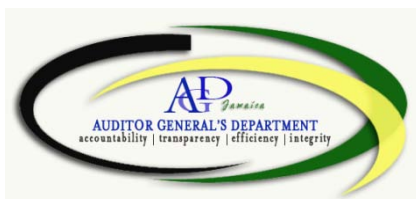


**AUDITOR GENERAL'S DEPARTMENT
PERFORMANCE AUDIT REPORT
OF THE
NATIONAL IRRIGATION COMMISSION (NIC)**



Auditor General of Jamaica
Auditor General's Department
8 Waterloo Road, Kingston 10
Jamaica, W.I.
www.auditorgeneral.gov.jm

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Auditor General's Overview

Jamaica Vision 2030 National Development Plan has recognised that food security is a national priority, as global economic and environmental forces combine to threaten long-term food supply and prices. This underscores the need to place increased focus on the development of the agricultural sector as a key driver of the Jamaican economy. In the 2013-14 Fiscal Policy Paper (FPP), the Government of Jamaica (GOJ) states that one of the strategies to increase real GDP growth rate was the targeting of key investment sectors, such as tourism, infrastructure, ICT, energy and agriculture. The GOJ projects that the agriculture, forestry and Fishing industry will improve by 3.5 per cent in 2013-14 due to increased use of technology (greenhouse, irrigation, ect) and best practices to capitalise on higher levels of domestic and global demand. To attain the Government's strategic projections for the agricultural sector, one of the key elements will be the efficient production and distribution of irrigation water. The National Irrigation Commission (NIC) is licensed as the irrigation authority in Jamaica, and it is charged with the responsibility to make irrigation water available to the agricultural sector. The main objective of the NIC is to manage, operate, maintain and expand existing and future irrigation schemes and systems, as may be established by the Government of Jamaica. As such, NIC must put in place a structured approach to manage and improve Jamaica's irrigation infrastructure.

The performance audit was planned to determine whether NIC is fulfilling its core mandate to contribute to the sustainable development of the agricultural sector, the achievement of its objectives and the efficient management of the irrigation infrastructure.

This report reveals that NIC has been challenged to fulfil its mandate due to financial constraints and its inadequate irrigation infrastructure. The report also highlights NIC declining productivity due to its aging and inefficient irrigation infrastructure, which contributed to aggregate water losses of \$1.2 billion over the period 2007 to 2012. Further, the absence of proper monitoring, maintenance and project management systems impaired NIC's ability to better manage its irrigation infrastructure. And, NIC did not implement planned capital projects under the National Irrigation Development Programme (NIDP) owing to financial constraints. In addition, NIC's distribution of water is exposed to contaminants, which poses health and environmental risks and threatened its ability to supply safe water to agricultural and commercial users.

This report is intended to assist the Commission to further improve the irrigation network to positively contribute to agricultural development. Therefore, the Board and the management of the National Irrigation Commission are encouraged to accept the recommendations outlined on pages nine and ten (paragraphs 7 to 10) and pursue their implementation.

I wish to thank the management and staff of the NIC for the courtesies extended to my staff during the audit.



Pamela Monroe Ellis, FCCA, FCA, CISA
Auditor General

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Executive Summary

The National Irrigation Commission (NIC), established in 1986, became operational in May 1987. NIC's main objectives are to manage, operate, maintain and expand existing and future irrigation schemes and systems, as may be established by the Government of Jamaica (GOJ). NIC's main role is to provide irrigation services to the agricultural sector by developing potential sources of irrigation water to spur agricultural production.

We conducted a performance audit to determine whether NIC is managing its operations effectively and efficiently to achieve its core business objectives. Our audit focuses on whether NIC employs appropriate systems and procedures to ensure:

1. The efficient and effective management of its financial resources.
2. The proper planning, executing and monitoring of irrigation projects.
3. The efficient and effective management of its irrigation infrastructure.

The audit also examined the economy of NIC administrative activities, and management's adherence to good corporate governance practices. The key findings are outlined in paragraphs 1 to 6.

Key Findings

Financial Position

1. **NIC has not been able to implement 43 of the 51 planned capital projects under the National Irrigation Development Programme (NIDP), due to inadequate resources.** In 1998, NIC estimated that the implementation of the 51 capital projects would cost US\$106 million over the 17-year period ending in 2015. Despite the plans, NIC did not identify a definite source of financial support for the projects. The eight projects that have been implemented to date were substantially funded by external lending agencies. We found that over the period under examination, 2006-07 to 2011-12, NIC's declining cash position impaired its ability to execute the projects. The net cash generated from operating activities declined by 234 per cent, moving from \$86.2 million as at March 2007 to negative \$115.4 million as at March 2011. We noted that NIC's financial position, before GOJ subsidy of \$2.8 billion, shows an aggregate deficit of \$2.79 billion, over the period 2006-07 to 2011-12. This position existed despite three increases in water rates during the period August 2010 to April 2012. The GOJ's subsidy to NIC increased by 30 per cent in 2011-12, moving from \$507.26 million in 2010-11 to \$660.32 million. This improved NIC's financial position to an aggregate surplus of \$38.6 million and net cash from operating activities to \$75.5 million in 2011-12. However, we found that on average administrative expense represented 25 per cent of the total expenditure, and it increased by 94.4 per cent, moving from \$122.05 million as at March 2007 to \$237.2 million as at March 2012. The administrative staff accounted for 57% of NIC's staff complement.

Irrigation Infrastructure

2. **NIC experienced declining productivity because of its aging and inefficient irrigation infrastructure.** We found that production and distribution costs increased by 87 per cent while water production volume declined by 26 per cent. NIC production and distribution costs moved

from \$380 million as at March 2007 to \$713 million as at March 2012 while total water production for the period declined by 28 million cubic metres (m³), moving from 109 million m³ in March 2007 to 81 million m³ in March 2012. The two main cost drivers are electricity and direct labour, representing total increases of 145 and 68 per cent respectively, for the period 2006-07 to 2011-12. To mitigate the rising electricity cost, NIC has initiated plans to develop a wind farm project to supply 1.5 megawatts of power to its Hounslow pump stations.

3. **NIC's financial constraints has resulted in maintenance activity that is triggered by a "need to repair basis" rather than a structured maintenance programme.** NIC's inability to undertake planned routine repairs and maintenance has compromised the integrity of its irrigation infrastructure and contributed significantly to the rising maintenance (labour and material) costs. NIC labour and material costs for the maintenance of the conveyance system increased from \$26.85 million in 2006-07 to \$70.4 million in 2011-12. NIC's records indicated that, as at March 2013, 20 of the 73 pump stations were without measuring meters and nine have malfunctioning meters. NIC estimated that \$1.2 billion is required to repair its malfunctioning irrigation infrastructure. Included in the \$1.2 billion, is a budgeted \$376.3 million to replace asbestos cement (AC) pipes with PVC pipes, to mitigate possible health implications. However, NIC was unable to provide an implementation schedule, as the source of funding is yet to be identified. The faulty and inadequate infrastructure also contributed to water losses of 159 million cubic metres (estimated at \$1.2 billion) from both the open and pressurised irrigation systems, over the six-year period, April 2007 to March 2012. NIC has recognised the deficiencies and has included in its 2013-2017 Strategic Plan, the need to develop and implement strategies to reduce systems losses and has stated the need to *"achieve operational efficiency of 75% for open systems and 95% for pressurised systems by 2018"*.
4. **NIC's distribution of water is expose to contaminants, which poses health and environmental risks.** An internal audit commissioned by NIC in August 2012, identified 10 locations where wastes such as fecal coliform, caustic soda, detergents, sulphur and oils are being deposited into NIC's open canals and water sources. This threatened the ability of NIC to supply safe water to agricultural and commercial users. NIC and the National Environment and Planning Agency (NEPA) are currently developing strategies to mitigate the contamination risks to its water supply. However, despite the recommendations by their internal audit, NIC has not engaged the services of a suitably qualified professional to assess the impact of the contaminants on the agricultural and other sectors.
5. **NIC projects that GOJ subsidy will increase by 40 per cent, moving from a budgeted \$496 million in 2012-13 to \$695.66 million by 2017-18.** NIC has indicated its intention to implement the GOJ's Water Sector Policy (2004). The policy proposes that NIC charges farmers an economic rate for irrigation water. However, it did not conduct an assessment to ascertain the impact the increased water rates may have on the agricultural sector.
6. **We found that the "Black Tank" irrigation projects implemented in St. Mary and Manchester lacked transparency.** This was a result of management's override of the control systems and disregard for established procurement procedures. NIC spent approximately \$2.8 million purportedly to procure 11 (1000 gallons) water tanks and provide water to the respective beneficiaries in the two parishes. However, despite our request, NIC did not present any evidence to substantiate the actual delivery of tanks and water to the beneficiaries. In addition, NIC failed to provide the basis used to select the beneficiaries, their names and addresses and evidence that the beneficiaries constructed the required reinforced concrete tank bases. Since May 2013, NIC has undertaken an exercise to confirm that the intended beneficiaries have

received the tanks. NIC presented an Interim Report dated May 15, 2013 on the Water Harvesting (Black Tank) Project, highlighting site visits to three farmers in Saint Mary, along with photographs. However, we are unable to confirm that these tanks were in fact purchased by NIC. The interim report stated, *“Additional follow-up will be done to ascertain the names of the farmers in Manchester as well as their agricultural impact. In addition, a further site visit will be planned as additional contacts have been made by the Chief Internal Auditor.”*

Recommendations

To improve the efficiency and effectiveness of irrigation management for sustainable development, NIC should consider adopting the following recommendations.

7. NIC’s Board should ensure that the executive management develops and implements, in the shortest time, appropriate strategies to ensure improvement in the current net operating cash flows. The strategies should aim to improve efficiencies in NIC’s operations and grow its customer base, so as to maximise its revenue from water and drainage charges. NIC should ensure that its energy substitution and other cost saving initiatives are implemented to decrease or at least contain expenditure. This would reduce NIC’s reliance on GOJ subsidy for its recurrent expenditure. The increased revenue and savings could assist NIC in financing the implementation of outstanding irrigation projects. In addition, NIC should renew the partnership with the Ministry of Agriculture and Fisheries (MoAF) to ensure the re-launch of the Arable Lands Irrigated and Growing for the Nation (ALIGN) initiative to meet its strategic objective of *“redevelopment of unused and underutilised arable agricultural lands within NIC’s irrigation districts”*.
8. The curtailment of water losses requires immediate attention. As indicated in paragraph 3, the NIC’s irrigation structure contributed to an aggregate estimated water loss of \$1.2 billion over the period 2007-2012. Coincidentally, NIC has estimated that the cost to repair the faulty irrigation network will be approximately \$1.2 billion. We have noted that NIC’s aggregate deficit position over period 2007-2012, excluding GOJ’s subsidy, amounted \$2.79 billion (**Table 5**). We have also noted that NIC has included in its Strategic Plan the development and implementation of a robust maintenance plan for the entire infrastructural outlay. As it stands, NIC is not generating sufficient income to offset its operating expenses. Therefore, it does not appear that NIC will be able to address its infrastructural challenges without financial assistance from external sources. Nonetheless, NIC should implement the advanced security measures, mentioned in its 2009-2010 Annual Report, to protect its irrigation infrastructure and prevent the illegal extraction of irrigation water.
9. NIC should explore the possibility of pursuing legal action against culpable individuals or companies to discourage the practice of discharging pollutants in its network of open canals and irrigation water sources. In addition, NIC should implement forthwith the recommendation of the audit report to employ the services of a suitably qualified professional to assess the impact of pollutants on the quality of irrigation water.
10. The Board should request that the executive management of NIC presents the criteria used to select the beneficiaries of the Black Tank projects in St. Mary and Manchester and to provide their names and addresses. In addition, NIC should provide evidence to indicate that the government received commensurate value for the \$2.8 million spent to implement the project in St. Mary and Manchester. For example, NIC should make available for physical inspection, within 30 days, the 11 water tanks and evidence that the nine contractors supplied 486,000

gallons of water to the 11 beneficiaries. In the event that the executive management fails to substantiate the payments made, the Board should initiate appropriate disciplinary action against the officers who certified, authorised and approved the transaction.

Part 1 Introduction

Background

- 1.1 National Irrigation Commission (NIC), established in 1986, became operational in May 1987. NIC's main objectives are to manage, operate, maintain and expand existing and future irrigation schemes and systems, as may be established by the Government of Jamaica. NIC's main role is to provide irrigation services to the agricultural sector by developing potential sources of irrigation water to spur agricultural production. NIC, which is the sole commercial provider of irrigation services in Jamaica, provides irrigation water to farmers and industrial users.
- 1.2 Section 4(1) of the Irrigation Act grants the portfolio Minister the power, subject to an affirmative resolution by the House of Representatives, to licence a company to be the Irrigation Authority. Such company shall be responsible for the implementation of the provisions of the Irrigation Act in relation to all irrigation and restricted areas for 10 years. The Minister has periodically granted such authority to NIC, the last being in 2011.
- 1.3 Section 5 of the Irrigation Act outlines the general duties of the authority:
- (a.) to make such investigations and surveys and do such work as may be necessary for the preparation of and to prepare and submit to the Minister one or more provisional irrigation schemes in relation to an irrigation area; and*
 - (b.) to do all such acts or things as may be necessary to be done to give effect to any confirmed irrigation scheme; and*
 - (c.) to manage, control and operate, subject to any directions given by the Minister, any irrigation works established in an irrigation area under any confirmed irrigation scheme and the distribution of water under such scheme; and*
 - (d.) to make such investigations into any matter affecting or relating to the irrigation of an irrigation area or any irrigation works therein as may be required by the Minister and if so required or without being so required if the authority consider it expedient so to do to make recommendations to the Minister upon any such matter; and*
 - (e.) to prepare and submit to the Minister for approval a reclamation scheme in relation to an irrigation area.*

NIC's Mission and Vision Statements

- 1.4 NIC promulgates its Mission as:

"To use the available resources to develop irrigation systems and to provide the most efficient and effective service possible to the agricultural community."

- 1.5 Also, NIC's Vision is:

"To become a first class company with a committed cadre of qualified employees empowered to professionally facilitate the development, coordination and expansion of the irrigation sub-sector in Jamaica in a sustainable manner."

Irrigation Areas and Schemes

- 1.6 NIC's operations are divided into three regions, Eastern, Central and Western. NIC operates ten irrigation schemes in five Irrigation Areas prescribed by the Act. Further, NIC's infrastructure included 73 pump stations, 79 wells, 207 canal networks and 194.24 kilometres of pressurized pipelines (**Table 1**).

Table 1 Schedule of NIC irrigation infrastructure

Irrigation Schemes	Pump Stations	Wells	Canals	Pipes (Km)
Rio Cobre Irrigation Works (RCIW)	18	22	26	31.01
St. Dorothy	8	7	28	-
Yallahs	3	3	-	15.21
Mid Clarendon Irrigation Work(MCID)	32	32	153	36.10
New Forest	2	4	-	26
Hounslow	5	5	-	41.40
Beacon Little Park	3	3	-	27.83
Seven Rivers	-	1	-	2.96
Colbeck	1	1	-	5.13
Braco	1	1	-	8.60
Grand Total	73	79	207	194.24

Source: AuGD compilation of information provided by NIC

- 1.7 In 1998, NIC in collaboration with the Rural Agricultural Development Authority (RADA) implemented the Gravity Drip Irrigation System, to assist small famers in rural areas with 'on-farm irrigation water'. The main objective of the gravity drip system is to supply small farmers in rural areas with on-farm irrigation water to increase production yield and improve the quality of produce.

Source of Funding

- 1.8 As shown in **Table 2**, NIC's audited financial statements revealed that aggregate revenue over the last six years, 2006-07 to 2011-12, totalled \$4.42 billion. Of this amount, 64 per cent (\$2.8 billion) represents subsidy provided by the Government of Jamaica (GOJ), while water sales and drainage charges accounted for 26 per cent (\$1.2 billion). The remaining ten per cent (\$416 million) represented other income, grant funding from GOJ and amortisation of deferred credit.
- 1.9 Over the six-year period, GOJ subsidy increased by 84 per cent, moving from \$359 million in 2006-07 to \$660 million in 2011-12. Revenue from water sales and drainage charges moved from \$140.5 million in 2006-07 to \$340 million in 2011-12; representing a 141.7 per cent increase. The audited financial statements also revealed that total expenditure over the last six years, 2006-07 to 2011-12, amounted to \$4.38 billion. Of this amount, 74 per cent (\$3.27 billion) represents water production and distribution costs, while administrative expenses accounted for 25 per cent (\$1.1 billion). The remaining one per cent represented finance cost. Over the six-year period, NIC's total water production and distribution costs increased from \$380.8 million as at March 2007 to \$712.8 million as at March 2012, an 87.2 per cent increase. While administrative expenses increased by 94.4 per cent, moving from \$122.05 million as at March 2007 to \$237.2 million as at March 2012.

