plan which includes among other subjects:
 - Situational analysis
 - WUE and IWRM national indicator framework
 - IWRM action plan
 - IWRM (national) monitoring plan

The project will also lead to (i) increased awareness among specific target groups on the importance of integrated water resource management in Suriname, (ii) enhanced capacity among technical staff and key institutions on the various aspects of integrated water resource management in Suriname and (iii) roadmap for enhanced development and implementation of IWRM in Suriname, (iv) expanding the existing knowledge on Integrated Water Resource Management in Suriname in main water management institutions of the Government.

Important stakeholders will be challenged to not only think about this important subject but also reach consensus, show political commitment and start cooperating to improve water management in Suriname.

1.3 Methods used for situational analysis

To compose an IWRM plan to support the implementation of IWRM, several steps need to be taken. In Figure 1-1 a planning cycle is visualized to set up such a plan. The planning cycle starts with Initiation. Initiation started a few years back when the initiative was taken to start IWRM development through activities to involve stakeholders and raise awareness. In the Long Term Development Plan 2017-2021 of the government of Suriname it is stated that an IWRM system will be developed. A clear vision of IWRM has not yet been adopted into water policies and should follow from this process of development of an IWRM plan for Suriname. As suggested in the cycle, this plan will be a working document, that will be adjusted and fine tuned constantly.

This report includes the situational analysis. It covers a description of the current situation in Suriname, a set of goals that are determined, water issues that are present and a gap analysis. To set up the situational analysis in a limited timeframe, the following methods were used. A literature study took place to examine information on IWRM in general and Suriname in particular. Especially useful was the information obtained from stakeholders at the seminars on Water Governance, Potable Water and Wastewater Management, held in 2016 and 2017. And the report "Towards an integrated water management in Suriname" (Del Prado, 2011). In addition to this literature study we performed interviews with key stakeholders (Annex 1) and held a workshop on the 7th of March (Annex 2).

The next step will be to determine which actions are needed to implement IWRM, prioritizing these actions and further develop them in a logical framework. This will result in the IWRM action plan. Following this, a IWRM monitoring plan will be set up. All will be included in a comprehensive IWRM plan. The methods used in these parts of the project will be described in a later report.



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Figure 1-1 Cycle for developing and adjust an IWRM plan (WMO, GWP, 2007)

1.4 Content of this report

In this report the situational analysis is described. The report contains several chapters.

Chapter 2 describes the IWRM principles and definition, and the vision and goals regarding IWRM in Suriname. This chapter is partly based on literature regarding IWRM and partly based on information obtained from the stakeholders in interviews and workshops/seminars.

Chapter 3 contains a water resources assessment of Suriname. This assessment includes a description of climatic conditions and of the water resources of Suriname. Also the different uses and users of the water resources are listed, as well as the current state of water conservation and demand strategies. Finally the main water issues are displayed.

Chapter 4 contains an analysis to determine the degree of implementation of IWRM in Suriname. This is done using an indicator framework introduced by UNEP in 2017. This framework covers four key components of IWRM implementation: enabling environment, institutions and participation, management instruments and financing. Each of the key elements is scored on a scale from 0-100.

The report ends with Chapter 5. This chapter contains the conclusions of the analysis of Chapter 4. The underlying causes and effects are visualized in a problem tree. Finally an overview is given in which areas Suriname needs development. A table is included with all gaps identified during the analysis. These gaps need to be filled, in order to have IWRM implemented in Suriname.

2. IWRM principles, definition, vision and goals

2.1 IWRM principles

Basis of IWRM are 4 principles, the Dublin principles, formulated in 1992 during the International Conference on Water and Environment. Since then, these principles have found universal support amongst the international community as the guiding principles underpinning IWRM (Global Water Partnership, 2000). The Dublin principles are:

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

2.2 IWRM definition

Worldwide several definitions are used to describe Integrated Water Resources Management (IWRM). The concept of IWRM is widely debated and an unambiguous definition of IWRM does not currently exist (Global Water Partnership, 2000). Below two different definitions are included, one which is used in several countries and one which is introduced in Suriname years ago (Del Prado, 2011) and used ever since.

Definition of IWRM used by several countries (Global Water Partnership, 2000):

" IWRM is a process which 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."

Definition of IWRM which has been used in Suriname (Jaspers, 2003):

"IWRM is management of surface and subsurface water in quantitative and qualitative environmental sense with multidisciplinary and participatory perspective and focus on the needs and requirements of the society at large, with regard to water for now and in the future."

Important aspects that can be learned from both definitions are that IWRM includes (Savenije, 2001):

- All water (spatial): all water within the hydrological cycle.
- All interests (social): consumptive and non-consumptive uses.
- All stakeholders (participatory): requires stakeholder involvement.
- All levels (administrative): involvement of all levels, starting at the lowest level.
- All disciplines (organizational): combination of technical and social disciplines.
- Sustainability (environmental, political, social, cultural, economic, financial, legal): IWRM must be carried out in a sustainable manner in all cases.

Whatever definition is used for IWRM, it is important to realize that IWRM is a continuing process, not a product or an end goal (Patandin, 2019).

The complexity of IWRM is shown in Figure 2-1 where the 3 dimensions of IWRM are visualized. The fourth dimension is time.



Figure 2-1 Dimensions of IWRM (Savenije, 2001)

2.3 IWRM vision

Suriname is still at the beginning stage of implementing IWRM. Until now no strategic vision regarding IWRM was formulated, let alone adopted into a water policy. One of the advantages of Suriname is the abundance of water. This advantage should be emphasized and build upon. The thing we have to work on, is using these water resources in a sustainable way, in all areas mentioned in Paragraph 2.2. Development and management based on IWRM principles will help us to do so. Therefore the vision for Suriname is formulated as follows:

By 2030 Suriname will be a country with an abundance of water resources, which will be used in a sustainable manner, developed and managed based on IWRM principles.

2.4 IWRM goals

The goals of IWRM in Suriname are determined together with the stakeholders. In the interviews by the project team, the key stakeholder were asked the question: what goals should IWRM have? Also in the workshop held on the 7th of March 2019, 4 keynote speakers were asked to state the goal of IWRM from their point of view. This resulted in a list of goals that IWRM should aim for in Suriname. Further on in the process of development of IWRM these goals can be subject to change due to new insights. The current goals of IWRM in Suriname are:

1. Ensure vital ecosystems
2. Ensure Public health through high water quality
3. Minimalize pollution of water resources
4. Support economic growth
5. Increase social welfare
6. Ensure access to water for all users and uses of water

7. Efficient use of available water resources
8. Sustainable use of available water resources
9. Ensure climate resilient development and management
10. Minimize negative impacts from flooding and droughts
11. Ensure democratic participation in governance
12. Ensure an integrated and coordinated approach in water management

3. Water resources assessment of Suriname

3.1 Climatic conditions

3.1.1 Climate

Suriname has a tropical climate with abundant rainfall, a uniform temperature, and high humidity. Suriname's tropical hot and wet climate is influenced by several factors. The passage of the Inter-Tropical Convergence Zone (ITCZ) typically results in a short wet season from December to February and a long wet season from May to mid-August. In between these seasons are the short dry season (February to late April) and the long dry season (mid-August to early December). Another key climatic influence relates to Suriname's surface conditions, characterized by rivers and swamps and vegetation cover that produce a large amount of water vapor. This, combined with convection and orographic lifting, help contribute to the country's relatively abundant precipitation. While the country generally sees warm temperatures all year round, the rainy seasons are a bit cooler than the rest of the year. (UNDP, 2016)

According to the Köppen climate classification, Suriname has a tropical rain climate (A-climate) which is subdivided into the following types:

- **Af** - climate: tropical rainforest climate, always humid and every month has rainfall exceeding 60mm.
- **Am** - climate: monsoon climate. One or more months have less than 60mm rainfall. The deficit is compensated by the annual value of rainfall.
- **Aw** - climate: humid and dry climate. One or more months have less than 60 mm of rainfall. The deficit is not compensated by the annual value of rainfall.

The northern part of Suriname has an **Af** - type of Köppen classification. This means that the mean monthly rainfall in the coastal area is always higher than 60mm. However, a small strip along the northwestern portion of the coastal area, including Coronie and Nickerie, might have lower than 60mm rainfall in the driest months. The greater portion of Suriname has an **Am** - type climate whilst in the southwest the **Aw** - type climate prevails (Amatali & Naipal, 1999).

3.1.2 Rainfall

Average precipitation in Suriname is 2,200mm/year (ABS, 2014). However rainfall is not evenly distributed over the country and over the year, see Figure 3-1. Annual rainfall varies from 1700 mm/yr – 3000 mm/yr across the country. Available data show that the highest amount of rainfall occurs in the center and the lowest in the northwest. Rainfall is the highest in the months May and June and lowest in September and October. Note that the latest map of rainfall distribution is made in 1999.

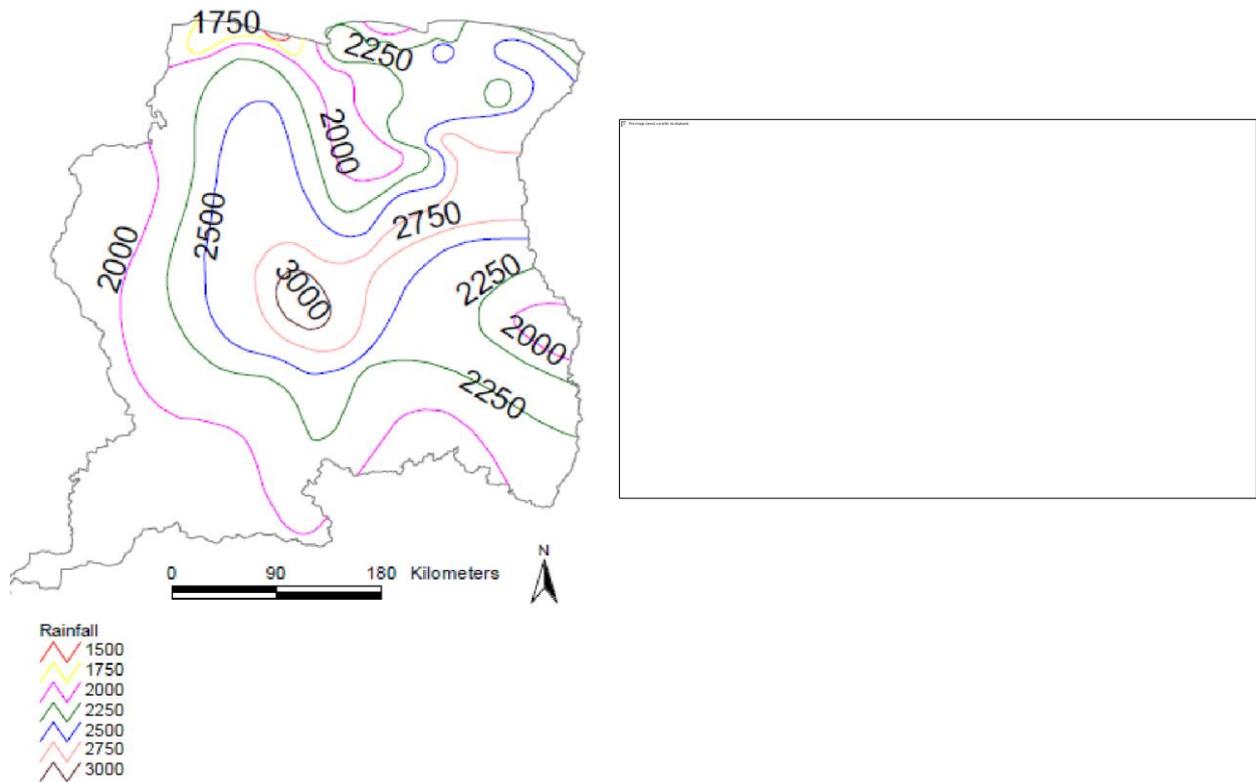


Figure 3-1 Annual Rainfall distribution (Narena, 1999) and monthly rainfall in Paramaribo

3.1.3 Temperature

Air temperature records at the national meteorological service, the Meteorologische Dienst van Suriname (MDS), indicate average daily temperatures of about 27 degrees Celsius with an annual variation of 2-3 degrees Celsius. The interior has relatively similar figures, although variation of daily temperatures can be larger (10-12°C). Temperature is highest in the months September and October, see Figure 3-2.

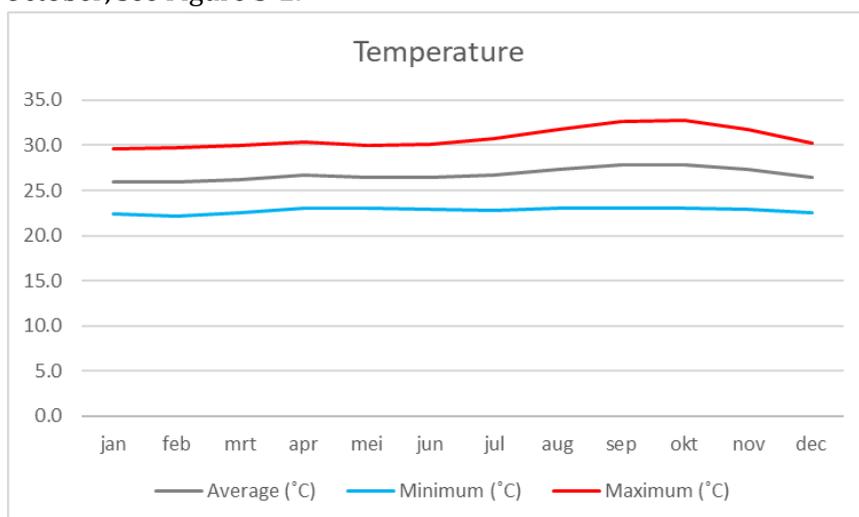


Figure 3-2 Monthly temperatures in Suriname

3.1.4 Floods and droughts

Floods and droughts frequently occur in Suriname. Floods and droughts occur regularly and the people of Suriname face the same problems every year. Below an overview is given of the impact of these floods and droughts, where distinction is made between rural area and urban area and the interior.

Rural area

In the rural area flooding of agricultural land due to excessive rainfall and/or high sea water levels causes losses of harvest and damage to public space, houses, transportation means (indirectly leads to the necessity to own 'large' vehicles to be able to mobile during high rain events). Flooding occurs every year, more or less severe, depending on the location.

Droughts in agricultural areas can lead to loss of harvest, especially since irrigation is not present or not up to standard. If drought increase because of climate change this problem will increase.

Urban area

Flooding of urban areas due to excessive rainfall and/or high sea water levels causes damage to public space, houses, transportation means. Some streets are flooded every big rainfall event. The acceptance level among the Surinamese people regarding flooding appears to be high.

Research has shown that there is a clear correlation between urban flooding and waterborne diseases (Seminar on Waste water management in Suriname, 2016).

Interior

In the interior high river levels cause flooding of villages. The severity can increase due to increasing activities such as wood lumbering and small scale gold mining, which can lead to higher peak discharges.

Droughts in the interior lead to limited availability of good quality water for domestic/drinking water use, since a lot of villages rely on surface water resources. Also droughts in the interior can result in low water levels in the Van Blommenstein reservoir, which is responsible for over 80% of Suriname's energy production.

3.1.5 Climate change

Climate Change is a major issue for Suriname. Regional climate modeling has shown that the following effects of climate change can be expected in Suriname (Caribsavé, 2012) :

- Increase in mean annual temperature of 4,8 °C by 2080.
- Large decreases in rainfall in all seasons; up to a 34% decrease in mean annual rainfall by the 2080s. The maximum decrease (of 74%) is projected for the months September, October and November.
- Sea level rise. Predictions about the magnitude of this sea level rise vary, up to 1,45 m in 2100. Also changes to the frequency or magnitude of storm surge experienced at coastal locations in Suriname are likely to occur.

The effects of these changes will have a great impact on Suriname. Sea-level rise is a major threat to the coastal zone, where most of the population of Suriname live and also where the most agricultural land is situated.

A decrease in rainfall can lead to more extensive droughts, this will endanger water availability (for all uses such as: potable water, agricultural water, tourism, etc.) and pose a threat on the energy supply from the Van Blommenstein reservoir.

Sea level rise in combination with low river discharges resulting from the decrease in rainfall will also increase salt intrusion from the sea land inwards. These will decrease the availability of fresh water for potable water and agriculture.

3.2 Description of water resources

3.2.1 Natural and manmade water resources

Suriname is a country blessed with a large amount of water resources. Suriname relies basically on three types of water resources:

Rainfall

Rainfall is of a direct significance, mainly, in the agricultural areas, especially in the coastal zone where rice culture, horticulture, banana culture, and other water intensive cultures are practiced. In the rural areas where the facilities for drinkwater supply are lacking, rainwater is used for potable purposes.

Surface water resources

The surface water resources consists of 7 major rivers (of which 2 transboundary), swamps, wetlands, man-made lakes (Van Blommenstein reservoir and several lakes as a result of bauxite excavation), man-made canals and urban and rural drainage systems. In Table 3-1 the hydrological characteristics are shown of the 7 major rivers of Suriname and in Figure 3-3 the catchment areas of these major rivers are displayed.

Salt intrusion effects all rivers. This salt intrusion leads to a lack of fresh surface water (for agricultural and domestic use) in parts of the coastal area.

