

**ASSESSMENT OF AQUIFER VULNERABILITY AND YIELD POTENTIAL OF
COASTAL AQUIFERS IN SURINAME**


CERTIFICATION

I hereby certify that this operation was approved for financing under the AquaFund (AQF) through a communication sent by Gerhard Lair (ORP/GCM) on February 26, 2014. Also, I certify that resources from the AquaFund (AQF) are available for up to US\$500.000 in order to finance the activities described and budgeted in this document. This certification reserves resources for the referenced project for a period of four (4) calendar months counted from the date of eligibility from the funding source. If the project is not approved by the IDB within that period, the reserve of resources will be cancelled, except in the case a new certification is granted. The commitment and disbursement of these resources shall be made only by the Bank in US dollars. The same currency shall be used to stipulate the remuneration and payments to consultants, except in the case of local consultants working in their own borrowing member country who shall have their remuneration defined and paid in the currency of such country. No resources of the Fund shall be made available to cover amounts greater than the amount certified herein above for the implementation of this operation. Amounts greater than the certified amount, may arise from commitments on contracts denominated in a currency other than the Fund currency, resulting in currency exchange rate differences, for which the Fund is not at risk.



Sonia M. Rivera
Chief
Grants and Cofinancing Management Unit
ORP/GCM

05/20/2014
Date

Approved: 

Sergio I. Campos G.
Chief
Water and Sanitation Division
INE/WSA

05/21/2014
Date

TC Document**Assessment of Aquifer Vulnerability and Yield Potential of Coastal Aquifers in Suriname****I. BASIC INFORMATION**

Country/Region:	Suriname
TC Name:	Assessment of Aquifer Vulnerability and Yield Potential of Coastal Aquifers in Suriname
TC Number:	SU-T1070
Associated Loan/Guarantee Name:	NA
Associated Loan/Guarantee Number:	NA
Team Leader/Members:	Marcello Basani (Team Leader, WSA/CGY); Rodrigo Riquelme, Fernando Miralles, Raúl Muñoz and Irene Cartin (INE/WSA); Marle Reyes (WSA/CGY); Carol Lieveld (CCB/CSU); and Guillermo Eschoyez (LEG/SGO)
Date of TC Abstract authorization:	February 26, 2014
Donors providing funding:	AQUAFUND OC
Beneficiary:	Republic of Suriname
Executing Agency and contact name	Suriname Water Company (SWM)
IDB Funding Requested:	US\$500,000.00
Local counterpart funding, if any:	US\$20,000
Execution period:	12 months
Disbursement period (which includes execution period):	14 months
Required start date:	October, 2014
Types of consultants:	Firm
Prepared by Unit:	INE/WSA
Unit of Disbursement Responsibility :	CCB/CSU
TC Included in Country Strategy (y/n): TC included in CPD (y/n):	Y (dialogue area) Y
GCI-9 Sector Priority:	Protect the environment, respond to climate change, promote renewable energy, and ensure food security.

II. OBJECTIVES AND JUSTIFICATION

- 2.1 The Government of Suriname (GOS) designated responsibilities for drinking water supply to two entities. Potable water supply in the districts of Paramaribo, Wanica, Para, Nickerie, and Marowijne (Albina and Moengo) is provided by the N.V. Surinaamsche Waterleiding Maatschappij (SWM, Suriname Water Company)¹, a government-owned utility that supplies water to approximately 70% of Suriname's population. The Department for Water Supply under the Ministry of Natural Resources (DWV/NH) is responsible for supplying drinking water in the coastal rural areas and in the country's interior, which accounts for approximately 21% of the population of the country. Currently, SWM is in the process of taking over some of the coastal systems from DWV/NH. The Ministry of Natural Resources has the overall responsibility for water policy for both institutions. The Fund for Development of Interior (FOB), which works under the auspices of the Ministry of Regional Development, plans and builds water supply systems for the Interior; however it plays no role in providing operation and maintenance of the systems, which resides within the Ministry of Natural Resources. In the absence of an independent regulatory body, the Council of Ministers approves tariffs.
- 2.2 The overall water resources management is shared among the following agencies: (i) the Ministry of Health, which monitors environmental health; (ii) the Ministry of Agriculture, Animal Husbandry and Fisheries, which is responsible for irrigation; (iii) the Hydraulic Research Division of the Ministry of Public Works, which promotes the optimum utilization, management and protection of water resources. The National Institute for Environment and Development in Suriname (Nationaal Instituut voor Milieu & Ontwikkeling in Suriname, NIMOS), established in 1998, is the institution responsible for the application of environmental impact assessment at project levels.
- 2.3 The area of Greater Paramaribo, the most populated area in Suriname, is supplied almost entirely by groundwater sources. This represents approximately 85% of the overall groundwater usage in the country. The most important and most exploited aquifers are: A Sand, the Coesewijne and the Zanderij. There are several other potentially exploitable aquifers in the country; however, they are considered not to be suitable for exploitation because of their small size, great depth to the water table, and expected bad water quality due to high salinity. Considering this situation, the planning for a sustainable potable water supply from underground sources currently represents a difficult task due to the lack of information regarding the dimensions, storage capacity, and extension of the recharge areas, recharge rates and sustainable yields of the country's main aquifers.

