



WATER SUPPLY INFRASTRUCTURE REHABILITATION (SU-L1018; 2451/OC-SU)

Project Completion Report (PCR)

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Electronic Links

1. [Development Effectiveness Matrix \(DEM\) Summary](#)
2. [Changes to the Results Matrix](#)
3. [Final version of the Progress Monitoring Report \(PMR\)](#)
4. [PCR Checklist \(Excel file\)](#)

Optional Electronic Links

5. [Ex post Cost-Analysis Report](#)
6. [Minutes of the project's Exit Workshop](#)

Acronyms and Abbreviations

CRMS	Customer Relations Management System
CSS	Country Strategies for Suriname
DMA	District Metered Areas
EA	Environmental Assessment
GOS	Government of Suriname
ICT	Information and Communication Technology
IDB	Inter-American Development Bank
MEC	Main Executive Consultant
MWh/year	Megawatt Hours/Year
NH/DWV	Ministry of Natural Resources, Department for Water Supply
NRW	Non-revenue Water
PAHO	Pan American Health Organisation
PCR	Project Completion Report
PEU	Project Executing Unit
PMR	Project Monitoring Report
SWM	Suriname Water Company
UIS	Update to the Institutional Strategy
WSMP	Water Supply Master Plan)

Basic Project Information

PROJECT NUMBER (S):SU-L1018

TITLE: WATER SUPPLY INFRASTRUCTURE REHABILITATION

LENDING INSTRUMENT: INL – INVESTMENT LOAN

COUNTRY: SURINAME

BORROWER: GOVERNMENT OF SURINAME

LOAN (S): 2451/OC-SU

SECTOR/SUBSECTOR: AS

DATE OF BOARD APPROVAL: 8 NOVEMBER 2010

DATE OF LOAN CONTRACT EFFECTIVENESS: 11 FEBRUARY 2011

DATE OF ELIGIBILITY FOR FIRST DISBURSEMENT: 30 NOVEMBER 2011

LOAN AMOUNT (S)

ORIGINAL AMOUNT: 12,000,000.00

CURRENT AMOUNT: 12,000,000.00

PARIPASSU: LOCAL CONTRIBUTION: 500,000.00

TOTAL PROJECT COST: 12,500,000.00

MONTHS IN EXECUTION

FROM APPROVAL:83

FROM CONTRACT EFFECTIVENESS: 80

DISBURSEMENTS PERIODS

ORIGINAL DATE OF FINAL DISBURSEMENT: 10 FEBRUARY 2016

CURRENT DATE OF FINAL DISBURSEMENT: 2 OCTOBER 2017

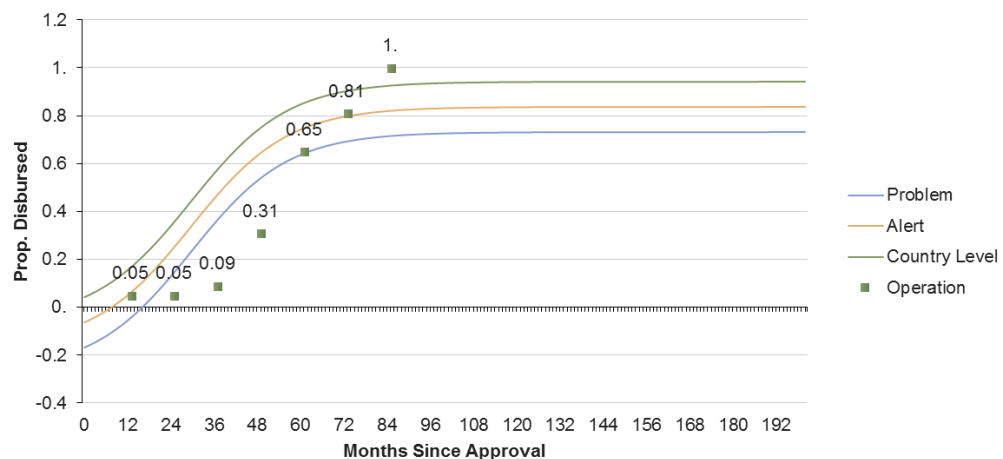
CUMULATIVE EXTENSION (MONTHS): 20

SPECIAL EXTENSIONS (MONTHS): NONE

DISBURSEMENTS

TOTAL AMOUNT OF DISBURSEMENTS TO DATE: 12,000,000.00

DISBURSEMENT GRAPH



REDIRECTIONING. HAS THIS PROJECT?

RECEIVED FUNDS FROM ANOTHER PROJECT NO

SENT FUNDS TO ANOTHER PROJECT NO

Ratings of project Performance in PMRs:

No.	PMR Date	PMR Stage	Classification	Actual Disbursements (USD millions)
1	2017	Final (Jan-Dec)	SATISFACTORY	12,000,000.00
2	2016	Final (Jan-Dec)	SATISFACTORY	9,780,116.44
3	2015	Final (Jan-Dec)	SATISFACTORY	7,800,000.00
4	2014	Final (Jan-Dec)	ALERT	3,720,000.00
5	2013	Final (Jan-Dec)	PROBLEM	1,080,000.00
6	2012	Final (Jan-Dec)	PROBLEM	600,000.00
7	2011	Final (Jan-Dec)	SATISFACTORY	600,000.00

EX POST ECONOMIC ANALYSIS METHODOLOGY: COST BENEFIT

EX POST EVALUATION METHODOLOGY: COST BENEFIT

DEVELOPMENT EFFECTIVENESS CLASSIFICATION: PARTLY SUCCESSFUL

BANK STAFF

POSITIONS	AT PCR	AT APPROVAL
VICE PRESIDENT VPS	SANTIAGO LEVY	SANTIAGO LEVY
VICE PRESIDENT VPC	ALEXANDRE MEIRA DA ROSA	ROBERTO VELLUTINI
COUNTRY MANAGER	THERESE TURNER-JONES	GERARD JOHNSON
SECTOR MANAGER	JOSE AGUSTIN AGUERRE	ALEXANDRE MEIRA DA ROSA
DIVISION CHIEF	SERGIO CAMPOS	FEDERICO BASANES
COUNTRY REP	CESAR FALCONI	ANSEL BREWSTER
PROJECT TEAM LEADER	EVAN CAYETANO	MARCELLO BASANI
PCR TEAM LEADER	EVAN CAYETANO	N/A

Staff Time and Cost

Stage Project Cycle	# of staff weeks	USD (including travel and consultant costs)
Preparation	6	10.000
Supervision	3	4.000
Total		14.000

STATEMENT OF THE DEVELOPMENT OBJECTIVES OF THE PROJECT/PROGRAM:

THE GENERAL OBJECTIVE OF THE PROPOSED PROJECT IS TO IMPROVE EFFICIENCY AND QUALITY OF THE POTABLE WATER SERVICES PROVIDED IN THE COASTAL AREA OF SURINAME. THE SPECIFIC OBJECTIVES ARE: (I) DECREASE THE LEVEL OF NON-REVENUE WATER (NRW), THROUGH THE DEVELOPMENT AND IMPLEMENTATION OF A NRW PROGRAM; (II) IMPROVE THE WATER SUPPLY DISTRIBUTION SYSTEM IN PRIORITY DISTRICTS OF THE COASTAL AREA THROUGH REHABILITATION WORKS; AND (III) STRENGTHEN SWM PERFORMANCE BY IMPROVING OPERATIONS AND MAINTENANCE, INCORPORATING A MANAGEMENT INFORMATION SYSTEM AND DECREASING ENERGY CONSUMPTION.

I. Introduction

With an area of 163,800 km², Suriname is divided into three (3) geographical areas: The Coastal Plain, the Savannah Belt, and the Interior Precambrian Shield (the Interior). About 70% of Suriname's 500,000 inhabitants live in Greater Paramaribo on the Coastal Plain, which includes Paramaribo and part of Wanica¹. Paramaribo, Suriname's capital, has a population of just about 200,000 and is located about 20 kilometres south of the Atlantic coast. The Savannah Belt is sparsely populated while the Interior, which makes up 80 to 85% of the total area, consists of hills, mountains, and tropical rainforests that are inhabited mainly by dispersed tribal people².

According to the Pan American Health Organisation (PAHO)³, 97% of the urban population and 79% of the rural population in Suriname had access to an improved drinking water source in 2006. This represented an increase of about 20% in the last 30 years. Despite this improvement, the water supply services still faced operational, maintenance, financial, and institutional challenges.

The Suriname Water Company (SWM) provides water supply services to most of Suriname's population, equivalent to 118,006 households, all of which are metered. SWM has 760 staff, with a ratio above six employees per 1,000 connections⁴. In 2017 overall production and distribution capacity has been estimated at 86,000 m³ per day, which is predominantly abstracted from three aquifers: the Zanderij, the Coesewijne, and the A-sand aquifer, with the Zanderij being the largest source of water. Most of the revenue originates from the districts of Paramaribo, Wanica and Para, where 89% of SWM's customers reside. Collection efficiency was 86.6% and total revenue stood at about US\$14.5 million in 2017.