Table 3-1 Hydrological characteristics of the major rivers of Suriname

Main River	Catchment area (km ²)	Mean discharge at outfall (m ³ /sec)	Specific discharge (l/sec/km ²)	Water level near outfall exceeded once in 25 years (m MSL)	Minimum salt intrusion in km from outfall	Maximum salt intrusion in km from outfall
Marowijne	68,700	1,780	25.9	2.14	57.0	59.0
Commewijne	6,600	120	18.2	1.93	60.0	---
Suriname	16,500	426	25.8	1.98	54.0	90.0
Saramacca	9,000	225	25.0	2.08	37.0	89.0
Coppename	21,700	500	23.0	2.22	31.0	95.0
Nickerje	10,100	178	17.6	2.50	28.2	105.0
Corantijn	67,600	1,570	23.2	2.80	40	82.0

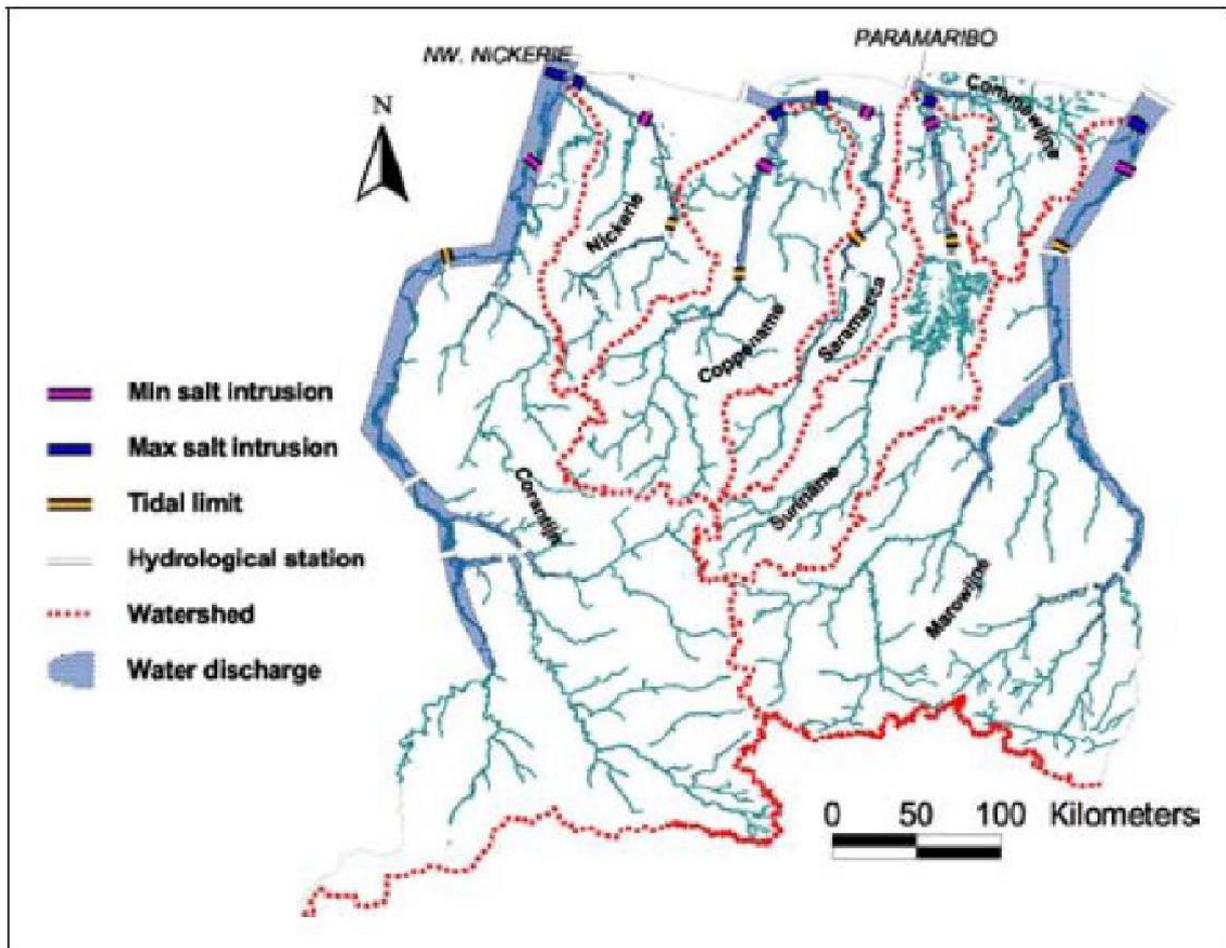


Figure 3-3 The 7 major catchment areas in Suriname, including salt water intrusion

Groundwater resources

Groundwater exists on large scale, which is a result, mainly, of (past) climatological and geological conditions of the area. Aquifers are found in the coastal zone, the thickest and most extensive aquifers are found in the west of Suriname. In the east only limited aquifers are found. In the interior there are no extensive aquifers. Groundwater conditions of the Precambrian shield are generally unfavorable, because the geological formations have little or no primary permeability. People in the interior therefore rely mainly on surface water resources.

The most important freshwater aquifers from which water is withdrawn are the:

- A-sand aquifer: no recharge; depths from 130-190 m;
- Coesewijne aquifer: no recharge; depths from 70-110 m (deeper in Nickerie);
- Zanderij aquifers: partly recharged from Savannah area; depths from 15-60 m (deeper in Nickerie).

Due to exploitation of the aquifers and the limited recharge, a problem that is faced is the advancing of brackish water towards the extraction points. In some area's (especially in Nickerie, the north of Paramaribo and in Commewijne) salt contents are already higher than the guideline value of 250 mg/l.

3.2.2 Alternative water resources

Alternative water resources are for example water produced by desalination and reuse/recycling of water. These alternative water resources are not used in Suriname. There are some industries that reuse their production water, but it is not clear how and to what extent.

3.2.3 Protected areas

At present, Suriname has 16 legally established protected areas, of which eleven nature reserves, four Multiple-Use Management Areas and one Nature Park, see Figure 3-4. A lot of the protected areas contains extended water resources and elaborate aquatic ecosystems. The current protected areas combined, cover 2.1 million hectares accounting for nearly 13% of the country's territory. The 1.6 million hectare Central Suriname Nature Reserve (CSNR) located in the forested interior is the nation's largest, representing 75% of the total protected area system. In addition, the CSNR is a World Heritage Site. Water and water related ecosystems are playing an important role in most of these protected areas.

The different types of protected areas differ in legal status and management regime (UNDP/GEF, 2011):

- Nature Reserves are locations with significant biodiversity and/or geological attributes. Nature Reserves are managed as high value natural areas with fairly restricted use. For instance, the Nature Preservation Law (1954) forbids persons “to either deliberately, or through negligence, damage the soil conditions, the natural beauty, the flora and fauna, or to perform any action which destroys the value of the reserve. Management plans have been developed for about half of the NRs;
- Nature Parks are relatively low-level conservation areas. Suriname has only one Nature Park (Brownsberg). Stinasu is responsible for management and the actual site belongs to Alcoa's (Suralco) bauxite concession. Stinasu has developed it for tourism, research and nature education; protection is important, but not as strict as in a NR. A management plan for Brownsberg NP has been developed.
- Multiple Use Management Areas (MUMAs) are designated to maintain biological productivity, ensure the health of globally significant wildlife, and protect resources for sustainable livelihoods. Although MUMAs are intended to be multiple-use areas, the conservation of biodiversity and maintenance of ecosystem services is the ultimate management objective. MUMAs may be commercially utilized within sustainable limits with permits required for both research and resource extraction; for all the MUMAs, management plans have been developed.

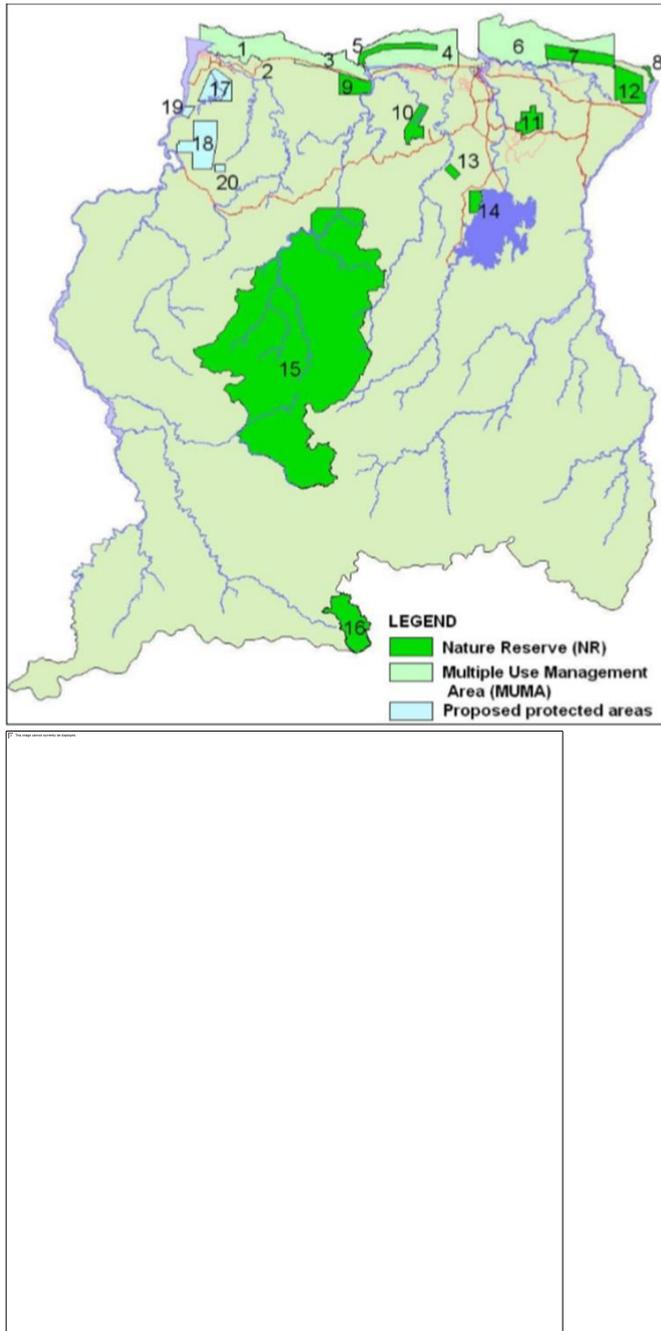


Figure 3-4 Map of the protected areas in Suriname (ATM, 2013)

3.3 Water conservation and demand management strategies

Since the general view is that there is an abundance of water in Suriname, there are no water conservation and demand management strategies in place.

3.4 Water uses and users

The available water resources are used in many different ways and by different groups of users. These uses of water resources in Suriname are listed below in table 3-2.

Table 3-2 Use of water resources in Suriname

Uses	Users
Conservation of ecosystems	Flora and fauna of Suriname, Ecotourism
Potable / domestic water use	SWM, bottling companies, citizens of Suriname, users of bottled water (also exported)
Agriculture	Farmers, waterboards
Industry	Private companies
Energy supply	Alcoa/EBS
Waste water discharge	Citizens of Suriname
Transport	Transport companies, citizens of Suriname
Fisheries	Fishermen, commercial and for own use
Recreation	Tourists (local and from abroad), people working in the tourist sector
Mining	Mining companies, illegal miners

According to statistics obtained from the World Bank, less than 1% of the renewable water resources are consumed in Suriname. Of this water 70% is used for agriculture, 8% for domestic water and 22% for industrial water. Figure 3-5 is a pie chart with the water withdrawal by sector in Suriname.

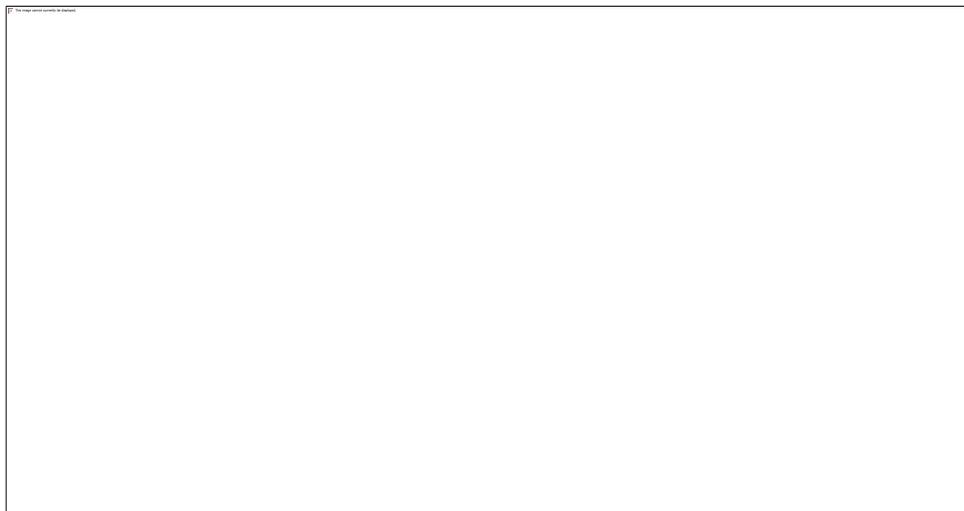


Figure 3-5 Water withdrawal by sector (FAO, 2006)

3.5 Water issues

There are several issues identified regarding water resources management in Suriname (Del Prado, 2011), (Seminar on Waste water management in Suriname, 2016) and (Workshop 'Situational analysis', 2019). These water issues are:

- Water quality is threatened by:
 - Inadequate waste disposal: For example waste is disposed at Ornamibo. The Para creek runs through this dumpsite, this can lead to pollution of this water resource. Also a lot of waste is still dumped in public space, which leads to pollution of especially roadsides and waterways. Also waste disposal at industrial terrains can compromise surface and groundwater.
 - Inadequate waste water management: There are no wastewater treatment plants. In the greater Paramaribo area (districts of Paramaribo, Wanica and a part of Para) 90% of the households do have a septic tank for treatment of water from the toilets, but due to bad design, installation and usage, most of these tanks are not working properly, resulting in pollution of water resources. In the interior of Suriname there are almost no septic tanks and wastewater is discharged directly into rivers and creeks, as are all other household water. Also water of hospitals does not receive proper treatment. Part of the industries do have some kind of wastewater treatment, but still a lot of industrial waste water is discharged directly on surface water.
 - Small scale (illegal) gold mining in the interior causes several water quality problems, especially use of mercury is a big problem. Besides the pollution with mercury, high turbidity of the water caused by gold mining activities, has a huge impact on the water quality.
 - Increasing use of pesticides: Use of pesticides for agricultural use (but also within household and government) has increased the last decades. These pesticides can have serious health effects on people and other organisms.
 - Inadequate protection and enforcement
- Ecosystems are threatened by:
 - Loss of water quality
 - Erected barriers, such as the dam of van Blommenstein reservoir
 - Inadequate protection and enforcement
- Public Health is threatened by:
 - Loss of water quality: especially because of inadequate waste water management and small scale gold mining. Research has shown that there is a clear correlation between urban flooding and waterborne diseases due to failing waste water management (Seminar on Waste water management in Suriname, 2016). Mercury used in gold mining is accumulating in fish, and eventually in the people of the communities living near these gold mining activities. This can cause serious health issues. Also the water of the rivers is polluted with mercury, making it unsuitable for drinking water.
 - Droughts, resulting in unavailability of safe water sources for potable water.
- Extensive damage due to flooding and droughts
 - Floods occur yearly leading to extensive damage to the public and private space.
 - Droughts lead to loss of harvest.

- Climate change threats:
 - sea level rise puts the coastal zone of Suriname in danger of extensive flooding
 - decrease in precipitation will increase droughts in the future
- No access to clean drinking water for everyone:
 - Not everyone in Suriname has access to safe drinking water, especially in the interior, but also in many rural areas.
- Salt intrusion in river systems and aquifers:
 - Salt intrusion in river systems reduces the availability of fresh surface water resources in the coastal zone of Suriname, especially for agricultural use (which creates the need to transport fresh water over large distances, with a lot of costs involved) and for drinking water purposes.
 - Salt intrusion in aquifers stress the need to use other (more expensive) purification techniques or displacement of extraction sites.
- In-efficient use of water:
 - Water is not used in an efficient way because of low supply efficiency (old infrastructure) and low user efficiency (no awareness and financial stimulants to encourage efficient use).
- Insufficient protection of source areas of major water resources. According to a presidential decision of March 2012, it has been decided to grant Amazon Resources AG license for exploration and exploitation of sustainable processing of fresh surface water throughout Suriname. However, on the 4th of March 2014, a proposal of the Ministry of Natural Resources for the withdrawal of the approval for entering into an agreement with Amazone Resources, has been approved by the Council of Ministers.

The water issues are often both cross-cutting and multidimensional, see Figure 2-1, and require an IWRM approach to improve and develop sustainable practices for the future.

4. Degree of implementation of IWRM

In 2015, 17 Sustainable Development Goals (SDGs) were set by the United Nations General Assembly. The SDGs were to succeed the Millennium Development Goals (MDGs) and are part of the 2030 Agenda for Sustainable Development. SDG 6 concerns Clean Water and Sanitation, the specific target concerning IWRM is SDG 6.5:

SDG 6.5: By 2030, implement integrated water resources management at all levels, including through transboundary cooperation as appropriate.

To measure the progress of this target, the indicator SDG 6.5.1 is formulated as: the degree of integrated water resources management implementation per nation (0 – 100). To determine the degree of IWRM implementation an indicator framework has been established. This framework is used in 2017 by UN Environment (UNEP) in a survey to determine the score on indicator 6.5.1, which was submitted by over 170 countries (UNEP/DHI, 2017).

Within this project the choice is made to use this indicator framework to describe the implementation of IWRM in Suriname more into depth.

The framework consists of four key components of IWRM. These key components are:

1. **Enabling environment**, which is about creating the conditions to support the implementation of IWRM. It includes the most typical policy, legal and planning tools for IWRM.
2. **Institutions and participation**, which is about the range and roles of political, social, economic and administrative institutions that support the implementation of IWRM. It includes some of the most typical institutions at different levels of society for IWRM. It includes institutional capacity and effectiveness, cross-sector coordination, stakeholder participation and gender equality.
3. **Management instruments**, includes the tools that enable decision-makers and users to make rational and informed choices between alternative actions. It includes management programs, monitoring water resources and the pressures on them, knowledge sharing and capacity development.
4. **Financing**, this concerns the adequacy of the finance available for water resources development and management from various sources.

In the following chapters the current situation in Suriname of each of the key components are described. For each of the key components several indicators have been established. These indicators are scored on a scale from 0 to 100. The overall score is given in the conclusions in Paragraph 5.1. The indicators are shown in Figure 4-1.

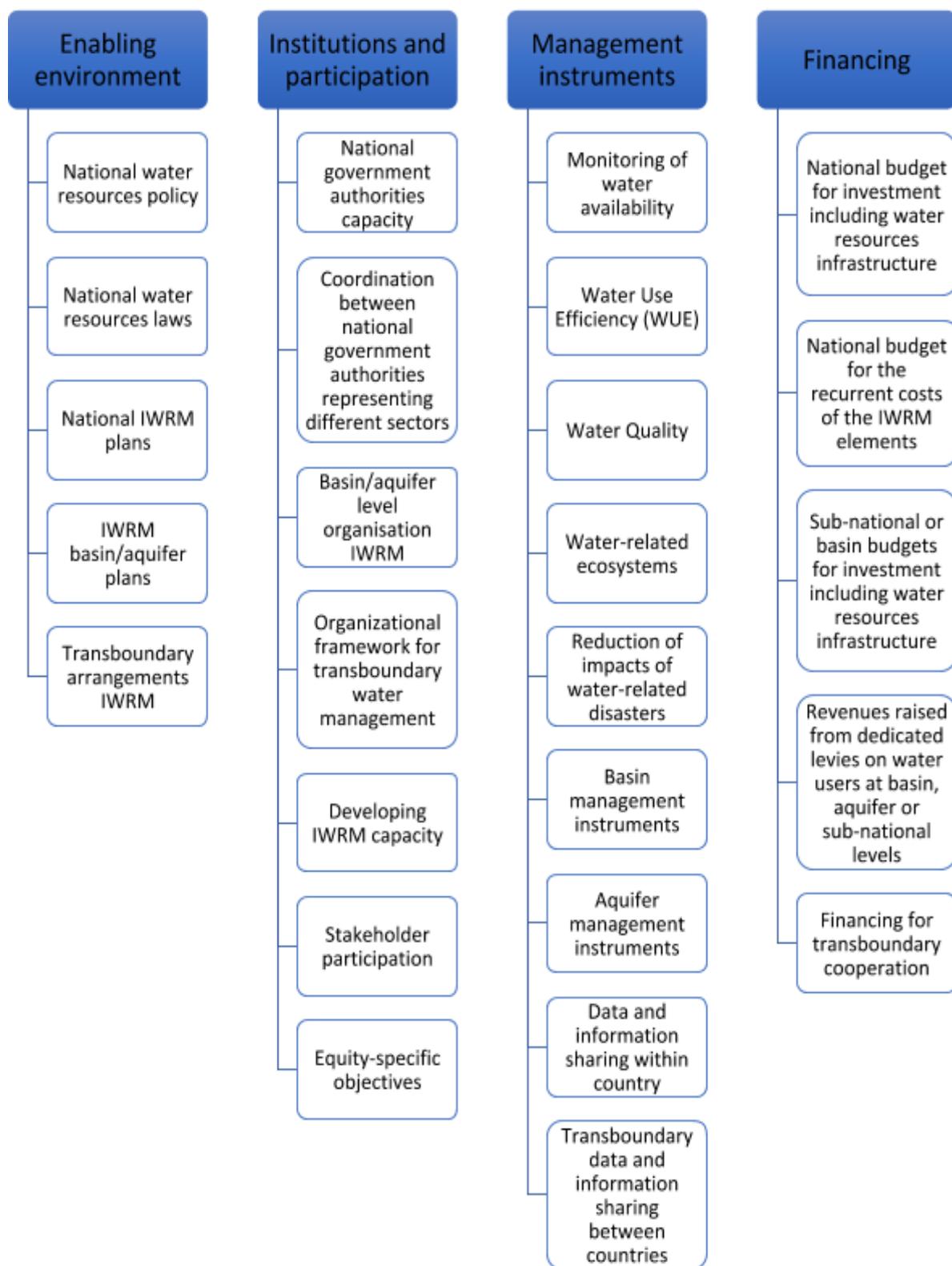


Figure 4-1 Indicator framework, degree of IWRM implementation

4.1 Enabling Environment

This section covers the enabling environment, which is about creating the conditions that help to support the implementation of IWRM. It includes the most typical policy, legal and planning tools for IWRM.

