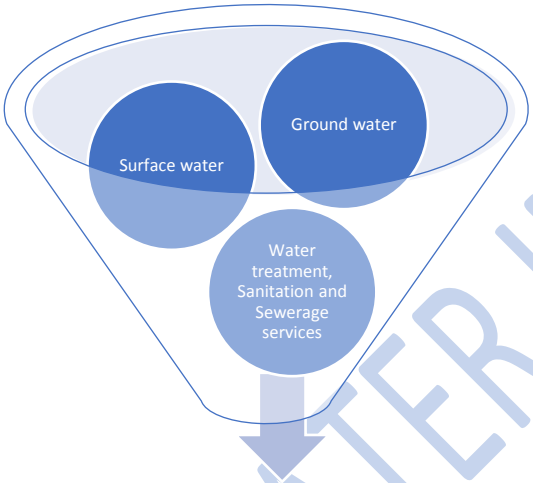
Guyana Water Incorporated
An Abstract
Water and Sanitation Sector Strategic Plan
2017 – 2021

Approved by the Board of Directors September 2017

Prepared by the GWI staff under the coordination of ***Lancelot F. Mars,*** *Head of the Strategic Planning, Evaluation and Monitoring Department with the approval of* ***Dr. Richard Van-West Charles****, Managing Director of GWI.*

EXECUTIVE SUMMARY

GWI is a Government of Guyana solely owned Public Corporation charged with the responsibility for water production and sewerage disposal in Guyana. Its mission is directed towards equity of services of potable water with the highest quality standards at affordable rates and the furtherance of government's policy regarding watershed management. The Corporation's new 5-year Strategic Plan covers the period 2017 – 2021.



Water Production, Distribution and Sewerage & Sanitation services provided to the citizens of Guyana

GWI derives 90% of its water from ground sources and the remainder 10% from surface sources. Water comes from 137 wells and is processed in 24 treatment plants. A review of the objectives and targets of the previous 4-year plan reveals that it did not adequately focus on the operational strategic objectives of the Corporation and demonstrated the supportive inputs required for mission success, not only to produce water but its elements of access, level of service and quality. **The new plan is projecting 212 million m^3 annual water production by 2021, 24-hours availability to a level of 5 metres with WHO quality standards and the expansion of services in coastal, rural and hinterland areas with a total Capital Budget of G$41.2 billion.** It will seek the PUC's approval for new Tariffs to generate additional revenue to cover costs. Funding for the new plan is expected from several sources, namely its own revenue G$6.3 billion, Government of Guyana (including electricity subvention) G$12.1 billion and the IDB/EU G$6.5 billion. It will be exploring additional funding for the **unfunded amount of G$16.3 billion which may extend beyond the 5-year program period**.

The operations support department has identified critical factors for mission achievement through their **Situation and Gap Analysis** such as an expansion of the customer base especially in hinterland communities and the reduction of Non-Revenue Water with rapid responses to leaks reports,100% metering for all accounts and the decrease of chemical dependent processes for its treatment plants. It plans to replace the aging distribution lines in Georgetown with a new 'ring' system which will link all the distribution lines for redundancy and efficiency of supply to service connections. The Corporation also will focus on solar technology for its energy usage in keeping with the government's efforts to transform Guyana into a 'Green Economy'. GWI has

reorganized several of its departments, notably water quality for better data collection and interventions to ensure quality standards. And, to address the problems with billing accuracy, it plans to replace the current HiAffinity Program with a new customer Information System. It introduced the concepts of Log frame, Situation Analysis of the population demand and the supply for water services and Program Budgeting to provide managers in the Operations and supporting departments with a blueprint for service delivery. The Corporation's programs are being planned in tandem with regional needs and it has instituted a process for communicating with the RDC's and NDC's to provide service information and obtain insights into development plans for communities. It has also developed an interactive public communications process (App) which allows customers and citizens to communicate and receive information on its services.

THE CORPORATION

Guyana Water Incorporated (GWI) was created in 2002 under the Water and Sewerage Act of Guyana and serves as the Public Supplier of water and sewer services in Guyana under a license issued by the government and functions under the ministerial control of the Ministry of Communities. Its service standards and rates are monitored and regulated by the Public Utilities Commission (PUC) which sets its Tariffs or charges for consumer water and sewerage services. The Minister of Communities is required to present GWI's Annual Report to Parliament by the ninth (9) month each year in a report to the sole shareholder (government) on behalf of the citizens of Guyana. Its functions and responsibilities are administered by a Board of Directors comprised of persons appointed by the Government of Guyana and the day-to-day administration is the responsibility of the Managing Director with the Corporate Management Team (CMT) comprised of various Executive Directors, in addition to managers, supervisors and non-management personnel.

Vision

The Corporation's **vision** statement is: To ensure an efficient, sustainable and financially viable water and sewerage Corporation delivering a high quality of service to customers.

Mission

Its **mission** is: To deliver safe, adequate and affordable water and ensure safe sewerage systems for improved public health and sustainable economic development.

Customer Centered Focus

GWI sees its mission's focus on the citizens of Guyana who use water and sewerage service provided by the Corporation. Therefore, service to customers is the central objective of the plans in this Strategic Plan.

Operating License

GWI has an operating license for the supply of water and the collection of waste water. The Corporation has advocated changes to some sections of the license such as the process for customer service disconnection for non-payments, unobstructed access to customer property and enforcement of penalties for charges. Efforts were made to obtain approval for these and this will continue during the life of the new plan, with the addition of a recommendation for Tariffs changes.

Corporate Governance

The corporate governance of the Corporation is carried out by the Board of Directors and the day-to-day management of the Corporation is the responsibility of the Managing Director, Dr. Richard Van-West Charles. The structure is also comprised of the Corporate Management Team (CMT) with Executive Directors and department heads. The CMT meets at least monthly to review organizational performance and managerial effectiveness and approve plans for operations and administration. Going forward, it will be the forum for planning and design and program execution meetings and the discussion of monitoring and evaluation reports submitted by the Strategic Planning Department. It will also receive reports from the Cross-Functional Programmatic Committees.

Cross-Functional Programmatic Committees

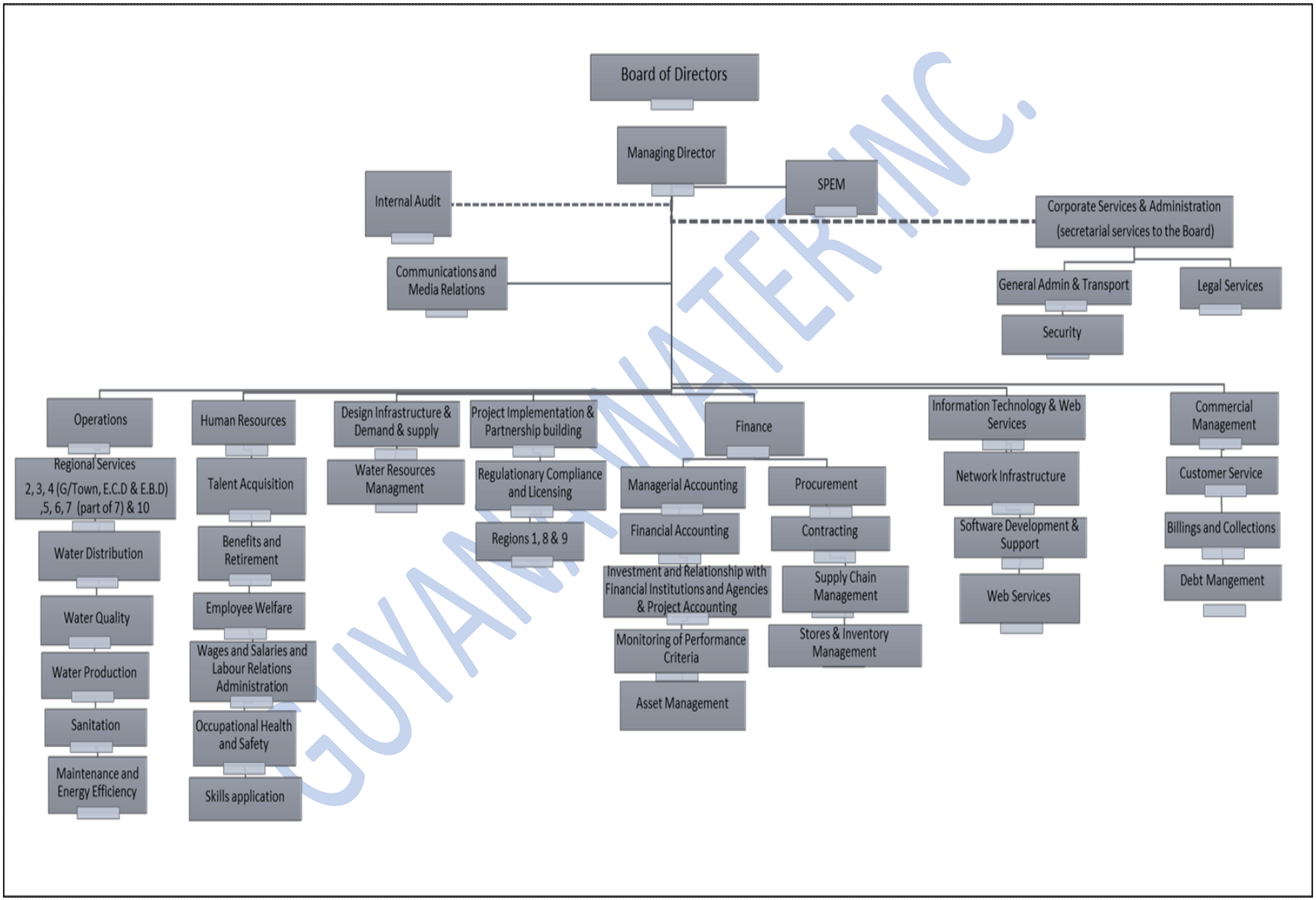
GWI has five (5) Cross-functional Programmatic Committees which monitor Water Production and Quality, Water Supply and Distribution, Sanitation, Organization and Management and Finance and Revenue. The committees meet monthly to review and approve operational matters.

Members of the Corporate Management Team

Members are left to right, Ramchand Jailall, Executive Director of Project Implementation & Partnership Building, Nigel Niles, Corporate Secretary & Executive Director of Corporate Services, Dwayne Shako, Executive Director of Operations (back row), Gail Doris, Executive Director of Human Resources, Lancelot Mars, Head of the Strategic Planning, Evaluation and Monitoring (back row), Marlon Daniels, Executive Director of Commercial and Customer Relations, Joseph Codette, Sr. Technical Advisor (back row), Beverly Fields, Acting Head of the Information Communications Technology, Jaipaul Ram, Executive Director of Finance (back row), Aubrey Roberts, Executive Director of Planning & design and Dr. Richard Van-West Charles, Chief Executive Director.

ORGANIZATION CHART

The organization chart with the positions that support the Corporation's mission objectives is on the next page.



A Review of the Strategic Business Plan 2012-2016

Plan Development

The Corporation's previous Strategic Business Plan covered the period 2012 to 2016. The plan was developed with the assistance of the Inter-American Development Bank in July 2012. It succeeded GWI's Turn Around Plan (TAP) which was used to chart the course for the Corporation in prior years.

Plan Objectives

The major objectives were the achievement of operational break-even in year 2015, reduction of Non-Revenue Water to 35% by 2016, 100% metering of customers by 2015 and the introduction of regulatory and enforcement mechanisms listed in the business license which was issued in November 2012. Additionally, the Corporation expected to improve levels of service to communities, increase coverage for new customers, decommission non-functioning wells and drill new wells, extend distribution and transmission mains, create District Metered Areas, construct and complete new water treatment plants, increase hinterland communities' coverage and conduct an Aquifer Study.