The rural areas served by the Ministry of Natural Resources, Department for Water Supply (NH/DWV), most of which are in the Interior, comprise approximately 40 systems. Most of the water supply infrastructure in the regions remote from the capital was damaged in the late 1980s and early 1990s, during the civil war. Since then, little has been done to improve the situation. Some of the problems experienced are: (i) depleted infrastructure, with Non-Revenue Water (NRW) levels estimated to be over 60% in the peri-urban and rural coastal areas; (ii) difficulties in servicing large areas with low population density; (iii) absence of a systematic revenue collection mechanism; (iv) lack of data on management and performance and absence of an information collection system; (v) potential mercury pollution from gold-mining processes and untreated wastewater in the Interior, where surface water is the most common source of supply; (vi) absence of a water quality program; and (vii) limited inspection, control and enforcement on the production and distribution systems. Due to these difficulties, during the last decade the Government of Suriname (GOS) has been implementing a program to hand over water supply responsibilities in the semi-urban and rural coastal areas from NH/DWV to SWM. These systems are often handed over in poor condition. Apart from the urgent need for rehabilitation, there is the need to connect the existing customers to SWM supply as well as billing system.

¹Water Supply and Sanitation Sector Diagnostic- KlasRingskog, 2005.

²Water Resources Assessment of Suriname – US Army Corps of Engineers, 2001

³Health Situation in the Americas, Basic Indicators 2009, PAHO.

⁴In its 2008 report, the Association of Water and Sanitation Regulatory Entities of the Americas reported an average for the region of 4 staff per 1,000 connections, with a maximum of 10.5 and a minimum of 1.3. A high ratio often indicates inefficient use of staff. A low ratio may indicate high operational efficiency.

In 2010, the Water Supply Master Plan (WSMP) for Suriname was developed under a technical cooperation financed by the Inter-American Development Bank (IDB) (SU-T1045; ATN/SF-11374-SU). Some of the more relevant problems encountered in the system, are summarized as follows: old infrastructure; insufficient maintenance and rehabilitation of the infrastructure; inefficient energy use; increasing demand for water; lack of an integrated management information system within SWM; lack of financial resources and autonomy; uncertainty of the aquifer's safe yield; and lack of a comprehensive water quality monitoring system.

The Water Supply Infrastructure Rehabilitation Program (2451/OC-SU; SU-L1018) was formulated in 2010 to respond as a first step in addressing the most pressing issues in water supply in priority districts of the coastal area and in strengthening the growing institutional and executing capacity of the SWM. The objective of this operation was to improve the access to water of the population of Suriname through the rehabilitation of key potable water infrastructure and the strengthening of SWM, the water utility in Paramaribo and coastal areas. Additional support was provided through the technical cooperation Assessment of Aquifer Potential and Groundwater Level (ATN/OC-14410-SU; SU-T1070) to address the need of the aquifer water supply management.

II. Core criteria. Project performance

2.1. Relevance

Considering the need to improve the SWM's water supply operations, the SWM and the IDB, in consultation with the GOS, agreed that the operation's work would concentrate on increasing the SWM's operational efficiency, and strengthening SWM's capacity for operating and maintaining its systems. The program was thus consistent with the GOS's aspirations for much needed investments due to the dilapidated state of the networks. The program is also aligned with the IDB's Country Strategy for Suriname.

a. Alignment with country development needs

The Program was developed as part of the implementation of the Water Supply Master Plan for Suriname, which aimed at determining the infrastructure investment and institutional strengthening needed to meet growing water demands for the entire country to the year 2024. Accordingly, the Program was designed to improve efficiency and quality of the potable water services provided in the coastal area of Suriname by decreasing the level of NRW, through the development and implementation of a NRW program; improving the water supply distribution system in priority districts of the coastal area through rehabilitation works; and strengthening SWM performance by improving operations and maintenance, incorporating a management information system and decreasing energy consumption. Based in these considerations, this report concludes that the program constituted a justified response to the needs for operational and institutional improvement on the water supply services provided by SWM.

The program development objectives were aligned with GOS's priorities and objectives which, according to the Multi-Annual Development Plan for 2006-2011, aim to increase the percentage of the population with clean drinking water. The sub-goals of the Plan were: (i) increasing water supply and supply sustainability (reducing NRW levels and increasing production); (ii) protecting and guaranteeing a reliable

and affordable provision of quality potable water; (iii) improving the efficient use of water; and (iv) regulating the protection, rational management and utilisation of the water resources. The program design was also aligned with the country's realities and development needs as it contributed to the implementation of the 2011 Water Supply Master Plan for Suriname which envisaged the rehabilitation and expansion of the water supply network in Greater Paramaribo.

b. Strategic Alignment

The program was executed during a period of almost seven years during which there were three different IDB Country Strategies for Suriname (CSS). The program was consistent with IDB's CSS (2007–2010) which recognized the importance of increasing access to basic services for expanding opportunities of the Surinamese people. As the program proposed to improve efficiency of the SWM, a state-owned company for delivering services of higher quality, it was also aligned with the Public-Sector Modernization pillar. The program was also consistent with the IDB's CSS (2011–2015), which sought to support the transition to modern public governance structures, diversifying the economy, and expanding social benefits. Water and sanitation was also listed as an area of continued dialogue between the GOS and IDB. The CSS (2016–2020) aims support economic stabilization, complemented by a longer-term view on modernization of the public and private sectors. The longer-term priorities focus on modernization of the state, private sector development and strengthened human capital. In this line, the program alignment with the latest CSS is in strengthening SWM to improve its efficiency as part of the state own enterprises.

The Program strategic alignment contributed to the improvement of development challenges defined in the Update to the Institutional Strategy (UIS). It specifically contributed to: (i) Social inclusion and equality by providing access to an improved water supply network to more than 16,650 households, therefore, providing inclusive water supply services (access and quality) and infrastructure services; (ii) Productivity and innovation, by contributing to SWM providing adequate water supply infrastructure through the rehabilitation of more than 55km of water supply network, the development and implementation of the NRW strategy, and the implementation of the energy efficiency pilot project; (iii) Institutional Capacity and Rule of Law, contributing to the improvement of the quality of services provided by SWM (a state-owned enterprise) through the Institutional Strengthening activities of the Program; and (iii) Climate Change, by contributing to the reduction of water losses and energy consumption, which is relevant considering the oil-based energy grid of the country.

c. Design relevance

The analysis of the design relevance will focus in the vertical logic and the adjustments of the original results matrix.

First, the vertical logic of the program was examined through an evaluation of the rationale behind each of the four components that comprised the program, as explained below.

Component 1: Water Supply System Rehabilitation

Considering the problems of the water supply system (see introduction) this component sought to rehabilitate secondary and tertiary networks in areas of Wanica and Para where the distribution system was being handed over from NH/DVW to SWM. It was structured based on the preliminary findings of the 2010 Water Supply Master Plan and included: (i) the completion of the final designs for water supply system rehabilitation; (ii) replacement of approximately 16 km of asbestos-cement pipes; (iii) replacement of 35

km of secondary distribution network; (iv) deeper re-laying of 70 km of secondary distribution network; (v) installation of 3,000 household meters in Wanica and Para; (vi) replacement of 5,000 household connections, including water meters and piping in Leidingen, an area within the Wanica district; and (vii) replacement of 7 km of an old cast-iron pipeline. The resulted outcomes were identified as 11,600 households connected to an upgraded water supply network. This was considered the central component of the Program since it involved direct service improvements to customers. Its estimated cost was 50% of the total direct program costs.

This sequence of actions constitutes a logical and valid cause-effect progression between the proposed outputs and the expected outcomes. Each output in this component contributes directly to the improvement in the water supply network; i.e. final designs are critical for bidding documents and contract for the required works, replacement of aged asbestos and cast-iron pipes, as well as secondary distribution network pipes, and installation of micrometers collectively contribute to network improvement and result in the outcome of improved efficiency and quality of the water supply service provided in the project area. The definition of outputs and outcomes is appropriate; the outcome is measuring “real” access by computing households connected. The component and the specific outcome also contribute to the specific objective of the program “improve water supply distribution”. Figure 1 summarizes this causal relationship.

Component 2: Non-Revenue Water Program

Considering the estimated levels of NRW, this component included the development of a management plan on NRW in Paramaribo and Wanica to minimize losses through the optimized operation of the distribution system. It was based on the recommendations of the on-going Water Supply Master Plan and included the following activities: (i) development of a network modeling and integration with the existing information system; (ii) implementation of a network simulation model; (iii) installation of 80 flow and pressure meters in the network; and (iv) training of SWM staff on NRW. The resulting outcomes were identified as an increase to 20.56m³/year of potable water billed and reduction in NRW in project areas to 35%.

This component was considered a key component in the program’s overall long-term sustainability objectives. The NRW reduction action plan was executed in 3 pilot areas, District Metered Areas (DMA). The installation of flow and pressure meters aimed to improve data accuracy. NRW reduction Strategy, Revenue Protection plan, Hydraulic Models of DMA’s and water audit guidelines would improve efficiency and quality of the potable water services provided by SWM. Its estimated cost was equivalent to 17.5% of the total direct program costs. This sequence of actions constitutes a logical and valid cause-effect progression between the proposed outputs and the expected outcomes. Each output under this component contributed to the outcome of reduction in NRW: the NRW Action Plan along with the simulation model described the interventions to be undertaken as well as the necessary monitoring of losses, and the NRW reduction works including installation of flow and pressure meters is directly related to reduction of NRW. Training of SWM staff is critical to assuring sustainability of the intervention. The outcomes contribute directly to the main objective of the program (improve efficiency and quality of the potable water services), specifically to the specific objective “decrease level of NRW and strengthen SWM performance”. Figure 1 summarizes this causal relationship.

Component 3: Energy Efficiency Pilot Project.