Table 2 Six-year analysis of NIC's Statement of Revenue and Expenses

	TOTAL	2011-12	2010-11	2009-10	2008-09	2007-08	2006-07
	\$	\$	\$	\$	\$	\$	\$
Water sales/drainage charges	1,168,515,600	339,643,490	210,860,229	199,933,806	140,508,074	137,055,071	140,514,930
GOJ Subsidy	2,832,738,031	660,317,536	507,264,171	426,616,417	469,307,035	409,863,174	359,369,698
Other non-capital funding	74,413,596	-	549,317	8,255,824	25,261,514	40,346,941	-
Other Income	116,743,533	12,492,177	19,777,547	16,483,417	31,094,547	17,288,224	19,607,621
Amortisation of deferred credit	225,496,161	39,805,864	42,761,575	39,335,337	36,261,773	35,300,960	32,030,652
Total Revenue	4,417,906,921	1,052,259,067	781,212,839	690,624,801	702,432,943	639,854,370	551,522,901
Change (%)		34.70%	13.12%	-1.68%	9.78%	16.02%	
Water Production & Distribution Costs	3,272,083,015	712,758,173	609,356,633	624,357,827	528,263,139	416,538,437	380,808,806
Administration expenses	1,120,057,208	237,222,231	153,964,423	223,069,477	230,834,916	152,910,259	122,055,902
Finance Costs	18,100,357	8,915,354	9,073,242	81,619	13,992	0	16,150
Taxation Credit	-30,953,836	35,798,657	-31,441,551	-43,796,788	-14,607,467	9,074,041	14,019,272
Total Expenditure	4,379,286,744	994,694,415	740,952,747	803,712,135	744,504,580	578,522,737	516,900,130
Change (%)		34.25%	-7.81%	7.95%	28.69%	11.92%	
Surplus/(Deficit)	38,620,177	57,564,652	40,260,092	-113,087,334	-42,071,637	61,331,633	34,622,771

Source: AuGD analysis of information obtained from NIC audited financial statements

Audit Scope and Methodology

- 1.10 We conducted a performance audit to determine whether NIC is managing its operations effectively and efficiently to achieve its core business objectives. Our audit was planned and conducted in accordance with the Government Auditing Standards, which are applicable to Performance Audit and issued by the International Organization of Supreme Audit Institutions (INTOSAI). The planning process involved gaining a thorough understanding of the operations of NIC and developing an issue analysis which focuses on four main areas; strategic planning and financial management, water production and distribution, project management and facilities monitoring and maintenance.
- 1.11 The audit was designed to determine whether NIC has in place a:
1. Strong financial management framework to ensure continued financial viability;
 2. Well-defined strategic planning, performance monitoring and risk management framework to ensure a sustainable irrigation network;
 3. Systematic approach for the efficient operation, monitoring and maintenance of irrigation schemes to ensure safe and reliable water supply to farmers; and
 4. Robust planning, implementation and monitoring mechanisms for irrigation projects.
- 1.12 Our assessment is based on the review of internal and external documents, interviews with senior management and staff, key stakeholders, observations and analysis of information provided by NIC and site visits to four irrigation schemes.

Part 2 Financial Management

Overview

NIC operating activities is being financed by increased irrigation water charges and government subsidy. In addition, NIC had to source funding to maintain operations by increased borrowing and capital grants. NIC's Commercial Corporate Objective is *"To expand the customer base, maximize the collection of revenue and ensure continued customer satisfaction."* However, NIC failed to increase its customer-base by the projected 10 per cent each year. While NIC has consistently achieved its commercial objective to collect 85 per cent of the total water invoiced, it is facing the risk of not collecting one third of trade receivables, for which it made impairment provision. Further, NIC is not maximising revenue through the failure to apply the interest on arrears in accordance with the Irrigation Act.

NIC's Corporate Objective under its Finance and Corporate Planning Unit is *"To continue development of financial management systems to provide accurate, reliable, timely and relevant information for decision-making to ensure that financial resources are optimally developed to drive service delivery."* We reviewed NIC's audited financial statements and annual reports for the last six years, 2006-07 to 2011-12; and assessed its control mechanisms to determine whether NIC is managing its financial resources, to ensure continued financial viability, in order to achieve its objectives.

NIC's Net Cash Flows Being Financed by Increased Charges and Govt Subsidy Instead of Core Operating Activities

- 2.1 The analysis as shown in **Table 3** reveals that NIC's total cash and cash equivalents balances decreased by 13 per cent (or \$13.03 million), moving from \$115.6 million as at March 2007 to \$102.6 million as at March 2012. We also found that net cash generated from operating activities declined by 234 per cent, moving from \$86.2 million as at March 2007 to negative \$115.4 million as at March 2011. In order to reverse this negative trend, NIC increased water rates by 50 per cent to agricultural users and 10 per cent to non-agricultural users, effective August 1, 2010¹. In addition, GOJ increased its subsidy by \$153.06 million (or 30 per cent) to \$660.32 million in 2011-12, from \$507.26 million in 2010-11. This improved NIC's net cash from operating activities to \$75.5 million in 2011-12.

¹ Table 7: Increases in Irrigation Rates

Table 3 Analysis of NIC Cash Flows

Cash Flow	2011-12 \$	2010-11 \$	2009-10 \$	2008-09 \$	2007-08 \$	2006-07 \$
Opening Balance	88,988,190	86,381,297	67,364,724	143,384,420	115,588,273	45,014,549
Net Cash Flow from:						
Operating Activities	75,485,851	-115,418,722	-13,199,008	-91,832,076	21,912,082	86,179,392
Investing Activities	-55,269,824	-25,777,904	-38,781,145	-33,113,539	-14,501,998	-25,282,130
Financing Activities	-7,105,347	144,668,866	70,728,352	44,128,555	19,720,109	9,215,718
Increase in Net Cash and Cash Equivalent	13,110,680	3,472,240	18,748,199	-80,817,060	27,130,193	70,112,980
FOREX Change	457,698	-865,347	268,374	4,797,364	665,954	460,744
Cash and cash equivalent at end of the year	102,556,568	88,988,190	86,381,297	67,364,724	143,384,420	115,588,273

Source: AuGD analysis of information provided by NIC

- 2.2 In addition, NIC had to source funding to maintain operations by increased borrowing and capital grants. We observed that a loan of \$120 million was obtained from Financial Sector Adjustment Company (FINSAC) in June 2011. The loan was repaid in two equal installments on June 30, 2011 and June 30, 2012.

GOJ's Subsidy Improves NIC Working Capital Position

- 2.3 NIC's audited financial statements, as at March 31, 2012, revealed that its current assets have exceeded current liability by \$13.13 million. This improved working capital position is mainly due to the increased water rates and government subsidy, which reverse the working capital deficits as at March 2011 of \$28.08 million and \$38.97 million as at March 2010; moving from a working capital surplus of \$42.1 million as at March 2009 (Table 4).

Table 4 Six-Year analysis of NIC Liquid Financial Position

Assets	2011-12	2010-11	2009-10	2008-09	2007-08	2006-07
Current Assets	301,661,879	290,368,600	261,266,354	225,664,851	315,501,828	269,788,809
Current Liabilities	288,530,651	318,450,201	300,246,062	183,561,196	246,319,809	246,221,476
Working Capital Surplus (Deficit)	13,131,228	- 28,081,601	- 38,979,708	42,103,655	69,182,019	23,567,333
Current Ratio	1.05:1	0.91:1	0.87:1	1.23:1	1.28:1	1.10:1
Acid Test Ratio²	0.88:1	0.75:1	0.7:1	1.2:1	1.2:1	1.1:1

Source: AuGD analysis of information obtained from NIC audited financial statements

NIC Revenues Generated Inadequate to Offset Increased Operating Expenses

- 2.4 NIC's audited financial statements revealed that aggregate revenue over the last six years, 2006-07 to 2011-12, totalled \$4.42 billion. Of this amount, 64 per cent (\$2.8 billion) represents subsidy provided by the Government of Jamaica (GOJ), while water sales and drainage charges accounted for 26 per cent (\$1.2 billion). The remaining ten per cent (\$416 million) represented other income and grant funding from GOJ. Over the six-year period, GOJ subsidy increased by 84 per cent, moving from \$359 million in 2006-07 to \$660 million in 2011-12. Revenue from water sales and drainage charges moved from \$140.5 million in 2006-07 to \$340 million in

² Adjusted for value of inventory which consist of pipe fittings and machinery spares remaining from previous capital projects

2011-12; representing a 141.7 per cent increase. Effective August 1, 2010 irrigation rates for agricultural and non-agricultural users increased by 50 and 100 per cent respectively. This was followed by a corresponding increase of 25 and 50 per cent respectively, which took effect April 1, 2011. NIC further increased the rates by 25 per cent for agricultural and 33¹/₃ per cent for non-agricultural users on April 1, 2012.

- 2.5 The audited financial statements also revealed that total expenditure over the last six years, 2006-07 to 2011-12, totalled \$4.4 billion. Of this amount, 74 per cent (\$3.3 billion) represents water production and distribution costs, while administrative expenses accounted for 25 per cent (\$1.1 billion). The remaining one per cent represented finance cost. Over the six-year period, NIC's total water production and distribution costs increased from \$380.8 million as at March 2007 to \$712.8 million as at March 2012, an 87.2 per cent increase. While administrative expenses increased by 94.4 per cent, moving from \$122.05 million as at March 2007 to \$237.2 million as at March 2012. Over the period 2006-07 to 2011-12, NIC incurred accumulated deficit before GOJ subsidy of \$2.79 billion. This position existed despite increases of 50 and 100 per cent in water and drainage rates charged to agricultural and non-agricultural users respectively, effective August 1, 2010. However, GOJ subsidy of \$2.8 billion improved NIC's financial position to an aggregate surplus of \$38.6 million for the period (**Table 5**).

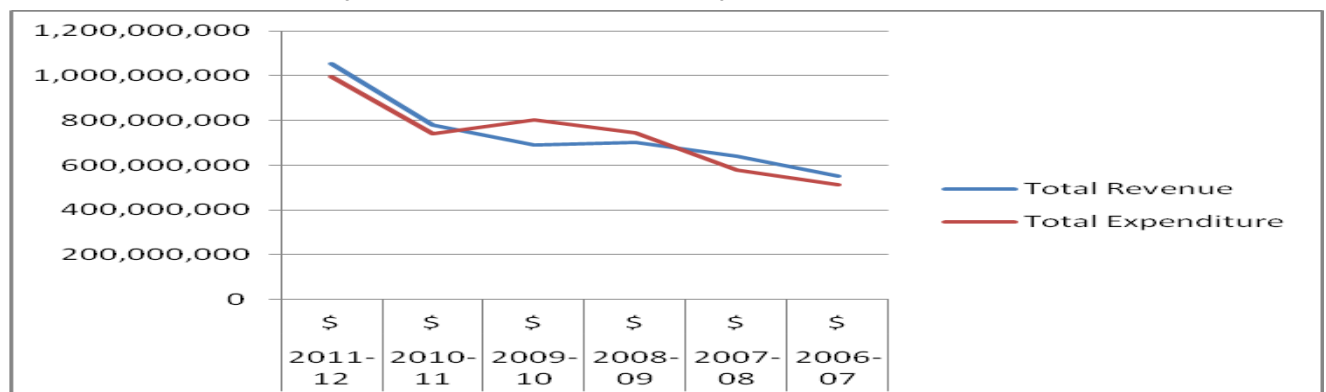
Table 5 NIC Surplus/(Deficit) position Before GOJ Subsidy

	TOTAL	2011-12	2010-11	2009-10	2008-09	2007-08	2006-07
	\$	\$	\$	\$	\$	\$	\$
Surplus/(Deficit) before GOJ Subsidy	-2,794,117,854	-602,752,884	-467,004,079	-539,703,751	-511,378,672	-348,531,541	-
GOJ Subsidy	2,832,738,031	660,317,536	507,264,171	426,616,417	469,307,035	409,863,174	324,746,927
Surplus/(Deficit) After GOJ Subsidy	38,620,177	57,564,652	40,260,092	-113,087,334	-42,071,637	61,331,633	34,622,771

Source: AuGD analysis of information provided by the NIC

- 2.6 **Chart 1** shows that for the six-year period ranging from 2006-07 to 2011-12, NIC total revenue has increased by an average 12 per cent, when compared to an average 12.5 per cent increase in operating expenses over the same period. **Chart 1** show that the aggregate revenue inflow of \$4.4 billion was \$38.6 million or more than the \$4.38 billion expenditure outflow for the period 2006-07 to 2011-12. Again, it is important to emphasise that the positive position is as a consequence of GOJ's subsidy.

Chart 1 – Six Year Analysis of NIC Total Revenue and Expenditure



	TOTAL	2011-12	2010-11	2009-10	2008-09	2007-08	2006-07	Average Annual Change
	\$	\$	\$	\$	\$	\$	\$	
Total Revenue	4,417,906,921	1,052,259,067	781,212,839	690,624,801	702,432,943	639,854,370	551,522,901	
Change (%)		34.70%	13.12%	-1.68%	9.78%	16.02%		12%
Total Expenditure	4,379,286,744	994,694,415	740,952,747	803,712,135	744,504,580	578,522,737	516,900,130	
Change (%)		34.25%	-7.81%	7.95%	28.69%	11.92%		12.5%
Surplus/(Deficit)	38,620,177	57,564,652	40,260,092	-113,087,334	-42,071,637	61,331,633	34,622,771	

Source: AuGD analysis of information provided by the NIC

NIC did not achieve annual Projected 10 per cent increase in Customer-base

- 2.7 NIC's Commercial Corporate Objective is *"To expand the customer base, maximize the collection of revenue and ensure continued customer satisfaction."* NIC did not achieve its annual target of 10 per cent; except for 2009-10, when its customer base increased by 14.75 per cent. NIC increased its customer-base by an average 7.35 per cent, over the six-year period (Table 5A). NIC attributed the 14.75 per cent increase in its customer base to the Ministry of Agriculture's Arable Lands Irrigated and Growing for the Nation (ALIGN) initiative in 2009-10.
- 2.8 MoA&F in partnership with NIC introduced the ALIGN initiative in February 2009 with the objective of *"revolutionising agriculture, by re-engaging all un-utilised and under-utilised land with irrigation infrastructure back into production"*³. NIC informed us that the ALIGN initiative is dormant; however, strategies were being finalised to re-launch the Programme. NIC subsequently responded that *the ALIGN Programme has been re-scoped and same will be re-launched by June 17, 2013, so as to attain the 10% increase in the customer base target for financial year 2013-2014*".

³ Jamaica Information Service JIS website

Table 5A Six-year analysis of NIC's Customer Base

Irrigation District		Active Customers					
		2011-12	2010-11	2009-10	2008-09	2007-08	2006-07
01	RIO COBRE	198	193	190	167	153	165
02	ST. DOROTHY	370	354	359	333	320	332
03	MID CLARENDON	301	262	300	239	205	247
04	HOUNSLOW	427	412	405	376	377	357
05	BRACO	106	106	102	96	92	94
06	YALLAHS	80	78	77	77	74	70
07	SEVEN RIVERS ⁴	12	11	11	2	2	N/A
08	BEACON/LITTLE PARK	216	207	182	127	83	N/A
09	COLBECK ⁵	20	N/A	N/A	N/A	N/A	N/A
	GRAND TOTAL	1,730	1,623	1,626	1,417	1,306	1,265
	Percentage Increase	6.59%	-0.18%	14.75%	8.50%	3.24%	-

Source: AuGD compilation of information provided by NIC

NIC Reported Improvement in Accounts Receivables

- 2.9 NIC has consistently achieved its commercial objective to collect 85 per cent of the total water invoiced over the period, 2006 to 2012. As shown in **Table 6**, over the six-year period, revenue as a percentage of water invoiced moved from 103 per cent in March 2007 to 98.5 per cent in March 2012. Trade receivables, as at March 2012, represent approximately 19 per cent of total water sales and drainage charges, improving from a high of 44.8 per cent in March 2007. We observed that, NIC trade receivables increase by 2.43 per cent, moving from \$62.96 million in March 2007 to \$64.5 million in March 2012 and total water invoiced increased by \$208 million (152 per cent), moving from \$136.6 million in March 2007 to \$344.6 million in March 2012.