Key Performance Indicators

The 2012 - 2016 plan had several performance indicators which measured the achievement of departmental targets and organizational objectives. The table below shows a summary of the performance indicators and achievements.

Summary of the Key Performance Indicators

Indicator	Target	Performance
Break-even	2015	Not achieved
Treated water coverage	75%	50%
Metered coverage	95% (2015)	45%
Hinterland coverage	85%	<80%
Non-revenue water (NRW)	35% (2016)	>60%
Energy efficiency	n/a	49%
District Metering Areas (DMA)	Activation of 142	25 activated[1]
Priority investments - Purchase meters - Purchase pumps, motors and panels	$5.7 million	$1.5 million
New Regulatory enforcement	2012	Not achieved

A General Review

A review of the plan years, indicates that although GWI personnel were aware of the Key Performance Indicators (KPI's), nevertheless there is very little evidence that data gathering and decision-making were tied to the monitoring and evaluation of performances with the objective of target achievement. Consequently, it has been a challenge to evaluate organizational performance against stated goals and objectives. Some examples of this are targets for revenue, billing and collections which were determined by the finance department and transmitted to the commercial department for implementation without

[1] They are in the various regions.

reviews and adjustments for performance variances. References can be made to the data verification of the customer database which is incomplete, the introduction of new tariffs which were not instituted and the use of statistical data (compiled and recorded on the Accountability Framework report) which has not been used for decision-making. Operationally, while there was great emphasis on the creation of District Metering Areas (DMA) and 100% metering, there is very little evidence that these objectives were aggressively pursued. At the end of 2016, 55% of the accounts were unmetered and while there were 410 Domestic Consumption Meters (DCM) which can provide data on the consumption of non-metered customers, this program has not been effective due to the flawed process of measuring input and output and the exclusion of time measurement.

Financial Performance

The state of the Corporation's finances seems to have a limited relationship to the Key Performance Indicators (KPI) for the 2012 - 2016 plan and it is noteworthy that the projected break-even for year 2015 was not achieved. The overall investment amount that was projected was US$155 Million with sources being from the Government of Guyana, international donors, financial institutions and GWI's own revenue. The total funding received by GWI during the 2012 – 2016 period was $13.6 Billion as shown in Table 2 below and this proved to be inadequate for the fulfilment of mission objectives.

Infrastructure Financing 2012-2016

Guyana Water Inc.

Financing Sources for Infrastructure Improvement and Expansion

Source	fin.data					
Years	FY2012	FY2013	FY2014	FY2015	FY2016	Grand Total
GoG	$1,155.000	$1,367.000	$1,844.960	$629.896	$627.204	$5,624.060
IDB	$1,084.448	$1,183.079	$1,223.442	$613.246	$361.350	$4,465.565
GWI	$533.867	$578.676	$772.938	$554.905	$927.289	$3,367.675
EU					$125.190	$125.190
Grand Total	**$2,773.315**	**$3,128.755**	**$3,841.340**	**$1,798.047**	**$2,041.033**	**$13,582.490**

Source: Ministry of Finance, National Budget Estimates, GWI, Finance Div.

Internal Audit

During the program years, the Corporation's policies and procedures were subjected to various audits to ensure that they were followed and work was satisfactorily performed. These audits, while not identifying any major non-compliance issues, were somewhat flawed since the personnel charged with the execution of verification duties were not fully trained to conduct technical inspections. Hence, the department's effectiveness was constrained to the identification of supporting documentation for the financial approval of payments, especially related to contracted services.

External Audit

The Corporation's finances were subjected to external audits over the plan years. These forensic audits highlighted many issues related to non-conformance with standard accounting practices and indicated the need for major improvements in financial reporting.

Proposed expenditure

The execution of the plan required expenditure in the areas listed hereunder. While some projects were completed, others have been rolled over into 2017.

Planned Expenditure

Indicator	Proposed Expenditure (G$)
Water Meter installation	$4.716 Billion
DMA construction and upgrade of service	$1.0 Billion
Pumps, Motors and Panels	$400 Million
Drilling new Wells	$1.75 Billion
30K of Sewerage Infrastructure Rehabilitation	$4.0 Billion
363K of Transmission Mains	$6.145 Billion
636K of Distribution Mains	$8.656 Billion
Construction of Water Treatment Plants	$7.2 Billion

Priority Investments

The Corporation had a priority projection for the purchase of new meters to improve billing. However, the number of unmetered accounts today represent 55% of all accounts with corresponding revenue deficits due to the high consumption and low charges for unmetered accounts. A singular problem regarding meter purchase has been the Corporation's failure to receive the projected G$4.7 Billion, in addition to another G$1 Billion for upgrading existing meters. This can be attributed to the lengthy administrative and procedural procurement process.

Replacing and Upgrading Electrical and Mechanical Units

The Plan also required investments for the critical replacement and upgrading of Pumping and Electrical Units, Electrical Panels, Power Factor and the installation of Variable Frequency Drives. At the end of 2016 many of these items were not procured due to delays in the approval process with the dire consequence of limited spares being available for replacements.

Salinity (intrusion of salt water) into the Aquifer

The plan identified the problem of salinity (salt water intrusion) in the Aquifer due to the close location of wells to the Atlantic Ocean. However, since there is very little evidence offered to support this contention, GWI instituted water quality testing for all wells in geographic proximity to the ocean to determine whether there are any significant levels of salinity and since this type of intrusion is usually barely perceptible and may only become a problem over time, it was felt that testing would offer adequate early warning for corrective measures to be instituted if alarming levels of salinity are found. The Corporation also felt It would be prudent to conduct geological testing of the areas where future wells are to be located to determine salinity. The salinity levels were measured in wells along the coast as part of ongoing efforts to safeguard water quality, and to ensure that these aquifers are protected from saline intrusion from the nearby sea. The following wells were monitored.

Salinity measurements in wells along the Atlantic Coast

Wells	Salinity: % (or mg/l)	Category of water
Kingston	0 % or (0 mg/l)	Fresh
Turkeyen	0 % or (0 mg/l)	Fresh
Better Hope	0.08 % or (800 mg/l)	Fresh
Friendship	0 % or (0 mg/l)	Fresh
Haslington	0 % or (0 mg/l)	Fresh

Victoria	0 % or (0 mg/l)	Fresh
Unity	0 % or (0 mg/l)	Fresh

From the results in table 4, it is seen that 6 out of the 7 wells recorded zero salinity. Better Hope recorded 0.08% which is extremely low and thus it can be concluded that each of these wells have fresh water and there is no saline intrusion at this point. Routine measurements will continue to monitor the salinity content.

Program Indicators

A comparison of the forecasted program indicators for the final plan year is shown in the Table below.

Indicators

Performance Indicator	Description	2016 Target	2016 Actual
NRW	% of volumetric production, unbilled	35%	>60%
Inaccurate accounts	Number of accounts physically verified	100%	No Data
Metered billing	• % of customers meters read • % of customers billed	100%	61%
Leakage	Number of DMA's commissioned26	26	No Data
Leakage	Estimated % of production lost through leakage based on DMA data	25%	No Data
Metered coverage	% of customers with revenue meters	95%	45%
Domestic Consumption Monitor	% of customer database monitored on un-metered basis	5%	No Data
Water Quality -Treated schemes sampled	% of schemes sampled (source/distribution) per quarter	100%	No Data
Residual Chlorine	% samples at source meeting WHO guidelines on residential chlorine	100%	77%
Residual Chlorine	% samples in distribution meeting WHO guidelines on residual chlorine	100%	45%
Dissolved Iron	% samples at source meeting WHO guidelines on dissolved Iron	100%	71%
Total Choliform	% samples meeting WHO guidelines on total Choliform at source	95%	24%
Fecal Choliform	% samples with zero Fecal Choliform at source	100%	94%
Total Choliform	% samples meeting WHO guidelines on total Choliform in distribution network	95%	16%

Fecal Choliform	% samples with zero Fecal Choliform in distribution network	100%	86%
Water Quality – Untreated schemes sampled	% of schemes sampled (source and distribution) per quarter	100%	No Data
Fecal Choliform	% samples with zero Fecal Choliform at source	100%	91%
Fecal Choliform	% samples with zero Fecal Choliform in distribution network	85%	88%
Hinterland coverage	% Hinterland communities with access to water	80%	71%
Hinterland cost recovery	% recovery of direct operational costs in small town	25%	No Data
Wells Static Levels	% operational Wells monitored quarterly	95%	90%
Pumping levels	% operational Wells monitored quarterly	95%	95%
Specific Capacity	% operational Wells monitored quarterly	95%	80%
Energy Efficiency -Net system efficiency	Average % conversion efficiency of power supplied to hydraulic power output estimated from rolling audit	70%	55%
Wells rationalization	Decrease the number of operational Wells in areas of acceptable levels of service	8	No Data
Sewerage – Disposal Efficiency	100% - Sewer system % unplanned downtime	95%	No Data
	Ratio of volume entering to volume extracted at pump stations	100%	No Data
	Number of overflows on gravity side of system	TBD	No Data
Finance and Commercial	Revenue (G$ Billion)	6.6	3.4
	Collection Efficiency	90%	72%
	Cash Collected	5.94	3.37
	O&M Cost (G$ Billion)	6.3	7.92
	Depreciation (G$ Billion)	2.0	1.21
	O&M Cash Expenses (G$ Billion)	4.3	4.97
	O&M Cash Expenses (G$ Billion)	4.3	No Data
	Operating Deficit (G$ Billion)	0.3	4.55
	Government Subvention (G$ Billion)	0	2.3
	Remaining Deficit (G$ Billion)	0	2.25

Non-Revenue Water

Non-Revenue Water (NRW) featured prominently in the plan and a 35% target was set for its reduction. However, at the end of the plan years, it was still high at >60%. An assessment of the reasons for this

failure demonstrates that real losses due to leaks and other types of water usage are not effectively monitored and have contributed to this phenomenon. In many instances, customers have complained that they observed and reported leaks and the Corporation's response seemed to have been inadequate with a low sense of urgency.

Administratively, the Corporation failed to put in place a process for the rapid deployment of personnel to fix leaks or to ensure through inspection that repair work was done satisfactorily. Additionally, regarding commercial losses, there were and continue to be problems with the HiAffinity Program which houses the customer database and contains grave inaccuracies which contribute to billing errors, account adjustments and has a negative effect on the Corporation's financial performance. It has been observed that the inaccuracies of the customer database inhibit a true accounting for water usage and the capture of information on illegal connections and connections to unoccupied or abandoned properties for appropriate action. The plan required the creation of District Meters Areas (DMA's) for the monitoring of consumption and the data would be used for service level decision-making. And, there would be Domestic Consumption Meters (DCM) for monitoring unmetered consumption. However, a review of these programs reveals that insufficient investment and lack of planning and assignment of personnel for the implementation of these programs resulted in them being inadequate and ineffective.

Water Production

Water production was projected to increase during the plan years but there were no detailed plans for increasing customer access, level of service and continuity of supply. There was an absence of planning and design which would ensure the service meets customer expectations and covered more communities progressively over the years.

Water Quality

While water quality has been identified as a critical factor for the Corporation's service delivery, the previous plan failed to address quality issues that required speedy identification and remedial action especially in the hinterland areas. Accepting the fact that surface water is most vulnerable to infiltration and can cause water borne diseases and that most of the hinterland areas have surface sources for supply, it was critical for water quality testing processes and timely decision-making should have been accorded greater emphasis. Leaks caused contaminated water to enter the distribution and supply system, especially in instances where lines were submerged in drains or trenches. These problems remained hazardous to water quality and were not addressed adequately.