This component was based on the results of the energy audit financed through a regional technical cooperation “Energy Efficiency for Caribbean Water and Sanitation Companies” (ATN/OC-11286-RG)

and intended to address the need to improve energy use within SWM facilities. It included: (i) purchase of portable measuring equipment and improvement of measuring procedures and practices; and (ii) replacement of inefficient pumping equipment and operational improvements of electric motors in eight locations selected in the most populated project area. The resulting outcome was identified as a reduction in the energy consumption of the 8 selected pilot facilities to 10,000 MWh/year. This sequence of actions constitutes a logical and valid cause-effect progression between the proposed outputs and the expected outcomes. The outcome contributes to the general objective of the program (improve efficiency of the potable water services), offering an appropriate vertical logic for this component. Figure 1 summarizes this causal relationship.

Component 4: Institutional strengthening.

Considering the need to strengthen SWM's capacity of operating and maintaining its systems, as well as the need to facilitate the handing-over of facilities from NH/DWV to SWM this component was focused on Institutional Strengthening activities. It included: (i) capacity building activities on operation and maintenance and energy efficiency for 15 SWM staff; (ii) NH/DWC staff trained on water quality; and (iii) management information system integration and upgrade of the major Information and Communication Technology (ICT) servers. The resulting outcomes were identified as the reduction of the time response to complaints from 10 to 5 days and an increase in staff-hours spent on maintenance activities, given the expected increase capacity of SWM on operation and maintenance as well as the integration and use of IT systems towards this end. This sequence of actions constitutes a logical and valid cause-effect progression between the proposed outputs and the expected outcomes. Outputs and outcomes also contribute to the objective of improving efficiency of the water services provided, specifically to the specific objective "strengthen SWM performance". Figure 1 summarizes this causal relationship.

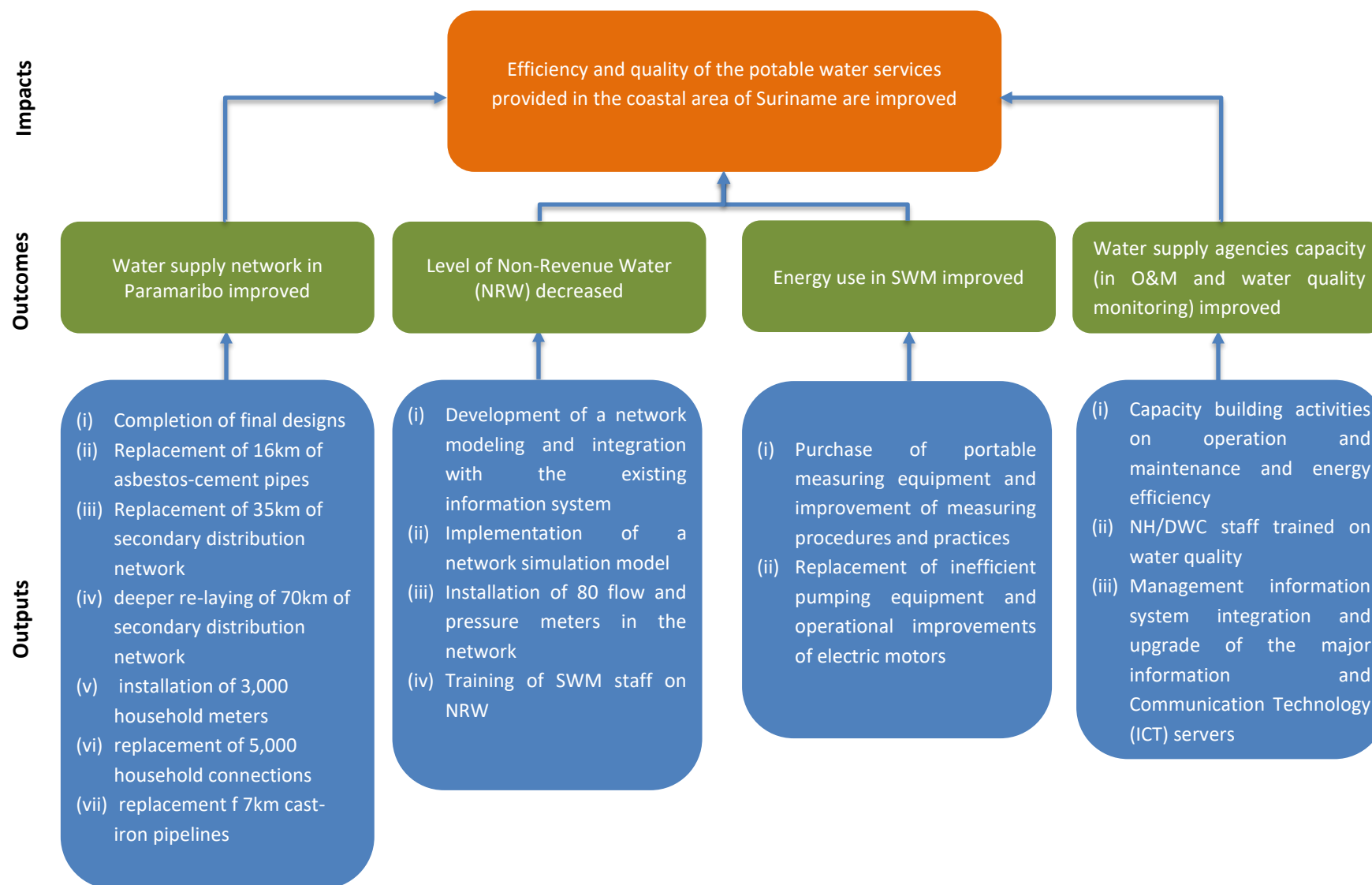
The original results matrix was adjusted during the program execution. The main changes are described in the electronic link 2. A review of the changes introduced in the Results Matrix after project approval indicates that modifications were made to reflect the realities of the project as the actual needs of the interventions became clearer, in several cases this involved adjusting the final targets. Other adjustments to outputs are related to the description of the related activity. Overall, these changes did not significantly alter the basic program objectives (as the activities involved were the same), the vertical logic of the program nor modified the essence of the individual components; and were made to reflect more accurate values through progressive elaboration of the interventions. All modifications were agreed with the executing agency and reflected on the annual operations plans and semiannual reports. Table 1. shows in details outcomes modified.

With the contributions of the outputs and the resulting outcomes, the overall impact of the project is improved efficiency of SWM operations and the quality of potable water services in the project area, which is depicted in the figure below. The central outcome is water supply network in Greater Paramaribo improved to which all other outcomes (i.e. level of NRW reduced, energy use in SWM improved, and SWM capacity in O&M and water quality monitoring improved) contribute. Sustainability of the investments would be assured via the link between a strengthened SWM management of the assets that constitute the water supply network.

Table 1. Results Matrix (@ approval, 60 days after reaching eligibility and @exit).

Indicators	At approval			At eligibility + 60 days			At project completion (PCR)			Comments
	Unit of measure	Baseline	EOP (P)	Unit of measure	Baseline	EOP (P)	Unit of measure	Baseline	EOP (A)	
Improve efficiency and quality of the potable water services provided in the coastal zone of Suriname										
Outcome 1. Water supply network in Greater Paramaribo Improved										
1.1 Households connected to an upgraded water supply network	Households	0	11,600	Households	0	11,600	Households	0	16,650	The target was exceeded due to the execution of additional interventions in the network. Originally the indicator was described as “Households benefitting from the improved water supply network”. The definition was revised to match the Bank CRF indicators.
Outcome 2. Level of Non-Revenue Water (NRW) decreased										
2.1 Volume of potable water billed	M m³/year	18.64	20.56	M m³/year	16.7	18.45	M m³/year	16.7	24.4	The nature of the indicator was not modified. The baseline and EOP target were adjusted at the eligibility stage to reflect the most updated information. The target was exceeded as a result of the NRW strategy and implementation.
2.2 Level of Non-Revenue Water (NRW) in areas targeted by the project through the NRW program	%	45	35	%	45	35	%	45	39.1	There were no modifications to the indicator.
Outcome 3. Energy use in SWM improved										
3.1 Energy Consumption in the 8 pilot facilities	MWh/year	13,000	10,000	MWh/year	13,000	10,000	MWh/year	13,000	12,133	The nature of the indicator was not modified. The energy consumption EOP target was modified in 2015 in line with an audit conducted by the Consultancy Firm supporting implementation of Component 3.
Outcome 4. Water supply agencies capacity (in O&M and water quality monitoring) improved										
4.1 Increase in number of staff-hours spent on maintenance activities per year	%	N/A	10	-	-	-	-	-	-	The outcome indicator was removed at eligibility stage due to the lack of an adequate mechanism to monitor indicator.
4.2 Time response to complaints	days	10	5	days	10	5	days	10	5	

Figure 1. Vertical logic



2.2 Effectiveness

a. Statement of development objectives

The general objective of the proposed project is to improve efficiency and quality of the potable water services provided in the coastal area of Suriname. The specific objectives are: (i) decrease the level of Non-Revenue Water (NRW), through the development and implementation of a NRW program; (ii) improve the water supply distribution system in priority districts of the coastal area through rehabilitation works; and (iii) strengthen SWM performance by improving operations and maintenance, incorporating a management information system and decreasing energy consumption. The assessment of the program effectiveness was based on a factual assessment of the extent to which the project achieved or is expected to achieve its intended objectives and outcomes established at the beginning of the program. For evaluation purposes, project objectives encompass both the objectives stated in the project documents and associated outcomes and outcome indicators, baselines and targets.

b. Results Achieved

The effectiveness assessment was based on an evaluation of the extent to which the project achieved, or is expected to achieve, its intended objectives, outcomes, and outputs established at the beginning of the program.

Next table summarizes the outcomes and outputs originally planned under each component (results matrix approved 60 days after eligibility⁵), revised, and the actual results obtained. The results indicate that the effect of some of the interventions is still to be fully realized and that progress is still possible in some key outcome indicators.