4.1.1 National water resources policy

There is no policy regarding IWRM in Suriname. In the Long Term Development Plan 2017-2021 (“Meerjaren Ontwikkelingsplan 2017 - 2021”) it is stated that an 'Integrated Water Resources Management System for Suriname' will be developed. This will be the starting point of determining a national IWRM policy.

In this Long Term Development Plan 2017-2021 priorities concerning WRM are given to:

- Conservation of the estuary coastal zone
- Stimulating water transport
- Obtaining energy from small-scale hydropower
- Availability of clean drinking water
- Mapping and planning of existing and to be exploited Water Resources
- Drainage of urban and rural areas
- Pollution control

The following outcomes should be further elaborated in the policies of the relevant ministries and institutes:

1. The Water Authority Suriname supervises compliance with the national drinking water strategy and the drinking water sector plan, including the reasonableness and fairness of the drinking water tariffs.
2. The production sources identified in the national drinking water strategy have been developed by the stakeholders in the drinking water sector and contribute to the continuity of the drinking water supply.
3. The implementation of programs for the protection against mercury, pesticides, herbicides and other harmful substances, the use of environmentally friendly methods and participation in international cooperation on relevant environmental and climate conventions, create new jobs and knowledge.
4. The drinking water sector achieves higher efficiency in water production and distribution and lower cost prices through more intensive use of ICT.
5. Commercial export of water strengthens the financial position of the Surinamese water producers and increases the sustainability of the drinking water supply.

(Regering van de Repuliek Suriname, 2017)

4.1.2 National water resources legislation

Water related legislation in Suriname is out of date and does not comply with current social requirements. Some shortcomings in the current legislation are the lack of rights and obligations of the water user, lack of control mechanisms, clear division of responsibilities and powers (no integration), lack of water quality standards, etc. Adjustment or renewal is therefore an urgent necessity.

Table 4-1 gives an overview and a brief description of the water related legislations currently present in Suriname. At this moment four draft legislation documents on water management have been prepared, namely: (1) draft act on the extraction of groundwater, (2) draft act on groundwater protection, (3) draft act on water supply supervision and (4) draft act Surinamese water authority. These laws concern mainly ground and drinking water legislation. These draft laws are currently being reviewed by a consultant and afterwards the related State Decree's will be developed by the consultant. These new legislations should replace part of the old legislation. Other legislation that is still in the draft stage is the draft Environmental Act. This legislation is important when it comes to pollution control. There is also a need for legislation regarding Surface water. The process of drawing up this law has not started yet.

None of the existing and draft laws are based upon IWRM.

Table 4-1 Water related legislation in Suriname

Act	Content
Protection of water resources in general	
The Drilling Act (<i>Boorwet G.B. 1952 no. 93</i>)	Contains provisions to protect the soil by regulating particularly the treatment of the drill holes. This Act does not aim to protect groundwater, but the main purpose is to prevent the mixing of the components of the soil.
The Nature Conservation Act (<i>Natuurbeschermingswet G.B. 1954 no. 26zlg. S.B. 1992 no. 80</i>)	Stipulates that the President may designate, having heard the State Counsel, land and waters belonging to domain land as a nature reserve. This in order to protect and preserve the natural resources in the country.
Water board Act of 2005 (“Waterschapswet 2005”)	This law regulates the establishment and management of water boards, as well as the authorization of the board, the obligations of the stakeholders, the possibility of administrative coercion, the supervision of the water boards and the possibilities of appeal against decisions taken by the board.
The Act on Territorial Sea and the Contiguous Economic Zone (<i>Wet Territoriale Wateren en de instelling van de aangrenzende economische zone S.B 1978 no. 26</i>)	Covers the extension of the territorial sea of the Republic of Suriname and the setting of the adjacent economic zone.

The Forest Management Act (<i>Wet Bosbeheer S.B. 1992 no. 80</i>)	Contains provisions to regulate the forest management and forest exploitation, as well as the primary wood processing sector.
Protection of water resources for drinking water supply	
Article 224 of the Penal Code (<i>Wetboek van Strafrecht G.B. 1911 no. 1 zlg. bij S.B. 2004 no. 105.</i>)	According to this Article: “He that deliberately puts a substances in a well, pump, source, creek that is used as common good or sharing with others as a drinking water device, knowing that thereby the water will be polluted or can harm the health, will be punished by imprisonment not exceeding fifteen years“.
Police Criminal Code (<i>Politie Strafwet G.B. 1915 no.77 zlg. bij S.B.S.B. 1990 no. 24.</i>)	In this Code is stated that “The polluter of water in a well, water hole or a ditch or generally any water that will be used to drink or wash shall be punished with a fine or imprisonment not exceeding one month”.
The Water Supply Act (<i>Waterleidingbesluit G.B. 1938 no.33.</i>)	Obliges owners of buildings and houses to make use of the public water supply system. It prohibits the possession of water tanks and wells in the areas where the law is applicable. It is prohibited to own or possess wells, pits or others that are used to extract water, bins, barrels or other similar objects which will be used for the collection and / or storage of water. Above-mentioned is not applicable for water companies that have a license from the Government.
The Concession Act (<i>Concessiewet G.B. 1907 no.34 geldende tekst 1944 no.129</i>) from 1907	Contains rules concerning the exploitation of the public utilities. The President can grant concession for the use of domain land for the construction and operation of works of public utility.
The Price-fixing and Price-control act (<i>G.B. 1957 no. 58.</i>)	The competence to intervene in the fixation of water tariffs is based on this Act.
The Anchylostomiasis act (<i>Anchylostoomwet GB 1917 no. 83, geldende tekst GB 1937 No. 23</i>)	Contains rules for the protection of water wells against contamination from anchylostomiasis. This act prohibits the use of faeces as fertilizer and protects wells against contamination with faeces.
The Mosquito’s Act (<i>Muskietenbestrijdingswet GB 1952 no. 9.</i>)	The objective of this Act is to prevent mosquito’s from entering water tanks and other objects that contain water for domestic use.

Draft Act concerning the protection of groundwater extraction areas (<i>Concept Wet Grondwaterbeschermingsgebieden</i>)	The protection of the catchment is to ensure that no bacteriological contaminated water, hydrocarbons or other toxic substances reach the wells within a period of 60days.
Draft Act concerning the extraction of groundwater (<i>Concept Grondwater wet</i>)	According to this act it is prohibited to extract groundwater without a license from the Minister of Natural Resources.
Draft Act supervision on water quality of water companies(<i>Wet Toezicht Drinkwaterkwaliteit</i>)	This draft act refers to standards that shall be set for drinking water quality and is applicable for all companies that supply potable water to the public.
Waste water management	
The Building State Order (<i>Bouwbesluit G.B 1956 no. 30 zlg. bij S.B.2002 no.93</i>)	Is a Government decision of November 26, 1956, pursuant to articles 1 and 3 of the Building Act 1956. Articles 1 and 3 of the Building Act sets the building through a compulsory licensing system. Some important provisions to be taken into account when building are: <ol style="list-style-type: none"> 1. Each toilet must be connected to a septic tank or a designated sewage. 2. Each building, in whole or in part, intended to house must have a well-established adequate drainage to drain rainwater and household water in a sewer to be designated by the Director of Public Works. 3. The stool (range) of a private may only take place through air- and watertight stones, metal or cement pipes in the septic tank.
The Nuisance Act (<i>Hinderwet G.B. 1930 no. 64 zlg. bij S.B 2011 no.63</i>)	According to the Nuisance act, a license from the District Commissioner of the respective district is required for certain types of enterprises. A license may be refused if the of enterprise would cause harm, damage property, business or health or nuisance of a serious nature such as spreading dirt or disgusting exhalations or odors.
The Harbor Decree (<i>Decreet Havenwezen S.B. 1981 no. 86.</i>)	Provides stipulations for the harbor. It prohibits the discharge of waste, oil, oil-contaminated water and condemned goods into public waters. It is also prohibited to pump oil, oil contained ballast and bilged water.
The draft Environment Act 2010	Provides rules for the conservation, management and protection of a healthy environment.

(Del Prado, 2014)

4.1.3 National IWRM plans

There is no national IWRM plan in place at this moment.

As mentioned in section 4.1.1 it is stated in the Long Term Development Plan 2017-2021 that an 'Integrated Water Resources Management System for Suriname' will be developed. The Ministry of Natural Resources has taken the lead to develop this system. For this they identified the need to develop a Roadmap for IWRM in Suriname. For the development of the roadmap a Water conference has been organized consisting of a series of seminars with the following themes:

- Wastewater management, held on the 17th & 18th of November 2016;
- Water governance, held from the 7th to the 10th of March 2017;
- Potable water, held on the 3rd of July 2017;

With the input of the stakeholders during these seminars, the Ministry of Natural Resources has developed a roadmap, see Figure 4-2. Some milestones of this roadmap have been reached, other activities to reach the milestone are still in process or have yet to be started.



Figure 4-2 Draft roadmap for development and implementation of IWRM in Suriname

The following milestones has been reached:

- Creation of an Interdepartmental Water Workgroup (IWW). This workgroup has been established and did work for a while, see section 4.2. However the workgroup has not been active for over a year. The workgroup needs a new impulse, the need for this workgroup is acknowledge by several stakeholders (Amatali A. , 2019), (Kromokardi, 2019), (Kromoreso, 2019) and (Ramnandanlall, 2019).

- Increase awareness. During the seminars mentioned before, awareness about IWRM is raised. Also Water Forum Suriname organized some activities to increase awareness about IWRM.

Milestones that have not yet been reached are:

- Water and Water Authority legislations are not completed yet. The planning is that within a year these legislations are passed (Abeleven, NH, 2019).

Milestones of which the activities have yet to be started:

- Set up of Water Authority – which can start when the specific law is passed.
- Start and set up of IWRM
- Drafting laws on surface water and export of water

4.1.4 IWRM basin/aquifer plan

There are no basin of aquifer plans based on IWRM in Suriname.

There are some documents at the N.V. Surinaamsche Waterleiding Maatschappij (SWM) that have elements of an aquifer plan, but are not made as such and are not based on IWRM. The most important documents are:

- **Water Resources Management Plan 2017-2019**, for the protection and management of the water resources which are used by SWM. The SWM uses mainly water from aquifers for the production of drinking water. In order to ensure that these will remain suitable for the provision of drinking water in the long term, these water resources must be protected. In anticipation of the adoption of the legislation and regulations for drinking water, SWM already wanted to take action to protect its water resources and to secure it for the long term. SWM has therefore drawn up a plan for Water Resources Management (WRM) for a structural approach to the protection and management of their water resources, mainly aquifers. (Engelenburg, 2017)
- **Water Supply Master Plan for the Coastal Area and Interior for Suriname**. The Water Supply Master Plan for Suriname was identified by the Government of Suriname as a necessary project to determine the infrastructure investment and institutional strengthening needed to meet growing water demands for the entire country to the year 2024. (Genivar & Ilaco, 2011)
- **Hydrological Assessment of the Coastal Aquifers of Suriname (HACAS)**
The aim of this project was to map the fresh groundwater resources in the coastal plain and to make exploitation plans that will secure the water supply until 2040. The research involved many activities: inventory of data and reports, determining water needs, geophysical field measurements, pump tests, the creation of databases and a geographic information system; furthermore making hydrogeological maps and groundwater models. (Acacia Water, 2016)

Overliggend Waterschap Multi-purpose Corantijn Project (OWMCP) in the district Nickerie is an organization that comes close to the IWRM principle. The OWMCP is responsible for supplying irrigation water to the polder population of Nickerie and provides services to the

waterboards in the district. For two (2) rice crops a year, it is necessary to have enough irrigation water. Therefore Integrated water management is important. (HTSPE Limited, 2009)

4.1.5 Transboundary arrangements IWRM

Suriname has two boundary rivers. Both boundary rivers of Suriname are source of bilateral conflicts. The definition of the borders are being discussed as this depends on multi interpretable river morphology concepts. As literature shows, cooperation can co-exist with conflict and that is also the case in Suriname.

In the East, the Marowijne River forms the boundary between Suriname and French Guyana. The boundary lies in the middle of the river. There is a discussion between both countries which definition of the middle of the river should be used. Representatives from BUZA, supported by researchers of ADEK, are in conversation with France to settle this issue. Because of this dispute the border committee has been formed (Kolader, 2019).

In the West, the Corantijn River forms the boundary between Suriname and Guyana. The main river is part of Suriname. No agreement on border issues exists currently. The issue between Suriname and Guyana is about the explanation of river morphology definitions in the upstream area, as the main source of the Corantijn river is not so obvious. But also here, despite the dispute cooperation exists. . This is indicated by the bilateral river council that has been formed. The willingness to solve the problem is present, but none of the countries gives in, which is politically very unfavorable (Kolader, 2019).

On a higher level, cooperation exist through the Amazon Cooperation Treaty Organization (ACTO). ACTO is an international organization aimed at the promotion of sustainable development of the Amazon Basin. Its member states are: Bolivia, Brazil, Colombia, Ecuador, Guyana, Peru, Suriname and Venezuela. Maps made within project of ACTO never show borders as Suriname is not the only country with border disagreements. Currently ACTO finances a bilateral project between Guyana and Suriname (Wellis, 2019).

4.2 Institutions and participation

This section is about the range and roles of political, social, economic and administrative institutions that help to support the implementation of IWRM. It includes some of the most typical institutions at different levels of society for IWRM. It includes institutional capacity and effectiveness, cross-sector coordination, stakeholder participation and equality. The 2030 Agenda stresses the importance of partnerships which will require public participation and creating synergies with the business sector.

4.2.1 National government authorities capacity

In Suriname a number of governmental agencies and institutions, without clearly defined roles, are involved in the protection and monitoring of water resources. All relevant organizations somehow involved with water management in Suriname on international and national are visualized in Figure 4-3,, some key actors on sub-national level are also mentioned.

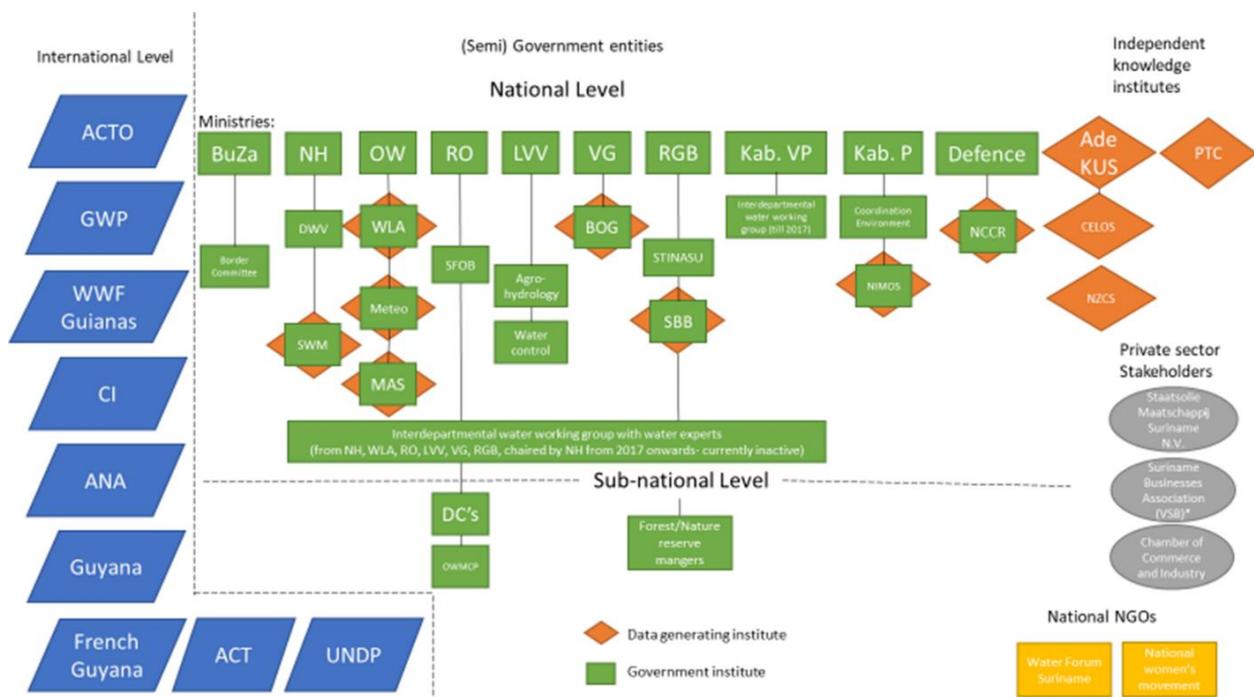


Figure 4-3 All parties involved with water resources management in Suriname

A summary of the different national government authorities and their capacity to lead the implementation of IWRM are listed below.

Ministry of Natural Resources (NH) (Leading ministry for IWRM)

The Ministry of Natural Resources delegated its responsibilities with regards to water supply to the Suriname Water Company (SWM), a parastatal company who is responsible for the water supply in the densely populated urban area in the Coastal zone of the country and in the rural area. Tasks are the inventory, exploration and optimal use and management of: minerals, natural resource water and natural resources needed for energy generation. Also NH is responsible for water management, where necessary in an inter-ministerial manner.

The ministry of Natural Resources is considered to be the leading actor in the implementation of IWRM. This ministry itself has the capacity of 3 full time employees of which some have followed several training sessions in water resource management and integrated water resource

management. The director of the ministry addresses that more capacity is needed, especially in terms of knowledge (Abeleven, 2019).

Cabinet of the Vice-President

The cabinet of the Vice-President who initiated the interdepartmental work group (IWW) would be able to allocate some working hours from the environmental employee to water (Ramnandanlall, 2019).

Ministry of Public Health (VG)

The Bureau of Public Health (**BOG**) under the Ministry of Public Health, is the national institute of preventive health care that focuses on the promotion and monitoring of the overall health for everybody in Suriname. The Environmental Inspection is a service under the BOG and is amongst others responsible for: monitoring of soil, air and water pollution at the micro and meso level, control over the management of waste, port hygiene, market control, hygiene of amenity areas, drinking water quality, advice on licensing conditions, complaints investigation and provide information regarding environmental aspects.