Treatment Process

The five (5) treatment plants at West Watooka, Wisroc, Linden Power Corporation (LPC), Wismar and Wisroc in the Linden area were expected to continue operations but there were no plans for their rehabilitation to improve their efficiencies and instead, the plans were to have them fully replaced with two (2) new plants at Amelia's Ward and Wisroc. GWI obtained evaluations from international experts which state that the treatment processes used in the existing plants are in many instances unsuited for the type of water source in the respective areas. Also, there is criticism regarding the heavy reliance on chemicals such as Alum which must be imported (there is an opportunity to develop local substitutes). In comparison with other water utilities, an example being neighboring Suriname, visits to their plant has shown that there can be less or no reliance on chemical usage when the plants are designed to use natural aeration processes.

A review of the new plants demonstrates problems with design of process and construction and it is evident that GWI was poorly served with technical oversight by the program advisors. Recently, the Government decided that the plants should be rehabilitated and it noteworthy that GWI is expected to finance the costs from its operating budget since the loan financing does not cover rehabilitation costs. Data derived from a Government of Japan funded study shows that the process for treatment using slow sand filtration for groundwater from 'A' sand wells should be of paramount consideration in designing new treatment plants due to the prevalence of 'A' sand wells. Currently there is approval for the construction of three (3) treatment plants at Diamond, Sheet Anchor and Uitvlugt.

Aquifer and Wells Performance

The plan addressed the requirement for safeguarding the Aquifer and stressed the need for Wells performance efficiencies and recommended decommissioning of some Wells. However, there is very little evidence that studies were initiated or attention was paid to the Aquifers and Wells locations either for development of infrastructure or during operations. Consequently, no Wells were decommissioned and since limited funds were expended on the maintenance of Wells, their efficiency levels declined over the years.

Sewerage

During the plan years, the Corporation provided sanitation services for wastewater primarily in Georgetown. These households use sewerage services to a limited degree while the areas outside of Georgetown make greater use of Latrines or residential septic tanks for their sewerage services.

Energy and Cost Reduction

A review of the plan demonstrates that energy costs were related to the operational hours and affected by power outages due to Guyana Power Limited (GPL) and there was poor planning for the use of alternative energy sources. The fact that there is a Government of Guyana subvention which covers electricity costs seems to influence the low desire for costs reductions due to efficient energy usage.

Hinterland Access

The plan highlighted some service operations in hinterland communities. However, commencing in the latter half of 2015, the Corporation's services begun rapid expansion beyond the scope outlined in the previous plan. The service expansion is directly related to reports of water borne diseases and health issues which created the need for testing and interventions to ensure safe water services. Services were expanded in many riverain communities with new wells and improved analysis and quality control of the water supply. New wells were drilled at Mahdia and Princeville, Rupertee, Aranaputa, Wowetta, Marcanata and Kwamwatta and at Silver Hill. A new water supply system was completed in Monkey Mountain. GWI purchased portable filtration units which have been distributed to communities including Kamarang, Kako, Quebenang, River View and Karrau for use for filtering water and making it safe for consumption. In addition, four larger units, which are named "Lifesaver C2" have been purchased and installed in Kamarang, Kako, Baracara and Tassarene.

The new Project Implementation & Partnership Building department continues its responsibility for certain hinterland regions (1,7,8 and 9) and the communities within them which were previously under the control of the Infrastructure Planning and Implementation Department (IPID). Some of the communities are densely and others are sparsely populated and thus the service is tailored to suit. Their water is derived primarily from the rivers and creeks since most persons live along the waterways. They share the land space with miners and the water sources are susceptible to chemical intrusion both in the

waterways and from ground seepage. GWI expects that governmental monitoring of mining activity will help prevent these intrusions and it will ensure that through frequent sampling and expeditious interventions, the water supply will be safe for the communities.

Water Treatment

Water treatment for the hinterland communities is planned as follows: Lethem and Mabaruma 100% in 2017, Mahdia, Port Kaituma and Moruca 100% in 2018, Region 1, 15% by 2021, Region 7, 10% by 2021, Region 8, 15% by 2021 and Region 9, 15% by 2021. The percentages are based on the geographic conditions in the regions.

Integrated Water Resources Management

A review of the efforts expended on Water Resources Management reveals that there were no structured processes for coordinating the activities of the various stakeholders. The committee that is expected to provide a forum for discussions and decision-making is non-functional.

Storage

While the production of water continued to increase, there were problems with the supply to meet customer demand which was restricted by limited storage facilities. Although there were overhead storage tanks, the Corporation seems to have neglected the monitoring and upkeep of the overhead tanks since the use of these facilities was largely discontinued and tanks were dismantled and sold. This is evident despite the need for expansion of service coverage in many communities and today, inadequate storage is limiting water supply and preventing the regulation of distribution to more adequately provide continuous supply over a 24-hour period.

Asset Management

The need for upgrading the Asset Management process was highlighted by the Auditors, signaling that very little effort was expended in ensuring that the Corporation's assets were properly documented and managed. This continues to be needed and it is expected that it will be addressed in the new plan.

Flood Protection

The Corporation has a Disaster Flood Plan which was used during the last flood emergency and there is a strategy in place for its review, update and to ensure its readiness for activation in the next emergency. Meanwhile, special construction was done around pump stations on the coastal areas to ensure protection from flooding of the water production and storage areas. GWI has commenced an inspection of protective measures and will plan and institute measures to protect the infrastructure from flooding in the future.

Plan Monitoring

The Corporation failed to create a department dedicated to monitoring and evaluating the performance indicators for the plan and this lead to poor target achievement or in some instances, difficulty in identifying any achievement. This problem has been addressed with the Strategic Planning, Monitoring and Evaluation (SPEM) department in the latter half of 2016. The department is tasked with reviewing the 2012 - 2016 plan and preparing a new 5-year plan (2017 – 2021) with KPI's for monitoring and evaluation to facilitate timely decision-making and enhance organization performance.

Infrastructure Projects

GWI started several infrastructure projects during the 2012 – 2016 plan years and those that were unfinished at the end of 2016 have been moved to the new plan period. Table 7 shows projects that are expected to be completed in 2017 (year 1 of the new plan period).

A REVIEW OF THE 2012 – 2016 STRATGIC PLAN

A comprehensive review of the plan shows that it did not achieve any of the major targets. This could be attributed to inadequate funding to meet the mission objectives, major delays in acquiring production resources, low percentage of meters purchased and installed to enhance revenue, failure to implement a rigid leak detection and repairs program, contributing to a high percentage of non-revenue water, inattention to the inefficiencies of the customer information and accounting programs and the need to ensure that the Information Communications Technology (ICT programs were safe from cyber intrusions which ultimately caused several intrusions that severely affected the Corporation's operations. Customer debt spiraled to a height of approx. 5 billion dollars. These elements have been examined and addressed in the new Strategic Plan.

STRATGIC FACTORS FOR TH 2017 – 2021 PLAN

Overview

Following the review of the 2012 – 2016 plan in the previous sections, it is necessary reference the Corporation's mission as enunciated by government which is to deliver safe, adequate and affordable water and to ensure safe sewerage systems for improved public health and sustainable economic development. GWI must examine the external factors such as governmental processes and plans for water and sewerage services which are required for its operations and the internal organizational changes that have occurred since 2015 when the Corporation's administration under the leadership of a new Chief Executive instituted policies and procedures that were designed to improve service delivery. These are considered critical since they play a significant role in providing organizational focus, direction and structure which are necessary for the plan's success.

External Factors

The traditional focus of GWI has been on certain urban areas of the country with the exclusion of many and very limited service in the hinterland. The new government has mandated a policy of ensuring equity of access for all regions, hence, GWI's planning for improved service delivery includes the neglected communities and the rural and hinterland areas. This new focus brings certain challenges which the Corporation has identified in its Situation Analysis documentation and plans for program execution have been set out in this strategic plan. Government assistance is expected through The Water Resource Council which is charged with monitoring water quality and this agency is expected to regulate activities in the hinterland areas especially regarding mining to guard against adverse effects on water supply. Government's assistance is also expected through the WSSDP[2] which provides funding for the semi urban and low income urban communities. This funding is critical since the cost of providing services to these communities are not being adequately covered by the current tariff and GWI will seek the approval of the PUC for a special tariff for these communities. These communities have been responsible for their water services and have not been successful in ensuring adequate supply of services. Hence, GWI's expanding

[2] The Water and Sewerage Strategic Development Plan (WSSDP).

role is designed to assist these communities with development infrastructure and this is evidenced by the programs undertaken in various communities.

Internal Structure

The Corporation has adopted a new approach to its mission since 2015 to bring service to more communities each year with the ultimate objective of service to all communities. The focus is on service access in each community, level of service to meet 24-hours continuous availability and quality of water to WHO standards for all customers. Hence, GWI has restructured its corporate and operational processes to place greater emphasis on communications with local government institutions such as NDC's and RDC's in each regional area and especially the hinterland. The Corporation is also focused on customer outreach and thus will have its regional staff create relationships with the various local government entities to provide information on its operations, address community concerns and participate in planning programs for the improvement of service in regional communities.

GWI is examining its operational areas and location of wells and treatment plants against the background that Guyana has large areas of surface water and these offer ready sources for water production without over burdening the ground water supply which is very delicate and limited. Ground water is extracted from the aquifer and the Corporation subscribes to the government's policy for watershed management to conserve its supply. Therefore, over the next five (5) years, efforts will continue to conserve and balance the use of ground and surface water sources with appropriate water treatment to meet water quality and demand.

With regards to water quality, GWI adheres to the undermentioned World Health Organization (WHO) international standards for water quality and has quality measurement and intervention methods to ensure adherence to these standards. And, over the next five (5) years the Corporation plans to maintain standards above and beyond the international recommendation.

International Standards

The Government of Guyana through GWI will demonstrate the fulfilment of its responsibility to provide the people of Guyana with access to clean, safe, and potable water which has been articulated in the MDGs and now in **the 2030 Agenda: Sustainable Development Goals (SDGs)**, "*specifically Goal 6 that speaks to water quality, security, and accessibility*[3]. GWI's new plan will continue to meet the government's water and sanitation sector objectives while adhering to international standards as enunciated by the United Nations.

Government's Expectations

The Government of Guyana expects that GWI will assure urban communities will have access to Potable water from 90% in 2016 to 98% in 2021, hinterland and coastal towns from 75% in 2014 to 85% in 2021 and all 100% beyond 2021 with an increase in sanitation service from 1% in 2016 to 45% in 2021.

Government Funding

Government investment for the water and sanitation sector is estimated to increase to US$30 million, or 0.2% of GDP by 2021. The increased investment contribution will address challenges in the hinterland and

[3] On September 25th, 2015, countries adopted a set of goals to end poverty, protect the planet, and ensure prosperity for all as part of a new sustainable development agenda. Each goal has specific targets to be achieved over the next 15 years.

coastal water sector through budgetary allocations and grants from about 30% in 2016 to at least 35% by 2017, 40% by 2018, 50% by 2019, 55% by 2020 and 60% by 2021. An overall increase in sector investment to US$30 million per annum for water and sanitation services country-wide will substantially improve service delivery and access to potable water supply for all Guyanese.

Water Sector Goals

GWI has adopted the following goals enunciated by the Government of Guyana:

To ensure sustainable harnessing, utilization and management of water resources by 2021:

1. Develop a framework for managing and protecting water resources for improved water security and enhanced resilience to climate change;
2. Strengthen water resource planning, decision-making and operational capacity through improved access to knowledge and expertise in integrated water resource management;
3. Ensure that effective institutional coordination and collaborative mechanisms for water resource management are in place; and
4. Strengthen and improve trans-boundary and international cooperation in the management of shared water resources.

GWI seeks provide access to potable to water, with less chemicals and quality assurance in accordance with WHO standards in addition to the goals enunciated above.