⁵ Eligibility on November, 17th, 2011

Table 2. Results Achieved Matrix

Outcome/Indicator	Unit of Measure	Baseline value	Baseline year	Targets and Actual achievement		% Achieved (Start-Up Plan)	% Achieved (Revised Annual Target)	Means of verification
Outcome #1 Water supply system rehabilitated								
1.1 Households connected to an upgraded water supply network ⁶	households	0	2010	P	11,600	100%	100%	Supervision Firm final report.
				P(a)	10,000			
				A	16,650			
Outcome #2 Level of NRW decreased								
2.1 Volume of potable water billed	Mill m3/year	16.70	2010	P	18.45 ⁷	100%	100%	Supervision firm final report.
				P(a)	18.45			
				A	24.40			
2.2 Level of Non-Revenue Water (NRW) in areas targeted by the project through the Non-Revenue Water (NRW) program	Percentage points	45	2010	P	35	59%	59%	Supervision firm final report.
				P(a)	35			
				A	39.1			
Outcome #3 Energy use in SWM improved								
3.1 Energy consumption in the 8 pilot facilities	MWh/year	13,000	2009	P	10,000	29%	108%	SWM reports.
				P(a)	12,200			
				A	12,133			
Outcome #4 Water supply agencies capacity (in O&M and water quality monitoring) improved ⁸								
4.1 Time response to complaints	days	10	2010	P	5	100%	100%	SWM reports.
				P(a)	5			
				A	5			

⁶ Originally the indicator was described as “Households benefitting from the improved water supply network”. Definition revised in the Results Matrix defined 6 days after the eligibility to match the CRF indicators.

⁷ In the original results matrix (loan document) the target was 20.56. This number was revised in the Results Matrix defined 60 days after the eligibility.

⁸ The loan document included another outcome “Increase in amount of staff-hours spent on maintenance activities per year” that was eliminated in the Results Matrix defined 60 days after the eligibility.

Output	Unit of Measure	Baseline value	Baseline year	Targets and Actual achievement		% Achieved (Start-Up Plan)	% Achieved (Revised Annual Target)	Means of verification
Component #1 Water Supply System Rehabilitation ⁹								
1.1 Asbestos pipes replaced	Km	0	2010	P	16	100%	100%	Supervision firm final report
				P(a)	22			
				A	22.6			
1.2 Secondary distribution network pipes replaced	km	0	2010	P	35	36%	100%	Supervision firm final report
				P(a)	12.5			
				A	12.5			
1.3 Secondary distribution network pipes re-laid	km	0	2010	P	70	16%	100%	Supervision firm final report
				P(a)	11			
				A	11			
1.4 Micrometers purchased and installed in Wanica and Para	Micrometers	0	2010	P	3,000	0%	NA	
				P(a)	Eliminated			
				A	Eliminated			
1.5 Household connections (including micro meters) in Leidingen replaced	km	0	2010	P	5,000	100%	100%	Supervision firm final report
				P(a)	5,000			
				A	5,000			
1.6 Cast Iron pipe replaced with PVC pipe	km	0	2010	P	7	100%	100%	Supervision firm final report
				P(a)	7			
				A	7			
Component #2 Non-Revenue Water Program ¹⁰								
2.1 Flow and pressure meters installed	meters	0	2010	P	80	100%	88%	SWM reports.
				P(a)	101			
				A	89			
2.2 Suriname Water Company (SWM) Staff trained on Non-Revenue Water (NRW)	people	0	2010	P	10	100%	100%	SWM reports.
				P(a)	15			
				A	30			
2.3 Non- Revenue Water (NRW) Action plan (on interventions	Program	0	2010	P	1	100%	100%	SWM reports
				P(a)	1			

⁹ The loan document included another output “Final design completed” that was eliminated in the Results Matrix defined 60 days after the eligibility.

¹⁰ The loan document included another output “Network modeling and integration within the existing information system completed” that was eliminated in the Results Matrix defined 60 days after the eligibility

Output	Unit of Measure	Baseline value	Baseline year	Targets and Actual achievement		% Achieved (Start-Up Plan)	% Achieved (Revised Annual Target)	Means of verification
related to NRW reduction) completed ¹¹				A	1			
2.4 Non- Revenue Water (NRW) program implemented by the Suriname Water Company (SWM) ¹²	Program	0	2010	P	1	100%	100%	SWM reports
				P(a)	1			
				A	1			
Component #3 Energy efficiency pilot project								
3.1 Portable measuring equipment purchased	Equipment	0	2010	P	12	100%	100%	SWM reports
				P(a)	12			
				A	12			
3.2 Pumping stations optimized (rehabilitated, calibrated, etc.)	Pumping stations	0	2010	P	8	75%	75%	SWM reports
				P(a)	8			
				A	6			
Component #4 Institutional Strengthening								
4.1 Suriname Water Company (SWM) Staff trained on energy efficiency ¹³	People	0	2010	P	21 ¹⁴	100%	100%	SWM reports
				P(a)	21			
				A	41			
4.2 Department for Water Supply under the Ministry of Natural Resources (NH/ DWC) Staff trained on water quality	People	0	2010	P	5	100%	100%	SWM reports
				P(a)	20			
				A	21			
4.3 Management Information System upgrades completed	Systems	0	2010	P	1	100%	50%	SWM reports
				P(a)	2			
				A	1			

¹¹ The output 2.3 “Final designs for civil works (on network rehabilitation and interventions related to NRW reduction) completed” was modified in August 2016 to define this new indicator.

¹² Included in the Results Matrix defined 6 days after the eligibility. It was not in the original results matrix

¹³ The original indicator includes training in energy efficiency and O&M. In March 2013 the executing agency requested to have separated outputs for the O&M training and the energy efficiency training.

¹⁴ Convergence shows “21” as original target, but the correct number is 15 (original target in the loan document and 60 days after eligibility). The target was revised (from 15 people to 21 people) in March 2013.

Output	Unit of Measure	Baseline value	Baseline year	Targets and Actual achievement		% Achieved (Start-Up Plan)	% Achieved (Revised Annual Target)	Means of verification
4.4 Information and Communication Technology (ICT) Servers and server room upgraded ¹⁵	servers	0	2010	P	2	100%	100%	SWM reports
				P(a)	2			
				A	2			
4.5 Suriname Water Company (SWM) Staff trained on Operation and Maintenance (O&M)	people	0	2010	P	20	100%	100%	SWM reports
				P(a)	20			
				A	20			

Where: P = Start-Up Plan; P (a) = Revised Annual Target; A = Actual.

¹⁵ Included in the Results Matrix defined 60 days after the eligibility. It was not in the original results matrix. The statement was modified from “Information and Communication Technology (ICT) Servers upgraded” to “Information and Communication Technology (ICT) Servers and server room upgraded” to include all the activities done under this indicator.

For Component 1, the outcome indicator of “Households connected to an upgraded water supply network”¹⁶ was fully achieved (16,650) and it is in fact above the original target (11,600) and the revised target (10,000). The achievement of the outcome indicator is due to the successful completion of the network rehabilitation works (Table 2). The increase on the number of beneficiaries is a direct consequence of the additional interventions the executing agency included as program activities after the downward adjustment of the end of project targets for some outputs in the same component (as explained in electronic link 2) which made financial resources available for other works. The output “micrometers purchased and installed in Wanica and Para” was eliminated to avoid repetition given the nature of output “Household connections (including micro meters) in Leidingen replaced” was similar in scope and geographic location. The target for the Secondary distribution network pipes replaced was reduced by more than half (from 35 km to 12.5 km) to prioritize the intervention in the transmission line at Domburg (instead of the distribution). Finally, cancellation of the deeper relaying of pipes in La Vigilantia and Leidingen”, linked with the output “Secondary distribution network pipes re-laid” was done considering several challenges: (i) some pipes where not re-laid due to safety reasons and proximity to electricity line poles; (ii) the conditions of the pipes were assessed as satisfactory to SWM; (iii) SWM would derive more benefits from replacement of asbestos pipes. A portion of this available resources was also utilized to procure additional materials that will be used for the replacement of asbestos pipes in the distribution network at Flora, Kwatta, and Welgelegen after project completion. Therefore, the program is expected to contribute to an additional 4,000 households with upgraded water supply network in 2018-2019.

The NRW component aimed at reducing the level of NRW, and two outcome indicators were identified: (i) the volume of water billed; and (ii) the level of NRW in areas targeted by the project. While most of the outputs for the component were satisfactorily completed only the outcome of volume of water billed was achieved and exceeded, the amount of water billed reported in 2010 increased from 16.7 mill m³/year to 24.4 mill m³/year in 2016 above the target of 18.45 mill m³/year. While the level of NRW was also reduced from 45% in 2010 baseline year to 39.1% in 2016, it was above the 35% target. The main contributors to the achievement of the outcome targets are the activities implemented under the program outputs, which were guided by the NRW Strategy prepared under the program. Part of the execution of the NRW strategy included water audits in 3 pilot District Metered Area’s: Republiek, Kwatta and Morgenstond. In 2014 the NRW in Republiek was 37.4% and after project activities the NRW was 33.0% in 2016. At Kwatta the baseline measured in 2015 was 16.4%, which was reduced by end of project to 9.9%. The largest DMA, Morgenstond started with an NRW of 40.5% and after project activities it was reduced to 31.7%. All outputs under the component were successfully achieved, except for the number of flow and pressure meters installed. While 101 flow and pressure meters were procured after the revision of the target, only 89 were installed, the remainder will be installed after project completion, since SWM was finalizing designs of additional DMAs, therefore the location for installation of the meters was not final. However, the original target (80 meters installed) was achieved. The indicator “Final designs for civil works (on network rehabilitation and interventions related to NRW reduction) completed” was modified to “Non- Revenue Water (NRW) Action plan (on interventions related to NRW reduction) completed” in August 2016 as the NRW interventions were focused on metering, enhancing the telemetry system for pressure and flow monitoring, and creation of DMAs. It did not involve the design of network rehabilitation interventions.