¹ In the district of Para SWM provides water only in the Republic area.

- 2.4 The studies undertaken to prepare the 2011 Suriname Water Supply Master Plan, financed with resources from the ATN/SF-11374-SU, identified clear trends of saline intrusion in the monitoring stations of the A Sand and Coesewijne aquifers. Additionally, it was estimated that the maximum global yield for the Coesewijne, A-Sands, and Zanderij aquifers (Greater Paramaribo Area) is $12,500\text{m}^3/\text{h}^2$ for the next 15 years³. However, after that period, or even before then, this yield would probably be drastically reduced due to an increase in salinity levels as direct consequence of the unsustainable exploitation of the A-Sand and Coesewijne aquifers. It is expected that, in the long run, the increasing saline intrusion may further limit the use of several groundwater sources for human consumption, unless expensive treatment is used (for instance, desalinization).
- 2.5 Considering that surface waters along the coast exhibits high salinity levels due to their connection with the sea waters, the population from these areas will continue to be supplied with water from underground sources. In order to protect and guarantee a reliable and affordable provision of potable water in the present and in the future, the Government of Suriname has requested to conduct a comprehensive hydrogeological assessment of the most vulnerable aquifers and to evaluate their potential for supplying the total volume of groundwater that would be required beyond the Master Plan horizon of 15 years.
- 2.6 Climate change is an important additional source of vulnerability to groundwater supply in Suriname, since sea level rise occurring as a result of it will further exacerbate the saline intrusion into these coastal aquifers. Because of this, climate change needs to be factored into the proposed hydrogeological assessment. In addition, the assessment will focus on quantifying the storage capacity for an envelope of climate change scenarios in order to identify the aquifer sustainable yield under such scenarios. This will lead to identifying robust measures towards climate adaptation in managing groundwater resources in the country.
- 2.7 The objective of this Technical Cooperation (TC) is to contribute to the provision of sustainable water supply to the population of Suriname, through:
- (i) An assessment of aquifer vulnerability and aquifer yield potential of the coastal aquifers in Suriname;
 - (ii) Identification of robust measures towards climate adaptation for managing groundwater resources in coastal areas; and
 - (iii) Strengthening of the country's capacity on hydrogeological assessments, coastal aquifer management, and climate change adaptation.

² This yield cannot be regarded as a safe yield. Hydrogeological conditions will have to be monitored especially for the salinity in view of extrapolating conditions beyond the next 15 years, as indirect recharge to these two aquifers cannot be evaluated with existing data.

³ SWM (2011). Suriname Water Supply Master Plan. Volume II. Situational Analysis of the Water Sector.

- 2.8 This TC is aligned with the Bank's Country Strategy (CS) for Suriname (2011-2015) that aims to support the transition to modern public governance structures, diversifying the economy, and expanding social benefits. Water and Sanitation is included in the CS as a strategic area of dialogue, with an explicit focus for inclusion in the technical cooperation program along the main strategic areas indicated in the CS. The TC is also aligned with the IDB's Ninth General Capital Increase's (GCI-9) lending target for the 2012-2015 period "Lending to support climate change initiatives, sustainable energy and environmental sustainability." Any future operation stemming from the study will also contribute to the lending target "Support development to small and vulnerable countries." Lastly, the TC is aligned with the fifth GCI-9 sector priority for 2012-2015 "Protect the environment, respond to climate change, promote renewable energy, and ensure food security".
- 2.9 The TC is included in the Country Program Document for 2014.

III. DESCRIPTION OF ACTIVITIES/COMPONENTS AND BUDGET

- 3.1 The proposed TC components are:
- 3.2 **Component 1. Hydrogeological assessment of the coastal aquifers in Suriname.** This component will finance a comprehensive hydrogeological assessment to evaluate the aquifer storage capacity and aquifer yield of the most vulnerable aquifers and to evaluate their capacity for providing the groundwater supply that would be required to cover SWM projected water demands for the next 20 years. The proposed assessment will improve SWM decision making capabilities to manage water resources and to protect and guarantee a reliable and affordable provision of potable water in the country. The component main activities will include: (i) inventory of coastal aquifers, incorporating the assessment of storage capacity and potential yield; (ii) aquifer testing to determine hydraulic parameters and long-term abstraction capacity; (iii) groundwater quality determination and monitoring, particularly with respect to salinity; (iv) groundwater modeling to simulate existing conditions of aquifer potential yield and salinity intrusion (v) aquifer vulnerability assessment, particularly with respect to salinity intrusion and sea level changes; (vi) use of cost benefit models to estimate sustainable groundwater supply (aquifer storage volume and extraction rates); (vii) climate change scenario definition; (viii) simulation of changes in aquifer storage capacity and sustainable yield and sensitivity analysis using groundwater modeling; and (ix) proposal of a groundwater resources management plan for the next 20 years that is robust with respect to climate adaptation. See Terms of Reference: [\(IDBdocs38731103\)](#)⁴.