The Strategic Planning, Evaluation and Monitoring Department

The Corporation created a Strategic Planning, Evaluation and Monitoring (SPEM) department late last year to review the current strategic plan and in collaboration with the various departments, create a new 5-year plan covering the period 2017 – 2021. The department is staffed with personnel who will monitor and gather data on the plan's Key Performance Indicators (KPI), analyze, evaluate and provide departments with information to improve the efficiency of their operations, including the review of billing adjustments. The SPEM department has used a collaborative approach to the review of the 2012 - 2016 and the development of the new plan. Meetings were held with department heads and their staff to examine areas of responsibilities and various performance indicators for each target or objective.

Research

The Strategic Planning Department is responsible for creating and administering research projects which will be designed to elicit data from customers to be used for program planning and the delivery of new and improved services. Additionally, GWI will consider a proposal for a new product, bottled water which is an extension of a limited bottled water production is sold wholesale to vendors for resale.

Communicating Performance Evaluations

The SPEM department will utilize the Blackboard electronic program for communications with departments and regional managerial personnel monthly for the review of data derived from their performance indicators (KPI's and PI's) and quarterly for their situation analysis update. It will allow real-time feedback from managers regarding the information and the changes they will implement to ensure target achievement.

A Systemic Approach to Creating the New Plan

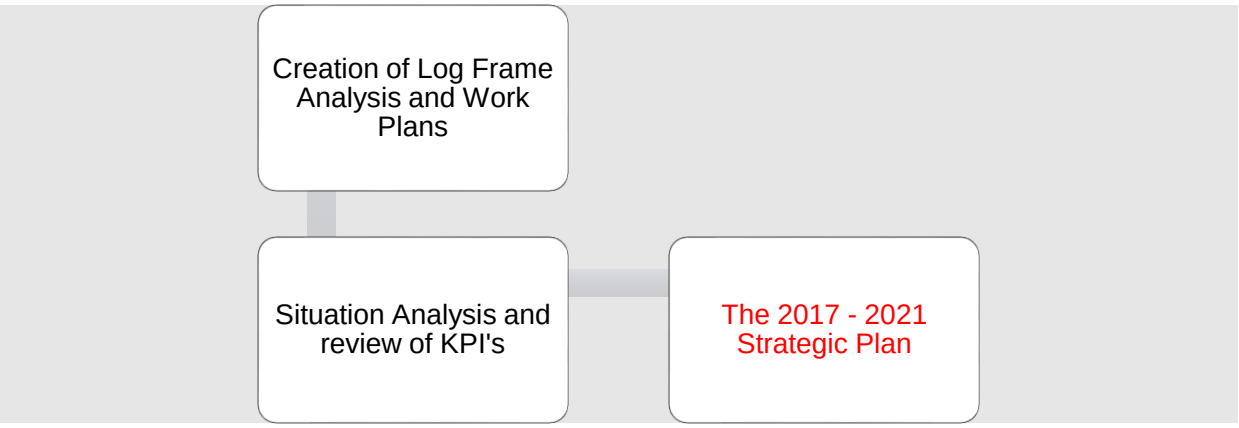
The Strategic Planning, Evaluation and Monitoring Department (SPEM) has engaged a participative and systemic approach to the creation of the new plan using the Situation/Gap Analysis done by each

department which identified the programmatic needs, proposed plans to address them and showed the resources required for achievement. SPEM conducted discussions with department heads, regional managers and other personnel to obtain their input in firstly reviewing the operations of their departments and then the conduct of a rigorous interrogation of the plans and processes that are being used to achieve the Corporation's objectives. The basis is the analysis of operational situations in each region, using the five (5) programmatic areas, determining the factors that are necessary for the elimination of inhibitors and the resources and decisions needed for the implementation of processes towards goal achievement. This approach can best be outlined in a diagrammatic form below showing the development of departmental Logical Frame Analysis from which Work Plans were created, the review of Situation Analysis, review of the Key Performance Indicators (KPI) in the 2012 - 2016 Strategic Plan and discussions with department heads regarding the components and KPI's for the new strategic plan.

Information and Knowledge Management

GWI will ensure that information which is developed from the monitoring of the plan will be used to improve data gathering and knowledge management. The officer in the Strategic Planning department who has responsibility for information and knowledge management will review the data monthly and discuss and transmit information to the respective heads of department for corrective action and to ensure that staff are aware and perform their duties accordingly.

A Schematic: **Creating the new Plan**



Identifying Key Performance Indicators

The new plan has several objectives, namely the management of water resources, Georgetown and Regional supply of potable water of the highest quality standards and the delivery of services with financial viability.

Use of Blackboard Communication

GWI will use Blackboard as a communication process tool to facilitate the flow of information among managers. They will interact with each other for exchanges of technical information and receive feedback on target achievement. This media will also facilitate interactions with persons outside of GWI for the dissemination of information on the Corporation's services.

Infrastructure Works

The Corporation's Infrastructure Planning and Implementation Department (which has been re-organized) had undertaken several projects, namely the water treatment plants at Shelterbelt, Linden, Eccles and Sophia with varying degrees of success since some of these plants are not operational and continue to pose significant challenges for the Corporation to determine the most effective way to make them operational. Consequently, plans are in place to seek technical assistance to find the best solution for their refurbishment.

Infrastructure Projects Program

GWI's infrastructure projects for the plan years are listed in Tables 7 and 8. They were developed through the participatory efforts of the operations, planning and design and infrastructure implementation departments. The projects represent the regional thrust of the Corporation to improve and expand its services in Georgetown, its environs and the hinterland. GWI's IPID was previously responsible for program infrastructure works and on satisfactory completion, these projects were turned over to the Operations Department. However, a review of the capital infrastructure works shows that while some projects were completed and became operationalized, some are still in progress and others were completed but are not turned over to Operations. In the case of non-operationalized projects, the corporation has instituted a process for their operationalization.

Institutional Strengthening Projects

Description	Unit of Measure	Cost (US$)
Operations and Maintenance Manuals	Manuals	100,000
Non-Revenue Water reduction staff training	Workshops	250,000
IT Systems (Financial, Commercial and Human Resources integrations	Systems	240,000
Consultancy to support Tariff structure and database verification	Action Plans	180,000
Groundwater Management	Action Plan	200.000
	Total	**970,000**

Projects not Commissioned

There are several projects which are near completion or have been completed which must be commissioned. The new Planning and Design Department has begun examining these projects to determine the requirements for their completion or commissioning and to ensure that new planning does not duplicate programs or projects that already funded.

Infrastructure Funding Sources

GWI expects to fund its operations primarily from three (3) sources, revenue from operations, funding from the Government of Guyana (GOG) and funding from other entities such as the Inter-American Development Bank (IDB) and European Union (EU). The revenue from operations will be derived from

billing to metered and unmetered customers who are divided into residential, commercial and government. Funding primarily for capital works will be derived from the GOG and IDB and the EU. The Corporation's focus will be on instituting processes and measures to enhance its internal financial viability and accountability to funding agencies for the efficient usage of their funding. In this regard, the planning of capital works will be in tandem with operations so that funding agencies can be assured of sustainability for the projects after completion.

Infrastructure and Capital Loan Program

During the 2012 - 2016 years, the Corporation received loans for capital projects which were guaranteed by the Government of Guyana. While these loans are recognized as inputs for capital works, they are not treated as liabilities (with expected repayment schedules) on GWI's balance sheet since it is understood that the Government of Guyana will repay the loans under the agreed terms. Hence, GWI can consider them as capital infusion by government. Government however expects that GWI will eventually achieve firstly operational and then operational break-even and thus contribute to government revenue which can be an offset for the loan financing it receives.

Regarding the impact of the projects that have been funded by these loans, GWI is faced with a situation where in the past, loans for capital projects were negotiated and approved and funds disbursed for such projects that today seem to be nonfunctional and may not provide the service that was intended. A classic case is the treatment plants at Wisroc and Amelia's Ward in the Linden Township where it has been found that the technical design, construction and functionality of these plants affects their functionality. The plants are not fully operational and the Corporation sought the help of international experts who recommended rehabilitation works with very high costs which must be borne by GWI. The plants are in areas where the water source is ground water and this type of water does not inherently require the kind of treatment that these plants are designed to provide. Their processes are more effective for surface water. GWI will undertake a comprehensive review of the operability of these plants towards finding a solution that would make them functional. In the meantime, the old plant in the Linden area have continued their operations.

Monitoring Infrastructure Projects

The Strategic Planning department will coordinate a team comprised of planning and design, project implementation, operations and finance (program budgeting) personnel who will plan projects to ensure they have a positive return on investment (ROI). The Management Accountant and the Budget Officer (SPEM) will monitor the use of funds for projects to ensure that the return on investment of funds is sufficient to justify the expenditure.

Capital Program Budgeting

During 2016, the Corporation changed its operations budgeting format to reflect program budgeting. This allows regional managers to plan their program activities and execute programs in accordance with their funding which is derived from GWI, Government of Guyana or other sources such as IDB and the European Union (EU). Program budgeting offers efficiencies and effective decision making with greater accountability for program execution.

Contracting Infrastructure Works Programs

An examination of the operations of GWI reveals that it has great reliance on contracted services. This can be traced to decisions over the years which virtually eliminated in-house capabilities for the execution of many functions such as well drilling, disconnections and reconnections. GWI recognizes that a change

of this policy will require proper planning, the identification of skills gap and the development of training programs for staff and this is already being developed by the Corporation. Hence, it is envisaged that it will systemically decrease its reliance on contracted services during the life of the new plan.

Cost Implications for the Non-Use of Contracted Services

While it is expected that the Corporation's costs will be affected with the proposed conversion from the use of contracted services to in-house personnel, nevertheless since the costs for these services are already captured in payments for such services, there are no significant projections for increases in human resources and materials expenses. Instead, it is projected that cost savings may occur due to better execution of these services by staff who will be subjected to stringent supervision and greater accountability.

Training of Personnel and Supervision of Contracted Services

While GWI will continue to use contracted services, it is concerned with the quality of work and accountability for performance as highlighted in the Forensic Audit. GWI has instituted a process to address these issues including training of corporation personnel to perform supervision. Firstly, it will initiate training for its personnel to perform quality inspections on contracted work and secondly, it will insist that contractors use trained personnel to perform the contracted services. The process for organizing the work of contracted service providers and monitoring performance is outlined in the schematic on the next page.

A Schematic: **Infrastructure Works Process**

Commencement of Construction	Monitoring of Construction	Approval and Payment	Construction completion
•Engineering reviews and changes approved	•Gantt Chart monitoring	•Engineering approval for Payments	•Commissioning

Continuing Current Projects

GWI will ensure that for purposes of continuity, projects undertaken during the previous plan that are not yet completed will be continued under the new plan. These projects will continue with closer supervision and accountability. Although the previous department which had responsibility for all project planning, design, construction and funding is no longer functional and the services have been divided between planning and design and project implementation, nevertheless, the current projects will continue to be the responsibility of the Project Implementation & Partnership Building department. Table 7 hereunder shows current projects which were rolled over from the previous plan.

The Corporation's Financial Health

Another area of major emphasis in the 2012 - 2016 plan was the Corporation's financial health. It was projected that the financial break-even year should have been 2015. And, in anticipation of this achievement, there were certain elements that were highlighted as being necessary for success. One of these is the enactment of the tariff that was approved by the Public Utilities Commission (PUC) and the meeting of the stipulations such as ensuring that the Corporation's customer database is accurate. Another is the reduction of Non-revenue water and the undertaking of capital works programs for the

supply and improvement of water services throughout the country. A review of the plan reveals that financial break-even was not achieved and the customer database continues to be problematic since it contains many inaccuracies that affect billing and revenue generation and results in many adjustments to accounts receivables.