¹⁶ Originally the indicator was described as “Households benefitting from the improved water supply network”. Definition was revised in the Results Matrix defined 60 days after the eligibility to be more precise on the targets of the indicator, providing better quality on the statement.

As for Component 3, the 2009 energy consumption baseline for the 8 pilot stations was 13,000 MWh/year, and it was expected that with the optimization of the pilot stations the energy consumption would be reduced to 10,000MWh/year. However, in 2015, the target was modified to 12,200 MWh/year in line with recommendation of the consultant supporting the execution of the component. The revised target considered the need for SWM to increase production and complete network adjustments to the hydraulic and energy efficiency models prior to fully implementing the initial energy reduction recommendations. Additionally, it considered the fact that some of the submersible pumps installed at the different stations were not fully performing as expected with regards energy efficiency. For at least 2 of the pilot stations, SWM is planning to further increase production capacity during 2018-2019. Despite the challenges, SWM has reported savings amounting 867 MWh/year. This outcome is linked with the output “pumping stations optimized”, that by the end of the project only achieved 75% of the expected target (6 pump stations were optimized). The optimization of all pump stations was not completed at the end of the project due to the need to further define the technical specifications for pumps to optimize the stations based on the adjusted hydraulic and energy models, which caused delays in the commencement of procurement processes and ultimately the achievement of the output target. Nonetheless, the achievement of the revised outcome target was met, and it is expected that SWM will be able to achieve further savings in energy consumption once the production of the stations is defined and based in the hydraulic and energy models are adjusted.

The institutional strengthening component aimed at improving the operation and maintenance and water quality capacities of the SWM. Originally two outcome indicators were identified¹⁷, although only one was finally set for the component in the results matrix approved sixty days after the eligibility of the program. The outcome indicator identified was the response time to complaints. The target was fully achieved, SWM time response to complaints is currently 5 days. The outputs for the component were also fully achieved according to the original targets. If we analyze the revised targets, the upgrade of one of the information systems was not achieved, this is the Customer Relationship Management (CRM) system. The target however was fully achieved in 2018 after the project completion. The shortfall in the upgrade of this system was due to a late procurement process emanating from delays in the definition of the requirement for the system. In the execution the testing and completion of system to go live took longer than expected. During the project implementation the customers of NHDW areas were taken over and adjustments were made in the pricing and categorization of customers. Given the relevance of the CRM, it is understandable that the management of SWM had to be totally comfortable with the change of the system and clearly define the new capacities and specifications. In order to better analyze the training for the SWM staff, the output indicator “Suriname Water Company (SWM) Staff trained on O&M and energy efficiency” was revised and two separated indicators were defined (one for O&M and another for energy efficiency).

c. Counterfactual Analysis

While the program did not consider conducting an impact evaluation, related literature suggests that the interventions implemented by the program are expected to be associated with improvements in the outcomes of interest, as the evidence for other countries that have implemented similar policies has shown. The following section presents the analysis of international and regional review of the literature that shows the relationship between the products generated in the case of Suriname program and the intended outcomes. While other factors out of control of program (such as increased water supply demand and policy decisions of the operator) might have affected the outcome indicators, overall the literature review conducted for this

¹⁷ Increase in amount of staff-hours spent on maintenance activities per year and Time response to complaints

attribution analysis suggests that it is fair to expect that the interventions implemented by the program produced observed improvements in the outcomes.

Outcome No. 1: Water supply network in Greater Paramaribo improved

What is financed?

- Asbestos pipes replaced
- Secondary distribution network pipes replaced and re-laid
- Household connections in Leidingen replaced
- Cast Iron pipe replaced with PVC pipe

Results:

- Households connected to an upgraded water supply network

Deteriorated water supply infrastructure is a potential threat to quality of water transportation system and to water quality¹⁸. It has been known that asbestos pipes could contribute to the numbers of asbestos fibers in conveyed water in the distribution system and that the age of the pipes is a contributory factor.¹⁹ Preventive maintenance activities of supply network infrastructure (products 1.1, 1.2, 1.3, 1.4, 1.5) maximize its useful life and contributes to more efficient service delivery.²⁰ There is empirical evidence that corroded iron pipes may lead to increase in concentration of Fe, turbidity, decay of disinfectant residual and suspension of iron particles that give tap water yellow, browns color of a dirty appearance.²¹ Quality of potable water is threatened by contamination due to corrosion of pipes, faucets and fixtures.²² In addition, replacement of old iron pipes by PVC pipes (product 1.5) not only removes the corrosion problem, but also contributes to improvement in water supply network by reducing leakage rate.²³ The program contributed to bringing the water supply network to acceptable level of quality by producing all 5 outputs comprised in Component 2. Replacement of aged asbestos and cast-iron pipes, as well as secondary distribution network pipes, and installation of micrometers jointly contribute to network improvement and result in the improved efficiency and quality of the provision of water supply service.

Outcome No. 2: Level of NRW decreased

What is financed?

- Flow and pressure meters installed
- SWM staff trained on NRW
- NRW Action Plan on NRW completed
- NRW program implemented by SWM

¹⁸ T. L. Gerke, J. B. Maynard, M. R. Schock, D. L. Lytle, Corros. Sci., 50 (2008) 203; L. L. Machuca, L. Murray, R. Gubner, S. I. Bailey, Mater. Corros., 65 (2014) 8.

¹⁹ E.P. White, J. Mordak and J. Wheeler (1988): Deterioration of Asbestos Cement Water Mains (MSP 9731 SLD) Final Report to the Department of Environment,

²⁰ The IDB's Water and Sanitation Sector Framework, par. 2.23 and studies cited there.

²¹ . C. Y. Peng, G. V. Korshin, R. L. alentine, A. S. Hill, M. J. Friedman, S. H. Reiber, Water Res.,44 (2010) 4570

²² Masters, Sheldon 2015. "Lead and Copper Contamination in Potable Water: Impacts of Redox Gradients, Water Age, Water Main Pipe Materials and Temperature", PhD Dissertation Virginia Polytechnic Institute and State University.

²³ Lambert, Allan 2002. "What do we Know About Pressure-Leakage Relationship in Distribution Systems?" IWA Conference 'System Approach to Leakage Control and Water Distribution Systems Management' Brno, Czech Republic, May 2000

Results:

- Volume of potable water billed
- Level of NRW in targeted areas

A World Bank (WB) discussion paper on challenges of reducing the NRW²⁴ concludes that NRW reduction is inherently complex. In addition to adoption of technical approaches, such as installation of water and pressure meters (product 2.1), it also requires comprehensive assessment and effective implementation of the NRW programs (products 2.1 and 2.4). The document also points out that tackling the NRW reduction problem is often exacerbated by the lack of necessary managerial capacity among utilities staff. In this sense, building specific skills in managerial force (product 2.2) needed to face the NRW reduction problem is an efficient way to address this problem. On the other hand, the IWA Water Loss Task force report²⁵ stresses the importance of appropriate and adequate use of water meters (product 2.1) for successful reduction of water losses from distribution systems.

Outcome No. 3: Energy use in SWM improved

What is financed?

- Portable measuring equipment purchased
- Pumping stations optimized (rehabilitated, calibrated, etc.)

Results:

- Energy consumption in the 8 pilot facilities

The energy consumption represents an important part of management and maintenance expenses, with shares around 30%.²⁶ The IDB's Water and Sanitation Sector Framework review of the evidence concludes that "efficient energy use, particularly in systems that involve significant pumping of water (drinking water and wastewater) or water production and treatment, [are] aspects that have a major impact on costs in the Caribbean region (representing on average 30% to 40% of operating costs)".²⁷ There is empirical evidence that corroborates that energy consumption in water supply systems depends on the pumping energy of pumping stations (product 3.2) and is directly related to quantity and quality of supplied water.²⁸ In addition, a study analyzing the electricity cost of pumping highlights that improved operation of pumps (products 3.1, 3.2) lead to a reduction in energy cost.²⁹ Also, a report by the United States Environment Protection Agency (EPA) points out that efficient pumping systems (products 3.1, 3.2) provide an opportunity for efficient energy use in water facilities.³⁰ Given that the project provided optimization of the pumping station

²⁴ The Challenge of Reducing Non-Revenue Water (NRW) in Developing Countries – How the Private Sector Can Help: A Look at Performance-Based Service Contract' (World Bank, December 2006) available at: <https://siteresources.worldbank.org/INTWSS/Resources/WSS8fin4.pdf>

²⁵ Rizzo, Alex, Pearson, David, Stephenson, Matthew and Harper, Neil; Apparent Loss Control: A practical Approach; International Water Association (IWA), Water 21 seventh article, IWA Task Force, June 2004.