Also BOG does not see a possibility to create capacity for IWRM implementation. (Warner, 2019)

Ministry of Public Works, Transport and Communication (OW)

The relevant departments under the Ministry of Public Works, Transport and Communication are the Meteorological Service and the Hydrodynamic Service. The Meteorological Service (**MDS**) is the preeminent authority responsible for data related to the "supply" of water (important part of the hydrological cycle). This service provides information necessary to manage spring waters of the country. The Hydrodynamic Service (**WLA**) has a very important function in terms of research and data collection which is essential for the formulation of an integrated water policy. The Drainage Works Service of the Ministry is responsible for maintaining the drainage structures and areas in adequate condition.

WLA does not have capacity to implement IWRM. MDS would also have a hard time finding capacity to contribute to IWRM as it is difficult to find graduates with a technical background, but as IWRM also includes social scientists the director does see potential. (Sallons-Mitro, 2019)

Ministry of Agriculture, Animal Husbandry and Fisheries (LVV)

Two important departments at the Ministry of Agriculture, Animal Husbandry and Fisheries when it regards water management are the Department "Management Water boards" and the "Pesticides Office". In the context of monitoring the proper use of land and waters issued for the agricultural sector, this ministry has responsibilities towards rehabilitation of the dry and wet infrastructure within the water boards. There has been specially set up within the Ministry's a Department "Project Management Water boards. Although not legally regulated, the Ministry executes the civil engineering works in rural areas to stimulate agriculture. After rehabilitation of the water boards, these will be transferred to the Ministry of Regional Development. Here there seems to be some degree of overlap in responsibilities as the Ministry Agriculture and Regional Development both pursuing their activities in the field of managing water boards. The use of chemicals for the agriculture sector is regulated by the Ministry of Agriculture. In the context of the protection of the water resources it is important that the use of agricultural chemicals is strongly controlled and monitored.

LVV cannot find capacity in human resource and knowledge at all levels partly caused by the limited availability of financial means. (Kromokardi, 2019) and (Kromoreso, 2019)

Ministry of Regional Development (RO)

The Ministry of Regional Development is responsible for the further development of the participatory process in decision-making at the level of the constituencies and districts. The garbage disposal and sanitation in the districts are inadequate which forms a potential source of contamination. The regional government is also responsible for the management and maintenance of secondary and tertiary civil engineering facilities (channels) which are outside the jurisdiction of the Ministries of Public Works and Agriculture. The regional administration has no powers when it regards sewerage and drainage in the context of building and construction. The lack of rules and control relating to the sewerage and drainage system in the districts has for decades been a major threat to the quality of water resources. Furthermore, the Minister of Regional Development is also responsible for monitoring the water boards of which the overarching OWMCP is currently the most important sub-national actor.

Ministry of Spatial Planning, land and forest management (RGB)

The responsibility of the ministry of spatial planning, land and forest management is restricted to regulate and monitor formally protected areas, nature reserves and is responsible for all natural water in protected areas.

When illegal activities in these areas occur, the ministry has the right to seizure. Control and monitoring of these reserves is considered difficult as logistics and financing are often not covered, especially as currently the economic situation is tough (Tajib, 2019).

The ministry of RGB would be able to support implementation of IWRM in terms of HR but lacks knowledge (Tajib, 2019).

MAS (Maritime Authority Suriname)

The Maritime Authority is an autonomous authority but falls under the Ministry of Public Works and is responsible for safe shipping in a socially responsible manner (Mahabier, 2019). This authority also measures seawater level at certain points (only the absolute level).

NIMOS

The National Institute for Environment and Development in Suriname (NIMOS) is the technical working arm of the Ministry of Labor, Technological Development and Environment. It is the intention with the approval of the Environmental law, to transform NIMOS into an environmental authority. An important task of this authority will be to control pollution of the environment and determining of environmental standards. In this way, the rivers and other waterways will get legal protection against pollution (Del Prado, 2014).

All in all, there is some capacity for IWRM implementation within the government, mostly in terms of human resources (hours). But many state that more knowledge on IWRM is required to adapt to the complexity of water challenges. Also responsibilities are divided between many governmental agencies and institutions, the ability to manage potential conflicts of interest between different sectors and/or stakeholder groups is not present.

Also financial means to collect data and properly monitor all water resources in Suriname is lacking. The density of the measurement network is low and accuracy is not always on a desired level (Tajib, 2019), (Amatali A., 2019), (Sallons-Mitro, 2019) and (Warner, 2019). Budget for the first phases of IWRM should come from the ministry of Natural Resources, but it is difficult to determine where the human resources and knowledge should come from.

4.2.2 Coordination between national government authorities representing different sectors on water resources, policy, planning and management

As explained in Paragraph 4.2.1, water resources management within the national government is strongly fragmented, also unambiguous policies are absent. There is a scattered responsibility concerning water management within the government in Suriname and there is no alignment, which leads to duplication of efforts. Also laws, Paragraph 4.1.2, are outdated, most laws concerning water, such as the 'Boorwet' from 1952, have never been updated (Abeleven, NH, 2019). The urgency to improve this situation is recognized and therefore three years ago a structural and closer cooperation on water management was initiated, by forming the interdepartmental water working group (IWW).

The cabinet of the Vice-President, represented by Drs. Ing. R.A. Ramnandanlall, was the initiator and chair of the IWW, pushing for improved water management. For approximately 2 years (2016-2017) this committee came together for monthly meetings. The group was formed by water experts from the ministries of NH, RO, OW, LVV and WFS and largely contributed to four draft legislation documents on water management, namely: (1) draft act on the extraction of groundwater, (2) draft act on groundwater protection, (3) draft act on water supply supervision and (4) draft act Surinamese water authority. Also this working group supported BUZA by the application for ACTO grants (Ramnandanlall, 2019). Currently the IWW is not active anymore (Kromokardi, 2019), (Ramnandanlall, 2019), (Abeleven, NH, 2019) and (Amatali A., 2019).

Public private partnerships (PPP) are marginally present in the water sector in Suriname. The presence of WFS has been considered a PPP as the contribution of this stakeholder in the IWW ensured an outside perspective. Project based consult to private parties occurs, but structural PPP regarding IWRM in Suriname remains poorly present uptill now.

Cooperation between ministries and knowledge institutes such as the Anton de Kom Universiteit van Suriname(ADEK), occurs mostly project based and cooperation usually does not go further than exchange of data and/or knowledge (Amatali A., 2019), (Naipal, 2019) and (Warner, 2019). In the past several seminars have been organized to bring stakeholders across sectors together to raise awareness on (Integrated) Water Resource Management and start capacity building. This has not yet led to implementation of IWRM. The conclusion of the Director of the ministry of Natural Resources is: "We need more expertise and bundle our resources. We would like to start doing so now and start successfully integrate our water resource management" (Abeleven, NH, 2019)

Current project base cooperation:

- Ministries of RO & LVV for rehabilitation of water boards
- Ministries of NH, OW (WLA specifically), RO, RGB and NIMOS in the GCCA+ project to improve current climate change adaptation capacity and mitigation efforts in Suriname (funded by EU & UNDP).
- WLA, ADEK and BUZA, working on defining the boundary in the Marowijne river in cooperation with France.
- RGB with Conservation International(CI) and WWF to achieve nature legislation in line with international standards, covering interests of indigenous and other local stakeholders

- ADEK together with the ministries of RO and RGB (Nature Conservation Department) on promoting sustainable use of ecosystem services of mangrove in Bigi Pan. Planning and safeguard priority free-flowing rivers, headwaters and valuable habitats.

Overall can be concluded that some cooperation is present, but coordination and overview is needed. A visualization of cooperation between actors can be found in figure 4-4.

4.2.3 Basin/aquifer level organizations IWRM

There are almost no organizations that can lead implementation of IWRM on basin of aquifer level. The only governmental organization that comes close to a basin level organization is the waterboard OWMCP, which operates in a sub-basin in the district of Nickerie.

Aquifer management and monitoring is done by SWM (Linger, 2019). The government, more specifically, the ministry of NH has the responsibility to control SWM. But NH does not have the capacity to do so, this is why currently SWM checks itself. The ministry recognizes this is a undesirable situation, but knowledge and budget is currently not available (Abeleven, 2019).

4.2.4 Organizational framework for transboundary water management

On an international level several partnerships and cooperation exist (Fig. 4-4). Most of these partnership run through BUZA. None of the partnerships are really into depth when it comes to joint development and management of transboundary water resources.

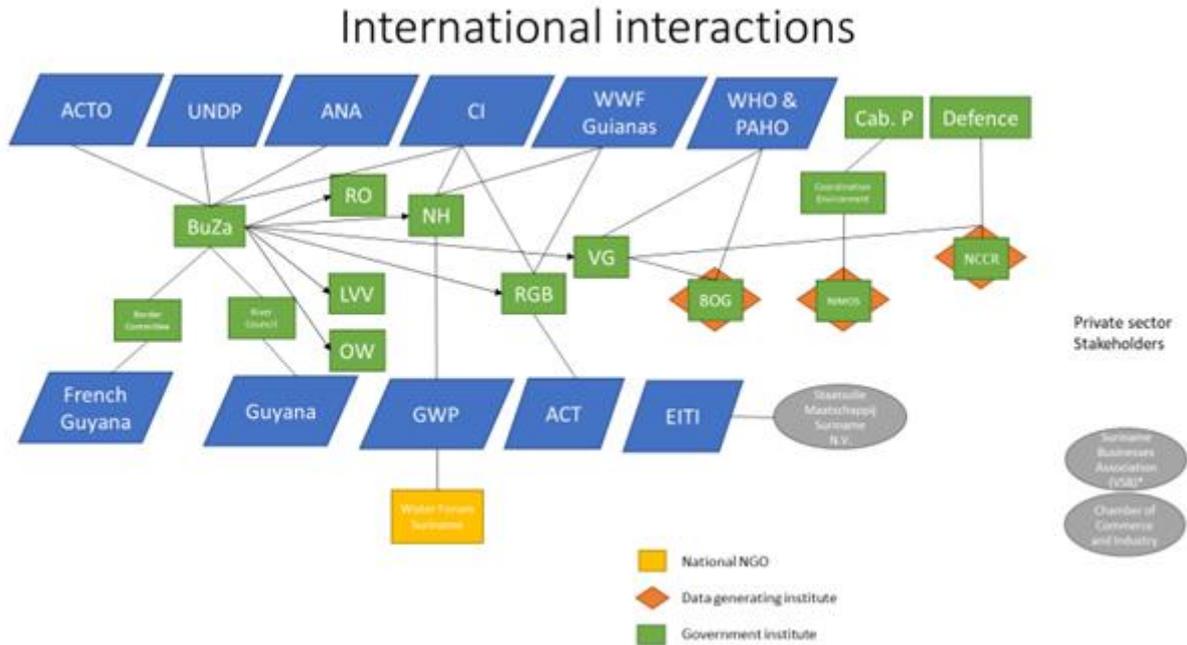


Figure 4-4 Partnership and cooperation on international level

4.2.5 Developing IWRM capacity

The Ministers of Natural Resources and Foreign Affairs from Suriname have signed the project “Institutional Capacity Building for the Development of a National Water Resources Management Strategy in Suriname” with Brazilian Cooperation ABC/MRE and Agencia Nacional de Aguas (ANA) of Brazil. Several employees of the ministry of NH, RGB, RO, OW and BUZA have received training through this cooperation and ACTO led conferences (Wellis, 2019). Sending people to those activities has been funded by UNDP and/or the ministries itself. But the knowledge has poorly been applied by the people who received the privilege to enrich their knowledge. More financial means and jurisdiction are considered to be part of a solution to this phenomenon (Tajib, 2019).

Suriname is a member of the Amazon Cooperation Treaty Organization (ACTO). Within this organization there is a project “Integrated and Sustainable Management of Transboundary Water Resources in the Amazon River Basin Considering Climate Variability and Change”. The project’s main objective is to develop a Strategic Action Program (SAP) for the Amazon Basin and to create a favorable environment, necessary for future implementation, necessary to achieve sustainable management in the Amazon catchment area. The Strategic Action Program (SAP) is the catalyst to achieve IWRM in the Amazon River Basin, considering its adaptation to climate variability.

Also both the ministry of NH and Water Forum Suriname are a member of Global Water Partnership (GWP) where knowledge and support can be found to increase capacity for future development of IWRM.

4.2.6 Stakeholder participation

Currently policy makers do invite stakeholders to participate. Often this is done by organizing workshops or seminars where consult with (key) stakeholders takes place, but decision making will not necessarily include all parties.

Currently in the water sector barely any participation of citizens takes place, only in the water board OWMCP in Nickerie. From April 2019 onwards, farmers are responsible for maintenance of the secondary and tertiary water works in this district after a document (Keur in Dutch) has been signed by the ministry of RO in September 2018 (DWT online, 2019).

Water usage of households is very inefficient because of the high subsidies of the government people are not aware of the real costs of clean drinking water (Heemskerk, 2019). Awareness of value of clean drinking water and water pollution are key before more people will see the essence or urgency of participating in water management and change their water usage.

The ministry of RGB stimulates participation, especially when new projected nature reserves are being discussed and local or indigenous communities are affected by water pollution (Tajib, 2019). For the ministry of LVV participation of farmers and farmer co-operations is very important as one of their goals is to reduce water pollution (Kromokardi, 2019) and (Kromoreso, 2019).

Overall participation in the water sector occurs mainly on ad hoc project basis and stakeholders are often only consulted and not involved in decision making.

4.2.7 Equity-specific objectives

At this stage, gender or other equity objectives has not explicitly been addressed. This concept is considered new for several stakeholders and is not yet included in any policy (Del Prado, 2019) and (Sallons-Mitro, 2019). Within many governmental organizations gender does not seem to be an issue as several ministries have a higher percentage of female employees, also in high positions (Tajib, 2019). Certain departments have a very high level of men, which can partly be explained by the fact that women are more reserved concerning physical jobs. But none of the governmental bodies and NGOs funding projects in Suriname often set equity specific objectives, only when donors require these.

It is good to address that in the past, BOG has cooperated with the National Women's movement on sanitation projects funded by NGO's (Warner, 2019). And especially when addressing drink water and sanitation women and children are often more affected by health issues so this is one of the areas where gender is very important to take into consideration (Heemskerk, 2019)

Within the Ministry of Internal Affairs there is a special Gender Affairs Office (Ministry of Internal Affairs, 2017).

4.3 Management instruments

This section includes the tools that enable decision-makers and users to make rational and informed choices between alternative actions. It includes management programs, monitoring of water resources, the pressures on them, knowledge sharing and capacity development. Management instruments can also be referred to as management tools and techniques, which include regulations, financial incentives, monitoring, plans/programs (e.g. for development, use and protection of water resources)

4.3.1 Monitoring of water availability

Only a part of the water resources of Suriname, Paragraph 3.2.1, is monitored on a regular basis. Monitoring effort is focused mainly on the major rivers and aquifers. There is no national monitoring plan where monitoring goals, objectives and measurement questions are clearly stated. Such a plan should help to provide a good overall view of water availability, not only of the rivers and aquifers, but also of the other water resources. There is almost no data to support management actions, for example for the management of water works, exception is OWMCP.

A major problem for monitoring of water quantity parameters is the lack of financial means and human resources. To acquire the right measuring devices, Suriname largely depends on foreign financing through projects.

WLA is responsible to do measurements in the rivers of Suriname. This department measures the water depth and flow (only in non-tidal area's). In the 1970s, there were 150 measuring stations active. During the 'interior war' these measuring stations were lost. Only 30 of them were reopened, of which 23 are within the tidal-range of the rivers. These stations take digital measurement, but most of them are not telemetric. Within the GCCA+ project 5 new measurement stations are being financed. They will operate in the non-tidal parts of the rivers, and will measure also the river flow and this data will be transferred through telemetry (Amatali A. , 2019). WLA is only responsible for collecting the data, no further analysis is done on a regular basis. The data therefore is not ready to give instant information about water availability. The last comprehensive study on river flow is done in 1999, largely based on information retrieved up until 1980. A lot of knowledge on the river systems are therefore based on old information.

MAS has tidal measurement stations in the Nickerie, Corantijn, Suriname and Commewijne rivers (Mahabier, 2019). Although these measurements does not directly give information about water availability, it does give information about influence of sea water inland and possible (climate) trends. Although the scientific significance of the data is non existent as water level is measured from the bed slope to the surface without information about sedimentation.

OWMCP does some measurements of the water levels and discharge to support their management actions, for example when to start the pumps at Wackay.

SWM does measurements of water levels of the aquifers. Measurements are only taken at their extraction sites, mainly to perform management actions, for example when to perform maintenance on a well. No measurements are done in aquifers they don't use or at places where there are no extraction sites. This makes it difficult to determine the water availability of the aquifers.

DMS is collecting rainfall and temperature data at several locations in Suriname. Evaporation is not measured, but calculated (Sallons-Mitro, 2019). The data can be used to determine climate trends. But to make more reliable future estimations, the density of the measurement stations should be improved. There is a lack of human resources with the right knowledge level to analyze

all the data, for example the last map with precipitation distribution originates from 1999, see Figure 3-1.

4.3.2 Water Use Efficiency (WUE)

Within Water Use Efficiency (WUE) multiple categories can be distinguished:

- 1) Supply efficiency: efficiency of water infrastructure:
 - a. Especially within the greater Paramaribo area, the drinking water infrastructure is old and needs to be replaced. The NRW (non-revenue water) of this area is between 40-50%, of which 30% is estimated to be the result of leakage (Starkenburg, 2017).
 - b. Irrigation systems do not function properly due to lack of finance for good maintenance. Maintenance is done ad-hoc, which results in non-functional or not optimal functioning systems. The available water resources are therefore not used in an optimal way.
- 2) User efficiency: efficient use of water by end-users:
 - a. Awareness raising: a very large part of water supplied as drinking water comes from non-renewable water resources, namely aquifers that are not recharged. Efficient use of water is therefore important. There are some initiatives taken to raise this awareness: SWM has drawn up a communication plan to improve awareness about water use efficiency and protection of their water resources (Engelenburg, 2017). But as said before there is no economic incentive as the government subsidizes drinking water.
 - b. Pay for use: SWM is in the process of metering the water use of every household to implement the pay for wat you use. This stimulates people to efficiently use water.
 - c. Monitoring of water use: use of surface water is not monitored. Water use of ground water is measured by SWM, but there is no data available of other groundwater users.
 - d. There are no mechanisms for allocating water between sectors (including environmental considerations).
 - e. No incentives are taken for bulk use, for example for agriculture, despite the great costs are made to deliver fresh water in area's with saltwater influence (for example Wackay pums deliver fresh water for the rice plantations in Nickerie). This doesn't encourage to use the water more efficiently, also no effort is done to change to less water demanding operations.
- 3) Water recycling and reuse:
 - a. There are some examples of recycling and reuse of water in Suriname. At the Seminar Waste Water Management, November 2016 was stated that some industries are reusing their process water, but it was not made clear how and on what scale this is done.
 - b. There is no known research done on this subject in Suriname.