Table 6 Analysis of NIC Trade Receivables

	2011-12 \$'000	2010-11 \$'000	2009-10 \$'000	2008-09 \$'000	2007-08 \$'000	2006-07 \$'000
Total Water Invoiced	344,626,109	202,804,823	197,439,085	137,568,764	135,400,457	136,630,349
Trade Receivables	64,497,777	82,417,330	53,398,027	55,874,065	63,768,056	62,965,704
Revenue from sales/drainage charges	339,643,490	210,860,229	199,933,806	140,508,074	137,055,071	140,514,930
Receivable as a % of Sales	18.99%	39.09%	26.71%	39.77%	46.53%	44.81%
Revenue as a % of water invoiced	98.5%	104%	101%	102%	101%	103%

Source: AuGD analysis of information provided by NIC

Thirty percent of NIC's Trade Receivables Appears Uncollectable

- 2.10 NIC faces the risk of not collecting 30 per cent of trade receivables. As shown in **Table 7**, NIC's impairment provision averages 30 per cent over the six-year period, 2006-07 to 2011-12. As at March 2012, impairment provision amounts to \$22 million (35 per cent) of the \$64 million in outstanding trade receivables. NIC's impairment provision includes amounts owed by customers suspended and terminated from its irrigation systems. As at December 2012,

⁴ Became operational in July 2007

⁵ Became operational in September 2011

terminated and suspended customers owe amounts totalling \$7.5 million; those suspended owe \$1.7 million, while terminated customers owe \$5.8 million.

Table 7 Trade Receivable balances

Trade Receivables	2011-12 \$'000	2010-11 \$'000	2009-10 \$'000	2008-09 \$'000	2007-08 \$'000	2006-07 \$'000
Trade Receivables	64,497,777	82,417,330	53,398,027	55,874,065	63,768,056	62,965,704
Impairment Provision	-22,386,099	-22,014,295	-17,270,000	-22,596,127	-15,318,759	-14,493,798
Net Trade Receivables	42,111,678	60,403,035	36,128,027	33,277,938	48,449,297	48,471,906
Impairment percentage	-35%	-27%	-32%	-40%	-24%	-23%

Source: AuGD compilation of information obtained from NIC audited financial statements

NIC not Applying Interest on Arrears in Breach of Irrigation Act

- 2.11 Section 50 of the Irrigation Act states; *“Any irrigation charges not paid at the expiration of three months after they shall have become due shall be increased at the rate of ten per centum.”* We found that NIC is operating in breach of the Act by not applying the specified 10 per cent increase on arrears. The non-application of the increase on arrears results in NIC not capitalizing on potential revenue. For example, NIC’s aged receivable records as at December 2012, shows that \$15.5 million remain outstanding for over 90 days. If the required interest of 10 per cent were applied and the amount collected, NIC could earn approximately \$1.55 million in revenue.

NIC’s Customers Security Deposits lodged to general bank account

- 2.12 NIC’s customers are required to sign a formal contract for the supply of irrigation water. The contract agreement provides for the payment of a security deposit payable by customers upon initial connection and reconnection. The imposition of the security deposit for new and disconnected-delinquent customers became effective July 1, 2002. NIC requires agricultural and non-agricultural customers to pay up to a maximum of \$20,000 and \$100,000 for security deposit respectively.
- 2.13 We found that NIC collected \$9 million from customers, as security deposit, which was lodged to the water sales bank account, through which all other transactions relating to the sale of water are processed. As at March 28, 2013, the closing balance on this account was \$13.2 million.

Part 3 Strategic Planning and Performance Monitoring

Overview

NIC is not On track to achieve its irrigation development plan by 2015. The NIDP Study identified and reviewed over 125 projects under nine categories. Out of this list, 83 projects were evaluated and 51 were proposed for implementation as part of a National Irrigation Development Plan. The recommended projects would irrigate 20,700 hectares with 15,000 hectares of new irrigation and should benefit over 6,900 farmers in twelve parishes. NIC scheduled the implementation of the 51 projects over a 17-year period from 1998 to 2015. Since the development of the NIDP Master Plan in 1998, NIC has partially completed the construction phase of five, and the rehabilitation of two irrigation schemes.

NIC's mission is *"to use available resources to develop irrigation systems and to provide the most efficient and effective service possible to agricultural community."* This is in line with the Vision 2030 National Development Plan (1-8 Support National Food Security) which recognised that the need for food security has emerged as a national priority. As such, one of the NIC's corporate objectives is to *"increase agricultural production and farmers' income as a result of improved irrigation management practices in the irrigable lands prioritised in the NIDP."*

NIC is not on Track to Achieve its Irrigation Development Plan by 2015

3.1 The Government of Jamaica (GOJ) commissioned NIC in 1998 to prepare a National Irrigation Development Plan (Master Plan). NIC was the implementing agency and the Planning Institute of Jamaica (PIOJ) was the executing agency for the study. The Inter-American Development Bank (IDB) and GOJ jointly financed the study.

3.2 The Master Plan contains the following:

- National Irrigation Development Plan (NIDP);
- The proposed implementation strategy;
- The state of agriculture production with irrigation development;
- recommendations on irrigation policy and strategies for successfully implementing the NIDP;
- proposals for institutional strengthening;
- generic environmental assessment on the irrigation sector;
- identification of projects and ranking them in order of priority;

3.3 The NIDP's Master Plan highlighted four types of major improvement possibilities to improve

irrigation.

- i. Rehabilitation of existing irrigation systems to improve efficiencies and performance;
- ii. Extension and expansion of irrigation into areas without irrigation;
- iii. Construction of long and short term storage to ensure more reliable water supplies particularly during peak demand periods; and

- iv. Implementation of a comprehensive on-farm development program that includes improvements in farm management; water management; installation and maintenance of irrigation equipment.

Fifty-one Irrigation Projects Recommended for Implementation Under NIDP

- 3.4 The NIDP Study identified and reviewed over 125 projects under nine categories: major irrigation⁶, NIC rehabilitation, private irrigation, small scale irrigation⁷, surface water storage, ground water recharge, waste water reuse, small tank program and land reclamation. Out of this list, 83 projects were evaluated and 51 were proposed for implementation as part of the National Irrigation Development Plan (**Appendix 1**).
- 3.5 The NIDP Master Plan scheduled the implementation of the 51 projects over a 17-year period from 1998 to 2015. The recommended projects would irrigate 20,700 hectares with 15,000 hectares of new irrigation and should benefit over 6,900 farmers in 12 parishes. The proposed NIDP projects have an estimated investment cost of US\$106 million, an annual incremental operation and maintenance cost of US\$12 million and an expected net return (NPV) of US\$99 million. Capital costs range from US\$ 1,700/year for NIC rehabilitation, US\$ 4,400/ hectares for small scale and up to US\$5,000 for major irrigation. **Table 8** shows the new and rehabilitated projects to be implemented over a 17-year period.

Table 8 NIDP Recommended Projects

	Total	Implemented	Difference
Major Irrigation	6	4	2
NIC Irrigation	4	1	3
Private Irrigation	5	0	5
Small Irrigation	34	2	32
Storage Irrigation	2	1	1
TOTAL	51	8	43

Source: AuGD compilation of information provided by NIC

- 3.6 Since the development of the NIDP Master Plan in 1998, we found that NIC has partially completed the construction phase of five, and the rehabilitation of two irrigation schemes. NIC has also completed the feasibility study for the Essex Valley and the St. Dorothy projects. NIC obtained joint financing for the six projects from GOJ, the Caribbean Development Bank (CDB) and the Inter-American Development Bank (IDB). NIC's Strategic Plan 2013-2017 indicated that the strategic direction is *"to secure finance and to facilitate the successful implementation of an additional 10% of NIDP by 2018"*. **Section 5** provides further details on the internationally funded projects.
- 3.7 As shown in **Table 9**, NIC has implemented, in part, four of the six major irrigation projects under the NIDP component. NIC in collaboration with Agro Investment Corporation (AIC) has irrigated 120 acres in Spring Plain/Ebony Park and proposed to irrigate a further 70 acres in the 2013-2014 financial year. NIC completed Phase 1 of the Yallahs irrigation scheme, but Phase 2 covering a land area of 162 hectares to benefit 124 farmers at an estimated cost of US\$1.2 million remains outstanding. NIC was unable to execute Phase 2 of the Yallahs irrigation scheme, owing to inadequate resource constraints.

⁶ projects with an area greater than 400 hectares

⁷ projects with an area up to 400 hectares

- 3.8 The Hounslow and New Forrest/Duff House irrigation were partially completed, while the Cabarita Irrigation scheme was not implemented. NIC has initiated the feasibility study for the Essex Valley project. However, as at March 2013, the feasibility study and final design remain outstanding; an amount of \$4.6 million is owed to the consultant.

Table 9 NIDP Major Irrigation Projects (Budgeted)

No	ID	Project	Parish	Implementation Status
1	CL2	Spring Plains / Ebony Park	Clarendon	Partially
2	TH1	Yallahs	St. Thomas	Partially
3	EL11	Pedro Plains inc. Hounslow Rehabilitation	St. Elizabeth	Fully
4	EL1	Essex Valley	St. Elizabeth	Not implemented
5	MN1	New Forrest/Duff House	Manchester	Partially
6	WE5	Cabarita Irrigation (Economic)	Westmoreland	Not Implemented
		Major Irrigation Total		

Source: AuGD compilation of information provided by NIC

- 3.9 As shown in **Table 10**, NIC did not conduct the planned rehabilitation works on the four irrigation projects, due mainly to lack of funding. In addition, NIC conducted a feasibility study on the rehabilitation of the St. Dorothy irrigation project. The report concluded, *“Agriculture may not be a worthwhile business in the Saint Dorothy area. It appears futile to pursue feasibility studies in this area as land seems to be changing and what was once arable agricultural land, is now being used for housing”*.

Table 10 NIDP NIC Irrigation Projects (Budgeted)

No	ID	Project	Parish
1	TR1	Braco	Trelawny
2	CA8	St. Dorothy Rehab. (Economic)	St. Catherine
3	CA7	NIC Rio Cobre Lining (Partial)	St. Catherine
4	CA6	Rio Cobre Blk A - E (Lome)	St. Catherine

Source: AuGD compilation of information provided by NIC

- 3.10 As at March 2013, NIC has completed two of the proposed 34 small irrigation schemes, Colbeck and Seven Rivers. However, none of the five Private Irrigation Projects has commenced (**Table 11**). NIC has since informed us that at Eastern Banana *“50 hectares is under development to facilitate onion production”*.

Table 11 NIDP Private Irrigation Projects (Budgeted)

No	ID	Project	Parish	Area (ha)	No. of Farmers	Construction Cost (US\$ million)
1	CL4	Victoria Banana	Clarendon	354	1	0.71
2	CL3	Monymusk Night Storage (Lome)	Clarendon	640	1	1.30
3	CA3	Bernard Lodge Night Storage (Lome)	St. Catherine	376	20	0.83
4	TH5	Eastern Banana	St. Thomas	1 000	1	6.06
5	TR3	Long Pond (Lome)	Trelawny	157	1	0.40
		Private Irrigation Total		2 527	24	9.30

Source: AuGD compilation of information provided by NIC

- 3.11 In reference to NIC's insufficient storage capacity, the 2004 Water Sector Policy notes that *"most seasonal flood run-off goes to the sea. Storage of this and other short-term surplus will assist in reducing deficits during drought periods and reduce the reliance on energy intensive ground water."* The Policy further outlines that *"the capacity of existing systems is insufficient to meet current irrigation demand."*
- 3.12 NIC rehabilitated the Clarendon Micro-dam, but the Bog Walk Off-stream Storage was not constructed (**Table 12**). NIC reported that a pre-feasibility study from the Water Resources Authority concluded that the Bog Walk Off-stream storage project would not be approved. We could not validate the conclusion, as NIC has not presented the report, despite request.

Table 12 NIDP Storage Irrigation Projects

No	ID	Project	Parish
1	CA9	Bog Walk Off-Stream Storage (Lome)	St. Catherine
2	CL6	Clarendon: Micro-dam Rehab. (Lome)	Clarendon
		Storage Irrigation Total	

Source: AuGD compilation of information provided by NIC

NIC did not set Clear and Measurable Performance Objectives

- 3.13 One aspect of effective governance is to set key performance objectives and employ effective and efficient mechanisms to monitor their achievements. Performance targets should be specific, measurable, achievable, relevant and timely. NIC outlines its strategic objectives in its annual Corporate Plan & Budget – with each operational department setting specific objectives. NIC's operational departments include NIDP; Corporate and Legal Service; Commercial; Engineer and Technical Service; Finance and Corporate Planning; and Information Systems.
- 3.14 We examined NIC's performance objectives for 2011-12, which are similar to those set for the last five years, and found that NIC did not at all times, set clear and measurable performance targets. NIC did not quantify either in absolute (numerical) nor relative (percentage) terms, the performance targets for NIDP; the Corporate and Legal Services; and the Engineer and Technical Service Departments (**Table 13**). We observed instances where the performance targets provided are actual objectives; for example, the target set for NIDP is to *"Increased hectares of farming, food production and net income."* In other cases, the performance measures were vague preventing us from understanding their meanings or significance. One

such example is the target under Corporate and Legal Services, which is stated as “*Staff trained*” and “*updated legislation*”. NIC’s failure to set clear and measurable targets prevented us from assessing their performance.

Table 13 NIC performance targets extracts from Corporate Plan and Budget 2011-12

Operational Departments	Objectives	Target Measures	Measurable Target
NIDP	-To increase high payoff agriculture & farmer’s income -To increase production and productivity of agricultural commodities and increase farm income (CDB)	Increased – hectares of farming, food production and net income	None
Corporate and Legal Services	-To implement and monitor the administrative systems, procedures and policies of the Commission to ensure the protection of its assets and legal rights and to provide an efficient support system through general office services	Staff trained and update legislation	None
Commercial Department	-To expand customer base and maximise the collection of revenue	Increase customer base by 10% p.a.	Did not achieve
		Collect 85% of water invoices	Achieved
Engineer and Technical Service	-To improve accuracy of measurements -To minimise energy usage per unit of water -To ensure the efficient distribution and use of water -To reduce water losses	None	None
Finance & Corporate Planning	-Improve management accounting -Improve the purchase of goods and services -Improve accuracy of fix asset recording process -Strengthen of the accounting system	-Provide audited financial statements by within four months of the end of each year.	Yes. Deadline not consistently achieved
Information Systems Department	-Information systems development and maintenance	-98% availability of relevant hardware and software	

NIC Involved in Non-irrigation Activities

- 3.15 In 2008, the MOA&F entered into a Memorandum of Understanding between the Rural Water Supply Limited and NIC for the upgrading of 17 fishing beaches in 10 parishes to provide for gear shed, bathroom facilities, fish processing and other infrastructure. The MOU states that *“the prevailing amenities, which exist on these beaches, do not meet the requirements of the relevant supervisory authority including the National Environment Protecting Agency⁸ and the Ministry of Local Government in that these facilities where they do exist are wholly sub-standard.”*
- 3.16 As at March 2013, NIC has received \$70 million, of which \$65.74 million was spent on the rehabilitation of fishing beaches, including Salem, Alligator Pond, Greenwich and Rae Town. This activity appeared to be the responsibility of the Fisheries Division in the Ministry of Agriculture, which is responsible for the conservation and sustainable utilization of the Jamaican fisheries resources in a manner that ensures optimum social and economic benefits to Jamaica.

⁸ Should read National Environment and Planning Agency (NEPA)

Part 4

Management of Irrigation Schemes – Operation, Monitoring and Maintenance

Overview

NIC's reported water losses represents 28 percent (159 cubic metres) of the 570 million cubic metres (m³) water produced between 2007 and 2012. When costed, water losses from both the open and pressurised irrigation systems, amounts to \$1.2 billion. NIC did not have in place measurement systems to determine the total quantity of irrigation water produced. In addition, NIC is facing increasing production and distribution costs while reported volume of production decline. The aging state of the irrigation infrastructure and the use of archaic pumps in the water production and distribution process have hindered NIC's ability to effectively manage its labour cost. NIC's heavy reliance on fuel energy to pump irrigation water from wells is proving costly. The unauthorised use of irrigation water and vandalism of infrastructure have been a prolonged challenge for NIC. NIC's ability to supply safe water for irrigation purposes is threatened by the release and disposal of industrial effluents in irrigation canals. Given the energy inefficiency, deteriorating irrigation infrastructure and rising labour costs, NIC may face difficulty in its plan to pass on the full economic cost to produce irrigation water to the farmers.