²⁶ Venkatesh, G., & Brattebø, H. (2011). Energy consumption, costs and environmental impacts for urban water cycle services: Case study of Oslo (Norway). *Energy*, 36(2), 792-800. <https://doi.org/10.1016/j.energy.2010.12.040>

²⁷ The IDB's Water and Sanitation Sector Framework, par. 2.23

²⁸ Idem footnote 8

²⁹ Jowitt, P. W., & Germanopoulos, G. (1992). Optimal pump scheduling in water-supply networks. *Journal of Water Resources Planning and Management*, 118(4), 406-422. [https://doi.org/10.1061/\(ASCE\)0733-9496\(1992\)118:4\(406\)](https://doi.org/10.1061/(ASCE)0733-9496(1992)118:4(406))

³⁰ Evidence from technical documents. US EPA Energy Efficiency in Water and Wastewater Facilities: A Guide to Developing and Implementing Greenhouse Gas Reduction Programs, 2013, available at <https://www.epa.gov/sites/production/files/2015-08/documents/wastewater-guide.pdf>

and the equipment measuring it, it is safe to expect that the improvements achieved in energy consumption in the 8 pilot facilities are related to the optimization of the pump station financed by the project.

Outcome No. 4: Water supply agencies capacity (in O&M and water quality monitoring) improved

What is financed?

- SWM Staff trained on energy efficiency
- NH/DWC Staff trained on water quality
- Management Information System upgrades completed
- Information and Communication Technology ICT Servers and server room upgraded
- SWM Staff trained on Operation and Maintenance (O&M)

Results:

- Time response to complaints

This component of the program focuses on institutional strengthening in water supply system through training of water supply agencies and provision of new information systems for better O&M and water quality monitoring. The IDB's Water and Sanitation Sector Framework review of the empirical evidence on what works in the W&S sector points out that (i) good management of a public company depends on company's management autonomy, clarity in the goals set, adequate transparency and accountability; (ii) trained personnel (products 4.1, 4.2, 4.5) is needed for the best practices in Operations and Management of water and sanitation systems to be implemented; (iii) information management systems and other information technologies (products 4.3, 4.4) potentially contribute to improvements in efficiency of water and sanitation services.³¹ It is worth noting that strengthening of Operations and Management and rehabilitation culture in utilities through personnel and technology training (products 4.1, 4.2, 4.5) contributes to strengthening of institutional capacity needed for sustainability of the program.³²

d. Unanticipated outcomes

No unanticipated outcomes have been identified.

2.3. Efficiency

a. Costs

The project was able to execute the procurements within the actual budget for goods and services. There were no costs overruns recorded for the project, in fact, SWM benefitted using savings and gains from exchange rate differences derived from the project and was able to acquire additional goods to strengthen their capacity to manage the NRW program, asbestos network replacement program, and the metering program.

³¹ Paragraphs 2.22, 2.24, 2.26 of the IDB's Water and Sanitation Sector Framework and studies cited there.

³² Paragraph 2.26 of the IDB's Water and Sanitation Sector Framework and studies cited there.

However, the project had a cumulative extension of 20 months, this responded to the low execution of the project during the first two years due to mainly a high turnover of appointed Project Management staff, and the unfamiliarity of the Executing Agency with Bank's procurement policies and methods. The Bank response to these challenges was to have increase supervision for the project, which included frequent interactions with the EA via supervision visits, video-conferences, and tele-conferences, as well as providing technical support to the EA by means of an external consultant, who was available to support in the preparation of technical specifications, review of bidding documents, plans, etc. The procurement specialist also provided additional support by conducting with SWM interactive sessions to clarify the procurement policies and having the bidding documents translated to Dutch for the use of the EA while facilitating bidding conferences to ensure better understanding of the Bank's requirements by the local contractors.

Considering that the Loan was the first one to be executed by SWM, design considerations could have included allocating financial resources to support the start-up of the Loan by providing a full-time consultant to support SWM during this stage. This could have aided to reduce the procurement policies and processes learning curve as well to accelerate the readiness of construction designs for the network rehabilitation.

Table 2 Costs of the Project

Component #1 Water Supply System Rehabilitation									7,154,790
Output Definition		2011	2012	2013	2014	2015	2016	2017	Cost
Asbestos pipes replaced	P	0		160,000	1,461,000	579,000			2,200,000
	P(a)			160,000	323,000	408,235	1,365,700	2,883,497	4,352,492
	A	0		0	305,540	482,185	681,270	2,426,782	3,895,777
Secondary distribution network pipes replaced	P	0		259,000	425,000	303,000			987,000
	P(a)			259,000	713,000	201,408	52,913	38,439	1,093,960
	A	0		0	774,369	159,718	121,434	49,173	1,104,694
Secondary distribution network pipes re-laid	P	0	24,115	132,000	699,000	580,000			1,435,115
	P(a)			132,000	100,000	638,688	1,247,945	9,161	279,560
	A	0	24,115	8,370	0	154,685	83,230	0	270,399
Household Connections (including micro meters) in Leidingen replaced	P	0	0	415,000	72,000	0			487,000
	P(a)	0	360,000	415,000	291,000	3,894		0	697,355
	A	0	0	420,924	272,537	3,894		0	697,355
Cast-Iron pipe replaced with Polyvinyl chloride (PVC) pipe	P	0		410,000	241,000				651,000
	P(a)			410,000	630,000	249,129	32,828	202,206	1,352,497
	A	0		0	613,555	4,617	532,119	36,274	1,186,565
Component #2 Non- Revenue Water Program									2,228,056
Output Definition		2011	2012	2013	2014	2015	2016	2017	Cost
Flow and pressure meters installed	P	0		120,000	650,000	230,000			1,000,000
	P(a)			120,000	500,000	247,539	203,165	34,034	543,608
	A	0		0	236,858	181,908	90,808	65,449	575,023
Suriname Water Company (SWM) Staff trained on Non-Revenue Water (NRW)	P	0		20,000	30,000				50,000
	P(a)			20,000		10,000	50,000	0	16,514
	A	0		0		0	0	0	16,514
NRW Action Plan (on interventions related to Non-Revenue Water reduction) completed	P	0	0	179,000	262,000	200,000			641,000
	P(a)		100,000	179,000		141,000	564,500	540,986	1,369,172
	A	0	0	0	0	76,500	751,686	476,377	1,304,563
Non-Revenue Water (NRW) program implemented by the Suriname Water Company (SWM)	P	0		90,000	410,000				500,000
	P(a)			90,000		138,025	345,448	0	266,904
	A	0		0	56,540	98,012	112,352	65,052	331,956
Component #3 Energy efficiency pilot project									534,688
Output Definition		2011	2012	2013	2014	2015	2016	2017	Cost
Portable measuring equipment purchased	P	0	2,112	40,000	0				42,112
	P(a)	0	2,000	40,000	18,791			0	42,030
	A	0	2,112	21,097	18,821			0	42,030
Pumping stations optimized (rehabilitated, calibrated, etc.)	P	0	10,000	100,000	180,000	170,000			460,000
	P(a)			100,000	106,000	74,750	334,894	314,098	445,428
	A	0	10,000	12,195	42,929	60,226	5,980	361,328	492,658

Component #4 Institutional strengthening
874,258

Output Definition		2011	2012	2013	2014	2015	2016	2017	Cost
Suriname Water Company (SWM) Staff trained on energy efficiency	P	0	10,000	0	2,000				12,000
	P(a)	0	10,000	0	2,000			0	11,951
	A	0	10,000	0	1,951			0	11,951
Department for Water Supply under the Ministry of Natural Resources (NH/DWC) Staff trained on water quality	P	0		22,000	8,000				30,000
	P(a)			22,000	42,000			0	42,127
	A	0		0	42,127			0	42,127
Management Information System upgrades completed	P	0		76,000	144,000				220,000
	P(a)			76,000	20,000	100,000	200,951	425,075	444,124
	A	0		0	5,715	13,334	0	489,801	508,850
Information and Communication Technology (ICT) Servers and server room upgraded	P	0		10,000	190,000	100,000			300,000
	P(a)			10,000		50,000	300,000	106,954	123,366
	A	0		0	0	0	16,412	273,635	290,047
Suriname Water Company (SWM) Staff trained on Operation and Maintenance (O&M)	P				50,000	53,000			103,000
	P(a)						84,533	0	6,032
	A					1,953	4,079	15,250	21,282

Other Cost		2011	2012	2013	2014	2015	2016	2017	Cost
Project administration	P	0	90,387	162,000	175,000	175,000	189,000		791,387
	P(a)	0	200,000	162,000	71,000	118,632	71,600	143,810	790,148
	A	0	90,387	124,926	112,830	206,709	111,487	529,920	
Auditing	P	0	0	0	40,000	40,000	40,000		120,000
	P(a)		24,000	0	32,500	13,410	31,662	29,880	80,288
	A	0	0	0	30,831	12,482	7,095	27,215	64,877
Work supervision	P	0	0	75,000	85,000	90,000			250,000
	P(a)		25,000	75,000	32,500	50,000	200,000	0	0
	A	0	0	0	0	0	0	0	0
Monitoring and Evaluation	P	0			30,000		30,000		60,000
	P(a)				14,781		14,781	25,000	41,931
	A	0		2,500	14,431		0	35,020	51,951
Contingencies	P	0	50		850,000	850,000			1,700,050
	P(a)							0	50
	A	0	50		0		0	0	50
Financial charges	P	0	0	45,000	45,000	45,000	45,000		180,000
	P(a)		36,000	45,000			172,829	0	10,941
	A	0	0	39,009	47,222	64,283	153,688	199,725	14,991
Project standard information campaign	P	0	0	13,400	21,000	19,600			54,000
	P(a)		13,600	13,400	27,000	5,000	54,000	0	0
	A	0	0	0	0	0	0	0	0
Total		2011	2012	2013	2014	2015	2016	2017	Cost
Total Cost	P	0	136,663.44	2,328,400	6,220,000	3,524,600	304,000		12,273,663
	P(a)	0	962,600	2,328,400	2,923,572	2,449,710	5,237,749	2,386,316	12,287,226
	A	0	136,663.44	629,021	2,576,256	1,520,506	2,671,639	5,051,001	12,585,087