Debt Write-Off - the Balance Sheet

The Corporation's 2015 financial report[4] shows an increased Allowance for Doubtful Debt on the Balance Sheet and this has been the trend for the past years. While the Corporation's board has been approving write-offs for percentages of debt covering several years, the Corporation should move towards a more accepted accounting practice[5] which recommends that a percentage of bad debt should be written-off annually up to the Allowance for Doubtful Debt on the balance sheet. The Corporation's accumulated debt over the years up to December 31, 2016 is $3.6 Billion dollars[6]. Based on the proposed write-off, it is projected that with a 40% arrears collection rate each year and if rigid controls are enforced to keep customer payments within the 28-day grace period, in approximately three (3) years the debt balance will be significantly reduced.

THE STRATEGIC BUSINESS PLAN 2017 - 2021

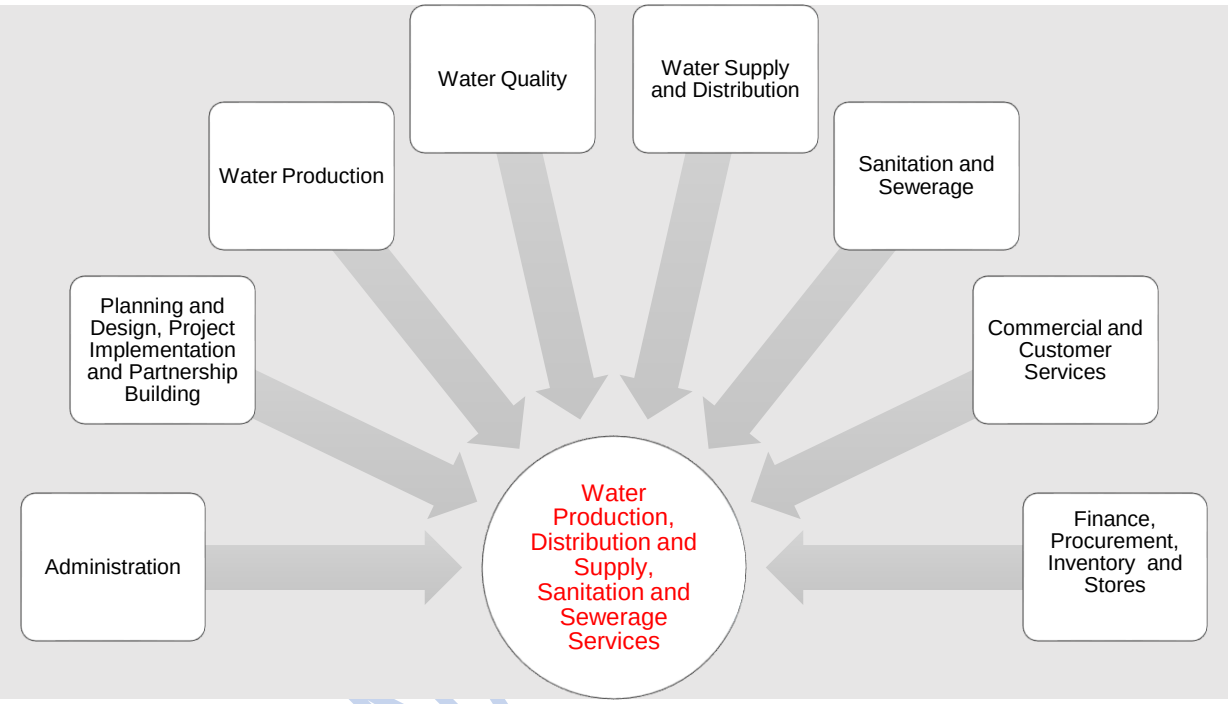
Plan Objectives

The 2017 – 2021 strategic plan is designed to chart the way forward for the Corporation. It uses data and information from the 2012 – 2016 plan for continuity of operations while focusing on new strategic areas for organizational growth. It reflects the mission objectives enunciated by the new Government of Guyana which was elected in 2015 and can be considered as a **Turn Around Document** for GWI. Its main objectives are as follows:

- To ensure that the government mandate to provide clean and efficient water and sewerage services to the country is achieved.
- To ensure that the Corporation employs personnel who are educated, skilled and knowledgeable in the performance of their functional duties for the fulfilment of the Corporation's mission and objective.
- To ensure that all personnel perform their duties in a safe and efficient manner, observing all required safety standards and regulations.
- To ensure that personnel receive adequate financial remuneration in accordance with government standards.
- 100% accurate customer database.
- Electronic billing and payments.
- To ensure that the Corporation's financial viability is achieved during the life of the plan.
- Reduction of the debt from an excess of 5 billion dollars.
- An increase of active Wells each plan year.
- To ensure that it has Tariffs that are socially acceptable and can contribute to the Corporation's financial viability.

[4] The 2016 Report is not yet available.
[5] GAAP (Generally Accepted Accounting Principles) guidelines.
[6] This amount changes daily due to the payment processing business rules that applies customer payments to the oldest unpaid balance (debt). The Debt Aging Schedule (HiAffinity Program) provides monthly updates of customer debt.

- Maintenance of water quality at 100% of WHO standards each plan year.
- The reduction of non-revenue water (NRW).
- The refurbishment and construction of treatment plants.
- The extension of water and sewerage services to all townships and new communities.
- The development and operationalization of water services to hinterland communities.
- The development of Water Shed Management for the safe, strategic and efficient use of water resources.



PROGRAMMATIC (SITUATION/GAP) ANALYSIS

GWI's administrative process places primary emphasis on the Operations Department's role in water production and service delivery. And, all other departments play a supporting role in the furtherance of the Corporation's mission objectives. In 2016, managers were taught the skills to create their Log Frame and Situation Analysis and in 2017, they created their **Programmatic** (**Situation) Analysis** which shows the organizational resources and capital financial support that is needed for goal achievement. This this was used to formulate the plans and funding requirements for the new 5-year Strategic Plan. Annual departmental goals will be formulated from the plan[7] and departments will develop work plans and procedures for their efficient functioning to provide the support needed for the Corporation to achieve its strategic objectives. The situation analysis was prepared using the (5) Programmatic Areas as a framework and information and data was gathered in each regional service area and support departments. Performance Indicators which are used to monitor strategic goals achievement have been developed and are listed in the respective sections in this plan.

[7] Goals (Strategic Objectives) are summarized and shown in each section.

Department Situation Analysis

The departments examined the Corporation's mission objectives and conducted their Gap Analysis which identified the critical elements and showed the requirements for the achievement of their programs objectives. A summary is set out in section below and in each departmental section of the plan.

- The **Operations Department's objective** is to provide 212 million m^3 annual water production by 2021, improved access in each region and specifically in each community based on their demographics, 24-hour continuity of service, level of service to a minimum of 5 metres, water quality in conformity with WHO standards and sanitation and sewerage services in accordance with government standards for wastewater disposal. Provide 100% metering for all service areas which received treated water and eliminate leaks to reduce non-revenue water.
- The **Planning and Design Department's objective** is to provide planning and design services for the gaps identified for the supply and demand for services in the regions and communities and the infrastructure to satisfy these service needs.
- The **Project Implementation & Partnership Building Department's objective** is the implementation of all infrastructure projects agreed to by the Board of Directors and the CMT.
- **Each Operational Support department** will perform the following:
    - **Commercial and Customer Services** will utilize a new customer Information System. Ensure that meter reading and billing are accurate to improve bill payment and improve interaction between customers and the Corporation.
    - **ICT** will provide services to ensure personnel access and competency to use electronic programs for operations efficiency and protection from Cyber Intrusions.
    - **Administration** will pursue the approval of new Tariffs for increased financial viability, regulations for service delivery and public relations programs for customer information and education.
    - **Human Resources** will decentralize its functions to HR Generalists in various regions to facilitate expeditious processing and decision-making.
    - **Finance** will implement a regional system to improve contractor payments and expedite purchasing and procurement.

Situation Analysis Performance Indicators (Operations)

Category	Indicator
Access to water	Domestic, Residential or Commercial services
Level of service	A minimum of 5 Metres
Continuity of service	24-hour service
Quality	Maintain international standards
Sanitation and Sewerage	Waste treatment and disposal

PLANNING AND DESIGN DEPARTMENT

Planning and Design Infrastructure Works

This department is responsible for planning and design which was previously performed by the Infrastructure Planning and Implementation Department (IPID). The Operations Department will identify program needs and gaps in the supply of services as they relate to regional and community needs and this department will plan and design projects for additional infrastructure to meet operational goals.

It functions within an administrative group comprised of the Operations, Strategic Planning and Project Implementation & Partnership Building departments. GWI's strategic focus for program delivery and service expansion will address the needs that are defined in the departmental and regional operations situation and gap analysis and the group will ensure that planning and design meets the identified needs.

PROJECT IMPLEMENTATION & PARTNERSHIP BUILDING DEPARTMENT

Current Hinterland Operations and new Infrastructure Works

The Project Implementation & Partnership Building Department is a replacement of the section of the Infrastructure, Planning and Implementation Department (IPID) that had responsibility for project administration, hinterland operations and project funding. It will continue the administration of hinterlands operations, be responsible for relations with funding agencies and be responsible for all infrastructure projects approved by the Board of Directors or the CMT.

Hinterland Operations

The department has responsibility for the operations and project implementation of potable water systems within Regions 1, 8, 9 and villages in the upper Mazaruni of Region 7. The Regions are divided into medium sized communities and small towns. The larger towns are Lethem and Mabaruma and small towns are Mahdia, Port Kaituma, Matthew's Ridge and Santa Rosa (Moruca) and Indigenous settlements. The residents in the town have individual service connections while in many communities, stand pipes are set up at strategic locations to serve the population.

	Target				
	2017	**2018**	**2019**	**2020**	**2021**
Region 1	32%	48%	63%	78%	93%
Region 8	11%	29%	44%	59%	68%
Region 9	20%	30%	45%	60%	75%
Region 7	46%	50%	56%	63%	70%

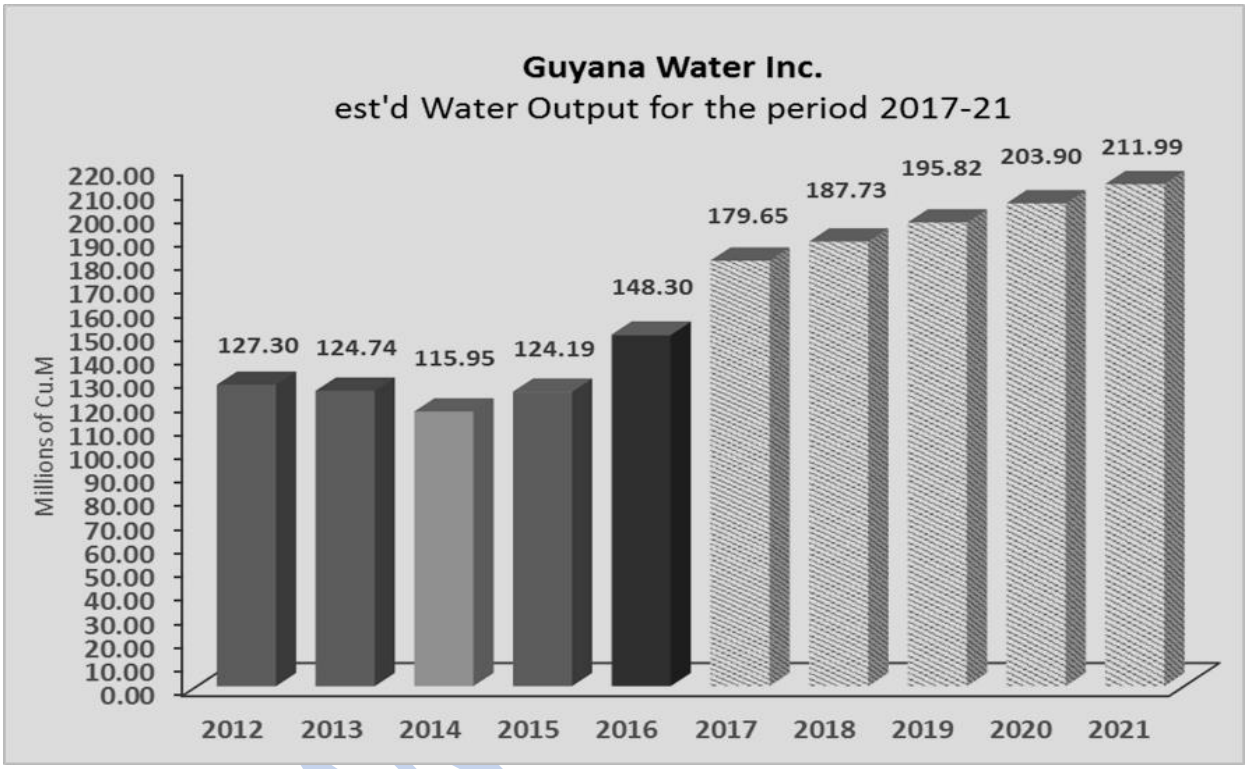
Allocation of Financial Resources under the WSSDP 2017-2021 (Gyd $blns)