4.3.3 Water quality

Despite many threats to the water quality in Suriname, named in paragraph 3.5, there are no control measures in place. There are no water quality guidelines set and adopted in Suriname. Within projects mostly PAHO/WHO guidelines are used. If industries ask NIMOS for advice about their waste water, reference is made to the guidelines of the World Bank (Seminar on Waste water management in Suriname, 2016).

No fees are taken from polluters. Therefore there is no 'polluter pays' principle in place. There are no taxes of any kind in place for wastewater.

Water quality of surface water monitoring is done by WLA. But their laboratory is outdated. Because of lack of funds and human resources these measurements are done only once every three months, where their goal was set to do monthly measurements (Amatali A. , 2019). Other organization concerned with water quality monitoring are BOG (Central Lab) and NIMOS. NIMOS only has some mobile equipment, they send their samples to other laboratory. Where WLA measures the water quality of the surface water resources, BOG focusses their monitoring at vulnerable end-users, like hospitals, retirement homes and households (Warner, 2019). The water quality of the aquifers is monitored by SWM, but only at their extraction sites. SWM has its own laboratory, but some parameters are analyzed by other laboratories, like Central Lab (BOG) or FiLab. Almost no monitoring is done at polluters. MAS takes water quality samples when dredging works are carried out, these measurements are project based (Mahabier, 2019).

There are some initiatives to raise awareness and share knowledge regarding water quality and the influence on public health, environment, ecosystems etc. Some of these initiatives are:

- Seminar on Waste Water Management (November 2016) by WFS and NH.
- Awareness programs concerning the use of mercury to educate small scale gold miners and people living in the interior.
- Education regarding water and sanitation in the interior of Suriname by BOG/UNICEF/PAHO/SFOB. Sometimes in combination with water treatment or filter to provide local communities with safer drinking water and educate both men and women on maintenance and small repair work of those systems.
- Awareness raising about clean drinking water at schools, general public and at fairs by BOG (Warner, 2019).
- Information about drinking water through TV, radio, new papers, leaflets etc by SWM (Linger, 2019).
- Documentation center at NIMOS, where information about various environmental topics, including water, is available for students and others (Ramsukul, 2019).
- Water Forum Suriname also reaches awareness through school projects, radio spots and activities on world water day.

Research on water quality is done on project base. There is a BSc. program on Environmental Sciences at ADEK. Regarding Waste Water Management, more often advice is asked by the business community of Suriname. There is also a course on Waste Water Management at ADEK (Seminar on Waste water management in Suriname, 2016).

4.3.4 Water related ecosystems

Management plans for the protected areas have been drafted, but lack the legal adoption and are not yet implemented (Tajib, 2019). The management plans must be included in the decision making of RGB. Currently, RGB is reviewing the old management plans.

The main concern for this ministry is currently the cross-border pollution (across the boundaries of nature areas). If pollution takes place outside a protected area, this often has an impact on the protected areas. (Tajib, 2019)

The intention is to classify the Coronie swamp into a protected area (Tajib, 2019). The degree of protection still needs to be properly investigated. Taking into account the local community, the degree of protection will be indicated.

The southern part of Suriname is only scarcely populated and most pristine area of our country. Almost half of Suriname's water resources spring from this southern part of the country. To conserve this ecosystem, Conservation International (CI) in close collaboration with WWF, the Amazon Conservation Team and RGB, the Trio and Wayana indigenous communities, have developed a plan to establish a 7.2 million-hectare protected area (CI/WWF/ACT/RGB, 2014). This project is initiated to support establishment and sustainable management of a high value conservation corridor in South Suriname that would secure a significant proportion of Suriname's freshwater resources and other renewable natural capital including tropical forests, biodiversity and the ecosystem services these resources provide. Another part of that collaboration is for the development of a mechanism to support the economic sustainability of this area. Currently, this project is proposed, it has not yet been approved by the government of Suriname. Before things can be set into motion, the government must include it in policy.

Species diversity is very high in Suriname. The Game Law states which species of wildlife may be hunted and during which period.

Animals which have a special protected status in Suriname, based on the Game Law, include:

- marine turtles: fully protected, both the adults and their eggs and young;
- migratory shore birds: fully protected;
- game species: protected during part the year (closed season); and
- Songbirds: certain species that are widely collected in the wild are protected.

Suriname's National Biodiversity Strategy (NBS) establishes the national vision, goals and strategic directions to be pursued in order to conserve and sustainably use the nation's biodiversity and biological resources. The NBS of Suriname provides a basis and a framework for the development of a Biodiversity Action Plan (BAP) which will identify the activities, tasks, outcomes, milestones, responsible actors to implement the strategic directions. The integrated National Biodiversity Strategy and Action Plan (NBSAP) will ensure the conservation of Suriname's rich biological diversity, foster the sustainable management of its natural resources, and support the equitable sharing of the biodiversity related services and benefits.

Ecosystem monitoring is especially targeted on monitoring of species, performed by researchers. There is limited monitoring to track ecosystem development, other than forest coverage from satellite data.

Enforcement is particularly difficult due to several reasons, such as the size of the area to manage and limited financial means.

4.3.5 Reduction water related disasters

No risk-impact analysis to reduce impacts of water related disasters is known to exist in Suriname. This should be the basis to determine necessary actions to reduce impacts of water related disasters. Impacts include social impacts (such as deaths, missing persons, and number of people affected) and economic impacts (such as economic losses in relation to GDP).

Water related disasters in Suriname that are known are:

1. Flooding due to extensive rainfall in urban, rural areas and in the interior
2. Taking into account the expected world-wide sea-level rise, the coastal zone will become more and more vulnerable to flooding from sea
3. Droughts, prolonged dry periods can lead to droughts that will effect water availability and is expected to damage the harvest

Within rural and urban area's interventions in the water systems are made without considering the effect on the water systems as a whole. For example the increasingly raising of low area's for housing, and therefore reducing the total water storage space, increases the water levels in downstream lower areas.

At ADEK an Early Warning System is developed to predict the occurrence of flooding (Naipal, 2019). This systems is in need of a platform in which it can function properly. It can help to prepare before a disaster happens, to reduce the impacts as much as possible. ADEK also performs research concerning climate change. Climate change (among other factors) influences the frequency and severeness of water related disasters in Suriname.

When a disaster (also water related) occurs, the National Coordination Centre for Disaster Management (NCCR: "Nationaal Coordinatie Center voor Rampenbeheersing") comes into action. The NCCR was established by the Surinamese government. The task of this organization is to coordinate the various services (police, fire department, military, NGO's, BOG, etc.) in an effective and organized manner in areas within the Surinamese territory that are affected or involved in an incident.

Some investments are made to prevent water related disasters, for example dikes to prevent flooding from sea (Coronie and Commewijne). To minimize flooding in rural and urban areas, a lot more investments are needed. Also at Weg naar zee a mangrove rehabilitation project of ADEK has been set up to protect the coastal area with a building with nature approach.

4.3.6 Basin management instruments

There is one example known in Suriname where basin management instruments are in place, only in Nickerie. The (sub)basin considered is the Corantijn Canal and the connection irrigation canals and drainage systems of Nickerie. This area is managed by OWMCP (Overliggend Waterschap Multi-Purpose Corantijn Project). They monitor water levels to determine the water management actions needed. No monitoring of water-use is done. Management actions are taken to accommodate in particular the agricultural sector.

4.3.7 Aquifer management instruments

Aquifers are not regarded as separate management units yet. Therefore there are not many aquifer management instruments in place. SWM is the stakeholder with the most information and tools for managing the aquifers. SWM monitors changes of water quality a quantity in the aquifers,

but only at the site of their activities, to take management actions when necessary. Also research considering the aquifers is done by SWM, in cooperation with NH.

No management instruments are in place yet to promote multi-level cooperation, and address potential conflict, among users, stakeholders and levels of government for the management of water resources in these aquifers.

4.3.8 Data information sharing within country

Most of the available data is not in digital format. For example the ministry of LVV and OWMCP does have an open policy for their libraries, where everyone has access to information.

Data is mainly shared on project basis. There are no structural data and information sharing arrangements. There are few governmental bodies who make periodic reports, for example BOG reports annually to the ABS (Warner, 2019).

Some organizations (OW (WLA, DMS) and MAS) don't have open access to their data. Data can be obtained by paying a fee.

Within the project 'Development of a Suriname Water Resources Information System (SWRIS)' a website has been created to exchange Water Resource Data. This website is called www.swris.sr. The Suriname Water Resources Information System (SWRIS) is a web-based scientific framework with water-related information on Suriname (water portal). It is open to public. The main goal is to promote and foster human resources development (knowledge and techniques) on integrated water resources management (IWRM) in Suriname focused on sustainable use of water resources (Nurmohamed, 2019).

Although the website is a good platform for data sharing, it is not used in an optimal way by the stakeholders involved in the water sector. This has several reasons:

- Stakeholders not familiar with website
- Outdated information: Part of information on the website is based on old information, it is not clear what the current data is.
- No open data-sharing, data can be obtained by filling a form, it is not clear immediately what kind of data you can request. For example maps with current (and old) measurement stations, with an overview of measured parameters and time period and frequency of measurements, would give more insight in available data.
- Ownership: The website needs a person/organization to keep the information up to date and who promotes the website.
- Not all stakeholders are involved in putting information on SWRIS.
- The website is barely used by key stakeholders of this project. As the ones knowing the platform consider it a place for people new in the Surinamese water sector. As requests for data go to the different organizations owning the data, the website only gives one an overview. They already know who to contact to collect the information they need.

4.3.9 Data information sharing between countries

Within the collaboration with ACTO (Amazon Cooperation Treaty Organization) data is shared upon request. All data exchange is coordinated by the ministry of Foreign affairs (BUZA). Data

exchange so far is one way, from Suriname to ACTO. Since there are no transboundary agreements regarding water management, there is no structural exchange of data.

4.4 Financing

Effective water resources management requires for both national and sub-national level financing for initial investments (development) and recurrent costs (ongoing). The financing for initial investment relates to the financial resources needed for the preparation of an Integrated Water Resource Management strategy and the recurrent costs relates to the resources required for implementation of both the changes in water governance and the infrastructure to implement IWRM. It include both the 'hard' structures such as dams, canals, pumping stations, flood control etc. as well as soft/green infrastructure such as water treatment, and flood management investments in land-management practices for water resources and nature-based solutions, among them, the reconnecting of rivers. Financing is also required for institutional strengthening for the development and implementation of IWRM.

Many sources can finance investment and recurrent costs, but frequently the government allocates budget to the relevant ministries and authorities. Other sources for investment and recurrent cost include fees and tariffs levied on water users, polluter fees or grants from different types of organizations.

This section concerns the sufficiency of the available financial resources for the development and management of water resources in an integrated manner.

4.4.1 National budget for investment including water resources infrastructure

In the national budget of Suriname, several water related activities are included. In Table 4-2 an overview is given of the national government budget of 2018 allocated to each ministry for investments on water related issues.

Table 4-2 National budget allocated to each ministry for investments in water management (CVR, 2017)

Nr.	Ministry	Program	Activity	Government budget
1	Regional Development (RO)	Subsidies and Contributions	Water boards	2,85 million SRD
2	Agriculture, Livestock and Fisheries (LVV)	Infrastructural works	Reactivation of water boards	0,75 million SRD
3	Natural Resources (NH)	Research and development	Institutional provision and legislation of the water sector	0,348 million SRD
		Drinking water supply	Water supply Cost maintenance of water companies and new connections	3,7 million SRD 1,5 million SRD
			Drinking water production center Commewijne	83,41 million SRD
	Total			89,7 million SRD

The Ministry of Regional Development (RO)

In the national budget of 2018 it is stated that the ministry of Regional Development will coordinate the water boards (waterschappen) and the collection of water fees will be implemented. Frequent visits will be made to the districts to participate in the water board activities. For the planned activities, an amount of SRD 2,850,000 is budgeted for 2018 for the Water Board Department and OWMCP.

The ministry of Agriculture, Livestock and Fisheries (LVV)

As part of the effective management and maintenance of the agricultural infrastructure, existing water boards will gradually be reactivated by LVV. Studies are carried out and the rehabilitation of the Henarpolder will be started. Furthermore, it is planned to also install water boards in the districts of Wanica, Saramacca, Coronie and Commewijne. For the planned activities, an amount of SRD 750.000,00 is budgeted for 2018. For the preparation and implementation of the re-activation of the water boards, the Surinamese government has taken out a loan from the IDB (Kromokardi, 2019) and (Kromoreso, 2019).

The Ministry of Natural Resources

For the establishment of the Surinamese Water Authority, which will mainly focus on the development of Integrated Water Resource Management in Suriname and the approval of the four draft water laws, an amount of SRD 348.000,00 is budgeted for 2018.

Activities such as expanding distribution networks, setting up new water supply installations, the rehabilitation of the drinking water facilities at the Brokopondo center and the purchase of solar pumps, electric motors etc. an amount of SRD 3.700.000, 00 is budgeted for.

The purchase of the materials and the execution of various activities must ensure that the continuity of the water supply to the community is guaranteed. The costs involved are a total of SRD 1,500,000.00.

On January 26, 2016, a Memory of Understanding (MoU) was signed by the Ministry of Natural Resources and the Flemish Water Supply Company for the realization of the Water Production Center in Commewijne. For 2018, an amount of € 9,500,000.00 was required which has been financed via a loan. For this activity, an amount SRD 83,410,000.00 is budgeted for 2018.

The ministry of Public Works (OW)

The Hydraulic Research Division of the Ministry of Public Works, Communication and Transport has gained donor funds from the UNDP for the GCCA+ project to equip their department with five telemetric stations (Amatali A. , 2019).

MDS has received support from the EU through the GCCA+ (Global Climate Change Alliance plus) and CCCCC (Caribbean Community Climate Change Center) project in the form of providing 7 hydro-meteorological stations for Suriname at a cost of US\$140,000.

Concluding from the interviews with different key stakeholders it can be stated that there is insufficient government budget for investments for water resources management at national and sub-national level. The responses during the interviews clearly indicated that the government's budget of 2018 was often only partly received by the ministries. Due to a very strict financial policy of the Ministry of Finance, every month funds are requested and after approval released to the each ministry. Large investments are often externally financed. Currently PAHO finances a project to determine the drinking water quality standards (Warner, 2019). Most ministries are heavily dependent on funds for investments. Financial resources are uncertain and well below desired levels.

4.4.2 National budget for the recurrent costs of the IWRM elements

Recurrent cost of the IWRM elements refers to all cost of all IWRM elements that require funding, e.g. policy, law making and planning, institutional strengthening, coordination, stakeholder participation, capacity building, and management instruments such as research, gender and environmental assessments, data collection, monitoring etc. In Table 4-3 an overview is given of the government budget for the recurrent costs of the IWRM elements.

Table 4-3 National budget allocated to each ministry for recurrent costs of IWRM elements (CVR, 2017)

Nr.	Ministry	Department	Program	Activity	Government budget
1	Public Works (OW)	Civil technical works	Infrastructural works	Maintenance bridges	1,180 million SRD
				Construction bridges	
				Maintenance drainage works	2,85 million SRD
				Improvement irrigation and drainage works	4,15 million SRD
				Maintenance of flood defense works	53,6 million SRD
				Improvement of flood defense works	1,0 million SRD
					0,750 million SRD
	Total				63,53 million SRD

Concluding from the interviews with different key stakeholders it can be stated that there is insufficient government budget for the recurrent costs of the IWRM elements.

The recurrent cost for the operation of SWM are financed through the water revenues. The budget for the recurrent cost of MAS comes from the combined services offered to the shipping sector. Currently only salaries and basic executive costs of several ministries can be paid. There are insufficient funds for the recurrent costs of the IWRM elements.

4.4.3 Revenues raised from dedicated levies on water users

For the implementation of IWRM financial instruments for the water sector are needed. There are different ways to raise revenues on water users. The three sources of funds are: taxes, tariffs (in the form of charges, tariffs and fees) and transfers.

Taxes are an indirect source of income from citizens and businesses. Taxes levied directly on the water sector are not necessarily returned back to the water sector. There is a possibility that the government will use the income for other purposes instead. Tariffs, on the other hand, are rates that may only be used for specific purposes, laid down in legislation or regulations. Transfers include grants, and charities and voluntary contributions. Because of the limited available direct funding, it is important not to overlook the funding from non-governmental sources. They contribute by cash or in-kind resources for specific projects, such as environmental restoration, monitoring water quality and maintaining ecosystem habitats.

Currently the MAS raises revenues by fees charged for data and the sale of tide table booklets, but these incomes are not cost-effective for purchase, maintenance of equipment and data analysis. It is seen as a public service because of the task of MAS.

At the ministry of Public works revenue is generated from fees for retrieving data. These revenues are very small, but where possible, are used for new measurements.

Currently, NH generates no income from the water sector. But in the future, is planned to send a percentage of the water tariff directly (without the intervention of the Ministry of Finance) to the National Water Authority. In addition, planned is to tax the extraction of groundwater.

At the LVV, no income is generated from the water sector. After the water boards have been reactivated, the idea is that the farmers will pay for maintenance and irrigation water.

Ecotourism and ecosystem services have potential for generating income for the water sector. Public private partnership is required for ecotourism. In addition, in cooperation with REDD + Suriname sees potential to generate money from carbon trading.

The polluter pay principle is one of the things that will be included in the environmental law. The plan is that there will be an environmental fund that could collect.

4.4.4 Financing for transboundary cooperation

There is no specific budget or other financial means for transboundary cooperation.

5. Conclusions and Recommendations

5.1 Degree of implementation of IWRM

Considering all information presented in Chapter 4, the conclusion can be drawn that IWRM is marginally implemented in Suriname yet. The score on all 4 key components of IWRM is very low, especially when it comes to Financing, see Figure 5-1. A slightly better score is obtained for Management instruments. There are some management instruments in place, but are not used to their full potential and do not cover the whole spectrum.

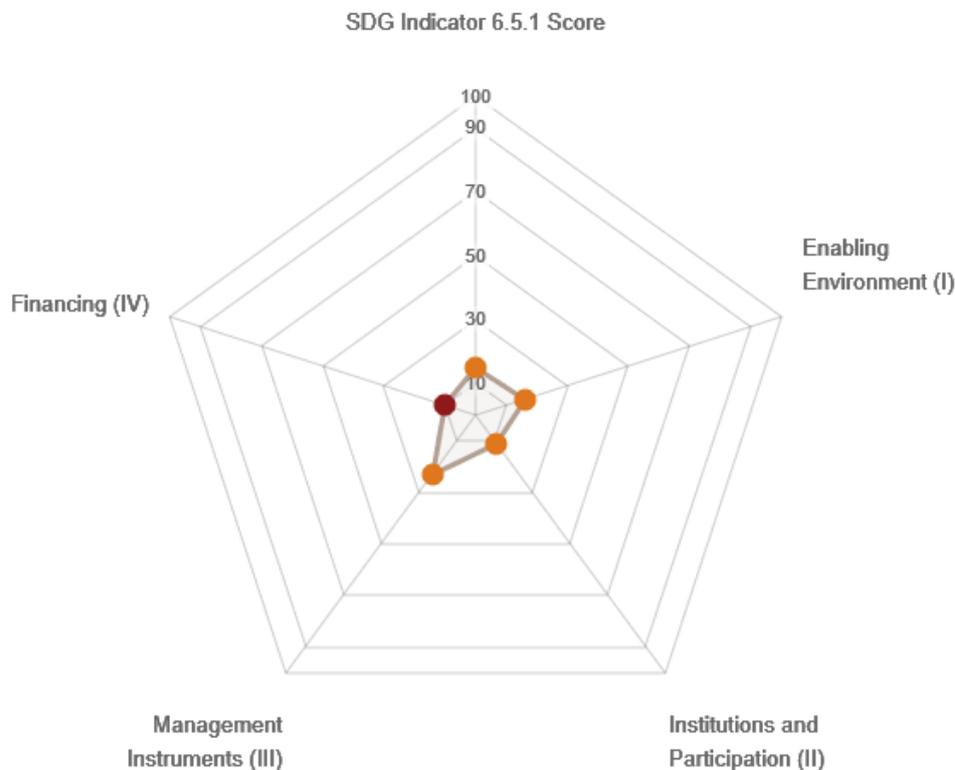


Figure 5-1 Score of Suriname on SDG 6.5.1: Degree of implementation of IWRM

5.2 IWRM Gap analysis

As described in Chapter 4 and Paragraph 5.1 it is clear that to implement IWRM in Suriname, improvements are necessary in all four identified key components of IWRM, and on all levels (national, basin/aquifer and transboundary). There are a lot of gaps to be filled in order to reach a higher degree of implementation of IWRM in Suriname. In Table 5-1 the gaps are listed, resulting from the analysis described in Chapter 4. The gaps identified will be the starting point of the IWRM action plan.