b. Cost Benefit analysis

A cost-benefit analysis (CBA) was performed at the time of project analysis and before loan approval. The ex-ante socioeconomic assessment divided the operation in three sub-projects: (i) NRW and rehabilitation program (that included Component 1 and most of Component 2); (ii) water meter project (part of Component 2); and (iii) energy efficiency project (Component 3). For all of them an ex-ante CBA was carried-out. The NRW and rehabilitation program was economically viable, showing an Economic Rate of Return (ERR) of 19.4%; the water meter project was also economically viable with an ERR of 56.7%; and for the energy efficiency component, each individual project was evaluated separately and were economically feasible. An ex-post CBA was conducted for each sub-project following the same methodology used in the ex-ante CBA. The NRW and rehabilitation program is economically feasible with an ERR of 16.8% and a Net Present Value (NPV) of US\$1,240,317. The water meter project was also economically feasible with an ERR of 29.9% and a NPV of US\$ 544,171. Regarding the energy efficiency project, five of the eight pump stations were not economically feasible, mainly because the energy consumption savings achieved were lower than expected. Additionally, a CBA for the whole Program was conducted. Aggregating all the estimated benefits and the cost of the four components, the Program is economically feasible with an ERR of 13% and an NPV of US\$435,932. The details of the results are presented in the Annex (link).

2.4.Sustainability

a. General Sustainability Aspects

The sustainability assessment of this Program considers the conditions that could influence the continuation of the results already achieved and the achievement of future expected results. A review of the factors that contribute to or could potentially undermine project sustainability revealed that no significant or insurmountable risks exist that could erode long-term sustainability, nor that identifiable risks could not be properly mitigated. For infrastructure works the widely recognized overriding risk is the lack of proper operation, or adequate maintenance, of the rehabilitated water supply network and equipment. It was noted, however, that SWM is thoroughly familiar with the works completed in the network. In addition, further rehabilitation works (i.e. asbestos pipes replacement) are already in the SWM plan for 2018, since this is all part of the Water Master Plan (2011) on which SWM continues to base its capital investments. Notwithstanding the familiarity and the plans for continuous work in this area, there are other factors that will require SWM to strengthen its operations and maintenance program, that is, the fact that SWM continues to take over the areas that the Ministry of Natural Resources use to manage for water supply. The network supply of these areas is often in bad conditions and will require SWM to redouble efforts to improve the level of service. SWM is aware of this and is already planning an Operations and Management Audit³³ for SWM to identify further areas of operational performance and efficiency improvement.

With respect to the Non-Revenue Water Strategy, this is a key area where the positive results of the program can be further expanded with adequate management support and institutionalization of the initiative. While the initiative was well received from management during the Program execution, so far, there has not been a complete institutionalization of the strategy that would ensure keeping the momentum of the activities,

³³ The Operations and Management Audit is planned under the Technical Cooperation SU-T1102 currently under preparation.

which could reach a stalling point if not given attention. SWM acknowledges this and it is an aspect to be included in the Operations and Management Audit, to be financed under SU-T1102.

In relation to the Energy Efficiency component, the full benefits of the energy efficiency initiative are yet to be seen. Once completed, the expected positive results will be a driver for management adoption of any roll-over to other areas. Given SWM interest in improving the performance and efficiency of the company which was demonstrated by the request of a Technical Cooperation to conduct an Operations and Management Audit, the probability of the no-continuation of this initiative is very low.

As for the Institutional Strengthening component, the activities comprised different areas from water quality, energy efficiency and information technology. SWM has advanced the implementation of the safety plan demonstrating that water quality is given high importance in the organization and the sustainability of the actions under the program. For the IT activities, there is no indications of current negative factors that would affect the continuation of improvements in this area. SWM has shown its commitment to increase the efficiency of operations using updated IT technology for the areas of customer service and water quality. In addition, the IT department of SWM has shown adequate technical capacity to maintain the current systems. However, IT is still an area of great opportunities considering that the integration of the systems is yet to be accomplished and the emerging use of smart water tools that can be included in the systems of water utilities to improve decision-making and higher operation efficiencies.

b. Environmental and Social Safeguards

The Program was classified as Category “B” under IDB’s Environment and Safeguards Compliance Policy (OP-703) since the potential impacts were considered minor to moderate, and manageable through the implementation of mitigation measures. The potential environmental and social impacts or nuisance during water supply system rehabilitation were identified to be those typically associated with such construction activities that develop in or near urban areas, such as pollution due to waste generation, traffic disruption, occupational risks and increased risk of accidents due to construction works, traffic of vehicles and construction equipment, disruption and damage to public services and urban infrastructure. A critical activity identified replacement of asbestos cement pipes and the health risk associated with its handling. The risk of limited institutional capacity to manage environmental and social impacts was also considered at project’s preparation.

In response to the risks identified some of the key safeguard measures were the following: (i) ensuring strict compliance of contractors to the Environmental and Social Management Framework, and SWM environmental guidelines through the designation of supervision role to a third-party consultancy firm. The Supervisory firm had the contractual responsibility to verify compliance to recommended mitigation measures. The mid-term and final evaluations conducted did not identify the occurrence of serious construction complications or conflicts with stakeholders, based on the reports reviewed and the interviews conducted; (ii) the risk of handling asbestos cement pipes was mitigated by leaving the pipes underground, and connections to the new network being done only by SWM approved personnel who would utilize adequate personal protective equipment; (iii) the executing agency demonstrated sufficient capacity to manage environmental and social impacts in coordination with the National Institute for Environment and Development in Suriname (NIMOS). In addition, the supervisory firm provided support on the ground to ensure compliance to the environmental and social management framework.

It is concluded that the risks identified, the mitigation measures, and the initial classification were adequate for the Project.

Non-Core Criteria

1.1. Bank Performance

The IDB is a major stakeholder of this operation by its loan financing role. The IDB worked very closely with the SWM to ensure the successful implementation of the project. The IDB was new to providing loan financing to a water infrastructure project in Suriname and had to adapt some of their policies and procedures to the unique situations in Suriname. In the early phases of the project, according to the Final Evaluation, the IDB was not very flexible in modifying some of their approaches to project implementation. This together with the PEU's inexperience with implementing IDB project and a hesitancy to make suggestions to the IDB, meant there was lack of effective communication which resulted in slow progress in the very early stages of project implementation. As both the SWM and IDB communicated more about the challenges, they worked together to overcome them with very good results. Where additional support was required for the PEU, the IDB provided guidance and assistance, and where there were circumstances specific to Suriname clearly explained and justified by the PEU, the IDB was willing to adjust. The Bank worked with the EA and Ministry of Finance to address implementation issues particularly those on procurement and disbursement. The Bank guided the PEU with regular mission, videoconferences and supervising in procurement.

1.2. Borrower Performance

The execution of the project and the utilization of the financing from the IDB was carried out by SWM, representing the Borrower, which is the Republic of Suriname. The Borrower ensured adequate coordination among the Bank and SWM. Originally the loan comprised of a local counterpart funding from the government of Suriname. During the project implementation instead of the Ministry, the SWM contributed to the local counterpart funding obligation.

During the early stages of the project, SWM experienced difficulties in fulfilling the Conditions Precedent to First Disbursement which caused initial delays in getting the project started. The cumulative impact of the delays effectively delayed the project by about 2 years related to hiring a Project Manager, submission of the Operations Manual, as well as late submission of the First Disbursement. There were issues with changing Project managers, procurement problems and perspectives on how the works were to be executed.

For proper project execution, there had to be interaction between the Project and Operations personnel for all the Project Components. However, according to the Final Evaluation, the Operations personnel generally did not take an active interest in the project. This was not unusual as Operations Departments tend to see Projects as separate and apart from the regular day to day work.

Although the project was structured to have the works contractors supervised by a Main Executive Contractor (MEC), there were weaknesses in the capabilities of the MEC which lead to more heavy reliance on the Operations Department, especially in the early phase of the pipelaying works. Also, the project intended for water meters to be installed by the Contractors, but this ended up being done by the Operations Department. These unexpected issues may have contributed to the Operations personnel believing that taking on anything else would be additional work and burdensome as they were already stretched with their regular work. This could therefore be considered a weakness in the project design not to have included

more involvement of the Operations Department personnel recognizing that they would have to integrate the project outputs into regular operations.

As presented in the mid-term evaluation report, there were examples of both good and challenging working relationships between project teams and the Operations Department. There was a very good working relationship between the Operations Department and the Team Leader of Component 3 – Energy Efficiency. It was reported that knowledge gained from training received in energy efficiency in operations and maintenance was put to effective use by SWM personnel in identifying areas where energy usage could be reduced.

Some project implementation delays, especially in the early phase of the project, resulted from less than optimal communication between the Component 1 and SWM Operations Teams. However, these issues were resolved during the latter part of project execution. The SWM Management recognizes the importance of the involvement of the Operations personnel in the project for all Components and sought to take steps to replicate the strategies that made for the excellent relationship on Component 3 between the project and the Operations department for the other project components.

Findings and Recommendations

Overall, it is concluded that the program was successfully executed. While the pace of implementation was slow during the first two years, this was due to unexpected events which had an impact in the leadership of the Program, while a permanent appointment of a Project Manager took time, once in place, the changes in execution were evident. Additionally, another major challenge was the unfamiliarity of the Project Execution Unit to Bank procurement policies, as well as the limited pool of experienced local contractors. The team is also of the opinion that the language barrier also had implications on the procurement processes.