NIC's mission is *"to use available resources to develop irrigation systems and to provide the most efficient and effective service possible to agricultural community."* Future agricultural development and sustainable food production depends on the efficient operation, continued maintenance, improvement and expansion of irrigation systems.

NIC's Operations Corporate Objective is *"To implement methods which will improve efficiencies in procurement, conveyance and delivery of irrigation water to enhance the quality and reliability of service."* Section 5(c) of the NIC Act outlines the general duties of the Authority. One such duty is *"to manage, control and operate, subject to any direction by the Minister, any irrigation works established in an irrigation area under any confirmed irrigation scheme and the distribution of water under such scheme."* Further, NIC corporate business objective is to manage, operate, maintain and expand existing and future irrigation schemes and systems.

The Selected Sector Strategies under Vision 2030 include the provision for *'adequate water supply, irrigation and drainage to meet the needs of the sector'* and *'strengthen farmer organisations'*. As shown in **Table 14**, NIC operates ten principal irrigation schemes in five Irrigation Areas. NIC assigns regional managers for each Irrigation Area to facilitate the proper running of the irrigation networks. The network comprises both open canal infrastructure and pressurized pipelines. Open canals comprises concrete-lined trapezoidal network. NIC channelled water through canal service gates equipped with measuring devices.

Table 14 Schedule of NIC Irrigation Schemes by Region

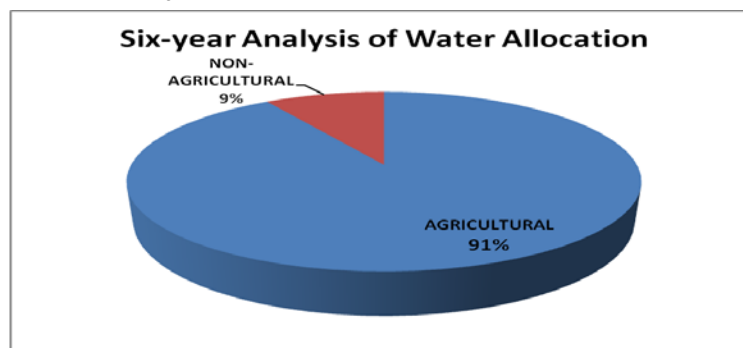
Irrigation Areas	Irrigation Schemes	Main System Type	Remarks
EASTERN REGION			
Saint Dorothy Plain Irrigation Area – St. Catherine – Gazetted 1961	Rio Cobre Irrigation Works (RCIW)	Gravity Flow Open canal - Reinforced concrete lining	Also comprises pressurized systems in Block A – E with mix of AC ⁹ and PVC Pipe network Pipeline (Approx. 31km) Canal – 98.8 km
	St. Dorothy	Pumped, open canal network - Reinforced concrete lining	Also comprises pressurized systems at Thetford, Sandy Bay, Spring Village and Colbeck
Yallahs Irrigation Area – St. Thomas - Gazetted 1994	Yallahs Irrigation Scheme	Pumped, pressurized - PVC Pipe	
CENTRAL REGION			
Mid-Clarendon Irrigation Area – Clarendon	Mid Clarendon Irrigation District (MCID),	Pumped, open canal network - Non-reinforced concrete lining	80% lined - Pressurized system at Rhymesbury.
	New Forest/Duff House ¹⁰	Pumped, pressurized - PVC Pipe	Commissioned in 2013
WESTERN REGION			
Hounslow Irrigation Area - Gazetted 1993	Hounslow	Pumped, pressurized - PVC and AC pipes	Rehabilitated in 2008
	Beacon/Little Park	Pumped, pressurized - PVC pipes	Commissioned in 2007
	Seven Rivers	Gravity intake, pressurized system - PVC and ductile iron pipes	Commissioned in 2007
	Colbeck		
Braco Irrigation Area – Trelawny - Gazetted 1984	Braco	Pressurized, pumped from river - AC pipes	Main use is non-agricultural

Source: AuGD compilation of information provided by NIC

Ninety per cent of Irrigation Water Invoiced to Agricultural Users

- 4.1 NIC distributes irrigation water to two categories of customers; agricultural and industrial users. **Table 15** shows that NIC invoiced 91 per cent of water produced over the last six years (2006 - 2012) to agricultural users.

Table 15 Analysis of NIC Water Allocation



Source: AuGD analysis of information provided by NIC

⁹ Asbestos concrete

¹⁰ Not yet operational

NIC Unaware of the Quantity of Water Produced

- 4.2 NIC did not have an adequate measurement system to determine the total quantity of irrigated water produced at its 73 pump stations. NIC presented a schedule dated March 2013, which shows that 20 pump stations are without measuring meters and nine have malfunctioning meters. (Table 16)

Table 16 List of Unmetered and Malfunctioning Pump Stations

REGION	No. of Pump Stations without meter	# of pump stations with malfunctioning meter
Eastern	2	2
Central	18	4
Western	0	3
TOTAL	20	9

Source: AuGD analysis of information provided by NIC

- 4.3 In addition, NIC's open channel measuring devices, weirs or rating structures, have measurement accuracy of 80 to 90 per cent. For example, NIC was unable to determine the volume of water produced at the Grove Farm/Nightingale Grove, Clarendon Park # 2 and Ebony Park Relief locations. NIC estimates water flows where no measuring devices exist at pump stations. NIC proposed that installation of meters for these pump stations would commence in the 2013-14 financial year.
- 4.4 NIC indicated in its 2013-2017 Strategic Plan an intention "to develop and implement a project to automate data capture at all delivery points by 100% by 2016". Further, the Plan requires NIC to "develop and implement a sustainable program to methodically improve production and distribution measurement capabilities".

NIC Faces Increasing Production and Distribution Costs While Water Production Decline

- 4.5 NIC is facing increasing production and distribution costs while reported volume of production decline. NIC's total water production and distribution costs increased from \$380.8 million as at March 2007 to \$712.8 million as at March 2012, an 87.2 per cent increase. However, total water production (m³) for the period declined by 27.79 million m³ (or 25.57 per cent), moving from 108.68 million m³ in March 2007 to 80.89 million m³ in March 2012. On an average annual basis, water production and distribution costs increased by 13.8 per cent, while reported water production (m³) over the period decreased by 0.66 per cent. (Table 17)

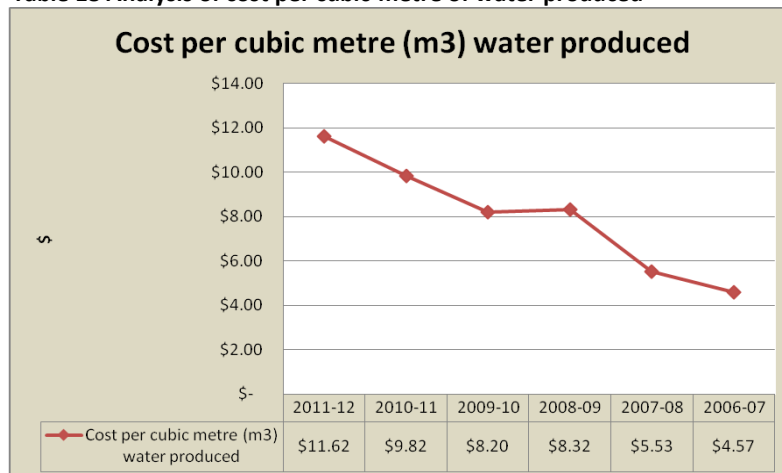
Table 17 Water Production and Distribution cost for 2006-07 to 2011-12

	2011-12	2010-11	2009-10	2008-09	2007-08	2006-07	Average Change
Production Cost/Volume							
Water Production & Distribution Cost (\$)	712,758,173	609,356,633	624,357,827	528,263,139	416,538,437	380,808,806	13.79%
Water Production (m3)	80,889,595	72,178,286	125,228,179	81,828,908	100,958,332	108,684,962	
% Change	12.07%	-42.36%	53.04%	-18.95%	-7.11%		-0.66%

Source: AuGD analysis of information provided by NIC

- 4.6 As shown in Table 18, the production cost per cubic meter (m³) of water increased by 154 per cent over the period, moving from \$4.57 in 2006-07 to \$11.62 in 2011-12.

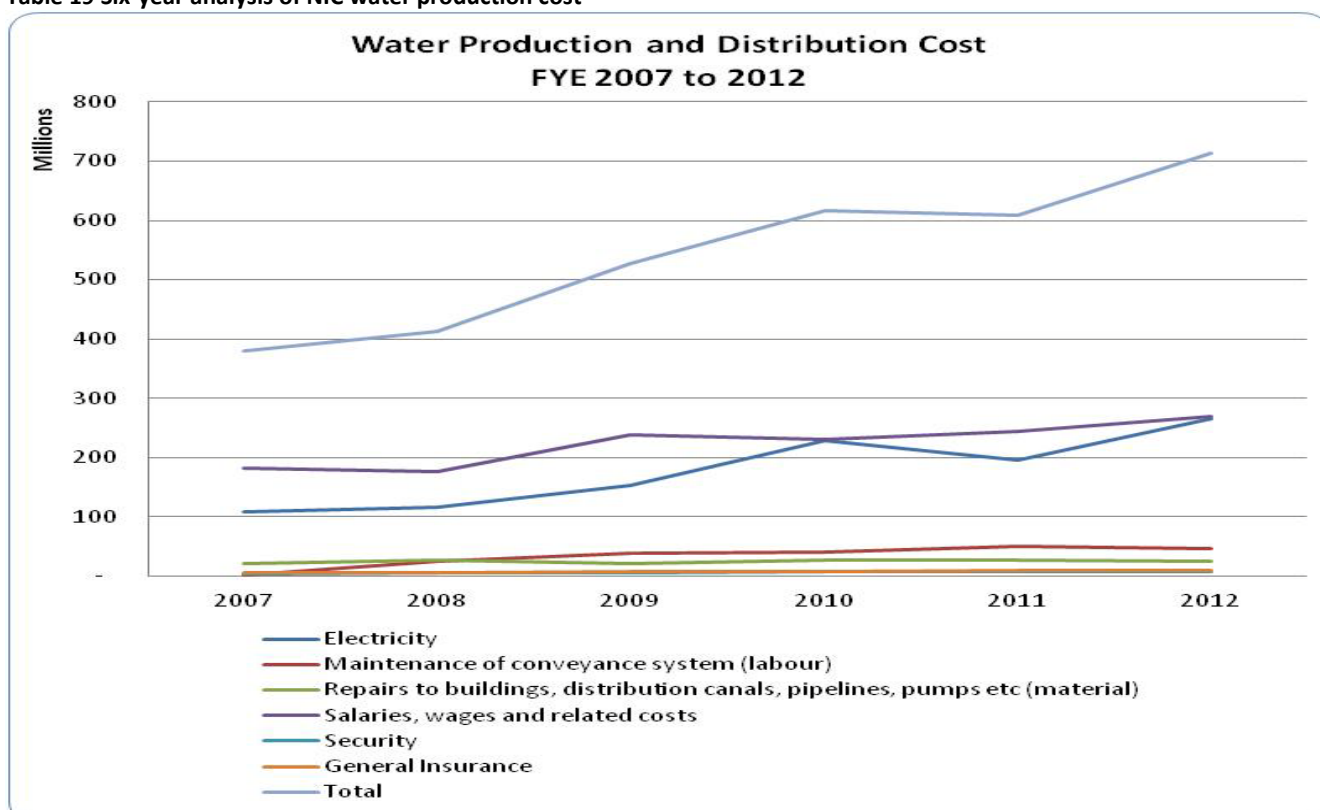
Table 18 Analysis of cost per cubic-metre of water produced



Source: AuGD analysis of information provided by NIC

- 4.7 As shown in **Table 19**, NIC's major water production and distribution costs include electricity, direct labour, repairs to building, distribution canals, pipelines, pumps and motor vehicle maintenance.

Table 19 Six-year analysis of NIC water production cost



Water Production and Distribution Costs (Selected)	TOTAL	2011-12	2010-11	2009-10	2008-09	2007-08	2006-07
	\$	\$	\$	\$	\$	\$	\$
Electricity	1,066,178,861	265,294,494	196,056,652	227,750,229	151,960,884	116,779,998	108,336,604
Maintenance of conveyance system (labour)	182,640,984	45,993,852	50,749,756	40,113,744	37,541,378	1,891,338	6,350,916
Repairs to buildings, distribution canals, pipelines, pumps etc (material)	145,403,601	24,438,198	26,226,147	27,546,565	19,798,597	26,893,313	20,500,781
Salaries, wages and related costs	1,359,707,736	269,163,242	244,473,489	230,503,861	238,080,267	196,232,259	181,254,618
Security	35,721,963	7,184,981	6,492,554	7,520,625	6,032,328	4,339,758	4,151,717
General Insurance	39,382,655	8,580,311	8,410,423	6,306,018	6,575,574	5,034,756	4,475,573
TOTAL Water Production and Distribution Cost	3,259,877,717	712,758,173	609,356,633	616,102,003	528,193,969	412,658,133	380,808,806

Source: AuGD analysis of information obtained from NIC audited financial statements

Rising Labour Cost Contributing to NIC's Increasing Production Cost

- 4.8** NIC incurred increasing labour for maintenance of conveyance system; amount moving from \$6.35 million in 2006-07 to \$45.9 million in 2011-12. NIC direct labour cost, over the six-year

period 2006-07 to 2011-12, accounted for 46 per cent of the aggregate cost of producing and distributing irrigation water. As shown in **Table 20**, direct labour cost increased from \$187.6 million as at March 2007 to \$315.2 million as at March 2012, a 68 per cent increase over the period. Although increases in the wage bill were attributable to periodic increases in wages, the aging pumps and conveyance systems have contributed significantly to increased labour cost.

Table 20 Analysis of NIC's Direct Labour Expenditure

Water Production and Distribution Costs	TOTAL	2011-12	2010-11	2009-10	2008-09	2007-08	2006-07
	\$	\$	\$	\$	\$	\$	\$
Salaries, wages and related costs	1,359,707,736	269,163,242	244,473,489	230,503,861	238,080,267	196,232,259	181,254,618
Maintenance of conveyance system (labour)	182,640,984	45,993,852	50,749,756	40,113,744	37,541,378	1,891,338	6,350,916
Total Direct Labour Cost	1,542,348,720	315,157,094	295,223,245	270,617,605	275,621,645	198,123,597	187,605,534

Source: AuGD analysis of information obtained from NIC

NIC Administrative Expenses Increased by 94 per cent

- 4.9** Over the period 2006-07 to 2011-12, NIC's administrative expenses increased by 94.4 per cent, moving from \$122.05 million as at March 2007 to \$237.2 million as at March 2012. Also, expenses increased by 54 per cent in 2011-12, moving from \$153 million in 2010-11 to \$237 million in 2011-12. We noted that the increase in NIC's administrative expenses was attributed to an 83 per cent increase in administration salaries, wages and other related costs¹¹, which moved from \$102 million to \$187 million in 2011-12. NIC in its 2011-12 annual report identified two main factors that contributed to the increase in administrative expense; a \$58 million increase in pension benefit cost and the payment of a GOJ sanctioned 7 per cent increase in salaries (**Table 21**).

Table 21 Analysis of NIC's Administrative Expenditure

	2011-12	2010-11	2009-10	2008-09	2007-08	2006-07
	\$	\$	\$	\$	\$	\$
Administration expenses	237,222,231	153,964,423	223,069,477	230,834,916	152,910,259	122,055,902
Change (\$)	83,257,808	-69,105,054	-7,765,439	77,924,657	30,854,357	
Change (%)	54.08%	-30.98%	-3.36%	50.96%	25.28%	

Source: AuGD compilation of information provided by NIC

Rising Electricity Cost Contributing to NIC's Increasing Production Cost

- 4.10** NIC's heavy reliance on electricity to produce irrigation water is proving costly. NIC electricity cost to pump water, over the six-year period 2006-07 to 2011-12, accounted for 33 per cent of the aggregate cost of producing and distributing irrigation water. **Table 23** shows that pump electricity costs increased by 144.88 per cent, moving from \$108.34 million in 2006-07 to \$265 million in 2011-12. As shown in **Table 22**, of the NIC's 10 operational schemes, eight rely on electricity to extract irrigation water from underground wells using submersible pumps. The

¹¹ Personnel emoluments, casual workers, pension benefit cost, insurance scheme, statutory contributions, vacation leave, gratuity, staff welfare, training, travel and subsistence

Rio Cobre and Seven Rivers irrigation scheme uses gravity flow to channel the irrigation water to its open canal network to supply farmers.