Table 5-1 Gap analysis implementation of IWRM in Suriname

Key component IWRM	Indicator	Gap
Enabling environment	National water resources policy	No national policy based on IWRM. Also sectoral policy on water management is limited.
	National water resources law	Current legislation does not cover all aspects of WRM and is sectoral. No (umbrella) legislation based on IWRM. There are 5 new draft laws, which still have to be adopted. No legislation on surface water.
	National IWRM plans	No national IWRM plan in place.
	IWRM basin/aquifer plan	No basin/aquifer plans.
	Transboundary arrangements IWRM	No arrangements between Suriname and the transboundary countries other than cooperation to determine the border.
Institutions and participation	National government authorities capacity	Limited capacity for leading implementation of IWRM, because of lack of personnel, in general, but especially with the required knowledge level. Also a lack of mandate limits the working area.
	Coordination between national government authorities representing different sectors on water resources, policy, planning and management	Almost no coordination between the ministries involved with water management in Suriname.
	Basin/aquifer level organization IWRM	There are no organizations that can lead implementation of IWRM on basin/aquifer level, there are not many organizations that operate on this level, or have sectoral interests.
	Organizational framework for transboundary water management	No organizational framework in place for transboundary water management.
	Developing IWRM capacity	There are some possibilities to increase knowledge in IWRM, but implementation remains difficult.

		Mandate, financial means and personnel are lacking.
	Stakeholder participation	Stakeholder participation does not occur on a regular basis. Stakeholders are mostly informed or consulted, but often do not have a real say in the process. Barely any participation of citizens.
	Equity-specific objectives	No equity-specific objectives have been addressed.
Management instruments	Monitoring of water availability	No national monitoring plan in place for all water resources with clear measuring goals. No monitoring in all water resources. Very limited analysis performed with available data.
	Water Use Efficiency (WUE)	Low water use efficiency because of old infrastructure and low awareness. Almost no reuse of water in Suriname. No know research on WUE in Suriname.
	Water quality	No water quality guidelines established. No monitoring of point sources of pollution. Limited research.
	Water related ecosystems	Ecosystems outside protected areas are not protected. Limited enforcement. No implementation of the management plans of protected areas. Limited ecosystem monitoring. Limited ecosystem research.
	Reduction of impacts of water related disasters	No risk-impact analysis to reduce impacts of water related disasters. Limited measures taken to prevent damage from water related disasters. Not prepared for climate change. Limited implementation of early warning system for flooding.
	Basin management instruments	Very limited management instruments available for development and management of water at a basin level.
	Aquifer management instruments	Very limited management instruments available for development and management of water at an aquifer level.

	Data and information sharing within country	Very limited structural data and information sharing arrangements within Suriname. There is a data-exchange platform, but it is rarely used by the stakeholders. No open-access of all data. Not all data in digital format.
	Data and information sharing between countries	No structural data and information sharing between countries.
Finance	National budget for investment including water resources infrastructure	Insufficient budget for investments. Budget often not available or financed by loans.
	National budget for the recurrent costs of the IWRM elements	Insufficient budget for the recurrent costs. Budget often not available, which lead to downsizing of recurrent activities.
	Revenues raised from dedicated levies on water users	No 'polluter pays' principle. Tariffs paid for drinking water are very low. No charges are in place for the use of bulk water. No income from tourism or ecosystem services. Incomes from the fees for acquiring monitoring or research data are by far not cost-effective.
	Financing for trans boundary cooperation	No common budget between Suriname and the transboundary countries.

5.3 Problem and solution tree

5.3.1. Conclusions

Suriname has one of the major advantages that there is an abundance of water present. Despite this, Suriname is facing several challenges regarding sustainable and integrated water resource management, such as lack of drinking water in some regions of the country, flood risks during heavy rainfall and shortages of irrigation water in dry seasons.

To improve the sustainable management of our water resources, Suriname aims to develop and implement Integrated Resources Water Management (IWRM).

Several studies have already been conducted on the area of IWRM, such as "*Naar een geïntegreerd waterbeheer in Suriname*" by Nancy del Prado (2011) and "*IWRM in de praktijk in Suriname*" by W. Starkenburg (2017). In 2016 the government of Suriname identified the need to develop a

Roadmap for IWRM in Suriname. With the support of the Cabinet of the Vice President, the Ministry of Natural Resources and Water Forum Suriname took the initiative to organize several workshops and seminars to raise awareness among all the stakeholders on IWRM.

This situation analysis report identifies many different gaps in the four (4) components of IWRM for Suriname. The main conclusion from this situation analysis is that IWRM is marginally implemented in Suriname.

Lack of awareness on sustainable use of water on all levels of the community is one of the main reasons that IWRM has not yet been implemented in Suriname.

Water related legislation in Suriname have never been updated. The current legislation does not comply with current social requirements. Some shortcomings in the current legislation are the lack of rights and obligations of the water user, lack of control mechanisms, clear division of responsibilities and powers (no integration) and lack of water quality standards.

Another reason for minimal implementation of IWRM in Suriname is that an unambiguous National Water Policy is absent. Current water resources policies within the government are strongly fragmented.

A number of governmental agencies and institutions in Suriname, without clearly defined roles, are involved in the protection and monitoring of water resources. There is no alignment among these institutions, which leads to duplication of efforts. The responsibilities concerning water resources management are scattered within the government.

There is almost no data to support water resources management actions. Major problems for monitoring of water quantity and water quality parameters are the lack of financial means and the lack of adequately trained human resources. To acquire the right measuring devices for collecting water related data, Suriname largely depends on foreign financing through projects.

These reasons mentioned above are the main challenges Suriname faces in the implementation of IWRM.

The different challenges Suriname faces with the implementation of IWRM and the effects of the absence of IWRM are illustrated in a problem tree (Figure 5-2).

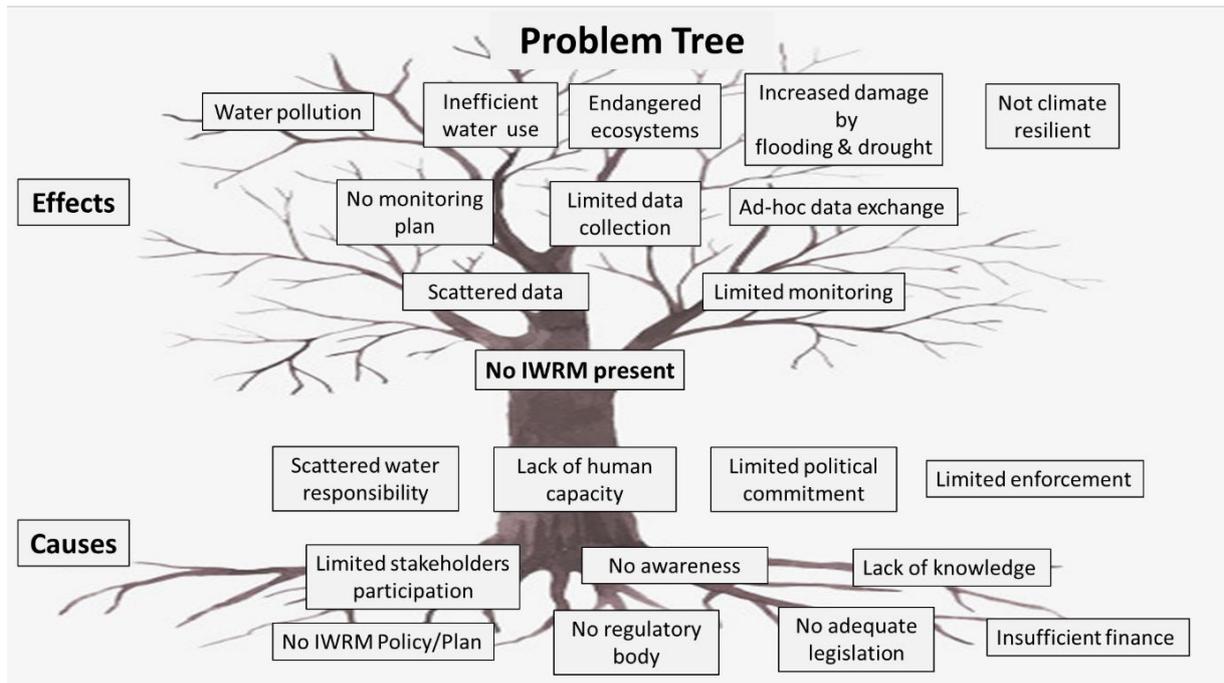


Figure 5-2 Problem tree for the absence of an Integrated Water Resources Management

5.3.2 Recommendations

For sustainable use of the water resources present in Suriname it is strongly recommended to develop an Integrated Water Resources Management Plan. This IWRM Plan should be incorporated in the National Policy of the government of Suriname.

It is highly recommended to increase awareness on the importance of IWRM on all levels of the society. An increased awareness on IWRM will stimulate the enabling environment for IWRM, which will lead to increased political commitment to develop and implement IWRM in Suriname.

Existing water legislation should be updated and new water legislation should be formulated. Approval of the new legislation is important in the development of IWRM.

It is also recommended to increase the number of skilled persons through capacity building programs in the area of water resource management.

It is important to increase stakeholder's engagement through the entire process of the development and implementation of IWRM in Suriname. Having a sufficient budget for the implementation of IWRM is also a requirement.

These abovementioned recommendations will be the basis of the formulation of an Action Plan on IWRM in Suriname.

The recommendations are illustrated in a solution tree (Figure 5-3) based on the identified problems regarding the absence of IWRM in Suriname.

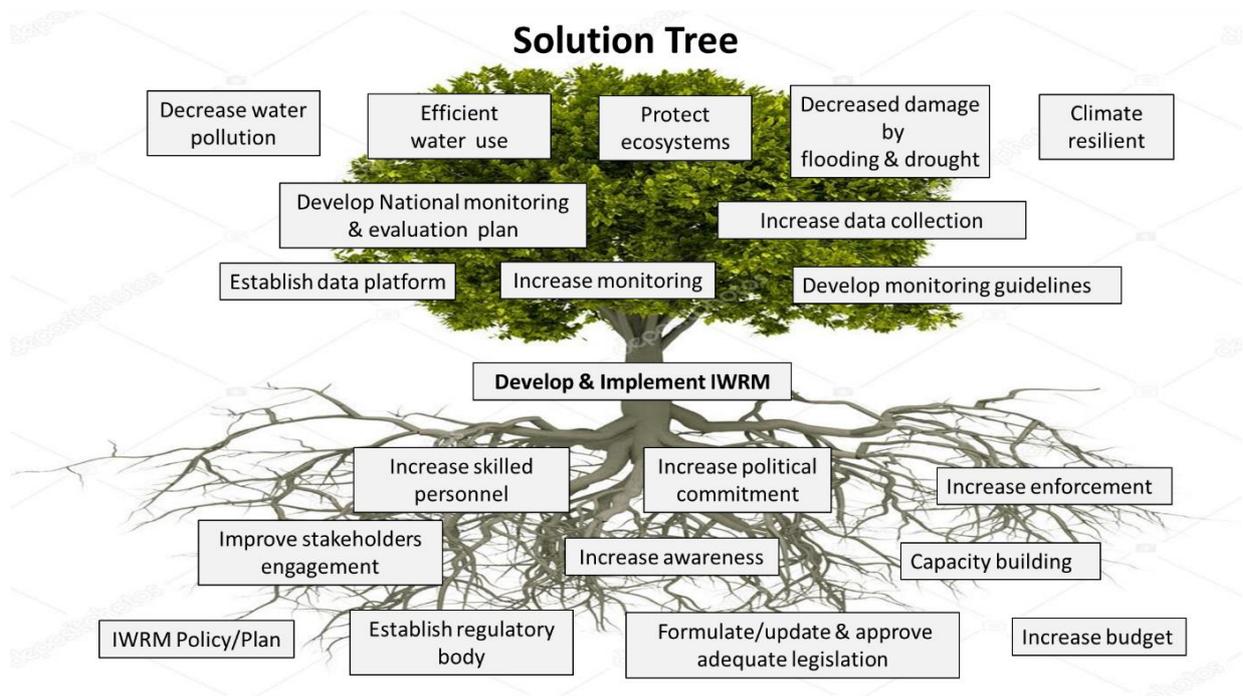


Figure 5-3 Solution tree for the development and implementation of IWRM

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ACTIONPLAN FOR IMPLEMENTING INTEGRATED WATERRESOURCE MANAGEMENT IN SURINAME

WaterForum Suriname

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List of Abbreviations

ACTO	Amazon Cooperation Treaty Organization
ADEK	Anton de Kom University of Suriname
BUZA	Ministry of Foreign Affairs
CM	Coordination Environment
COMP	Component
DNA	The National Assembly
FIN	Ministry of Finance
GCCA+	Global Climate Change Alliance+
GWP- C	Global Water Partnership - Caribbean
GOS	Government of Suriname
IBG	International Biodiversity Society of the Guiana Shield
ITP	Indigenous Tribal People
IWRM	Integrated Water Resource management
IWW	Interdepartmental Water Workgroup
JP	Ministry of Justice and Police
LVV	Ministry of Agriculture, Animal Husbandry and Fisheries
MAS	Maritime Authority of Suriname
MDS	Meteorological Service Suriname
M&E	Monitoring & Evaluation
MINOWC	Ministry of Education, Science and Culture
NGO	Non-Governmental Organization
NH	Ministry of Natural Resources
NIMOS	National Institute for Environment and Development in Suriname
NZCS -CMO	National Zoological Collection/ Center for Environmental Research
OW-MCP	District Water Board Multipurpose Corantijn Project
OWTC	Ministry of Public Works, Transport and Communication
RGB	Ministry of Physical Planning, Land- and Forest Management
RO	Ministry of Regional Development
SDG	Sustainable Development Goal
SWRIS	Suriname Water Resources Information System
UNDP	United Nations Development Programme
VG	Ministry of Public Health
WFS	Water Forum Suriname
WHO	World Health Organization
WLA	Hydraulic Research Division
WRM	Water Resources Management

1. BACKGROUND

Suriname is a country in South America, neighboring French Guyana to the East, Guyana to the West and Brazil in the South. The coast of Suriname is flat and enclosed by the Marowijne River in the East and the Corantijn River in the West. In total Suriname has over 500.000 inhabitants, the coastline is relatively densely populated as 80% of the population lives in this area (FAO stats, 2015).

Suriname is facing several key constraints regarding sustainable and integrated water resource management, such as lack of drinking water in some regions of the country, flood risks during heavy rainfall and shortages of irrigation water in dry seasons. Water pollution due to inadequate wastewater treatment, the use of pesticides and pollution from the mining sector, challenge water quality in the whole country (Abeleven, 2017). Also, there is little awareness among the general population on the importance to address the country's water issues in an integrated manner. Increasing human activities, such as mining, urban development, industries, fishing, tourism, wood logging and agriculture, together with climate change effects such as changing precipitation patterns and rising sea levels, increase the urgency to act. But acting is especially difficult as water management is fragmented and is only at a national level.

Suriname is aiming to improve the situation by implementing the concept of Integrated Water Resource Management (IWRM), but due to, among other things, this fragmentation the implementation of IWRM is progressing slowly. Also, technical staff and key institutions involved in water management lack technical and institutional capacity to develop and implement solid integrated water management plans. The different institutions within the government have a different understanding of IWRM while some are not yet familiar with the concept. In 2016 the Government of Suriname (Cabinet of the Vice-President and the Ministry of Natural Resources) identified the need to develop a Roadmap for Integrated Water Resources Management for Suriname. It was decided that this process be led by the Ministry of Natural Resources (NH). In this light, the Interdepartmental Water Workgroup (IWW) was established in 2016 and draft water legislation was discussed. During this period, the Ministry of Natural Resources also initiated the formulation of a draft law for establishment of a Water Authority. In order to bring awareness on IWRM, the Ministry of NH in collaboration with Waterforum Suriname organized a series of seminars on water governance. Although the IWW became inactive in 2018, it is still high on the agenda of the Ministry to proceed with the IWRM process. In support of the policy of the Ministry, Water Forum Suriname with financial support of the UNDP initiated the project to formulate an action plan IWRM in Suriname.

The project activities are divided into two phases. The focus in the first phase was to conduct a situation analysis and gap analysis. This analysis should feed into the second phase of the project, which is now in progress. This phase is aimed at the formulation of an Action Plan for a phased implementation of IWRM in Suriname.

2. OBJECTIVE

The overall objective of the proposed Action plan is to support the ministry of NH to implement IWRM for Suriname, in close collaboration with other ministries, government agencies, knowledge institutes, NGOs and representatives of local communities.

The Situational analysis identified a significant number of gaps in the current state of affairs regarding water governance in Suriname, when compared to the ideal of a fully integrated IWRM approach according to standard SDG 6.5.

For purposes of clarification, and to prevent misunderstandings, this action plan focuses on developing *the IWRM system*, i.e., the set of conditions necessary to successfully apply the principles of IWRM in policy development and implementation. This action plan does *not* discuss priorities in water policy, resp. planning itself. In fact, the leading idea is that improving the IWRM system will lead to better, i.e. more integrated and better founded, policies and plans, and these, in turn, should lead to a more sustainable, socially and ecologically beneficial water system.

The proposed Action plan will therefore identify the key components of the IWRM system, identify actions needed to bring these components to a required level, and map out a first road map with indicators to be monitored during the implementation process of the plan.

While the focus in the action plan is on implementing IWRM as a leading principle for water management, it is re-emphasized that IWRM is a means to achieve the real goals of 'good' water management: safe and healthy (drinking) water for all, healthy ecosystems, sustainability of water resources, maximum benefits to society from water as a resource. Efforts to implement IWRM as a guiding principle should enhance and improve, but not delay or be substituted for necessary projects to enhance these ultimate goals of water management.