⁴ The Terms of References cover all the services required for the implementation of the proposed TC.

- 3.3 **Component 2. Capacity building activities on hydrogeological analysis.** Complementing Component 1, this component will finance capacity building activities within SWM to strengthen the country's capacity on hydrogeological assessment, coastal aquifer management, and climate change. Activities will include: (i) review of information systems on aquifer monitoring and data management; (ii) incorporation of the groundwater modeling simulation tool into SWM operations; (iii) training of SWM personnel on groundwater modeling and management; (iv) other activities to strengthen and improve groundwater management and planning; and (v) implementation of information systems on aquifer management for SWM. Also, potential synergies with the University of Suriname will be identified to improve and strengthen the current country capabilities for assessing and managing groundwater resources. See Terms of Reference ([IDBdocs38731103](#)).

Indicative Results Matrix

	Key Outcome Indicators	Unit	Baseline Value	Target Value
1	Number of times knowledge produced has resulted in changes in clients working practices	Number of times	0	1
2	Number of times knowledge produced has been used as input for programming and strategy documents	Number of times	0	1
	Key Output Indicators	Unit	Baseline Value	Target Value
<i>Component 1</i>				
3	Hydrogeological assessment completed	Study	0	1
	Aquifer exploitation strategic plan completed	Plan	0	1
<i>Component 2</i>				
4	SWM and University of Suriname trained in groundwater management	entity	0	2

Procurement plan ([IDBdocs38731094](#))

Indicative Budget (in US\$)

Activity/Component	IDB/Fund Funding US\$	Counterpart Funding US\$	Total Funding US\$
Component 1	415,000	-	415,000
Component 2	70,000	-	70,000
Project Administration and support to Project Execution Unit (including transportation, office costs, etc.)	-	20,000	20,000
Audits and Evaluation	15,000	-	15,000
Total	500,000	20,000	520,000

Detailed budget ([IDBdocs38731082](#)).

- 3.4 Monitoring and Supervision will be carried out by the Bank technical team with the support of the Country Office and individual consultants. At the end of the execution, once 90% of the resources of the Bank's Contribution have been disbursed, the SWM will hire an independent consultant to conduct the final evaluation of this TC operation and to assess the quality and scope of the outputs and outcomes developed in relation to the objectives initially stated as well as lessons learned, sustainability, and to identify the challenges ahead. All activities for this TC should be completed by December, 2015.
- 3.5 An external audit of the TC will be performed by a firm of independent auditors acceptable to the Bank. The audit will be contracted and managed by the Executing Agency (EA). The cost of the audits will be financed with TC resources. Financial reporting requirements will consist of: (i) the financial audit report to be submitted within 90 days following the current disbursement expiration date, and (ii) any other financial reporting requirements considered necessary by the Bank.

IV. EXECUTING AGENCY AND EXECUTION STRUCTURE

- 4.1 The Executing Agency (EA) will be SWM, through a Project Executing Unit (PEU) within the Planning Department, which will be responsible for the overall administration of the proposed operation, including planning, budgeting, financial management, and implementation. SWM is knowledgeable of the Bank's procurement and financial policies and procedures as it has executed ATN/SF-11374-SU and is currently executing 2451/OC-SU. The core members of the PEU of the 2451/OC-SU will be involved in the execution of this TC, with the technical support of a geo-hydrological engineer.
- 4.2 The Government of Suriname, upon the conclusion of a programming exercise with the IDB, requested this Technical Cooperation on October 3, 2013.

V. MAJOR ISSUES

- 5.1 SWM is currently executing 2451/OC-SU, which minimizes the risks associated to the lack of understanding of the Bank's policies and procedures. Considering the slow execution pace of such loan, the only risk is related to the need to execute the TC in a timely manner. The risk, however, is mitigated by the very limited number of procurement processes. Also, SWM will appoint a project coordinator to ensure proper and timely execution and coordination.

VI. EXCEPTIONS TO BANK POLICY

- 6.1 No exceptions to Bank policy were identified.

VII. ENVIRONMENTAL AND SOCIAL STRATEGY

- 7.1 This TC has been classified as Category “C”. No environmental assessment or studies or consultations are required for Category “C” operations ([IDBdocs38731119](#)).

ANNEXES

Detailed Budget ([IDBdocs38731082](#))
Procurement Plan ([IDBdocs38731094](#))
Terms of Reference ([IDBdocs38731103](#))
Government Request for Bank Execution: ([IDBdocs38595143](#))