Lessons learned

Findings	Recommendations
Technical-Sectorial dimensions	
Finding #1: Project design. Changes to the Results Matrix. Several outputs were redefined to align them to the reality of the project.	Recommendation #1: The results matrix outputs should be as specific as possible. In cases when information regarding a proposed output may not be available defining milestones can help for the teams to fully understand the development intentions.
Organizational and managerial dimensions	
Finding #2: Project management capacity. Capacity of those responsible for the project's management, including planning and supervision. Incredible difficulties emerged during the first two years of	Recommendation #2. Risk mitigation measures should have been identified upon inception considering the lack of local skilled personnel, which was not fully appreciated during the initial risk assessment.

Findings	Recommendations
<p>execution in identifying suitable candidates to fulfill the positions for the professional figures identified at the beginning of the program to support the core project management unit in the program implementation (i.e. a program manager and a distribution specialist).</p>	<p>Recommendation #3. In this case, additional technical support provided by the Bank, in the form of an individual consultant, who aided PMU to streamline activities and strengthen the quality of procurement documents on the technical side proved effective and is a recommended replicable action in similar circumstances.</p>
	<p>Recommendation #4. Recognizing the challenges with the availability of project management resources, the Bank team set in place an intense supervision plan including Supervision visits, Video-conferences, and regular tele-conferences with the PMU.</p>
<p>Finding #3: Project management capacity. Capacity of those responsible for the project's management, including planning and supervision. Project planning in the Annual Operating Plans (AOPs) was at the beginning too ambitious. The SWM did not factor in adequate time for the procurement of goods and services and risks during implementation; specifically, for the pipelaying works.</p>	<p>Recommendation #5. Careful review by the Bank's team of the AOP and the feasibility of the targets is necessary. The Bank communicated often with the SWM team during the preparation of AOP to improve and make the planning more realistic.</p>
	<p>Recommendation #6. Synchronizing supervision visits to the period for the AOP preparation to have face-to-face discussions facilitated planning conversations and improvements.</p>
<p>Finding # 4: Project management capacity. Matters related to meeting eligibility conditions for disbursement. The project took 10 months to reach eligibility. The imminent change in Government brought about substantial changes in the communication protocols between the Government and the Executing Agency, which somehow delay the capacity of the project team to gain eligibility.</p>	<p>Recommendation #6. Risk mitigation measures should have been identified with regards the change in Government. The implications of the change were not fully appreciated during the initial risk assessment.</p>
	<p>Recommendation # 7. With the support of CSU, the communication protocol of the project (all communications were directed to the Permanent Secretary rather than directly to the Executing Agency) was adjusted to improve its efficiency</p>
<p>Finding # 5: Project management capacity. Structure and Location of the Executing Agency. The SWM, as the Executing Agency, was fully responsible for execution of the project. The SWM designated and assigned a full complement of staff for a Project Execution Unit responsible for preparation and implementation of the AOPs, budgets, and procurements, assurance of fiduciary and environmental controls, as well as monitoring of the progress of the project activities. The PEU was also responsible for contracting and execution of external audits and evaluations in coordination with the SWM Managing Director</p>	<p>Recommendation #8. The fact that the PEU was comprised of SWM staff and was physically operating from SWM offices was beneficial for project execution. While the team had to go through a learning curve, the PEU grew stronger and contributed to a sense of project ownership by SWM. The PEU benefited from building capacity and will contribute to ensuring sustainability of the project activities.</p>

Findings	Recommendations
<p>Finding #6: Intra/inter coordination. Coordination at intra-institutional level. The PEU and SWM management realized that the lack of involvement of the Operations Department from the project design phase and throughout implementation can impede the smooth execution of infrastructure projects like this one, and potentially adversely affect the sustainability of the project outcomes.</p>	<p>Recommendation #9: An action to minimize this was appointing a Leader to each component. The Team leaders will then ensure inclusion of relevant operation's staff. While the level of involvement from the Operations Department was not ideal, it was successful in critical moments. The benefits have been seen where Project Team Leaders have developed effective coordination with the Operations Department. It has led to better resolution of conflicts where changes must be made to either the project approach or the operations and maintenance activities.</p>
<p>Finding # 7: Intra/inter coordination. Roles and responsibilities among different actors responsible for implementation. In the early phase of the project approval for all decisions and documents had to be sought from the Ministry of Natural Resources (DWV/NH). This caused several delays in project implementation due to difficulties in coordination and prompt response between the two agencies.</p>	<p>Recommendation #10. Initial roles and responsibilities may need to be adjusted to ensure efficient communication and decision making. Considering the challenges, the role of the DWV/NH was modified. It was established that SWM Management can take decisions and sign off on documents if the Permanent Secretary is not available. The Ministry of Natural Resources remained copied on all communication between SWM and the IDB.</p>
<p>Finding # 8: Intra/inter coordination. Coordination level with multilaterals, donor's other actors. The Executing Agency learnt that it should communicate the challenges being experienced to the IDB/funding agency early; and when doing so make recommendations to resolve them. This approach helped to facilitate better project execution</p>	<p>Recommendation # 11. The Bank's team make itself available to the Executing Agency to build a stronger relationship. For the PEU the Bank must be a supportive team rather than a scrutinizing donor. Building a better relationship with the PEU and the Executing Agency helped to prevent issues and to act more effectively when actions to resolve problems were necessary.</p>
Dimension 2: Fiduciary Dimensions	
<p>Finding #9: Acquisitions and procurement – bidding stage. Level of experience in managing procurement processes. One of the major challenges at the start of the execution was the unfamiliarity of the PMU to Bank procurement policies. This resulted in many procurement processes planned and longer periods for preparation of bidding documents, which ultimately caused delays in project execution.</p>	<p>Recommendation #12. The Procurement Specialist at CSU was very instrumental in improving this situation. Involvement of the PS to provide constant training to the PMU resulted crucial for the improvement of the project. Support included also the translation of bidding documents to Dutch to ensure interested bidders would understand IDB requirements.</p> <p>Recommendation #13. The procurement plan should be structured in a way to reduce as much as possible the number of procurement processes. For similar projects the procurement plan should not be fragmented. For example, lots can be used for similar works in different geographic locations</p>

Findings	Recommendations
	and supply-installation contract should be favored.
<p>Finding # 10: Acquisitions and procurement – bidding stage. Participation level of contractors and providers in the procurement process. Most of the works had to be retendered due to lack of participation of suitable contractors during the bidding process. This caused delays in project execution.</p>	<p>Recommendation # 14. When bidding processes may not be attractive to International bidders, the bidding documents requirements (financial capability and technical experience) should be defined based on the local market capabilities and ensure supervisory services are strong to provide needed support.</p>
	<p>Recommendation # 15. Pre-bid meetings should be conducted timely to provide sufficient time for clarifications. In the case of Suriname, translation of bid documents was an effective measure to ensure interested contractors fully understood the administrative requirements of the process.</p>
	<p>Recommendation #16. Infrastructure work packages could have been prepared to attract International Bidders. This option was not considered during the project due to the long delays to start execution and the Executing Agency preference to work with smaller packages.</p>
<p>Finding # 11: Cost and Budgetary Aspects Currency fluctuations, economy and/or financial market conditions. The project was impacted by devaluation of the Surinamese currency. Although there were several contracts in execution that required cost adjustments. The final cost of contracts affected resulted in a positive balance for the EA equivalent to 0.08% of the loan. The situation could have been cause for further delays in project execution, however, the IDB project team did intense follow-up with the Executing Agency and the Supervision Firm to arrive to a resolution on the matter considering the interests of all parties involved.</p>	<p>Recommendation #17. Cost adjustments due to currency devaluation can be cause of delays in a project. The resolution of the situation should not be taken for granted. The IDB team did intense follow up with the EA and also provided through a technical consultant additional support to ensure the process was fair and considered real increases in costs due to the devaluation. The recommendation is to act promptly and to provide the EA with resources needed to provide confidence of fairness to the process, if necessary.</p>
<p>Finding #12: Risk Management. The risk “Weak SWM capacity to multi-task and execute timely the operation” was minimized.</p>	<p>Recommendation #18. While there was still the need for a project extension the hiring of support consultants to strengthen and support SWM in project implementation proved to be an effective measure to minimize the risk. The capacities of the PEU were strengthened despite challenges at the beginning of project execution.</p>
<p>Finding #13: Risk Management. The risk “Health-related risks associated to poor handling of asbestos cement pipes to be replaced” was minimized.</p>	<p>Recommendation #19. To avoid extensive management of asbestos, SWM proposed to leave the asbestos pipes underground and built the new network adjacently. The methodology was</p>

Findings	Recommendations
	approved by NIMOS and proved to be effective in minimizing any adverse effect due to handling of asbestos.
Finding #14: Risk Management. The risk “Contract amounts, and language barrier may deter external firms and consultants from bidding” materialized despite implementing the mitigation measures.	Recommendation #20. An alternative implemented in this case was to focus on making the procurement packages attractive to local contractors, ensuring they could meet financial requirements, and when necessary ensure the local market understanding of the works, risks and administrative procedures.
Other Dimension	
Finding #15: Energy Efficiency Component. Changes in the production demands affected the possibility of SWM implementing all of the recommendations for several of the pilot project stations.	Recommendation #21. The recommendations of the EE component should have considered the scenario of water supply demand and included alternative measures for implementation of recommendations without fully depending on the production rate at each station.