3. IWRM DEVELOPMENT

3.1 Leading philosophy

As concluded in the Situation Analysis report, Suriname is still a long way from full implementation of IWRM. The adoption and implementation of IWRM as a leading principle for good water management is a dynamic process which calls for a multi sectoral and adaptive approach. It will be a long process which requires regular review, adaptation and possible reformulation, involving the main actors in water governance and water use. Therefore, the plan should be a revolving plan with features of evaluation and reformulation at periodic intervals¹. The current plan proposed here intends to kick-start this process by providing an overall framework, identifying key directions, initial priority actions, and indicators that can be used to monitor progress.

3.2 Management Framework

The process towards implementation of IWRM should take place in a management framework that enables coordination and integration and that is accepted by the stakeholders. The following management framework is recommended:

1. On behalf of the Government of Suriname, the ministry of NH will have the lead role of the process, mobilizing funding and determining the policy framework.

¹ Integrated Water Resources Management Plans, Training Manual and Operational Guide, March 2005, UNDP, GWP and Cap-Net

2. A national overseeing committee, comprised of stakeholder representatives will mobilise support across sectors and interest groups, guarantee quality input and monitor progress. The Committee should drive the plan through all stages of development, to ensure that the initiative is managed effectively and will provide maximum benefit. This committee should at least include representatives of the Ministry of NH, OWT&C, LVV, RO, VG, ROGB and NIMOS, as well as representatives from the private sector.

3. For each of the identified activities, an implementation partner or collaborating partners are assigned.

4. A facilitating institution or NGO to provide a neutral platform for dialogue, support the process by providing advice and sharing knowledge, and foster capacity building and training by providing key liaison and coordination with capacity building networks. Either the Water Forum Suriname or the Anton de Kom University could play this role.

3.3 Methodology

The following basic methodologies were applied to start the development of an action plan that facilitates the planning and implementation of Integrated Water Resources Management:

1. Literature review; the stage of preparation of the situation analysis report started with desktop study. Several studies, reports were reviewed.

2. Discussions and consultations with relevant stakeholders were held to understand the actual situation with regards to IWRM. These meetings were very useful for identifying the gaps for implementation of IWRM

3. Workshops were crucial, as these provided a forum for dissemination of information and discussion on IWRM.

The situation analysis report was prepared, discussed in a workshop and accepted by the Ministry of NH. The analysis revealed the weaknesses in the water management system in Suriname but also pointed out the aspects that should be addressed in order to improve the situation.

The weaknesses that were identified during the situation analysis were used as a basis to further develop a draft action plan. The draft was discussed at a stakeholder workshop on June 11, 2019, and inputs from the workshop were used to finalize the plan.

4. ACTION PLAN

The proposed IWRM Action Plan is to a large extent based on the Situation Analysis report of May 3, 2019. The report has assessed the situation regarding implementation of IWRM along different perspectives: enabling environment; institutions and participation; management instruments; and financing. For each of these perspectives, a variety of gaps has been identified, which provide the starting points for this action plan. Some of these perspectives lead to a wide variety of partly overlapping actions, addressing different parts or components of the WRM governance system. Therefore, the actions in this plan have been grouped according to the following five key components of the WRM system:

1. **enabling environment**, comprising political engagement and support, and public and private stakeholder awareness, engagement and participation.
2. **the legal framework**, covering a variety of current and required future laws that structure the water governance system and provide regulatory tools for policy instrumentation and regulation.
3. **institutions and capacity**, focusing on coordinating procedures and processes of public entities involved in (parts of) water management, as well as their capacity (in terms of numbers and qualifications of personnel and material supports)
4. **Data and knowledge infrastructure**, covering data collection, exchange, research into different parts of water systems, development of knowledge based tools for policy development, etc.
5. **financial means**, required to support capacity development, knowledge development, and other actions -- and in the end investments in water infrastructure as needed

When adequately developed, these different components together provide the necessary inputs and conditions for successful IWRM. They are not independent of each other. For example, public engagement and awareness stimulates or may even be needed for political support; political support is needed for allocating and attracting funding required for research and capacity development. On the other hand, knowledge development helps create public and political awareness of (potential) water related problems, supports the capacity for policy development, and can help obtain funding for promising projects. And an appropriate legal framework and institutional capacity are needed to efficiently develop good and implementable policies, plans and projects leading to integrated sustainable water management. Because of these mutual dependencies, parallel action, co-development and iterative learning are needed.

Monitoring then should focus on progress along each of these components, and on the qualities of the policies, plans and projects developed. These should, over time, increasingly display the characteristic features of the integrated approach.

4.1. ENABLING ENVIRONMENT

The enabling environment to support IWRM generally includes political and public support, including engagement of key stakeholders. Public and stakeholder understanding of and involvement in the process, and political support for IWRM are essential to its success. Increasing human activities, such as mining, urban development, industries, fishing, tourism, wood logging and agriculture, together with climate change effects such as changing precipitation patterns and rising sea levels, increase the urgency to act by involving all stakeholders. The goal in this area is therefore to raise and maintain public awareness of and political support for IWRM. Public

support can only be enhanced if the public is being educated and informed and if their interest is being considered. Similarly, private sector linkages need to be established.

4.2 LEGAL FRAMEWORK

Water related legislation in Suriname is out of date and does not comply with current social requirements. Some shortcomings in the current legislation are the lack of rights and obligations of the water user, lack of control mechanisms, clear division of responsibilities and powers (no integration). Up to now, four (4) draft laws on water management have been prepared, namely: (1) Act on the extraction of groundwater, (2) Groundwater protection Act, (3) Act on Supervision of drinking water quality (4) Act on the Surinamese Water Authority. These laws will be submitted to Parliament before the end of 2019. Currently, the Ministry of NH is executing a project to formulate draft regulations to be implemented under the acts. Other legislation that is supportive to water management is the draft Environmental Act. Currently this law is being discussed in Parliament and a set of pollution control regulations under this draft Act have also been formulated. In order to have an improved and integrated legal framework to support IWRM a comprehensive evaluation of existing water resources legislation must be undertaken. This evaluation should also include legislation to support IWRM and management of water and other natural resources. This evaluation must show which amendments and repeals will be necessary to harmonize existing water resources legislation.

4.3 INSTITUTIONS AND CAPACITY

The review of the institutional framework revealed that there are several governmental agencies and institutions, without clearly defined roles, that are involved in the protection and monitoring of water resources. However, there is currently a limited capacity for leading implementation of IWRM, because of lack of personnel, in general, but especially with the required knowledge level among the various governmental agencies and institutions. There is also no alignment among these institutions, which leads to duplication of efforts. The responsibilities concerning water resources management are scattered within the government.

For IWRM to be successful it is important to clarify the roles of the different institutions, provide mechanisms for coordination and cooperation, and provide the relevant agencies and institutions with sufficient capacity to effectively execute their tasks. The government should therefore develop a strategy to grow and maintain capacity for implementing IWRM. In the run-up to setting up a water coordinating body, the ministry of NH will designate a department within the ministry in charge of coordination. This department will fall directly under the Permanent Secretary of the Ministry.

4.4. DATA AND KNOWLEDGE INFRASTRUCTURE

There is a significant need for knowledge to support water resources management actions. Structural data and information sharing arrangements is very limited and the existing data-exchange platform is rarely used by the stakeholders. Applied research in water resources management related issues is essential for the success of IWRM. Water investments to a large extent require huge resources and are non-shift able. Thus, costly mistakes in investments in water projects could be avoided if they are based on careful research and analysis of information and data. Knowledge is a key ingredient for effective IWRM.

First, more data are needed to assess the seriousness of the various water-related problems, and how they develop over time. Second, insight into the functioning and interactions of the different components of the water system is needed to understand the causes of problems, and develop ideas about their possible solutions. Third, knowledge is needed to assess the comparative effectiveness and costs and benefits of alternative policy measures, to support policy decisionmaking. Data collection and research must address different aspects, depending on the particular topic. Issues such as flood risks, water scarcity, pollution, groundwater depletion, upstream/downstream conflicts, ecological preservation, erosion and sedimentation all require their special combination of data and insights. Therefore, some of the key goals within the research and research infrastructure area are:

- Establish a hydrological and hydro geological service tailored for the water resources situation and the key water resources issues;
- Establish a water resources knowledge base based on monitoring and water resources assessments, supplemented by modelling if necessary and make suitable parts available as part of public awareness raising;
- Develop a data and knowledge sharing infrastructure, covering knowledge producers such as universities and consultants, and knowledge users such as staff and management of water governance institutions.

4.5 FINANCING

Effective water resources management requires for both national and sub-national level financing for initial investments (development) and recurrent costs (ongoing). The financing for initial investment relates to the financial resources needed for the preparation of an Integrated Water Resource Management strategy and the recurrent costs relates to the resources required for implementation of both the changes in water governance and the infrastructure to implement IWRM. It includes both the 'hard' structures such as dams, canals, pumping stations, flood control etc. as well as soft/green infrastructure such as water treatment, and flood management investments in land-management practices for water resources and nature-based solutions, among them, the reconnecting of rivers. Financing is also required for institutional strengthening for the development and implementation of IWRM.

Many sources can finance investment and recurrent costs, but frequently the government allocates budget to the relevant ministries and authorities. Other sources for investment and recurrent cost include fees and tariffs levied on water users, polluter fees or grants from different types of organizations.

The analysis reveals that there is insufficient budget for investments and recurrent costs, which lead to downsizing of recurrent activities. Furthermore, the tariffs paid for drinking water and charges for the use of bulk water are very low and currently there is no income from ecosystem services, while the fees for acquiring monitoring or research data are by far not cost-effective

5. ACTION PLAN FOR THE IMPLEMENTATION OF IWRM IN SURINAME

OVERALL GOAL:					
The implementation of integrated water resources management in Suriname					
COMPONENT 1: ENABLING ENVIRONMENT					
GOAL: To attain political support for and commitment to implementation of IWRM, and awareness and engagement of relevant stakeholders and the general population.					
Expected outputs	Activities	Collaborating partners	Time Frame		
			Short ²	Medium ³	Long ⁴
Public support for IWRM mobilized, including stakeholder participation, with special attention for women and vulnerable groups	Develop and implement a general and specific public information, education and awareness campaign considering stakeholders interest; including promotional and educational material	RO, MINOWC, VG, LVV, NGO's, ITP's & and private sector	x	x	x
	Identify a respected political or social figurehead as a champion to assist in creating awareness and gradually build support		x		
	Create stakeholders' forums for efficient & effective engagement	RO, MINOWC, VG, LVV, NGO's, ITP's & private sector	x	x	x
	Identify and implement strategies to reach target groups through catalysts, considering culture, local language and circumstances	Local experts, local communities, NGO's, donors.		x	

² Short term: within 2 years

³ Medium term: Between 3-5 years

⁴ Long term: > 5 years

	Develop and implement an educational program with IWRM as course component	NH/Min. Educ/ADEK RO, NGO's, ITP's		x	x
	Identify and initiate interests and joint actions with key sectors or firms, e.g. agriculture, tourism, industry, mining, health, etc.	Private sector, relevant ministries and government agencies, CM		x	
Support for IWRM from the Policy makers	Develop & implement political awareness with the focus on conservation & sustainable use of water resources	CM, relevant government agencies and political parties	x		
	Briefing of policy makers and Parliament members	Parliament	x		
National Policy stating the ambitions for IWRM is endorsed	Incorporate IWRM in Development Plan 2022 – 2027	Planning Office, other relevant ministries and government agencies, private sector	x		
COMPONENT 2: LEGAL FRAMEWORK					
GOAL: To have in place an improved legal framework to support IWRM in Suriname					
Expected outputs	Activities	Collaborating partners	Time Frame		
			Short	Medium	Long
Comprehensive evaluation of existing water resources legislation in light of IWRM requirements.	Analyse ⁵ existing and draft water resources related legislation to identify necessary amendments and repeals to harmonize existing water resources legislation, including provisions that are	JP/NIMOS/OW/VG/RO/LVV/DNA/BUZA/HI/CM/ROGB/MAS/NGO's ITP's	x		

⁵ The analysis should consider relevant international conventions and standards, rights of ITP's and the OAS court rulings on land rights of ITP's and relevant national legislation which includes protected areas, issuance of land, spatial planning and decentralization. It is also important to safeguard against flooding through regulations

	already suitable for implementation of IWRM				
	Organize stakeholder meetings to present the outcomes of legal analysis and discuss the prioritization of legislation to be drafted	JP/NIMOS/ OW/VG/RO/ LVV/Parliament /Policy makers/State Council,etc.		x	
Improved/ updated legislation to support IWRM is in force	Draft new legislation ⁶ that includes necessary regulatory requirements for licensing systems, participation, equity, financing mechanisms, as well as clear determination of roles and responsibilities of different entities on different levels, including a coordinating body.	JP/NIMOS/ OW/VG/RO/ LVV	x		
	Enact and implement new legislation, including the provision of necessary means			x	x
COMPONENT 3: INSTITUTIONS AND CAPACITY					
GOAL: To strengthen the institutional capacity of NH, the coordinating body and other relevant agencies of GoS for IWRM					
Expected outputs	Activities	Collaborating partners	Time Frame		
			Short	Medium	Long
Institutions involved in the protection, management and monitoring of water resources have adequate capabilities.	Identify existing agencies with water related roles/ responsibilities	RO, WLA/MDS, LVV, RO, ROGB, NIMOS	x		
	Asses if/how IWRM functions are being performed and how these can be improved, and identify gaps in existing institutional mandates/ capabilities with respect to IWRM.		x		

⁶ New legislation such as surface water, sewerage, wastewater and effluent discharges legislation, pollution control, catchment protection and management etc

	Identify bodies on the local level which can play a future role in the Implementation of water management		x		
	Develop and implement an IWRM capacity building training program for Suriname		x		
A coordination body for IWRM is operational	Set up Department within the Ministry of NH, directly under the Permanent Secretary to startup coordinating of IWRM processes		x		
	Development of operational plan for a Coordination Body (including a gradual transition from IWRM coordination department from NH to an independent coordinating body)		x		
	Establishment of the Coordinating Body for IWRM (including sufficient housing, staffing and infrastructural works)		x	x	
Strategy to grow and maintain IWRM capacity of the Coordinating Body, NH and other agencies developed	Develop succession strategy to retain and increase IWRM staff		x		
	Implement career development programs for institutions in the water sector, considering equity objectives			x	
Technical infrastructure for execution of IWRM task in place	Assess infrastructural capacity and needs			x	x
	Obtain necessary office space, equipment and supplies, including computer hardware and software, vehicles, monitoring equipment, etc.			x	x
Committee on Transboundary Water Use is established	Develop an institutional structure for transboundary management (f.e. a Committee for border rivers/basins)		X		

	Draft Protocols for use of transboundary waters with Guyana and France (French Guyana)		x	x	
	Hold meetings with Guyanese and French Guyanese counterparts on the establishment of a Committee on Transboundary Water Use.		x	x	
COMPONENT 4: Data and knowledge infrastructure					
GOAL: To develop knowledge and tools to support effective policy making, including the associated Data and knowledge infrastructure					
Expected outputs	Activities	Collaborating partners	Time Frame		
			Short	Medium	Long
The water problem is qualitatively and quantitatively assessed	Identify data & Information gaps	WLA/MDS/MAS/SWM/OW-MCP/NZCS-CMO/NIMOS	x		
	Collect data to fill the gaps		x		
Understanding of how the water system works	Design research program for the different aspects of the system (quality, quantity, water use efficiency, water related ecosystems, Climate Change, flooding, water, pollution, demand in the different sectors, etc .)	WLA/MDS/MAS/SWM/OW-MCP/NZCS-CMO/NIMOS	x		
	Design research projects to obtain new and additional data and develop tools (e.g. modelling)			x	
	Implement research projects with partners and communicate results	WLA/MDS/MAS/SWM/OW-MCP/NZCS-CMO/NIMOS		x	

Understanding possible policy instruments and measures and their effectiveness	Execution of several impact assessments for the watersector such as Environmental Impact assessments, economic assessment, cost-benefit analyses, etc.	NIMOS/ADEK/FIN		x	
A centralized data platform, gradually transferring into a centralized knowledge centre sharing data and information within the country	Identify national primary data sources	WLA/MDS/MAS/SWM/OW-MCP/NZCS-CMO/NIMOS	x		
	Set up of sharing platform, based on primary data sources	WLA/MDS/MAS/SWM/OW-MCP/NZCS-CMO/NIMOS	x		
Data and information is shared between countries	Identify international data sources, especially from neighboring countries	ACTO/IBG/GWP-C		x	
	Set up of international sharing platform, based on primary data sources	ACTO/IBG/GWP-C		x	
A National water monitoring plan is developed and implemented	Support the rehabilitation, and upgrade the hydro-meteorological monitoring networks as well as introduce new technologies for data collection and analysis.		x		

COMPONENT 5 : FINANCING

GOAL: To achieve goals and objectives of IWRM approaches and national development strategies and priorities by Implementing the action plans

Expected outputs	Activities	Collaborating partners	Time Frame		
			Short	Medium	Long
Adequate financial and material resources for IWRM secured	Ensure adequate provision is made by GOS for start-up of IWRM activities in NH and Coordination body.	FIN and other relevante ministries and CM	x		
	Develop a short and long – term investment plan with alternative investment inputs	FIN and other relevant ministries and Private sector,	x		

		Planning Office and Investsur			
	Explore and develop cost recovery strategy for investments		x		
	Develop a strategy on creating partnership between responsible implementing authority and private sector and community to facilitate resource mobilization		x		
	Develop quality project proposals that suit a range of donor requirements			x	x
	Generate local resources (cash and in-kind) from government and private sources as well as communities to implement IWRM			x	x
Revenues for IWRM are introduced and implemented	Identify other potential short- and long-term income sources for IWRM services			x	

The above action plan should lead to:

1. Strengthening of the regulatory and institutional framework for managing and protecting water resources
2. Enhancement of public awareness and education in water resource management issues.
3. Improved, and improved access to, water resources knowledge base to facilitate water resources planning and decision making.
4. Improved trans-boundary and international cooperation in the management of shared water resources.
5. Ensurance of gender equity in water resources management and planning.
6. Ensure implementation and financing mechanism supporting IWRM.
7. A national M&E system to track progress in IWRM implementation.

6. MITIGATION MEASURE

To achieve the goals, a few challenges have been identified that can slow down the process of getting to IWRM. To cope with these challenges, the following mitigation measures have been proposed; some of these are already included in the general plan above, but the risk analysis emphasizes their importance.