Functional Areas	**Recurrent Cost**		**Capital Cost**		**Total Cost**	
Water production & Quality	$8,873.97	21%	$18,615.0	45%	$27,488.97	32.9%
Water Distribution & Quality	$8,451.4	20%	$16,133.0	39%	$24,584.40	29.4%
Organization & Management	$15,212.52	36%	$1,572.1	3.8%	$16,784.62	20.1%
Sanitation	$5,493.41	13%	$2,482.2	6.0%	$7,975.61	9.5%
Finance & Revenue	$4,225.7	10%	$2,565.2	6.2%	$6,790.90	8.1%
Grand Total	**$42,257.00**	**100%**	**$41,366.52**	**100%**	**$83,623.52**	100%

Funding Sources and the projected gap

Source	**Total** Amt.		**Total** Amt.	**Average per/ann.**	**Average per/ann.**	**%**

	(US$mn)		(Gyd$bln)	Amt. (US$mn)	Amt. (Gyd$bln)	
Development Partners	$31.861		$6,531.54	$6.3722	$1,306.31	15.8
Central Government	$59.132		$12,122.18	$11.827	$2,424.436	29.3
Guyana Water Incorporated	$31.029		$6,361.00	$6.206	$1,272.20	15.4
Unfunded/gap/deficit	$79.765		$16,351.80	$15.953	$3,270.361	39.5
Grand Total	**$201.788**		**$41,366.52**	**$40.358**	**$8,273.30**	**100**



Georgetown Service

The Corporation has examined the level of service for the Georgetown area and plans to increase its service level to 24-hour in all areas. Currently there are 9 wells which last year provided 9,595,154 m^3 of water, representing 40% of the service needs while the remaining 60% is supplied from a surface source, the East Demerara Conservancy. There are three (3) treatment plants, Sophia, Shelter Belt and Central. Based on the current demand, it is expected that GWI can increase its production capacity easily. However, the major challenge will be the storage of water to regulate its distribution. Currently, there are plans to upgrade and drill new wells and since water is distributed through service connections which are aged, there is some concern that increasing the supply distribution would lead to major leaks.

Water Storage

In prior years, GWI had overhead water storage tanks in various locations but in the absence of a discernable maintenance program, many of these tanks become inoperable and have been stolen and abandoned. While it is understood that the proliferation of customer's 'black tanks' is a phenomenon that will not disappear in the short run, it is felt that the feasibility of refurbishing existing tanks and the construction of new tanks should be investigated since they can play a pivotal role in regulating service

supply and contribute to energy cost reductions. Therefore, it is proposed that a special team of persons can be assigned to inspect and recommend refurbishment efforts for these tanks. Water produced from wells could then be pumped into the tanks for storage and can be released with gravity feed during the low demand periods (nights) without pumping water directly from wells to the distribution systems. This would result in lower operational energy costs for wells which will only produce water to replenish the overhead tanks.

Expanding Storage

The distribution of water is hampered by inadequate storage and this is critical in the Georgetown areas, notably at the Central Ruimveldt Station. The absence of adequate storage restricts the availability of water and the Corporation's ability to provide 24-hour full service in all areas of the city. Consequently, GWI proposes to build more storage facilitation as shown below during the plan years.

WATER QUALITY

Water Quality

Throughout Guyana, water is supplied to the various communities through two main sources namely, well water from 'A' and 'B' sand wells and surface water from rivers, creeks, springs and canals. These sources have inherent characteristics which require respective treatment and monitoring to address the following parameters: pH, turbidity, color, iron, aluminum, total coliforms and E. Coli etc. The Corporation has 24 treatment plants which supplies water to 45% of its customers along the coast and 132 wells from which water is distributed directly to the network without first passing through a treatment facility. There are also clear water springs in the hinterland locations from which water is distributed directly to the network in a similar manner to the wells.

The use of Mini Labs

Water is being produced on a 24-hr. basis for consequent supply to customers. The quality of this water must be monitored continuously and it is for this reason that mini labs are being set up countrywide. The mini labs will monitor more frequently to monitor operational efficiency and quality assurance of the water supplied. This will require added staff, especially field staff, and an increased supply of reagents to facilitate the volume of tests. This quality information gathered from these min labs will be used by management to continuously monitor and evaluate the individual treatment processes to improve the overall system. It will also serve to arrest any deviation from quality guidelines before it escalates.

Filters for Hinterland and Riverain Communities

With respect to the hinterland areas, where accessibility to potable water has been a challenge, the water quality has been monitored from the various sources used by the residents. These sources, because they are open to the environment, unprotected from intrusion, animals and possible sources of contamination, have presented very high numbers of microbial contamination. Conventional treatment such as coagulation-flocculation; filtration, aeration etc. has been a challenge and as such, mitigating the levels of health based parameters, has been the focus. Studies were conducted on different filters which remove the turbidity and microbial loads from the water sources. These studies included the effectiveness and robustness of several filtration technologies including: solar bags, sawyer filters, and Life saver filters etc.

Testing during the Distribution Process

The water quality can become compromised in the distribution process if regular flushing isn't done. The Quality department has intensified monitoring in the distribution networks, currently in Georgetown and Region 5 and this will be done in all the regions, with the aim of analyzing the chlorine residuals, turbidity spikes and microbial re-growth. These parameters indicate when flushing is necessary, and the need for added protection against microorganism. Recent analyses in the distribution in Georgetown show that iron is still an issue of concern and as such, iron removal technologies must be prioritized in the rehabilitation of the Shelter Belt water treatment plant.

Special Institutions

The plan identifies institutions in communities such as hospitals, health clinics, schools and places where children and the elderly reside as deserving special considerations for water services. The availability of regular, clean water is critical especially in healthcare and for school children to practice good health habits such as hand washing and using safe potable water. Hence, the performance indicators facilitate the monitoring of service levels in communities that have hospitals, clinics and schools.

GWI will institute procedures to help the regional administration and institutional management for schools and health clinics or hospitals to monitor the quality of water which students or patients access, which most often is received indirectly from GWI through 'black tanks' that store water which is dispensed to the clientele or from reservoirs for hospitals. Tests conducted on these tanks demonstrate alarming levels of contaminants which can affect users of water stored in these tanks. Therefore, GWI is considering an approach to government for a partnership with personnel from the Ministry of Health and Ministry of Education to create and enforce regulations for the cleaning and monitoring of these tanks, until GWI's level of service makes their usefulness obsolete. With regards to reservoirs for hospital water supply, it is expected that their universal precautions procedures will ensure that water quality is at the highest quality level. Additionally, GWI will deploy monitors to ensure that it can track water levels in the reservoirs.

SANITATION AND SEWERAGE

Sanitation

GWI currently operates 24 sewerage pumping stations in Georgetown under the Georgetown Sanitation Improvement Program (GSIP) and 12 for the Urban Sewerage and Water (USWS) and plans to build 2 plants in Georgetown during the plan years. Its operating license dictates that it should operate at 98% sewerage disposal efficiency however, currently there is no data to measure its operating efficiency[8]. The sewer pump stations operate against fixed systems and the operating points are relatively constant and pumps are sized to ensure sewerage disposal at the stations. Waste water is discharged directly into the rivers.

GWI operates and maintains two (2) interconnected sewerage systems in the City of Georgetown. One system serves Central Georgetown while the other serves the Tucville community. The systems are dub-divided into 24 separate sub-basins to permit gravity flows within each sub-basin. These are comprised of yard or collecting sewers, street sewers, a pump station and forced main into which each station

[8] The need for measuring instrumentation is being addressed in the new plans.

discharges. In areas not served by the sewerage system, wastewater is disposed by septic tanks. Outside of Georgetown, the greater percentage of sewerage is disposed by septic tanks and other configurations.

Planned expansion of the Georgetown Service Area

The expansion of the services of the Georgetown Sewerage system will encompass the following:

- The construction of a wastewater treatment plant designed for the optimum utilisation of its bi-products, whilst effectively treating all sewage collected from the capital city of Georgetown and its surrounding villages.
- The re-engineering of an existing sewage collection station at Tucville, thereby increasing its capacity, and capability which will allow for the disposal and subsequent treatment of sewage from the neighbourhood, along with sludge collected from cesspit and septic tanks outside of the sewerage area and brought to the facility by sewage tankers.
- The elimination of the current non- hygienic and environmentally degrading manner under with the sludge from cesspit and septic tanks are extracted and disposed.
- The extension of centralized sewage systems (Georgetown and Tucville systems) into communities outside of the current sewer area and other areas outside of Georgetown, with a focus on new government and private housing schemes. The intention is to replace on-site treatment (septic tanks), where practical, with central WWTP which are more superior in their operation.
- The establishment of municipal wastewater treatment especially in the new towns, in keeping with the country's green initiative.
- The provision of basic sanitation facilities, utilising low-cost, low-maintenance wastewater treatment initiatives within the country's hinterland regions.
- Collaboration with the local authorities in all the regions on matter of sanitation.
- Collaborated arrangement with the Ministry of Health in the formulation of action programs/plans designed to eliminate the spread of tropical diseases associated with to poor and/or inadequate access to sanitation services.

Wastewater Treatment outside of Georgetown

The Corporation considers the treatment of wastewater outside of Georgetown with equal importance and wishes to have equity of service for the residents in outlying communities. Therefore, the Haag Bosh Sanitary Landfill, located behind the community of Eccles, or an area around the old Mandela dumpsite, behind Mocha village or another suitable area is being considered for the construction of a drying bed. or another suitable wastewater facility for the disposal and treatment of sludge removed from septic tanks and in the future, from wastewater plants. This area was considered for the construction of a lagoon, stabilization wastewater plant, or drying beds built to accept septic tank waste which will be treated through this low-cost method which will also provide polishing before discharging into nearby waterways. The drying beds however are a superior choice and can be incorporated into the lagoon system which will provide treatment from the liquid waste released from the drying beds during the drying process.

Residential and Commercial Sewerage Tanks in the Hinterland

GWI is concerned with residential and commercial sewage septic tanks and wishes to ensure that they are properly designed and serve to efficiently process sewage and wastewater to prevent health hazards. Therefore, it will work in partnership with the Bureau of Standards, the Public Health Department of the Ministry of Health and Georgetown Municipality and rural townships to ensure that citizens can have access to properly designed plans for tanks, obtain approval for residential and commercial building

permits and construct tanks accordingly. In this regard, the Corporation's personnel have benefitted from technical training in the design of sewerage tanks and will be engaged in public awareness programs.