Table 22 Irrigation schemes supported by gravity flow and energy intensive pumping systems

Irrigation Schemes		Gravity Flow	Energy Intensive Pumping System
Rio Cobre	Existing	√	
St. Dorothy	Existing		√
Yallahs	Existing (Rehabilitated) ¹²		√
Mid-Clarendon	Existing		√
New-Forrest Duff/House	Existing		√
Hounslow	Existing (Rehabilitated)		√
Beacon Little Park	New		√
Seven Rivers	New	√	
Colbeck	New		√
Braco	Existing		√

Source: AuGD compilation of information provided by NIC

NIC Exploring Energy Substitution Initiative

4.11 NIC, in its 2011-12 Annual Report states that the Petroleum Corporation of Jamaica (PCJ) has requested that they identify and submit an energy project, which can guarantee a 35 per cent savings for funding. NIC's proposal is to develop a wind farm project to supply 1.5 megawatts of power to its Hounslow pump stations. This is in line with NIC's 2013-2017 Strategic Plan "to implement an energy substitution (wind/solar power) initiative to¹³ by 2018". NIC through the Ministry of Science, Technology, Energy and Mining (MSTEM) has secured grant funding from the *Organisation of American States (OAS)* to implement the Wind Powered Irrigation Project. NIC Projects and Energy Conservation Sub-Committee Minutes dated February 21, 2013 stated; "MSTEM has advised that the agreement with the *Organisation of American States (OAS)* has been signed and a sum of US\$60,000 was now available for the NIC to commence the Wind Assessment Project". These initiatives would be in keeping with GOJ's 2004 Water Sector Policy objective "to provide an irrigation service in support of the agricultural sector in an efficient, cost-effective and sustainable manner".

4.12 In addition, we found that NIC commenced preparation of quarterly reports on the efficiency and profitability of its irrigation schemes in October 2011. NIC produced the reports for three only quarters between October 2011 and June 2012. The reports lacked pertinent information for four irrigation schemes. The failure to continue to prepare the reports deprived NIC of critical efficiency and profitability information that could assist in making informed decisions to improve its operations. **Table 23** shows the summarised average of the three quarters' data (**Appendix 2**).

¹² One existing and two new pumping stations

¹³ sic

Table 23 Summarized average of NIC Irrigation Schemes quarterly profile profitability & efficiency metrics Oct-11 to Jun-12

	RIO COBRE	ST. DOROTHY	MID CLARENDON	HOUNSLOW	BRACO	YALLAHS	SEVEN RIVERS	BEACON/ LITTLE PARK	COLBECK
Earnings Margin	26%	-273%	-60%	-1442%	16%	-1609%	-428%	-1%	-1483%
Charge / Vol. Pumped (\$/m3)	\$12.21	\$5.58	\$8.05	\$13.60	\$9.67	\$15.55	N/P	\$23.29	N/P
Consump. /Vol. Pumped (KwH/m3)	0.34	0.20	0.22	0.41	0.33	0.77	N/P	0.72	N/P
Charge /Hour Pumped(\$/hr)	\$1,447	\$3,299	\$2,162	\$7,839	\$1,843	\$2,387	N/P	\$5,838	N/P
Charge /Volume Produced (\$/m3)	\$0.80	\$5.58	\$3.43	\$13.60	\$9.67	\$15.55	N/P	\$23	N/P
Revenue /Volume Billed	\$5.82	\$3.71	\$12.28	\$2.36	\$43.44	\$1.82	\$21.59	\$29.67	\$4.35
System Losses	27%	28%	63%	N/P	8%	N/P	N/P	1%	N/P

Source: AuGD compilation and analysis of information provided by NIC

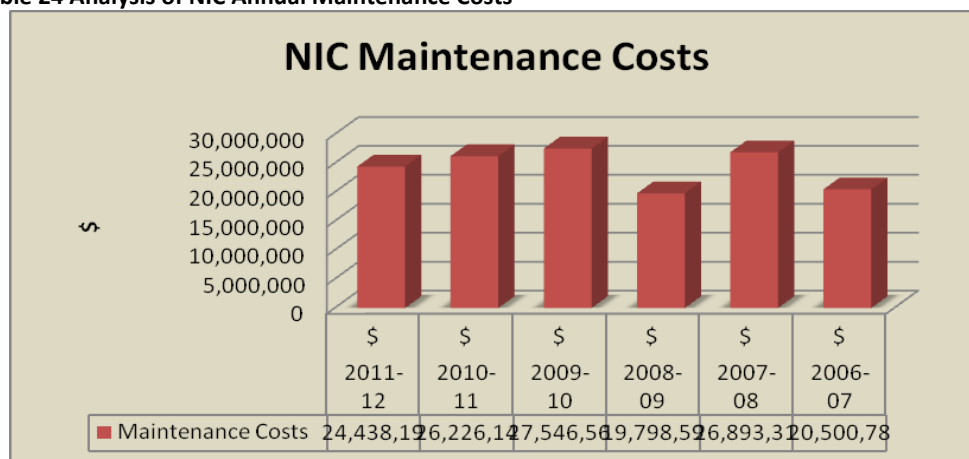
NIC Does not Have a Comprehensive Maintenance Plan

- 4.13** We observed that NIC has in place a maintenance manual for pumps and an Operation and Maintenance Procedure for the Rio Cobre System (prepared 1989). However, NIC presented only a draft maintenance policy for its irrigation infrastructure including wells and pressurized pipelines. We noted that NIC in its 2013-2017 Strategic Plan highlights as one of its high level strategies the *“development and implementation of a robust maintenance plan for the entire infrastructural outlay by 2016”*.

NIC Requires \$1.2 Billion to Repair Irrigation Infrastructure

- 4.14** NIC is experiencing declining productivity in its operations due to its aging and inefficient distribution canals, pipelines and pumps. The inability of NIC to undertake significant repairs and maintenance has resulted in malfunctioning irrigation infrastructure that has contributed significantly to the rising maintenance (labour and material) costs. NIC provided a schedule, which shows capital requirement of \$1.2 billion to repair its malfunctioning irrigation infrastructure (**Appendices 3 & 4**). The schedule details significant cracks and leaks in the distribution pipelines and canals, the need to replace earthen canal with concrete lining and the replacement of valves and hydrants and asbestos pipes with PVC pipes. Over the last six years, 2006-07 to 2011-12, total maintenance cost for repairs to buildings, distribution canals, pipelines and pumps amounted to \$145 million (**Table 24**).

Table 24 Analysis of NIC Annual Maintenance Costs



Source: AuGD analysis of information obtained from NIC audited financial statements

- 4.15** NIC reported that the lack of funds and low agricultural demand for irrigation water were the main reasons for the poor state of the irrigation infrastructure (**Appendices 3 and 4**). **Table 25** shows that NIC requested amounts totalling \$1.38 billion between 2007-08 and 2012-13, for capital expenditure to allow them to undertake necessary maintenance of irrigation facilities. However, NIC only received \$205.5 million of the amount requested, inclusive of \$164.5 million for lining of canal infrastructure. NIC responded that *“This information solidifies the point that the NIC has been significantly underfunded in maintaining its infrastructure works hence the current sub-standard state. This also impacts the resources required over the years to maintain adequate measuring equipment to capture production flows adequately”*.

Table 25 NIC Request for Capital Expenditure

FISCAL YEAR	BUDGET REQUEST-LINING OF CANALS	BUDGETED-OTHER CAPITAL WORKS	TOTAL CAPITAL A BUDGET REQUEST	APPROVED BUDGET - LINING OF CANALS	APPROVED BUDGETED - OTHER CAPITAL WORKS	TOTAL CAPITAL A BUDGET APPROVED	DIFFERENCE (SHORTFALL)/EXCESS
	\$	\$	\$	\$	\$	\$	\$
2012-2013	84,481,000	107,456,000	191,937,000	32,550,000	0	32,550,000	-159,387,000
2011-2012	162,117,000	169,060,000	331,177,000	32,000,000	0	32,000,000	-299,177,000
2010-2011	18,000,000	10,000,000	28,000,000	0.00	0	0	-28,000,000
2009-2010	18,000,000	22,000,000	40,000,000	28,000,000	10,000,000	38,000,000	-2,000,000
2008-2009	445,900,000	115,000,000	560,900,000	40,000,000	25,000,000	65,000,000	-495,900,000
2007-2008	140,000,000	92,500,000	232,500,000	32,000,000	6,000,000	38,000,000	-194,500,000
TOTAL	868,498,000	516,016,000	1,384,514,000	164,550,000	41,000,000	205,550,000	-1,178,964,000

Source: AuGD compilation and analysis of information provided by NIC

Water Losses Amount to \$1.2 Billion due to Faulty and Inadequate Infrastructure

- 4.16** NIC's reported water losses (or unaccounted for) represents 28 percent (159 cubic metres) of the 570 million cubic metres (m3) of water produced and distributed over the six-year period, April 2006 to March 2012. When costed, water losses amounts to \$1.2 billion, from both the open and pressurised irrigation systems, over the period (Table 20). As shown in **Table 26**, water losses as a percentage of total water production, moved from 19 per cent in 2006-07 to 36 per cent in 2011-12. Further, the water production cost foregone increased by 260 per cent, moving from \$94 million in 2006-07 to \$338 million in 2011-12. The NIC has indicated that the nature of its open irrigation system will likely have a 20 to 25 per cent system loss and has acknowledged in its Strategic Plan 2013-2017 the need to develop and implement project (s) to reduce systems losses and has set a strategic objective to *“achieve operational efficiency of 75% for open systems and 95% for pressurised systems by 2018.”*

Table 26 Six-year analysis of NIC's Non-Revenue Water

Period	Water Production (m ³)	Water Invoiced (m ³)	Variances (losses)	Variance Percentage	Cost per m ³ per NIC)	Cost for Variances
Apr 2011 – Mar 2012	80,889,595.00	51,821,293.00	29,068,302.00	35.94%	11.62	337,773,669.20
Apr 2010 – Mar 2011	72,178,286.45	50,849,621.13	21,328,665.32	29.55%	9.82	209,447,493.40
Apr 2009 – Mar 2010	125,228,179.11	97,577,546.00	27,650,633.11	22.08%	8.20	226,735,191.50
Apr 2008 – Mar 2009	81,828,907.79	55,408,359.60	26,420,548.19	32.29%	8.32	219,818,960.90
Apr 2007 – Mar 2008	100,958,332.00	67,337,862.00	33,620,470.00	33.30%	5.53	185,921,199.10
Apr 2006 – Mar 2007	108,684,962.00	88,166,196.00	20,518,766.00	18.88%	4.57	93,770,760.62
Total	569,768,262.35	411,160,877.70	158,607,384.65		48.06	1,273,467,275.00
Percentage	100%	72%	28%		-	-

Source: AuGD compilation and analysis of information provided by NIC

NIC Challenged by Vandalism of Irrigation Infrastructure

- 4.17** Section 38 of the Irrigation Act states, “Every person who wilfully or maliciously blocks up or obstructs or causes to be in any way blocked up or obstructed, or who encroaches on or damages any irrigation works or watercourse, or who breaches or cuts through the banks of the same shall be liable on summary conviction before a Resident Magistrate to imprisonment for three years or to a fine of one hundred thousand dollars or to both such imprisonment and fine.”
- 4.18** The problem of vandalism of irrigation infrastructure has been a prolonged challenge for the NIC. NIC's SWOT analysis, published in its Corporate Plan and Budget for the financial years 2011-12 and 2012-13, identified vandalism of irrigation infrastructure as an ongoing issue. The impact of this threat includes increasing security and maintenance costs and loss of revenue. Security cost increased by 73 per cent, moving from \$4.2 million as at March 2007 to \$7.2 million as at March 2012 (**Table 27**).

Table 27 Six-Year Analysis of Security Cost

Security Cost	TOTAL \$	2011-12 \$	2010-11 \$	2009-10 \$	2008-09 \$	2007-08 \$	2006-07 \$
Cost	35,721,963	7,184,981	6,492,554	7,520,625	6,032,328	4,339,758	4,151,717
Change (\$)		692,427	-1,028,071	1,488,297	1,692,570	188,041	
Change (%)		10.66%	-13.67%	24.67%	39.00%	4.53%	

Source: AuGD analysis of information obtained from NIC audited financial statements

- 4.19** Further, between January 2010 and November 2012, NIC recorded 11 cases of damage to its irrigation equipment, due to vandalism, amounting to \$16.47 million (**Table 28**).

Table 28 Cases of damage to NIC irrigation infrastructure

	Pump Station	Date Vandalized	Nature of Damage	Cost of Damage
1	Port Henderson Relift	Jan-10	Removal of earth cable, damage to motor control centres & variable speed drive	\$12,000,000.00
2	Colbeck	Mar-10	Newly installed electrical panel completely destroyed	\$1,144,125.00
3	Bodles #2	Apr-10	Control Centre vandalized	\$2,060,302.50
4	Ebony Park	Oct-10	Pump battery and gas stolen	\$35,000.00
5	Freetown	Mar-11	XLPE Core cable wire stolen	\$201,082.35
6	Ebony Park	Apr-11	Battery taken along with hose and pump exhaust manifold	\$230,000.00
7	Guinep Pen	Jun-11	Pump door & window vandalized (Not in operation)	-
8	Bodles #2	Aug-12	Cable wires stolen, switch panel damaged	\$325,000.00
9	Clifton #5	Aug-12	Cable wires stolen	\$165,000.00
10	Port Henderson Relift	Nov-12	Wires removed from Pump station	\$128,900.00
11	Clifton #5	Nov-12	Cable & electrical wires stolen	\$187,500.00
				\$16,476,909.85

Source: AuGD compilation of information provided by NIC

- 4.20** Table 29 shows that of the 73 pump houses operated by NIC, 33 are not fenced. NIC, in its 2009-10 Annual Report, acknowledged the potential risk and states that it has *“commenced the exploration and implementation of advanced security measures to protect this critical and expensive infrastructure.”* Further, Board Minutes dated September 26, 2012 noted, *“Board approval was now being granted for a revised listing of twelve (12) locations at an estimated cost of \$7.2M”*. In February 2013, NIC presented a revised Priority listing of the 12 pumps stations showing preliminary cost estimates of \$8 million and monthly operating cost of \$120,000. To date, the security system has not been acquired.

Table 29 Analysis of Security Features at NIC pump houses

LOCATIONS	AMOUNT OF PUMP STATIONS	Not Fitted With Fence
Rio Cobre Irrigation Works	18	9
St. Dorothy	9	6
Yallahs	3	0
Mid Clarendon Irrigation Work	32	17
Hounslow	5	1
New Forrest	2	0
Beacon Little Park	3	0
Braco	1	0
Grand Total	73	33

Source: AuGD compilation of information provided by NIC

NIC Plagued by Theft of Irrigation Water

- 4.21** NIC is empowered under the Irrigation Act to pursue legal actions against any individual for unlawful use of irrigation water from its network of irrigation pipe and open canals. Section 39(1) of the Act states; *“Every person who wilfully causes waste of water conserved by any irrigation works, or who not being entitled thereto wrongfully draws off or converts to his own use, water from such works or from any watercourse or channel connected therewith, shall be*

liable on summary conviction before a Resident Magistrate to imprisonment for three years or fine of one hundred thousand dollars or to both such imprisonment and fine.” Further, Section 42(1) states; “Every person who without the consent of the authority opens or closes or otherwise tampers with any sluices, water gates, regulators, pipes, bench marks, water gauges or other works forming part of any of the irrigation area shall be liable on summary conviction before a Resident Magistrate to imprisonment for three years or to a fine of one hundred thousand dollars or to both such fine and imprisonment.”

- 4.22** **Table 30** shows that between 2008 and 2013, NIC reported 22 cases of illegal water extractions, tampering and other forms of irrigation breaches. Despite requests, NIC did not provide the data for 2009. NIC settled 16 of these cases by arbitration and through the Courts; while five are being pursued.