Risk log

Component	Description Risks	Type : political/institutional/ financial/technical/etc.	Mitigation measures
1	Lack of political will/involvement	political	Min NH and WFS organize awareness sessions on IWRM for policy makers/decision makers/lawmakers
2	Lack of capacity to formulate technical laws and regulations	institutional	Legal training in the development of water legislation. Seek assistance from WHO/ACTO and other relevant international organization.
3	Lack of capacity to develop water management plans on local level	institutional	Training of stakeholders
3	Inadequate human capacity to enforce regulations	institutional	Training of enforcement personnel
3	Non-availability of expert staff needed for the Suriname water Authority	institutional	Training of required staff
1	No cooperation of public authorities in the IWRM capacity assessment	institutional	Awareness sessions for GOV agencies on their role in IWRM and the need improved capacity COMP 3
3	Institutions withholding information	institutional	Memoranda of Understanding between the different institutions



MONITORING AND EVALUATION FOR IMPLEMENTATING INTEGRATED WATERRESOURCE MANAGEMENT IN SURINAME

WaterForum Suriname

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List of Abbreviations

ACTO	Amazon Cooperation Treaty Organization
ADEK	Anton de Kom University of Suriname
BUZA	Ministry of Foreign Affairs
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COMP	Component
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GCCA+	Global Climate Change Alliance+
GWP- C	Global Water Partnership - Caribbean
GOS	Government of Suriname
IBG	International Biodiversity Society of the Guiana Shield
ITP	Indigenous Tribal People
IWRM	Integrated Water Resource management
IWW	Interdepartmental Water Workgroup
JP	Ministry of Justice and Police
LVV	Ministry of Agriculture, Animal Husbandry and Fisheries
MAS	Maritime Authority of Suriname
MDS	Meteorological Service Suriname
M&E	Monitoring & Evaluation
MINOWC	Ministry of Education, Science and Culture
NGO	Non-Governmental Organization
NH	Ministry of Natural Resources
NIMOS	National Institute for Environment and Development in Suriname
NZCS -CMO	National Zoological Collection/ Center for Environmental Research
OW-MCP	District Water Board Multipurpose Corantijn Project
OWTC	Ministry of Public Works, Transport and Communication
RGB	Ministry of Physical Planning, Land- and Forest Management
RO	Ministry of Regional Development
SDG	Sustainable Development Goal
SWRIS	Suriname Water Resources Information System
UNDP	United Nations Development Programme
VG	Ministry of Public Health
WFS	Water Forum Suriname
WHO	World Health Organization
WLA	Hydraulic Research Division
WRM	Water Resources Management

1. Background

Suriname is a country in South America, neighboring French Guyana to the East, Guyana to the West and Brazil in the South. The coast of Suriname is flat and enclosed by the Marowijne River in the East and the Corantijn River in the West. In total Suriname has over 500.000 inhabitants, the coastline is relatively densely populated as 80% of the population lives in this area (FAO stats, 2015).

Suriname is facing several key constraints regarding sustainable and integrated water resource management, such as lack of drinking water in some regions of the country, flood risks during heavy rainfall and shortages of irrigation water in dry seasons. Water pollution due to inadequate wastewater treatment, the use of pesticides and pollution from the mining sector, challenge water quality in the whole country (Abeleven, 2017). Also, there is little awareness among the general population on the importance to address the country's water issues in an integrated manner. Increasing human activities, such as mining, urban development, industries, fishing, tourism, wood logging and agriculture, together with climate change effects such as changing precipitation patterns and rising sea levels, increase the urgency to act. But acting is especially difficult as water management is fragmented and is only at a national level.

Suriname is aiming to improve the situation by implementing the concept of Integrated Water Resource Management (IWRM), but due to this fragmentation the implementation of IWRM is progressing slowly. Also, technical staff and key institutions involved in water management lack technical and institutional capacity to develop and implement solid integrated water management plans. The different institutions within the government have a different understanding of IWRM while some are not yet familiar with the concept. In 2016 the Government of Suriname (Cabinet of the Vice-President and the Ministry of Natural Resources) identified the need to develop a Roadmap for Integrated Water Resources Management for Suriname. It was decided that this process be led by the Ministry of Natural Resources (NH). In this light, the Interdepartmental Water Workgroup (IWW) was established in 2016 and draft water legislation was discussed. During this period, the Ministry of Natural Resources also initiated the formulation of a draft law for establishment of a Water Authority. In order to bring awareness on IWRM, the Ministry of NH in collaboration with Waterforum Suriname organized a series of seminars on water governance. Although the IWW became inactive in 2018, it is still high on the agenda of the Ministry to proceed with the IWRM process. In support of the policy of the Ministry, Water Forum Suriname with financial support of the UNDP initiated the project to formulate an action plan IWRM in Suriname.

The project activities are divided into two phases. The focus in the first phase was to conduct a situation analysis and gap analysis. This analysis should feed into the second phase of the project, which is now in progress. This phase is aimed at the formulation of an Action Plan for a phased implementation of IWRM in Suriname.

2. Objective

Monitoring and evaluation (M&E) are key elements in the implementation of the IWRM Plan. Through M&E, progress towards goals and objectives can be tracked and lessons captured to improve performance.

The monitoring and evaluation system helps to ensure that the IWRM action plan meets its main objective of fostering positive change, and also that the action plan can adapt to evolving needs and conditions.

3. Monitoring and Evaluation

According to Organization for Economic Co-operation and Development (OECD - 2002) monitoring is defined as “a continuous function that uses the systematic collection of data on specified indicators to provide management and the main stakeholders of an ongoing development intervention with indications on the extent of progress and achievement of objectives and progress in the use of allocated funds”. Monitoring of the implementation of IWRM Action Plan involves measuring progress towards IWRM and should provide the policy and decision makers, stakeholders, and the public at large with systematic feedback on progress in implementation, results achieved and early warning indicators of problems that need to be addressed and rectified. Monitoring is mainly for reporting on actual performance against what was planned or anticipated¹.

Evaluation can be defined as a time bound and periodic exercise in search to provide credible and useful information to answer specific questions to guide decision making by staff, managers and policy makers². Evaluation including analysis and interpretation of data and indicators will provide credible information that is useful in identifying gaps, challenges and in incorporating lessons learnt into the decision-making process. Based on evaluations and interpretation, the Government of Suriname will be in a better position to assess the sector’s efficacy, impact, relevance and sustainability. Evaluation and interpretation of water data and indicators are proved to be useful tools to examine if the IWRM concepts and assumptions were effective within the country specificities. It will also provide answers to decision makers on what worked, what did not work and why it didn’t work. It will also provide indications to the potentially successful solutions for specific problems. In all cases, monitoring and evaluation require the use of indicators³.

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Hosny Khordagui, Sustainable Water Integrated Management (SWIM) - Support Mechanism, Activity 1.3.6 Assessment of IWRM monitoring Indicators in selected Mediterranean Countries, Project funded by European Union.

² Ibid.

³ Ibid.

3.1 Indicators as part of the M&E system

There is no set of fixed IWRM indicators. Good indicators need to be easily understood and meaningful to those who seek to use the information they provide. In the context of Suriname, it will be for both the Government, stakeholders and the public at large. It is important that capacity exists to analyze the information and use it for adaptation.

The indicators developed for the current IWRM action plan are based on relevance, effectiveness, efficiency, results and sustainability of the activities and outputs. Therefore they should be kept specific, simple and measurable, realistic and start in an early stage of implementing the IWRM action plan.

The indicators in the present monitoring plan are related to the activities. These are performance indicators that all influence the achievement of the desired outputs.

In general, the indicators relate to the following:

1. Political commitments towards IWRM concept.
2. Degree and level of multi-stakeholders' participation in planning for IWRM
3. Capacity development identified to enable the implementation of IWRM plan.
4. Institutional and legislative reforms to implement IWRM concept.

3.2 Roles and Responsibilities

The IWRM Action plan provides for a management framework for coordination and integration. The monitoring and evaluation of the progress of the action plan is tasked to a national overseeing committee, comprised of stakeholder representatives. This committee will mobilise support across sectors and interest groups, guarantee quality input and monitor progress. The Committee will drive the plan through all stages of development, to ensure that the initiative is managed effectively and will provide maximum benefit. This committee should at least include representatives of the Ministry of NH, OWT&C, LVV, RO, VG, ROGB and NIMOS, as well as representatives from the private sector.

It is recommended that the overseeing committee is provided with a secretariat to provide logistical and administrative support. Although the committee is responsible for monitoring the progress, it is recommended to provide for the option that an independent consultant/firm can be hired for specific monitoring activities or assessments required for the purpose of monitoring.

The major internal progress monitoring tools proposed are the biannually progress reports and annual performance reports to be presented at the regular committee meetings. Annual review meetings will be organized by the committee and the participants will be drawn from key sector institutions, development partners, collaborating ministries, and district and local government representatives and other stakeholders.

An important aspect of monitoring and evaluation is communicating results to stakeholders. This includes the direct stakeholders involved in the implementation of the action plan as well as the

general public. Regular stakeholder communication can help to mobilize support for the action plan and to increase accountability. The communication should be in a way that is readily understandable to the target group and that addresses their needs or concerns⁴.

Part of the on-going work of the process is to support better decision-making in IWRM. The Monitoring and Evaluation Tool should be used to provide the Government of Suriname with the information to further implement and improve decisions related to the Action plan. Therefore it is required that the overseeing committee provides a regular update to decisionmakers on the progress of implementation.

⁴ Technical Brief 3: Monitoring and evaluation indicators for IWRM strategies and plans

4. Monitoring and Evaluation for the Action plan

Monitoring and evaluation (M&E) are key elements in the implementation of the IWRM Plan. Through M&E, progress towards goals and objectives can be tracked and lessons captured to improve performance. Operational and progress indicators (Output Indicators) can be identified as part of the plan implementation. However, for Suriname, a general M&E plan has been developed to track progress of the Action plan.

The major internal progress monitoring tools proposed are the quarterly progress reports and annual sector performance reports to be compiled and presented at the regular sector working group meetings. Annual review meetings will be organized and the participants will be drawn from key sector institutions, Development Partners, collaborating Partner Ministries, and District and Local Government representatives.

**OVERALL GOAL:
The implementation of integrated water resources management in Suriname**

COMPONENT 1: ENABLING ENVIRONMENT

GOAL: To attain political support for and commitment to implementation of IWRM, and awareness and engagement of relevant stakeholders and the general population.

Expected outputs	Activities	Key Indicators
Public support for IWRM mobilized, including stakeholder participation, with special attention for women and vulnerable groups	Develop and implement general and specific public information, education and awareness campaign considering stakeholders interest; including promotional and educational material	<ul style="list-style-type: none"> • Public Information, Education and Awareness Plan developed. • Promotional material for general public and specific target groups developed. • Women and Indigenous and Tribal communities are specifically targeted in Public Information, Education and Awareness Plan.
	Identify a respected political or social figurehead as a champion to assist in creating awareness and gradually build support	<ul style="list-style-type: none"> • IWRM Champion has been identified. • Champion is assisting in creating awareness for IWRM implementation.
	Create stakeholders' forums for efficient & effective engagement	<ul style="list-style-type: none"> • Formal framework/mechanism for stakeholder participation is established. • The framework is functional.
	Identify and implement strategies to reach target groups through catalysts, considering culture, local language and circumstances	<ul style="list-style-type: none"> • Report on strategies to reach specific target groups • Strategies are implemented in the local context,
	Develop and implement an educational program with IWRM as course component	<ul style="list-style-type: none"> • Curriculum for education and educational material • MOUs for joint actions within key stakeholders, such as University, Vocational Schools, etc.

Support for IWRM from the Policy makers	Identify and initiate interests and joint actions with key sectors or firms, e.g. agriculture, tourism, industry, mining, health, etc.	<ul style="list-style-type: none"> • MoU's for joint actions signed • # Joint actions
	Develop & implement political awareness with the focus on conservation & sustainable use of water resources	<ul style="list-style-type: none"> • #Meetings with policy makers
	Briefing of policy makers and Parliament members	<ul style="list-style-type: none"> • # Meetings with Parliament to educate on IWRM concepts and implementation in Suriname
National Policy stating the ambitions for IWRM is endorsed	Incorporate IWRM in Development Plan 2022 – 2027	<ul style="list-style-type: none"> • Development Plan 2022-2027 is approved by Parliament

COMPONENT 2: LEGAL FRAMEWORK		
GOAL: To have in place an improved legal framework to support IWRM in Suriname		
Expected outputs	Activities	Key Indicators
Comprehensive evaluation of existing water resources legislation in light of IWRM requirements.	Analyze ⁵ existing and draft water resources related legislation to identify necessary amendments and repeals to harmonize existing water resources legislation including provisions that are already suitable for implementation of IWRM	<ul style="list-style-type: none"> • Report on identification of necessary amendments to existing and draft water resources related legislation and suitability of existing and draft legislation for implementation of IWRM.
	Organize stakeholder meetings to present the outcomes of legal analysis and discuss the prioritization of legislation to be drafted	<ul style="list-style-type: none"> • Stakeholder meetings held. • Topics for legislation have been prioritized.
Improved/ updated legislation to support IWRM is in force and implemented	Draft new legislation ⁶ that includes necessary regulatory requirements for licensing systems, participation, equity, financing mechanisms, as well as clear determination of roles and responsibilities of different entities on different levels, including a coordinating body.	<ul style="list-style-type: none"> • # of water Laws approved by Parliament

⁵ The analysis should consider relevant international conventions and standards, rights of ITP's and the OAS court rulings on land rights of ITP's and relevant national legislation which includes protected areas, issuance of land, spatial planning and decentralization. It is also important to safeguard against flooding through regulations

⁶ New legislation such as surface water, sewerage, wastewater and effluent discharges legislation, pollution control, catchment protection and management etc

COMPONENT 3: INSTITUTIONS AND CAPACITY

GOAL: To strengthen the institutional capacity of NH, the coordinating body and other relevant agencies of GoS for IWRM

Expected outputs	Activities	Key Indicators
<p>Institutions involved in the protection, management and monitoring of water resources have adequate capabilities.</p>	<p>Identify existing agencies with water related roles/ responsibilities</p>	<ul style="list-style-type: none"> List of Agencies with water related roles and responsibilities.
	<p>Asses if/how IWRM functions are being performed and how these can be improved, and identify gaps in existing institutional mandates/ capabilities with respect to IWRM.</p>	<ul style="list-style-type: none"> Overview how IWRM functions are currently performed by existing institutions Overview of identified gaps in capabilities of existing institutions
	<p>Identify bodies on the local level which can play a future role in the Implementation of water management</p>	<ul style="list-style-type: none"> List of bodies on the river basin/ local level.
	<p>Develop and implement an IWRM capacity building training program for Suriname</p>	<ul style="list-style-type: none"> IWRM training program developed Number of institutions and number of participants participated in IWRM training program
<p>A coordination body for IWRM is operational</p>	<p>Development of operational plan for a cross-sectoral Coordination Body</p>	<ul style="list-style-type: none"> Operational Plan for cross-sectoral Coordination Body developed.
	<p>Establishment of the cross-sectoral Coordinating Body for IWRM (including sufficient housing, staffing and infrastructural works)</p>	<ul style="list-style-type: none"> Cross-sectoral coordination body is functional. At least 75% of staff recruited
<p>Strategy to grow and maintain IWRM capacity of the Coordinating Body, NH and other agencies developed</p>	<p>Develop succession strategy to retain and increase IWRM staff</p>	<ul style="list-style-type: none"> Report with the succession strategy which includes # and qualification of available staff and # of senior management personnel acquainted with IWRM and Staff motivation to implement IWRM

	Implement career development programs for institutions in the water sector, considering equity objectives	<ul style="list-style-type: none"> • # of career development programs implemented
Technical infrastructure for execution of IWRM task in place	Assess infrastructural capacity and needs	<ul style="list-style-type: none"> • Overview of infrastructural capacity and needs.
	Obtain necessary office space, equipment and supplies, including computer hardware and software, vehicles, monitoring equipment, etc.	<ul style="list-style-type: none"> • Adequate office space obtained • Necessary equipment and supplies are available
Committee on Transboundary Water Use is established	Develop an institutional structure for transboundary management (e.g. a Committee for border rivers/basins)	<ul style="list-style-type: none"> • # Number of bilateral trans-boundary waters agreements with neighboring countries prepared • # Number of multilateral Transboundary waters arrangements and commitments made.
	Draft Protocols for use of transboundary waters with Guyana and France (French Guyana)	<ul style="list-style-type: none"> • Protocols developed for use of transboundary waters with Guyana and France (French Guyana) • Protocols signed and operational.
	Hold meetings with Guyanese and French Guyanese counterparts on the establishment of a Committee on Transboundary Water Use.	<ul style="list-style-type: none"> • # Number of meetings held on yearly basis to establish and operate a Committee on Transboundary Water Use.

COMPONENT 4: Knowledge and knowledge infrastructure		
GOAL: to develop knowledge and tools to support effective policy making, including the associated knowledge infrastructure		
Expected outputs	Activities	Key Indicators
The water problem is qualitatively and quantitatively assessed	Identify data & Information gaps	<ul style="list-style-type: none"> • Report on Data and Information gaps
	Collect data to fill the gaps	<ul style="list-style-type: none"> • Report with the collected data.
Understanding of how the water system works	Design research program with the University for the different aspects of the system (quality, quantity, water use efficiency, water related ecosystems, Climate Change, flooding, water, pollution, demand in the different sectors, etc.)	<ul style="list-style-type: none"> • # Number of Research programs designed.
	Design research projects to obtain new and additional data and tools (e.g. modelling)	<ul style="list-style-type: none"> • # Number of Research programs designed.
	Implement research projects with partners	<ul style="list-style-type: none"> • #Number of Research Programs implemented. • Evaluation report of implementation of Research Program
Understanding possible policy measures and their effectiveness	Execution of several impact assessments for the water sector such Environmental Impact assessments, economic assessment, and cost benefits analysis, etc.	<ul style="list-style-type: none"> • # Number of impact Assessment reports
Data and information within the country are shared	Identify national primary data sources	<ul style="list-style-type: none"> • List of National primary data sources
	Set up of new data sharing platform or use existing data sharing platform, based on primary data sources	<ul style="list-style-type: none"> • Data sharing platform functional, including overview of available data
Data and information are shared between countries	Identify international data sources, especially from neighboring countries	<ul style="list-style-type: none"> • List of International data sources.

	Set up of sharing platform, based on primary data sources	<ul style="list-style-type: none"> • Regional data sharing platform established
A National water monitoring plan is developed and implemented	Support the rehabilitation, and upgrade the hydro-meteorological monitoring networks as well as introduce new technologies for data collection and analysis.	<ul style="list-style-type: none"> • Overview of Hydro-meteorological monitoring networks that are rehabilitated and functional • New technologies for data collection and analysis have been demonstrated and are in use.

COMPONENT 5: FINANCING

GOAL: To achieve goals and objectives of IWRM approaches and national development strategies and priorities by Implementing the action plans

Expected outputs	Activities	Key Indicators
Adequate financial and material resources for IWRM secured	Ensure adequate provision is made by GOS for start-up of IWRM activities in NH and Coordination body.	<ul style="list-style-type: none"> • There are specific budget lines in the budget of the ministry of NH for start-up expenditures of NH and coordination body
	Develop a short and long – term investment plan with alternative investment inputs	<ul style="list-style-type: none"> • Presentation on and approval of the Investment Plan for short and long – term investments.
	Explore and develop cost recovery strategy for investments	<ul style="list-style-type: none"> • Presentation on and approval of the Cost recovery strategy for investments
	Develop a strategy on creating partnership between responsible implementing authority and private sector and community to facilitate resource mobilization	<ul style="list-style-type: none"> • Presentation on and approval of Strategy on creating partnership.
	Develop quality project proposals that suit a range of donor requirements	<ul style="list-style-type: none"> • # Number of project proposals formulated for main IWRM donors
	Generate local resources (cash and in-kind) from government and private sources as well as communities to implement IWRM	<ul style="list-style-type: none"> • Report on the resources spent (cash and in-kind)
Revenues for IWRM are introduced and implemented	Identify other potential short- and long-term income sources for IWRM services	<ul style="list-style-type: none"> • Overview of other potential income sources, including estimated available budgets