Approvals for Septic Tank Construction

GWI whilst not having the authority for approval of septic tank designs and sizing, is currently reviews construction plans for septic tanks. Our focus therefore should be to seek the authority to either approve individually or collaboratively the design and construction of septic tanks with the local government entities within the regions. Priority should also be given for the management of septic tank sludge, which includes established procedures for the de-sludging of septic tanks and the environmentally appropriate disposal of the extracted sludge.

Education and Litigation for sanitation regulations non-compliance

GWI will provide information and participate in forums to educate persons on safe and legal sanitation practices. However, in such instances where it is observed that there are flagrant and willful violations of sanitation regulations, the Corporation will pursue legal actions to ensure compliance.

THE HUMAN RESOURCES DEPARTMENT

Human Resources Talent Acquisition and Retention

The Human Resources department is responsible for the acquisition of Talent and retention of personnel who are required for the administration of the Corporation's operations. The situation analysis has been used to project the staffing needed in each department to fulfil their mission objectives during the program years. The current staffing level is 813 employees who comprise the senior and middle managerial, supervisory, technical and rank and file positions. The department will however ensure that the Corporation has the correct staffing level for its operational efficiency and it is recommended that in developing countries such as Guyana, the staffing level should be well below the ratio of 12 (considered to be an inefficient mix). Thus, using the recommended formula, the current ratio, based on an approximate customer base of 160,000 and current staffing is at 813 and this translates to five (5) staff persons per 1,000 customers served. This is at the benchmark in the industry of <5 and the staffing level is expected to increase to 880[9] over the life of this plan to support the Corporation's objectives. While the increase would move the average ratio to 5.5 of the recommended range for the current customer base, it is expected to move to a lower positive number with the expected increases in customer base and service expansion in urban and rural regions.

CORPORATE SERVICES

Corporate Administration

The Corporate Services Department provides legal and administrative support for the Corporation's mission and objectives. During the life of the strategic plan, the department will continue the pursuance of the objectives (section 1.3) listed in the previous strategic plan. The department is tasked to engage state and governmental entities to develop procedures for the enforcement of GWI's right to obtain payment for debts incurred by homeowners prior to the grant of a transfer of property. The Corporation is experiencing a critical issue regarding blocked sewerage and this is having a tremendous financial impact

[9] Increases are projected with the conversion from contracted services to in-house personnel in operations.

on the sewerage operational costs. The Corporation is seeking help from the government to prosecute and enforce payment of penalties for the blocked sewerage system.

PUBLIC RELATIONS

Public Relations Programs

This department is responsible for presenting GWI's programs to the public using various media such as a radio, TV, print and press conferences. It is also responsible for school outreach programs aimed at educating school children regarding water usage and conservation. Programs to highlight the Corporation's efforts to develop technical expertise for its personnel through the signing of technical service agreements with international entities are also brought to the public's attention through the department's press releases and facilitation for media presence at signing ceremonies during which they can obtain information on the agreements.

Personnel providing Customer information -On Air at 94.1 FM

INFORMATION COMMUNICATION TECHNOLOGY

15.0 Information Communication and Technology

The Information Communication and Technology department is responsible for providing computer software, hardware, a network and communication platform and Cyber Security support for the Corporation's business activities. The strategic plan will focus on the implementation, integration and interoperability of the various electronic programs for improved and efficient organizational performance which were identified in its Gap Analysis and Situation Analysis. The current Financial Information Management System (FIMS), Oracle EBS, which is used for financial management and reporting will have an interface with the new Customer Management Information and Billing System (CMI&BS) which will be selected. The current CMI&BS (HiAffinity) will be replaced because of the many disadvantages which are inhibit data collection, reporting and record-keeping. This integration will eliminate the need for manual and delayed transmission of financial information from the CMIS&BS to the FIMS for the timely preparation of the Profit and Loss and Balance Sheet.

CUSTOMER SERVICES AND REVENUE

17.0 Commercial and Customer Services

The Corporation's commercial and customer services department was reorganized to facilitate electronic interaction for customers to receive information regarding level and quality of service, access their accounts, pay their bills and report service issues. The objective of this department is to ensure that billing is accurate, that it is delivered to customers in a timely manner and payment is received promptly as is depicted in the schematic below. An electronic program with an App for access via cellphones and Tablets will be available for use by the Corporation's personnel. The program will display regional data such as levels of service, quality, demographics etc. for information sharing and decision-making. It will also have an interactive feature for customers to access data regarding their account, enter meter reading, review their bill, make their payment and generate bills and receipts.

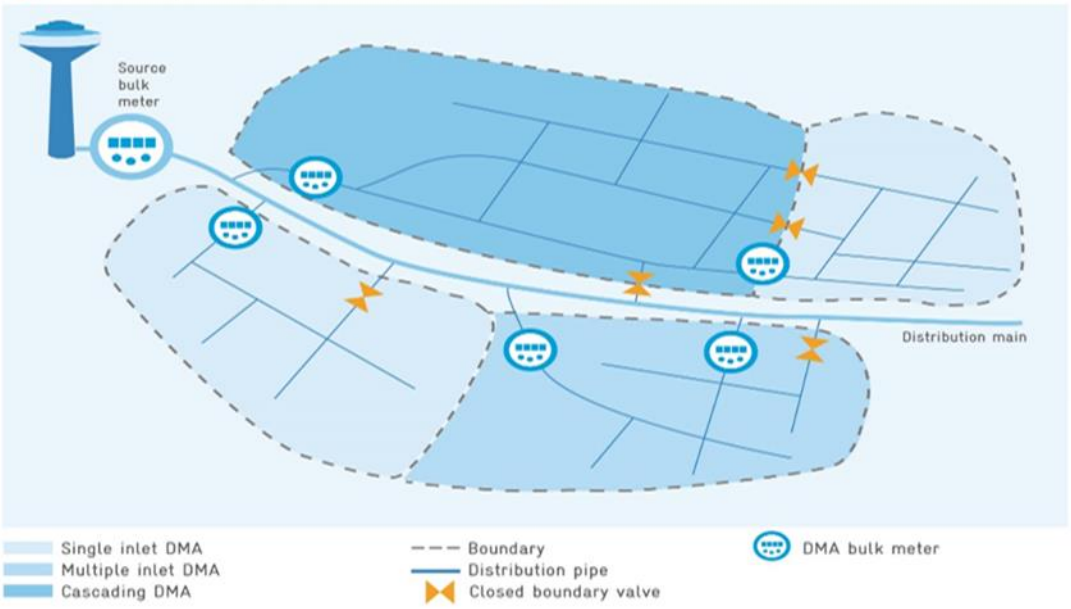
Tariffs (Pricing)

An analysis of the data collected shows that while it is possible to accurately bill metered customers for usage, unmetered accounts are billed using the basic minimum consumption of 12 m^3 but the actual consumption is closer to 25 m^3 or [>/per month]. Hence, in creating the justification for a new Tariff, the Corporation plans to meter 100% of its accounts to better reflect actual consumption and this should have a positive impact in reducing NRW since it is felt that real production losses can be reduced with an expansion of metering especially in areas where treated water is supplied.

District Metering Areas Program (DMA)

The District Metered Area (DMA) is an isolated geographic area in which the consumption of a specific number of customers is measured and reconciled with the inflow and /or outflow of water into the area. The transmission and distribution system is fitted with valves that defines boundaries in which flow into and out of the specified area is measured. The readings from the bulk meters when compared with the actual (or estimated) customer consumption gives an indication of the losses due to leaks or illegal consumption. GWI employs the use of data loggers, which reads the bulk meters in real time and transmits these readings to a central hub for use by its engineers. There were at the end of 2016 approximately 15 active DMAs whose implementation has seen marked reduction in water losses within the areas where they were activated and properly monitored. For the DMA program to be expanded and sustained, adequate human and technical resources must be readily available. Over the years GWI has grappling with not having enough data loggers for use on all the DMAs, thus the activating and monitoring of DMAs had to be reduced. There is also the need for relevant personnel to regularly monitor the DMAs to get accurate data of water loss. Also, there is the need for DMAs to have approximately 100% metered customers in the designated areas, thus the need for resources to make this a reality.

Figure 6.2 Typical layout of DMAs, based on [22]



Adapted from a web publication

Domestic Consumption Monitors (DCM) Program

One of the critical factors regarding non-revenue water is the monitoring of consumption for unmetered customers. GWI has recognized this in the past and addressed it with the placement of 410 Domestic Consumption Monitors (DCM) in various areas to provide data on consumption by unmetered customers. The usefulness of these monitors (meters) continue to be vital and although the Corporation plans to have 100% metering of all accounts, nevertheless until this is achieved, it is considered prudent to continue to monitor the unmetered accounts. Consequently, an exercise has been initiated to identify the current placement of these meters, ensure that they are being read and the data is captured for analysis. In consideration of the cost of new meters, the Corporation surmises that it would not be feasible to provide all new meters for this process when costs can be realized with the use of some refurbished meters. While the data is not used for billing, it will be collected and transmitted to the strategic planning department for analysis to determine appropriate levels of service.

Targets for Installing Meters

Regions	FY2016	Planned Metering Programme					TUMC	2016	projected increase annually					W A.UM
		FY2017	FY2018	FY2019	FY2020	FY2021			2017	2018	2019	2020	2021	
Region 2	**5567**	1969	985	984	738	246	**4922**	**53.1%**	18.8%	9.4%	9.4%	7.0%	2.3%	4.9%
Region 3	**11875**	7677	3838	3838	2879	960	**19192**	**38.2%**	24.7%	12.4%	12.4%	9.3%	3.1%	19.2%
Region 4-GT	**18933**	5170	2585	2585	1939	646	**12925**	**59.4%**	16.2%	8.1%	8.1%	6.1%	2.0%	12.9%
Region 4-EBD	**7538**	4791	2395	2395	1797	599	**11977**	**38.6%**	24.6%	12.3%	12.3%	9.2%	3.1%	12.0%
Region 4-ECD	**15345**	7651	3826	3826	2869	956	**19128**	**44.5%**	22.2%	11.1%	11.1%	8.3%	2.8%	19.1%
Region 5	**3941**	3832	1916	1916	1437	479	**9580**	**29.1%**	28.3%	14.2%	14.2%	10.6%	3.5%	9.6%
Region 6	**14249**	6982	3491	3491	2618	873	**17455**	**44.9%**	22.0%	11.0%	11.0%	8.3%	2.8%	17.4%
Region 7-Bartica	**1447**	219	120	150	0	0	**489**	**74.7%**	11.3%	6.2%	7.7%	0.0%	0.0%	0.5%
Region 10-LIN	**4172**	1352	676	676	507	169	**3380**	**55.2%**	17.9%	9.0%	9.0%	6.7%	2.2%	3.4%
Region 1,8,9-H/l	**156**	357	168	320	255	0	**1100**	**12.4%**	28.4%	13.4%	25.5%	20.3%	0.0%	1.1%
Total	**83223**	**40000**	**20000**	**20181**	**15039**	**4928**	**100148**	**45.4%**	**21.8%**	**10.9%**	**11.0%**	**8.2%**	**2.7%**	