Table 30 Analysis of reported cases of vandalism, illegal use of irrigation water

Year	No. of Cases Cited For Illegal Water Extraction	No. of Cases Cited For Tampering	Others: Dumping, Encroachment	Cases in Arbitration/Court	Settled By Arbitration Or Within The Court
2013	2	1	-	1	2
2012	3	1	-	3	1
2011	5	-	2	1	6
2010	2	-	2		4
2009	Not Provided	Not Provided	Not Provided	Not Provided	Not Provided
2008	4	-	-	0	4
Total	16	2	4	5	17

Source: AuGD compilation of information extracted from NIC files

Pollutants Threatens NIC’s Ability to Supply Safe Water

- 4.23** NIC is one of three agencies responsible, under to meet the requirement for safe and adequate water and sanitation. We observed that NIC’s ability to supply safe water for irrigation purposes is threatened by the release and disposal of effluents in its network of open canals and water sources.
- 4.24** In August 2012, NIC conducted an internal audit of its open canals to determine whether there are any sizeable discharges from any sewage plants or otherwise into these canals. We obtained a copy of the audit report, which provides a schedule of pollutants being discharged into NIC’s canals.
- 4.25** As shown in **Table 31**, the NIC audit identified 10 locations, seven in St. Catherine and one each in Trelawny, St. Elizabeth and St. James, where industrial wastes such as fecal coliform, caustic soda, detergents, sulphur, oils and other forms of waste matters are being deposited directly into NIC’s open canals and water sources. The audit also highlighted that the frequency of the discharge at five of these locations are continuous, while the other five are periodic and in some instances, for example Braco and Rio Cobre River, the pollution is not directly into its canals, but rather the water source.

Table 31 NIC audit findings of pollutant of NIC irrigations canals and water sources

Pollutant Source	Location of Source	Point Of Entry in NIC Works	Likely Contaminant	Frequency
Entity 1	Saint Catherine	Old Harbour Branch Canal, Rio Cobre	Fecal Coliform	Continuous
Entity 2	Saint Catherine	Damhead, Rio Cobre	Caustic soda	Periodic
Entity 3	Saint Catherine	Turners Pen Canal, Rio Cobre	Detergents, Sulphur	Periodic
Entity 4	Saint Catherine	Cumberland Canal, Rio Cobre	Feacal Coliform	Continuous
Entity 5	Saint Catherine	Sydenham Canal, Rio Cobre	Effluent	Continuous
Entity 6	Saint Catherine	Caymanas Canal, Rio Cobre	Fish waste	Continuous
Entity 7	Saint Catherine	Main Canal, Rio Cobre	Oils, detergents	Continuous
Entity 8	Trelawny	Rio Bueno, Braco	Oils	Periodic
Entity 9	St. Elizabeth	Drains to the Black River, St. Elizabeth	Dunder, heat	Periodic
Entity 10	St. James	River at Seven Rivers, St. James	Organic Materials	Periodic

Source: AuGD compilation of information provided by NIC

4.26 The audit report states, *“given the growing concern on water quality issues, may I recommend that NIC employs the services of a suitably qualified professional in this regard”*. However, to date, the recommendation has not been implemented.

4.27 NIC, by way of letter dated February 07, 2013, brought to the attention of the National Environment and Planning Agency (NEPA) *“the urgent matter of contaminants entering our irrigation network as well as attendant water sources”*. NEPA responded in March 2013 indicating, in part, that the *“Pesticide Control Authority will be informed about the improper use of pesticides in Sevens River, Saint James and as for other issues, these will be investigated and the necessary action taken based on the results of those investigations”*. NIC has reported that their representatives have met with NEPA to develop strategies to mitigate the contamination risks.

NIC Plan to Replace Asbestos Cement (AC) Pipes in Irrigation Network

4.28 NIC provided a schedule, which shows capital requirement of \$1.2 billion to repair and replace its irrigation infrastructure. Included in the Schedule is a budgeted \$376.3 million to replace asbestos cement (AC) pipes with PVC pipes, to mitigate possible health implications (**Table 32**). However, NIC was unable to provide the implementation schedule, as the source of funding is yet to be identified.

Table 32 Selected Irrigation Networks with Asbestos Cement Pipes

REGION	SCHEME	LENGTH (m)	Unit Cost (\$/M)	TOTAL	NIC REMARKS
Eastern	Block A, Bernard Lodge	3,000	5,000	15,000,000	Replacement over time based on available funding
	Sandy Bay & Bowers	16,000	4,000	64,000,000	Approx 95% of pipes are Asbestos Concrete
Central	Gravel Hill	1,500	5,000	7,500,000	14 inch dia. Proposal being developed to immediately replace 400 metres
	Vernamfield	7,700	6,000	46,200,000	AC pipes being replaced by year-end as part of Sugar Transformation Project
Western	Hounslow	32,000	6,000	192,000,000	30% replaced under CDB Funded NIDP Projects
	Braco	8,600	6,000	51,600,000	Replacement over time based on available funding
	TOTAL (m)	68,800		376,300,000	

Source: AuGD analysis of information provided by NIC

NIC's Canal Reservation Impacted by Squatting

- 4.29 NIC reported that there are health risk exposures arising from the existence of informal settlements on its canal reservations. NIC, in its 2010-11 Annual Report, stated that *“These communities have little or no potable water, and, the irrigation water which is untreated is often times used for domestic purposes”*. NIC provided us with a list, which details informal settlements along its canal reservation in the parish of Saint Catherine. We noted that these informal settlements emerged for periods ranging from as recent as four months to 25 years.

Policy Plan for WUAs to Manage Irrigation Schemes Fails to Materialize

- 4.30 The GOJ Water Sector Policy 2004 proposed the establishment of Water Users Associations (WUAs), which should be self-governing unit that manage irrigation systems. The Policy states, *“WUAs are seen as a way to reduce public expenditure and to ensure better operation and maintenance (O&M), by making users responsible for the facilities that they enjoy.”* The Policy further states, *“With the establishment of WUAs, the role of the NIC will shift progressively to focus on planning, monitoring and regulating the irrigation sector. Regulation in this context will primarily embrace policy and technical, as well as organizational issues, while tariff issues will remain within the purview of the Office of the Utilities Regulation (OUR). In addition, this context will reinforce the NIC's role as a developmental agency rather than a utility. In that regard, the NIC should be seen as a facilitator for agricultural development”*.
- 4.31 The aim of the WUAs is to promote and encourage farmers' participation in the irrigation sector and to establish legal entities with farmers as members and shareholders who will have the power to govern these organizations. NIC would eventually transfer the responsibility for the local management of irrigation water distribution, monitoring and system maintenance to the WUAs.
- 4.32 NIC established pilot Water Users Groups at six of its irrigation schemes – namely: Colbeck, Yallahs, New Forest/Duff House, Hounslow, Beacon/Little Park and Seven Rivers. However, an Organisational Audit report concluded that the model of full O&M responsibility by the WUA's was not suitable for Jamaica and that a detailed study to identify a more appropriate model

should be undertaken. In April 2013, NIC responded that, “no action has been taken to date to comply with the conclusion in the Organisational Audit Report”.

NIC Employs More Administrative Staff Than Technical Staff

- 4.33** NIC’s core duty is to manage, operate, maintain and expand irrigation schemes and systems to ensure the efficient supply of irrigation water to farmers, in order to increase agricultural produce. The nature and scope of NIC’s operations require technical skills and knowledge to ensure the effective and efficient monitoring, and maintenance of these infrastructures, in order to provide reliable irrigation services to farmers.
- 4.34** We found that the composition of staff that provides technical services vis-à-vis administrative support services did not appear consistent with NIC’s core mandate. As shown in **Table 33**, NIC’s total staff complement as at May 2013 amounts to 197 employees. Of this amount, 57 per cent (112) represents administrative officers; while 43 per cent (85) represents technical officers (**Appendix 5**).

Table 33 Analysis of NIC Staff Compliment

Category	Staff Compliment	Percentage
Administrative	112	57%
Technical	85	43%
Total	197	100%

Source: AuGD compilation of information provided by NIC

NIC Gradually Increasing Irrigation Rates to Reflect Economic Cost

- 4.35** Given the deteriorating irrigation infrastructure and rising electricity and labour costs, NIC may face difficulty in its plan to pass on the full economic cost to produce irrigation water to their main customers, the farmers. The GOJ Water Sector Policy 2004 recommended that, within five years, NIC should seek to introduce cost recovery mechanisms to ensure that the direct beneficiary pays economic costs for irrigation water to ensure financial viability.
- 4.36** In December 2006, OUR conducted a review of NIC’s irrigation rates. The review cited the “GOJ’s expressed intent to promote the introduction of cost recovery mechanisms to ensure that the direct beneficiary pays for the supply of irrigation service, it is expected that agricultural rates paid by farmers for irrigation water should continuously increase until it is cost reflective.” As such, NIC is gradually increasing irrigation water and drainage charges, as part of its cost recovery plan, to increase farmers contribution to the economic costs of providing irrigation water.
- 4.37** NIC proposed to charge farmers a flat fee of \$700 for the first 20 cubic metres of water used and \$38 per cubic metre for the next 50 cubic metres and an additional \$28.50 per cubic metre greater than 70 cubic metres used. NIC plans to increase irrigation rates from the current flat rate to reflect the economic cost of producing irrigation in each irrigation scheme. NIC currently charges a flat rate of \$1.83 per cubic-meter for the first 5,508 cubic-meters of water consumed by farmers; and \$2.39 per cubic-meter for any additional amounts.
- 4.38** **Table 34** shows that effective April 1, 2011, irrigation rates for agricultural and non-agricultural users increased by 25 and 50 per cent respectively. This followed a corresponding increase of 50 and 100 per cent, which took effect August 1, 2010. NIC further increased the rates by 25

per cent for both agricultural and non-agricultural users on April 1, 2012. NIC could also face increasing difficulty funding its operations and may have to rely on increased government subsidy, if the farmers are unable to pay the increased water charges. However, we found that NIC did not conduct an assessment to determine the impact of these price increases on agricultural output.

Table 34 Increases in Irrigation Rates

		April 1, 2012		April 1, 2011		August 2010	
		per m ³	%	per m ³	%	per m ³	%
Agricultural	First 5,508 m ³	\$1.83	25%	\$1.46	25%	\$1.17	50%
	Additional m ³	\$2.39	25%	\$1.91	25%	\$1.53	50%
Non-Agricultural	NWC	\$47.25	25%	\$31.50	50%	\$21.00	100%
	Industrial Users	\$99.00	25%	\$79.20	50%	\$52.80	100%
	Ramp Sales	\$384.05	15%	\$333.96	15%	\$290.40	1000%
	Industrial – Special Flow Through	\$52.80	25%	\$42.24	50%	\$28.16	100%

Source: AuGD compilation of information provided by NIC

NIC May Face Difficulty Imposing Economic Rates on Farmers

- 4.39** Our site visit to an irrigation scheme coincided with a WUA's meeting at which the farmers revealed that the cost of irrigation water is adversely affecting their ability to purchase the requisite amount of water to satisfy production requirements. This issue was confirmed in letter from the President of one of the water users association dated April 22, 2013 appealing *"for a stay of the pending charge to be applied to their water bills or for a reduction in the amount being charged"*.

Overview

NIC's failure to develop a proper project management framework prevented it from successfully implementing the 51 irrigation projects under the NIDP Master Plan. As such, NIC did not realize the potential net present value (NPV) return of US\$ 99 million from the proposed irrigation of 20,700 hectares – which should have benefitted over 6,900 farmers in 12 parishes. NIC only completed six of the targeted 51 irrigation projects selected for implementation over the 17 years period 1998 and 2015. NIC also failed to fulfil its obligation to execute – on a timely basis – key project deliverables for eight of the 51 projects funded by the CDB and IDB. NIC also failed in its fiduciary responsibility to effectively and efficiently plan and execute two gravity-drip irrigation projects in St. Mary and Manchester. The projects lack transparency and accountability – resulting from management's override of the control systems and disregard for established procedures.

From the list of 51 projects proposed for implementation under NIDP, the Plan identified 27 projects for implementation during the first five years, 1998 to 2003. Construction investment for the projects was valued at J\$1.53 billion (US\$43.7 million). The net present value (NPV)¹⁴ for the 27 projects at a 12 per cent discount rate was J\$1.84 billion (US\$53 million). This is a measure of the present value of the net increase of income to the national economy after subtracting all costs. The project proposed to benefit 3,300 farmers. The irrigated area on the completion of the projects would be 10,100 hectares. The incremental increase in new irrigated area resulting from the Plan is 7,200 hectares.

NIC Implemented Only 8 of the 51 NIDP Irrigation Projects

5.1 NIC did not achieve its target under NIDP Master Plan to implement the 27 irrigation projects within five years, between 1998 and 2003. We found that it was not until May 2002, NIC through the GOJ entered into a loan agreement with the Caribbean Development Bank (CDB) for US\$8.1 million to implement three projects, representing 68 percent of the estimated US\$12 million for the three projects. The GOJ financed 14 per cent (US\$1.7 million); while the farmers financed the remaining 18 per cent (US\$2.2 million). The three projects include the construction of two new irrigation schemes, Beacon/Little Park and Seven Rivers and the rehabilitation of the Hounslow irrigation scheme.

¹⁴ The difference between the present value of cash inflows and the present value of cash outflows.

5.2 **Table 35** shows that the infrastructure components, under the CDB loan, includes the construction of six new pumping stations at Hounslow and Beacon/Little Park irrigation schemes, and the rehabilitation of five pumping stations at Hounslow and the installation of 38.8 km of pipelines. In addition, NIC should construct WUA's offices at each irrigation scheme. NIC planned to complete the infrastructure works for the three irrigation schemes between 2003 and 2005. However, NIC completed the construction of Beacon/Little Park and Seven Rivers irrigation schemes in 2006 and 2007 respectively and completed the rehabilitation of the Hounslow irrigation scheme in May 2008.

5.3 We found that as at March 2013, NIC had rehabilitated the five pumping stations at Hounslow and constructed three new pumping stations at Beacon/Little Park irrigation scheme. NIC also installed 54.5 km of pipelines, 15.7km more than the original scope of work of 38.8 km. The three WUA buildings were constructed; however, the capacity building component of the WUAs remains incomplete, as NIC did not provide the farmers with relevant training.

Table 35 Comparison of original and actual project scope – CDB Funded Projects

Irrigation Schemes	Pump Stations		Pipelines		Hectares covered		WUA Building	
	Org. Scope	Actual	Org. Scope	Actual	Org. Scope	Actual	Org. Scope	Actual
Hounslow ¹⁵	7	5	16km	17km	420 ha	658 ha	1	1
Beacon/Little Park	4	3	20km	32km	360 ha	203 ha	1	1
Seven Rivers	-	-	2.8km	5.5km	32 ha	32 ha	1	1
Total	11	8	38.8 km	54.5 km		-	3	3

Source: AuGD compilation of information provided by NIC and obtained during site visits

5.4 Further, as a condition to the special CDB project funding arrangement, NIC was required to achieve key project deliverables, under three components, Irrigation Infrastructure Improvement (IFI), Water Users Association (WUA) Development and Improvement of Agricultural Production and Productivity (IAPP). As shown in **Appendix 6**, under the IFI component, NIC installed the irrigation infrastructure and the three WUAs offices in 2007.

5.5 Under the IAPP component, NIC was also required to improve Agricultural Production and Productivity by the provision of Agricultural Technical Services (ATS) to include management Agricultural Development Officers (ADOs) along with crop production and marketing services. NIC engaged the services of an ADO and consultant agronomist, whose contract expired in 2007, however the marketing services of RADA was utilised instead of hiring a marketing consultant.

5.6 On May 27, 2005, the GOJ/NIC signed a loan agreement with the Inter-American Development Bank (IADB) for US\$16.8 million to finance another five irrigation projects. These five projects include the construction of three new irrigation schemes: Colbeck, New Forest/Duff House and Essex Valley; and the rehabilitation of two schemes; Yallahs and St. Dorothy. The US\$16.8 million represents 80 per cent of the total estimated cost of US\$21 million for the implementation of the five projects, with GOJ financing the remaining 20 per cent (US\$4.2 million). **Table 36** shows the activities on which NIC spent US\$14.7 million on the project.

¹⁵ 5 new and 2 refurbished pumping stations

Table 36 Breakdown of budgeted and loan draw down for the IADB funded projects

	Budget			Drawdown		
	IDB US\$	GOJ US\$	TOTAL US\$	IDB US\$	GOJ US\$	TOTAL US\$
Engineering, supervision & admin.	2,836,800	484,500	3,321,300	2,395,438	1,762,728	4,158,167
1 - Institutional strengthening	651,500	302,000	953,500	582,476	91,926	674,403
2 - Promotion and formation of WUAs	1,378,100	310,200	1,688,300	431,887	174,441	606,329
3 - Technical assistance and training	781,500	386,000	1,167,500	364,212	123,675	487,888
4 - Irrigation systems infrastructures	8,368,163	2,240,000	10,608,163	7,219,675	1,370,442	8,590,119
Concurrent costs – Audits	300,000	0	300,000	112,806	0	112,806
Contingencies	1,198,937	363,300	1,562,237	0	0	0
Financial costs	1,285,000	114,000	1,399,000	28,360	0	28,360
Total	16,800,000	4,200,000	21,000,000	11,134,857	3,523,215	14,658,073

Source: AuGD compilation of information provided by NIC

5.7 The irrigation infrastructure include wells, pump houses, power supply, pipe networks, pumping equipment, and on-farm systems in the construction of three new irrigation schemes and the rehabilitation of two existing schemes. The contract document also specified that these systems would benefit approximately 1,000 farmers and irrigate 1,700 hectares. The pre-investment includes feasibility studies and final designs for Essex Valley and St. Dorothy as well as the rehabilitation plans for the other two major irrigation systems administered by NIC, Mid-Clarendon and Rio Cobre.

5.8 The contract document specified that of the US\$10.6 million earmarked for the irrigation infrastructure component of the project, US\$9.3 million will fund the construction of nine new pumping stations in Colbeck, New Forest/Duff House and Yallahs and the rehabilitation of two pumping stations in Colbeck and Yallahs. NIC did not complete the full scope of the projects. In that, NIC has only constructed five of the nine scheduled new pumping stations in Colbeck, New Forest/Duff House and Yallahs. **(Table 37).**

Table 37 Comparison of original and actual project scope - IADB Funded Projects

Irrigation Schemes	Pump		Pipelines		Hectares covered		WUA Building	
	Org. Scope	Actual	Org. Scope	Actual	Org. Scope	Actual	Org. Scope	Actual
IDB Funded Projects								
Colbeck ¹⁶	2	1 new -	4.9km	5.5	110 ha	110	1	1
New Forest/Duff House	5 new	4 new	18.6km	28.7	368 ha	398	1	1
Yallahs ¹⁷	4	2 new -	18.8km	15.4	303 ha	245	1	1
Saint Dorothy					500			
Essex Valley					400			
Total	11	7	-	-	-	-	-	-

Source: AuGD compilation of information provided by NIC and obtained during site visits

5.9 The IDB loan agreement requires the construction of five pumping stations and the installation of 18.6 km of pipelines at the New Forest/Duff House irrigation scheme. We found that while NIC dug wells for all five locations, the Rows Corner well was abandoned because of salinity

¹⁶ 1 new and 1 refurbished pumping stations

¹⁷ 3 new and one refurbished pumping stations

problems with the water. Pumps were installed at New Forest and Duff House. However, no pumps were installed at Plumwood and Lane pump houses (**Table 38**).

Table 38 List of New Forest/Duff House Wells

Name of Well	No. of Wells Installed
Rowes Corner	-
New Forest	1
Plumwood	0
Lane	0
Duff House	1
Total	2

Source: AuGD compilation of information provided by NIC

- 5.10** NIC entered into a contract for the supply and installation of pumps and pump houses valued at \$77.3 million in May 2011. NIC has incurred \$46.7 million to construct the wells at Plumwood and Lane; however, the wells are not functional due to the absence of the pumps. NIC, in a report dated April 15, 2012, states that the two pumps procured by the contractors could not fit in the well casings, and therefore could not be installed in the wells. NIC acknowledged that the specifications given to the contractor was incorrect and indicated that included in the budget request for 2013-14 financial year was \$34 million for the acquisition and installation of two pumps. NIC reported that one of the pumps was installed, while the other pump is stored as spare at its Old Harbour facility.
- 5.11** NIC did not meet, on a timely basis, the deliverables under the IDB loan facility. These include NIC institutional strengthening; promotion and formation of WUA; providing farmers with technical assistance and training; and the construction and rehabilitation of the IDB loan funded irrigation projects. NIC did not meet the scheduled 2010 completion for these project components. As shown in **Table 39**, except for the institutional strengthening component, NIC has not completed the other three deliverables up to February 2013.
- 5.12** In relation to the irrigation infrastructure component, NIC is yet to complete the full scope of the construction of the Colbeck and New Forest/Duff House irrigation schemes and the rehabilitation of Yallahs irrigation scheme.

Table 39 Status of Deliverables for IDB Funded Projects as at February 2013

Components	Status
I Institutional Strengthening of the NIC	100 %
II & III Promote & formulate Water Users Associations and to deliver technical assistance & training to farmers	70 %
IV To provide irrigation infrastructure (Construction of Colbeck and New Forest/Duff House irrigation schemes and the rehabilitation of Yallahs)	99 %

Source: AuGD compilation of information provided by NIC

Ninety-one Farmers Benefited From Black Tank Project Between 2009-12

- 5.13** In 1998, NIC in collaboration with the Rural Agricultural Development Authority (RADA) implemented the Gravity Drip Irrigation System, to assist small famers in rural areas with on-farm irrigation water. The main objectives of the system are to increase production yield and improve the quality of produce. The targeted beneficiaries include RADA registered farmers, who have no natural water sources; or are not connected to a public irrigation scheme. Gravity

drip system is an on-farm irrigation technique that relies on gravity to supply the power or energy needed to operate it. This involves placing water tanks at an elevated level to generate pressure to increase the flow of water.

- 5.14** We obtained a training manual, prepared by RADA, which outlines the specifications for the operation of the gravity drip system. The manual specifies the type of drip hose and recommends that water tank capacity of 880 gallons or more should be elevated on reinforced concrete stands 3.6 feet in height and 6 feet by 6 feet in length and width. The manual, which also detailed the installation instructions, states that this type of irrigation system is the most efficient and economical method of water application to crops, where there is limited water resources. The initiative, known as the “*Black Tank Project*”, is part of NIC’s Rainwater Harvesting Project. NIC reported that between 2009 and 2012, 91 farmers benefited from the installation of black tanks in the parish of St. Elizabeth.

St. Mary and Manchester Black Tank Projects Lack Transparency

- 5.15** In 2011, NIC developed a project proposal to extend the Black Tank Project to the parishes of St. Mary and Manchester. The project proposal states, “*The promotion of the use of storage tanks will be initiated by developing a set of demonstration plots in St. Mary and Manchester.*” NIC spent approximately \$2.8 million purportedly to implement the project. The proposal further states, “*Small farmers in Saint Mary and Manchester, who are for the most part unable to access irrigation water, agricultural production is limited by a combination of rain fed management and dependence of expensive trucked water. The project seeks to alleviate this problem by supplying 15 irrigation water storage tanks and bases in St. Mary and 5 of the same systems in Manchester.*” As shown in **Table 40**, the responsibilities of key stakeholders are as follows;

Table 40 Responsibilities of key stakeholders

Stakeholders	Responsibilities
Small Farmers	<ul style="list-style-type: none"> Financing and installation of the Tank Base
NIC Board Committee	<ul style="list-style-type: none"> Assist with the identification of Projects. Supports project by way of recommendation to full Board.
GOJ representatives to include NIC’s key function	<ul style="list-style-type: none"> Approval, Project implementation, commissioning, operation, and monitoring

Source: AuGD compilation of information provided by NIC

- 5.16** The proposal further states that the farmers are responsible for the construction and installation of reinforced tank bases. NIC is responsible for the provision of the tanks and the supply of water. NIC’s technical officers are required to conduct the necessary pre and post assessments of the projects. This includes, verifying and assessing the physical locations; providing advice on the specification and most suitable location for the water tank; and ensuring the construction of the concrete stand to the required specifications.
- 5.17** As shown in **Table 41**, the project proposal outlined a four-week duration to undertake the six activities under the project – these include site visit and assessment; procurement of material; design and construction of base; installation of storage tanks and the handing over process.

Table 41 – Proposed project activities

Project Activity		Weeks			
		1	2	3	4
1	Site visit & assessment				
2	Procure material				
3	Design Base				
4	Construct Base				
5	Install storage tanks				
6	Hand over systems				

Source: Extracted from NIC's project proposal

- 5.18** We found that NIC procured 11 (1000 gallons) water tanks at a cost of \$342,507, which were purportedly distributed to farmers in St. Mary and Manchester. We identified two cheques for the amounts of \$140,805 and \$201,702, which were made payable to hardware companies located in Manchester and St. Ann respectively (**Table 42**). We noted an undated notation, on the related purchase order, by a senior officer of NIC stating, *"The purchase of these tanks are urgently required. A list of names will be supplied today. We will make payment to the supplier of the storage tanks."* NIC did not provide the basis of selection, the names and addresses of the respective beneficiaries under the Programme and evidence that the required reinforced concrete tank bases were constructed, and the requisite Board approval, despite our request.

Table 42 Details of the purchase of water tanks purportedly for farmers

Suppliers' Invoice				Purchase Order Request				Payments (Cheque)	
	Date of Invoice	No. of Tanks	Amount on Invoice	Date Requested	Date Approved	No. of Tanks	Amount	Amount	Date of Cheque/ Collection
1	15-Dec-11	3	\$84,483	15-Dec-11	16-Dec-11	3	\$84,483	\$140,805	23-Dec-11
2	15-Dec-11	3	\$84,483	20-Dec-11	20-Dec-11	2	\$56,322		
3	15-Dec-11	5	\$168,085	15-Dec-11	Undated	5	\$168,085	\$201,702	23-Dec-11
4	15-Dec-11	5	\$168,085	20-Dec-11	20-Dec-11	1	\$33,617		
Total		16	\$505,136			11	\$342,507	\$342,507	

Source: AuGD compilation of information provided by NIC

- 5.19** NIC's disbursement register disclosed that both cheques were disbursed on December 23, 2011, however, there was no evidence that the tanks were received by NIC or delivered to the farmers. We further found that the related payments vouchers were supported by faxed copies of proforma invoices, instead of the required original tax invoices from the suppliers. In addition, NIC did not obtain any competitive price quotations to select the suppliers for the 11 water tanks. Consequently, we were unable to determine whether the prices paid were fair and reasonable.

NIC Paid \$2.4 Million to Provide Water to Unknown Beneficiaries

- 5.20** We found that NIC engaged the services of nine contractors to provide water to un-named the beneficiaries at a cost of \$2.4 million (**Table 43**). The signed agreement entered into between the NIC and the contractor stated as a deliverable *"to supply a minimum of 54,000 gallons of*

water by each contractor; contractor must be available to deliver water upon the request of the farmer; contractor to supply to a minimum of four (4) farmers at least once per week”.

Table 43 Contractors engaged by NIC for the supply of irrigation water to farmers

Names	Contract Date	Contract Price and Amount paid	Cheque Date	Date Encashed
Contractor 1	Undated	\$270,000	23-Dec-11	03-Jan-12
Contractor 2	Undated	\$270,000	23-Dec-11	03-Jan-12
Contractor 3	Undated	\$270,000	23-Dec-11	03-Jan-12
Contractor 4	Undated	\$270,000	23-Dec-11	03-Jan-12
Contractor 5	Undated	\$270,000	23-Dec-11	03-Jan-12
Contractor 6	Undated	\$270,000	23-Dec-11	03-Jan-12
Contractor 7	Undated	\$270,000	23-Dec-11	03-Jan-12
Contractor 8	Undated	\$270,000	23-Dec-11	03-Jan-12
Contractor 9	Undated	\$270,000	23-Dec-11	03-Jan-12
Total		\$2,430,000		

Source: AuGD compilation of information provided by NIC

- 5.21** We noted a memorandum dated December 23, 2011, from a senior officer stating *“Under the Water Harvesting Programme whereby water storage tanks are provided to the farmers in St. Mary and Manchester, payment is being requested for the following person for the supply of irrigation water from water trucks.”* However, up to the date of this report, NIC was unable to provide the name of the beneficiaries. NIC’s disbursement register disclosed that the nine cheques totalling \$2.4 million were disbursed on December 23, 2011. A former employee of the Ministry of Agriculture and Fisheries collected the nine cheques; however, NIC did not present the requisite written authority from the contractors for the officer to collect the cheques on their behalf.
- 5.22** NIC presented an Interim Report dated May 15, 2013 on the Water Harvesting (Black Tank) Project, highlighting site visits to farmers in Saint Mary to identify the beneficiaries. The interim report stated, *“Additional follow-up will be done to ascertain the names of the farmers in Manchester as well as their agricultural impact. In addition, a further site visit will be planned as additional contacts have been made by the Chief Internal Auditor.”*

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Appendices

Appendix 1 NIDP Project List

No	ID	Project	Parish	Area (ha)	No. of Farmers	Construction Cost (US\$ million)	Cost/ha (US\$)	O&M Cost (US\$ million)	O&M Cost/ha (US\$)	NPV (US\$ million)	BCR	EIRR (%)	TECH. Max=670 (%)	ENV. Max=120(%)	Social Max=700 (%)	INST. Max=80 (%)
MAJOR IRRIGATION PROJECTS																
1	CL2	Spring Plains / Ebony Park	Clarendon	690	172	2.20	3 188	0.52	754	6.30	1.92	39.22	75	100	97	75
2	TH1	Yallahs	St. Thomas	472	418	4.00	8 475	0.19	403	5.13	1.80	25.17	75	100	97	63
3	EL11	Pedro Plains inc. Hounslow Rehabilitation	St. Elizabeth	1 110	803	5.76	5 189	1.51	1 360	0.06	1.00	12.10	79	58	97	63
4	EL1	Essex Valley	St. Elizabeth	2 040	1 067	17.10	8 382	3.20	1 569	8.04	1.18	17.11	70	100	97	0
5	MN1	New Forrest/Duff House	Manchester	450	400	2.30	5 111	0.63	1 400	1.04	1.14	16.67	70	58	94	0
6	WE5	Cabarita Irrigation (Economic)	Westmoreland	1 000	220	3.85	3 850	0.40	400	-0.18	0.98	11.43	87	100	79	0
		Major Irrigation Total		5 762	3 080	35.21		6.45		20.39						
N.I.C. IRRIGATION PROJECTS																
1	TR1	Braco	Trelawny	100	83	0.22	2 200	0.02	200	1.88	5.33	87.49	75	100	100	100
2	CA8	St. Dorothy Rehab. (Economic)	St. Catherine	1 569	316	1.87	1 192	0.02	13	7.14	4.50	48.90	79	58	97	100
3	CA7	NIC Rio Cobre Lining (Partial)	St. Catherine	400	130	8.18	20 450	0.31	775	1.08	1.10	13.56	70	58	91	100
4	CA6	Rio Cobre Blk A - E (Lome)	St. Catherine	940	86	2.39	2 543	0.76	809	-0.02	1.00	11.90	79	100	79	100
		N.I.C. Irrigation		3 009	615	12.66		1.11		10.08						