Regions	FY2016	Estimated Programme Out-turn 2017-2021											W A.M
		FY2017	FY2018	FY2019	FY2020	FY2021	FY2016	Dec-17	Dec-18	Dec-19	Dec-20	Dec-21	
Region 2	**5567**	7536	8520	9505	10243	**10489**	**53.1%**	71.8%	81.2%	90.6%	97.7%	100%	6.7%
Region 3	**11875**	19552	23390	27229	30107	**31067**	**38.2%**	62.9%	75.3%	87.6%	96.9%	100%	14.3%
Region 4-GT	**18933**	24103	26689	29274	31213	**31859**	**59.4%**	75.7%	83.8%	91.9%	98.0%	100%	22.7%
Region 4-EBD	**7538**	12329	14724	17120	18916	**19515**	**38.6%**	63.2%	75.5%	87.7%	96.9%	100%	9.1%
Region 4-ECD	**15345**	22996	26822	30647	33517	**34473**	**44.5%**	66.7%	77.8%	88.9%	97.2%	100%	18.4%
Region 5	**3941**	7773	9688	11604	13041	**13520**	**29.1%**	57.5%	71.7%	85.8%	96.5%	100%	4.7%
Region 6	**14249**	21231	24723	28214	30832	**31705**	**44.9%**	67.0%	78.0%	89.0%	97.2%	100%	17.1%
Region 7-Bartica	**1447**	1666	1786	1936	1936	**1936**	**74.7%**	86.1%	92.3%	100.0%	100.0%	100%	1.7%
Region 10-LIN	**4172**	5524	6200	6876	7383	**7552**	**55.2%**	73.1%	82.1%	91.0%	97.8%	100%	5.0%
Region 1,8,9-H/l	**156**	513	681	1001	1256	**1256**	**12.4%**	40.8%	54.2%	79.7%	100.0%	100%	0.2%
Total	**83223**	**123223**	**143223**	**163405**	**178444**	**183372**	**45.4%**	**67.2%**	**78.1%**	**89.1%**	**97.3%**	**100%**	
mean	**8322**	12322	14322	16341	17844	18337	note: cumulative metering percentage/yr						
median	**6553**	10051	12206	14362	15979	16518							
max	**18933**	24103.4	26821.8	30647.4	33517	34473							
min	**156**	513	681	1001	1256	1256							

notes**
1. TUMC: total number of unmetered customers
2. metered accounts baseline 12/2016
3. weighted average metered accounts (W/A.W)
4. weighted average unmetered accounts (W/A.UM)

Analyzing and Setting Revenue Targets for 2017 – 2021

The projection for the new plan's revenue targets begins with an examination of the premise and assumptions which were used for the 2012 – 2016 years. The plan stated that the projected water production for the end of the 2012 - 2016 period could surpass the averaged total production of 130,000,000 m^3 or 130 x 10^6 cubic meters in 2016. It assumed that at 35% NRW, the 2016 annual operational and maintenance budget would be G$6.3 billion which meant that there would have to be billable volume of 65% x 130 x 10^6 cubic meters or 84.5 x 10^6.

The Corporation is cognizant of the fact that while the 2012 – 2016 plan placed great reliance on efforts to reduce NRW and had a projection for reduction to 35%, nevertheless, events and data reviewed over the plan years have consistently demonstrated that emphasis should have been on a more realistic acceptance that NRW reduction[10] will be gradual and will be dependent on the removal of certain inefficiencies before reductions can be realized.

Consequently, GWI is examining areas of inefficiencies in its operations and will be aggressively pursuing the expansion of its customer base (aligned with the national 2012 Census), expansion of services to new and existing communities, 100% metering of unmetered accounts, especially in areas where treated water

[10] See Section x.

is produced and effecting expeditious leak repairs. These will ensure that water production matches real customer demand, resulting in reduce non-revenue water and increase revenue water.

Projected NRW Decreases

The plan is projecting that NRW will decline over the next five (5) years, as set out in the following table. Correspondingly, it is expected that revenue water will increase and have a positive impact on GWI's revenue each year.[11]

NRW Reduction Projection

Component	2017	2018	2019	2020	2021
% loss	64%	60%	56%	52%	48%

Debt/Equity Ratio

GWI carries on its balance sheet the loans that it received from international agencies whose repayment is guaranteed by the Government of Guyana. While the corporation is not burdened with treating loans as liabilities which must be repaid, it must be concious of the fact that it is financing its capital purchases and operations through debt (leveraging) and does not escape the financial requirements for ensuring that loans financing is used to generate revenue that justifies its infusion. Using the data available from the audited 2015 financial report[12], it is observed that the Debt/Equity Ratio is 0.427 (2015) and 0.428 (2014). The Corporation must ensure that its Debt/Equity Ratio is positive (<1) so that it maintains financial viability, can achieve break-even[13] and eventually be able to make contributions to the government. Being able to demonstrate a positive relationship between the use of assets derived from loans and the revenue generated will demonstrate efficient use of resources.

New Five-Year Government subventions projections

Five (5) year (est.)	2017	2018	2019	2020	2021
Subvention - payment for electricity cost (G$)	$2.63 blns	$2.60 blns	$2.4 blns	$2.2 blns	$2.1 blns

PURCHASING AND PROCUREMENT

Purchasing and Procurement

The Corporation has restructured its procurement and purchasing department and placed it in the Finance Group for better financial control and operational efficiency. Under the 2012 - 2016 Plan and with the old administrative structure, there were many delays in the purchase and procurement of critical items of supply which adversely affected the operational efficiency of the departments. Additionally, in keeping with the recommendation made by the forensic audit team, the department's procedures for reviewing, documenting and ensuring that approvals are given for tender awards must be revamped to offer more

[11] See Table 48.
[12] 2016 Report is unavailable.
[13] Projected for 2021.

transparency and efficiency. The department controls an annual budget of Guy$3.0 Billion dollars with a stores inventory of approximately Guy$1.2 Billion dollars.

NON-REVENUE WATER

Non-Revenue Water (NRW)

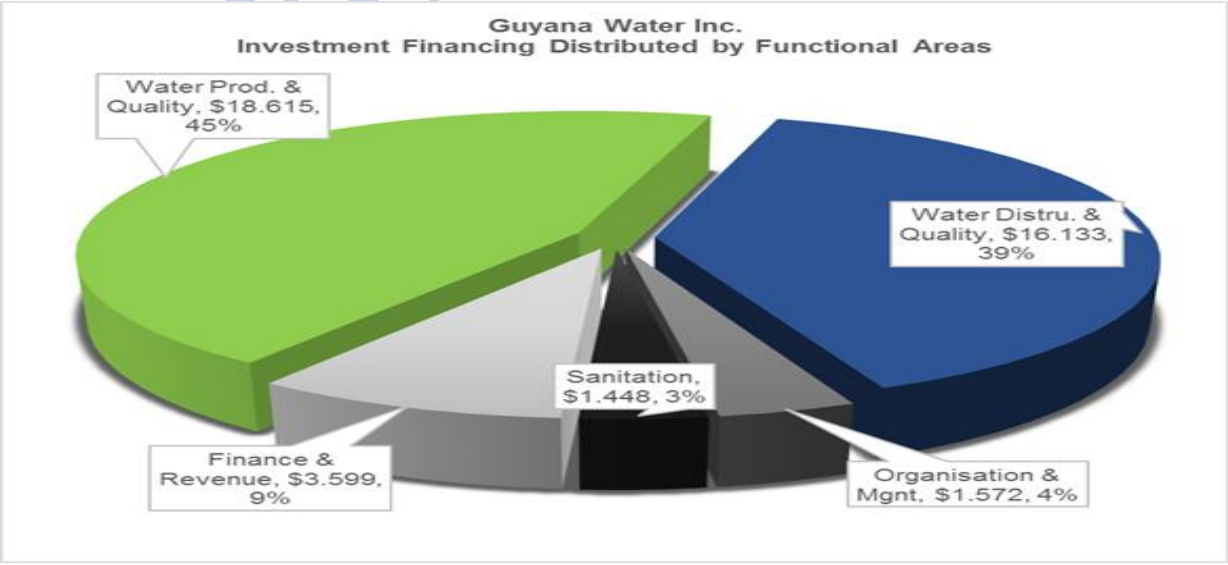
Non-Revenue Water (NRW) represents a significant aspect of financial loss for the Corporation and thus deserves special attention. While the current strategic plan has a performance indictor which stipulates the reduction of non-revenue water, nevertheless because of the complex nature of NRW, it is felt that it is more feasible to target the gradual its reduction during the life of the plan. Hence, the Corporation is seeking approval for the services of a consultant to examine NRW and plan intervention strategies for its reduction. The preliminary information submitted by a consultant in an Inception Report states that the Corporation needs to know the physical location and condition of pipes, valves, connections, and service connection lines since this data will be required for the design of a hydraulic network optimization, including network zoning; planning and executing leak detection campaigns and the assignment of personnel to perform pipe and service connections replacement.

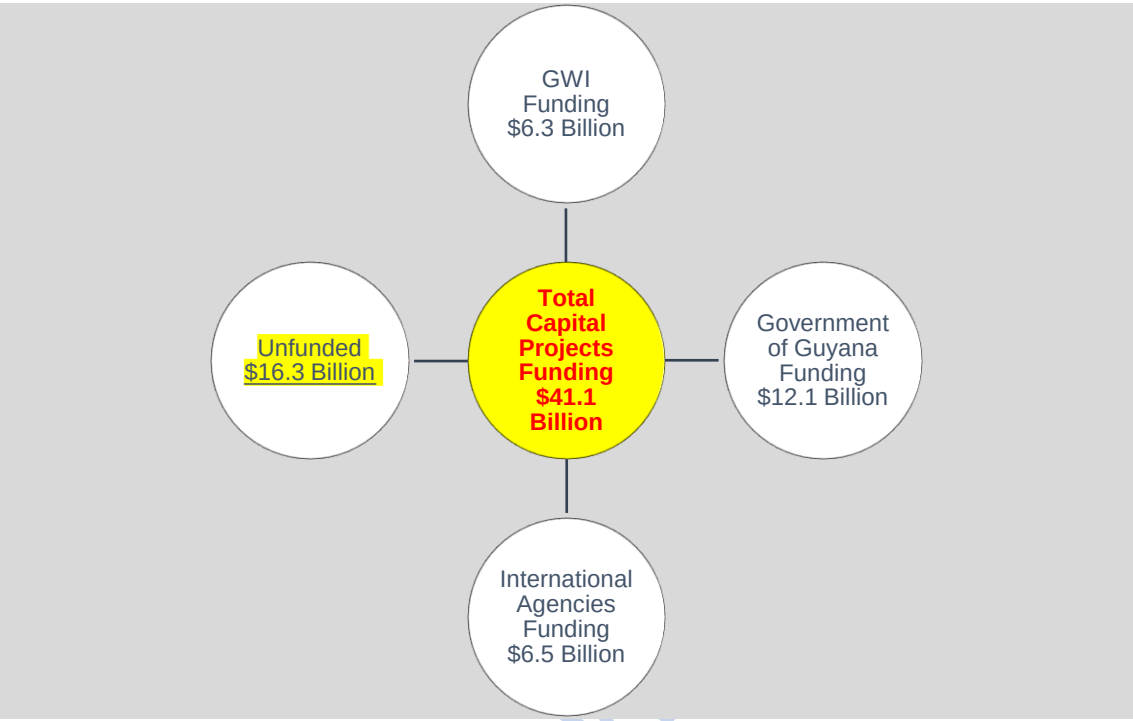
FINANCING THE SECTOR INVESTMENT PROGRAM

Capital Investment Programme 2017-2021

The various sources of financing for implementation of SP2017-2021

Source	**Total** Amt. (US$mn)	**Total** Amt. (Gyd$bln**)**	**Average per/ann.** Amt. (US$mn)	**Average per/ann.** Amt. (Gyd$bln)	**%**
Development Partners	$31.861	$6,531.54	$6.3722	$1,306.31	15.8
Central Government	$59.132	$12,122.18	$11.827	$2,424.436	29.3
Guyana Water Incorporated	$31.029	$6,361.00	$6.206	$1,272.20	15.4
Unfunded/gap/deficit	$79.765	$16,351.80	$15.953	$3,270.361	39.5
Grand Total	**$201.788**	**$41,366.52**	**$40.358**	**$8,273.30**	**100**




GWI
Funding
$6.3 Billion
Unfunded
$16.3 Billion
Total
Capital
Projects
Funding
$41.1
Billion
Government
of Guyana
Funding
$12.1 Billion
International
Agencies
Funding
$6.5 Billion

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