No	ID	Project	Parish	Area (ha)	No. of Farmers	Construction Cost (US\$ million)	Cost/ha (US\$)	O&M Cost (US\$ million)	O&M Cost/ha (US\$)	NPV (US\$ million)	BCR	EIRR (%)	TECH. Max=670 (%)	ENV. Max=120(%)	Social Max=700 (%)	INST. Max=80 (%)
		Total														
PRIVATE IRRIGATION PROJECTS																
1	CL4	Victoria Banana	Clarendon	354	1	0.71	2 006	0.05	141	2.92	3.21	52.62	79	58	93	63
2	CL3	Monymusk Night Storage (Lome)	Clarendon	640	1	1.30	2 031	0.16	250	1.33	1.51	22.61	75	100	96	63
3	CA3	Bernard Lodge Night Storage (Lome)	St. Catherine	376	20	0.83	2 207	0.06	160	0.51	1.39	18.66	79	100	87	100
4	TH5	Eastern Banana	St. Thomas	1 000	1	6.06	6 060	0.24	240	2.42	1.25	17.07	79	100	100	100
5	TR3	Long Pond (Lome)	Trelawny	157	1	0.40	2 548	0.07	446	-0.03	0.97	10.92	79	58	97	25
		Private Irrigation Total		2 527	24	9.30		0.58		7.15						
SMALL IRRIGATION PROJECTS																
1	WE6	Retreat/Spring Garden	Westmoreland	50	40	0.08	1 600	0.03	600	1.32	5.06	138.23	87	58	97	0
2	MA1	Dover	St. Mary	134	40	0.21	1 567	0.06	448	2.29	4.20	100.19	79	58	97	25
3	MN2	Spring Ground	Manchester	62	25	0.29	4 677	0.06	968	2.06	3.52	73.34	82	17	89	0
4	WE4	Roaring River (Economic)	Westmoreland	350	110	0.33	943	0.05	143	2.01	3.74	65.24	82	100	90	25
5	WE2	Mylersfield	Westmoreland	100	60	0.36	3 600	0.09	900	1.77	2.58	55.06	70	58	89	25
6	WE1	Silver Spring (Drainage)	Westmoreland	100	50	0.48	4 800	0.05	500	2.19	3.28	55.00	82	58	89	38
7	PO1	Shrewsbury	Portland	100	45	0.31	3 100	0.07	700	1.17	2.19	47.84	87	83	97	25
8	CA4	Colbeck	St. Catherine	120	140	0.63	5 250	0.10	833	2.37	2.55	47.23	91	100	97	63
9	AN3	John Reid	St. Ann	36	90	0.16	4 444	0.03	833	0.59	2.37	46.14	82	100	94	25
10	CA10	Hill Run Fish Ponds	St. Catherine	284	130	1.5	5 282	0.05	176	5.23	3.75	45.73	70	58	100	100
11	TH2	Mt. Ida/Coley	St. Thomas	60	75	0.34	5 667	0.05	833	1.21	2.52	45.69	91	100	91	0
12	TR4	Barnstable	Trelawny	164	60	1.03	6 280	0.20	1 220	3.54	2.28	43.89	82	100	97	25

No	ID	Project	Parish	Area (ha)	No. of Farmers	Construction Cost (US\$ million)	Cost/ha (US\$)	O&M Cost (US\$ million)	O&M Cost/ha (US\$)	NPV (US\$ million)	BCR	EIRR (%)	TECH. Max=670 (%)	ENV. Max=120(%)	Social Max=700 (%)	INST. Max=80 (%)
13	AN4	Douglas Castle/Cricket River	St. Ann	24	65	0.14	5 833	0.02	833	0.36	2.11	36.93	82	58	96	25
14	MA5	Frontier	St. Mary	30	120	0.18	6 000	0.04	1 333	0.47	1.90	36.79	87	100	84	25
15	MA4	Gayle/Pembroke Hall	St. Mary	200	30	1.17	5 850	0.17	850	2.59	1.97	33.84	91	83	89	0
16	PO5	Millbank	Portland	80	30	0.24	3 000	0.06	750	0.53	1.71	32.65	87	83	97	0
17	EL9	Font Hill	St. Elizabeth	319	150	1.53	4 796	0.32	1 003	2.62	1.61	29.00	87	100	91	0
18	WE3	Leamington	Westmoreland	50	30	0.23	4 600	0.06	1 200	0.38	1.51	28.21	82	100	89	63
19	JA3	Irwin	St. James	107	2	0.68	6 355	0.14	1 308	1.17	1.60	28.90	87	100	84	0
20	EL3	Braes River	St. Elizabeth	200	110	0.74	3 700	0.09	450	0.92	1.57	25.41	87	58	94	0
21	CL5	Gimmie-a-Bit	Clarendon	40	40	0.10	2 500	0.03	750	0.14	1.39	25.41	87	58	100	75
22	WE7	Bog, Bronte	Westmoreland	50	60	0.33	6 600	0.06	1 200	0.43	1.51	25.26	87	100	97	0
23	EL8	Pepper	St. Elizabeth	317	150	1.52	4 795	0.22	694	1.88	1.53	25.02	82	100	89	25
24	MA3	Industry/Retreat	St. Mary	160	120	0.96	6 000	0.14	875	1.07	1.49	23.68	82	83	89	0
25	HA1	Hazelymph & Sevens River	Hanover & St. James	220	107	1.10	5 000	0.05	227	1.15	1.70	23.63	82	100	100	25
26	PO6	Seamans Valley	Portland	165	60	0.50	3 030	0.11	667	0.41	1.26	21.02	87	83	100	25
27	PO4	Golden Vale	Portland	175	55	0.53	3 029	0.12	686	0.41	1.24	20.48	91	83	97	25
28	MA2	Gibraltar	St. Mary	70	100	0.25	3 571	0.04	571	0.15	1.24	18.61	82	58	94	0
29	JA5	Latium/Guilsbro	St. James	42	220	0.38	9 048	0.07	1 667	0.20	1.20	17.57	91	100	97	0
30	AN5	Cave Valley	St. Ann	74	90	0.44	5 946	0.06	811	0.20	1.21	17.14	91	100	97	25
31	PO3	Comfort Castle	Portland	40	25	0.13	3 250	0.03	750	0.05	1.12	16.73	87	83	97	0
32	TH3	Friendship (Economic)	St. Thomas	140	70	0.72	5 143	0.15	1 071	0.12	1.06	13.87	91	100	89	0
33	WE8	Chesterfield	Westmoreland	70	60	0.53	7 571	0.12	1 714	0.08	1.05	13.64	87	100	97	0
34	EL2	Elim (Lome)	St. Elizabeth	146	150	0.91	6 233	0.10	685	-0.07	0.96	11.04	87	42	93	0
		Small Irrigation Total		4 279	2 709	19.03		3.01		41.01						

STORAGE IRRIGATION PROJECTS

No	ID	Project	Parish	Area (ha)	No. of Farmers	Construction Cost (US\$ million)	Cost/ha (US\$)	O&M Cost (US\$ million)	O&M Cost/ha (US\$)	NPV (US\$ million)	BCR	EIRR (%)	TECH. Max=670 (%)	ENV. Max=120 (%)	Social Max=700 (%)	INST. Max=80 (%)
1	CA9	Bog Walk Off-Stream Storage(Lome)	St. Catherine	4 940	470	29.46	5 964	0.89	180	20.36	1.56	19.66	70	58	80	25
2	CL6	Clarendon: Micro-dam Rehab. (Lome)	Clarendon	185	30	0.64	3 459	0.06	324	0.07	1.06	13.26	70	58	80	25
		Storage Irrigation Total		5 125	500	30.1		0.95		20.43						
51		Grand Total		20 702	6 928	106.3		12.10		99.06						

Appendix 2 Details of NIC Irrigation Scheme Profile Profitability and Efficiency Metrics

Irrigation Districts	Oct – Dec. 2010	Jan – Mar 2011	Apr - Jun 2011	Average
RIO COBRE				
Earnings Margin	20%	24%	33%	25.67%
Charge / Volume Pumped (\$/m3)	\$10.53	\$12.65	\$13.44	\$12.21
Consumption /Volume Pumped (Kwh/m3)	0.29	0.37	0.36	0.34
Charge /Hour Pumped(\$/hr)	\$1,506.12	\$1,453.33	\$1,381.59	\$1,447.01
Charge /Volume Produced (\$/m3)	\$0.60	\$1.00	\$0.81	\$0.80
Revenue /Volume Billed	\$3.55	\$7.63	\$6.29	\$5.82
System Losses	17%	36%	29%	27%
ST. DOROTHY	Oct – Dec. 2010	Jan – Mar 2011	Apr - Jun 2011	Average
Earnings Margin	-470%	-283%	-65%	-273%
Charge / Volume Pumped (\$/m3)	\$6.20	\$4.93	\$5.61	\$5.58
Consumption /Volume Pumped (Kwh/m3)	0.21	0.18	0.20	0.20
Charge /Hour Pumped(\$/hr)	\$3,213.50	\$2,504.77	\$4,177.76	\$3,298.68
Charge /Volume Produced (\$/m3)	\$6.20	\$4.93	\$5.61	\$5.58
Revenue /Volume Billed	\$2.39	\$3.87	\$4.87	\$3.71
System Losses	36%	47%	0%	28%
MID CLARENDON	Oct – Dec. 2010	Jan – Mar 2011	Apr - Jun 2011	Average
Earnings Margin	-131%	-49%	0%	-60.00%
Charge / Volume Pumped (\$/m3)	\$7.92	\$8.12	\$8.12	\$8.05
Consumption /Volume Pumped (Kwh/m3)	0.24	0.21	0.21	0.22
Charge /Hour Pumped(\$/hr)	\$2,271.99	\$2,125.19	\$2,088.22	\$2,161.80
Charge /Volume Produced (\$/m3)	\$3.64	\$3.50	\$3.14	\$3.43
Revenue /Volume Billed	\$10.97	\$14.70	\$11.17	\$12.28
System Losses	72%	65%	52%	63%
HOUNSLOW	Oct – Dec. 2010	Jan – Mar 2011	Apr - Jun 2011	Average
Earnings Margin	-2127%	-1245%	-955%	-1442%
Charge / Volume Pumped (\$/m3)	\$13.07	\$14.27	\$13.47	\$13.60
Consumption /Volume Pumped (Kwh/m3)	0.4	0.41	0.43	0.41
Charge /Hour Pumped(\$/hr)	\$8,260.32	\$7,269.69	\$7,988.27	\$7,839.43
Charge /Volume Produced (\$/m3)	\$13.07	\$14.27	\$13.47	\$13.60
Revenue /Volume Billed	\$1.69	\$2.32	\$3.07	\$2.36
System Losses	Not Provided	Not Provided	Not Provided	Not Provided
BRACO	Oct – Dec. 2010	Jan – Mar 2011	Apr - Jun 2011	Average
Earnings Margin	28%	13%	8%	16%
Charge / Volume Pumped (\$/m3)	\$11.82	\$10.50	\$6.70	\$9.67
Consumption /Volume Pumped (Kwh/m3)	0.37	0.31	0.3	0.33
Charge /Hour Pumped(\$/hr)	\$2,415.68	\$2,555.57	\$557.71	\$1,842.99
Charge /Volume Produced (\$/m3)	\$11.82	\$10.50	\$6.70	\$9.67
Revenue /Volume Billed	\$31.79	\$43.69	\$54.83	\$43.44
System Losses	8%	9%	8%	8%
YALLAHS	Oct – Dec. 2010	Jan – Mar 2011	Apr - Jun 2011	Average
Earnings Margin	-1540%	-1388%	-1899%	-1609.00%

Charge / Volume Pumped (\$/m3)	\$14.85	\$16.02	\$15.78	\$15.55
Consumption /Volume Pumped (Kwh/m3)	0.89	0.95	0.48	0.77
Charge /Hour Pumped(\$/hr)	\$2,498.17	\$2,677.37	\$1,986.45	\$2,387.33
Charge /Vol. Produced (\$/m3)	\$14.85	\$16.02	\$15.78	\$15.55
Revenue /Volume Billed	\$1.52	\$1.92	\$2.01	\$1.82
System Losses	Not Provided	Not Provided	Not Provided	Not Provided
SEVEN RIVERS	Oct – Dec. 2010	Jan – Mar 2011	Apr - Jun 2011	Average
Earnings Margin	-419%	-447%	-417%	-428%
Charge / Volume Pumped (\$/m3)	Not Provided	Not Provided	Not Provided	Not Provided
Consumption /Volume Pumped (Kwh/m3)	Not Provided	Not Provided	Not Provided	Not Provided
Charge /Hour Pumped(\$/hr)	Not Provided	Not Provided	Not Provided	Not Provided
Charge /Volume Produced (\$/m3)	Not Provided	Not Provided	Not Provided	Not Provided
Revenue /Volume Billed	\$19.76	\$27.71	\$17.30	\$21.59
System Losses	Not Provided	Not Provided	Not Provided	Not Provided
BEACON/ LITTLE PARK	Oct – Dec. 2010	Jan – Mar 2011	Apr - Jun 2011	Average
Earnings Margin	-30%	14%	12%	-1%
Charge / Volume Pumped (\$/m3)	\$23.37	\$23.99	\$22.51	\$23.29
Consumption /Volume Pumped (Kwh/m3)	0.7	0.68	0.78	0.72
Charge /Hour Pumped(\$/hr)	\$5,757.82	\$4,485.75	\$7,272.22	\$5,838.60
Charge /Volume Produced (\$/m3)	\$23.37	\$23.99	\$22.51	\$23.29
Revenue /Volume Billed	\$24.10	\$34.27	\$30.65	\$29.67
System Losses	0	2%	0	1%
COLBECK	Oct – Dec. 2010	Jan – Mar 2011	Apr - Jun 2011	Average
Earnings Margin	-1259%	-1397%	-1793%	-1483%
Charge / Volume Pumped (\$/m3)	Not Provided	Not Provided	Not Provided	Not Provided
Consumption /Volume Pumped (Kwh/m3)	Not Provided	Not Provided	Not Provided	Not Provided
Charge /Hour Pumped(\$/hr)	Not Provided	Not Provided	Not Provided	Not Provided
Charge /Volume Produced (\$/m3)	Not Provided	Not Provided	Not Provided	Not Provided
Revenue /Volume Billed	\$5.32	\$4.77	\$2.96	\$4.35
System Losses	Not Provided	Not Provided	Not Provided	Not Provided

Appendix 3 Mal-Functioning Irrigation Infrastructure - Canal Network

1. CANAL NETWORK - CLARENDON

ACTIVITIES	CURRENT STATUS	REMEDIAL PLAN	LGTH/NO (Meters)	UNIT RATE (\$/M)	EST. COSTS	Period of Occurrence(yrs)	PROGRESS OF RESTORATION, BARRIERS
LOCATION: MID CLARENDON							
Old Milk River	Large cracks and leaks	900mm HDPE Piping Solution	8,929.20	31,000.00	276,805,171.30	15	Sections completed within last 5 yrs. Current low agricultural demand. Availability of funds restricting further work.
Comfort Distributory	Cracks and Leaks	500mm HDPE Piping Solution	1,097.82	8,500.00	9,331,507.29	4	Lack of funds, low ag. Demand
Communal	Deteriorated Surface	500mm HDPE Piping Solution	2,140.29	8,500.00	18,192,502.10	15	Low agricultural demand
Pauplar	Earthen Canal	Concrete Lining	3,470.25	9,300.00	32,273,298.85	10	Lack of funds, low ag. Demand
Line 41	Cracks and Leaks	Masonry repairs	1,831.06	9,300.00	17,028,868.50	12	Lack of funds, low ag. Demand
Line 12	Deteriorated Surface	Masonry repairs	1,713.16	12,600.00	21,585,786.80	10	Lack of funds, low ag. Demand
Line R	Cracks and Leaks	500mm HDPE piping Solution	2,474.67	8,500.00	21,034,711.26	7	Lack of funds, low ag. Demand
West Line	Cracks and Leaks	500mm HDPE Piping Solution	1,859.36	8,500.00	15,804,532.31	15	Lack of funds, low ag. Demand
Baileys Pen	Cracks and Leaks	500mm HDPE Piping Solution	1,757.61	8,500.00	14,939,673.95	10	Lack of funds, low ag. Demand
Farm Branch	Cracks and Leaks	500mm HDPE Piping Solution	1,651.13	8,500.00	14,034,566.66	8	Lack of funds, low ag. Demand
Clarendon Park No 2 Pump Line	Leaks	500mm HDPE Piping Solution	1,540.00	8,500.00	13,090,000.00	15	Lack of funds
Tollgate	Cracks and Leaks	600mm HDPE Piping Solution	3,070.58	10,500.00	32,241,123.74	12	Lack of funds, low ag. Demand
SUB TOTAL			31,535.13		486,361,742.77		
LOCATION: ST. CATHERINE							
Lawrencefield Canal	Earthen and Derelict canal section	canal repairs	200	9300	\$ 1,860,000.00	10	Low demand

ACTIVITIES	CURRENT STATUS	REMEDIAL PLAN	LGTH/NO (Meters)	UNIT RATE (\$/M)	EST. COSTS	Period of Occurrence(yrs)	PROGRESS OF RESTORATION, BARRIERS
Caymanas Branch Canal	Exposed Siphon	800mm HDPE Piping solution	5070	18500	\$ 45,000,000.00	5	Lack of funds, uncertainty on long-term land use, emergency remedial work underway
WEST-OLD HARBOUR BRANCH	Derelect Canal	Masonry Repairs	4000	30000	\$ 120,000,000.00	4	Flow occurring but repairs needed
Little Hartlands Canal	Derelect Canal	500mm HDPE Piping solution	2000	8500	\$ 17,000,000.00	6	Flow occurring but repairs needed
Bushy Park Canals 1-3	Derelect Canal	masonry repairs	3000	24500	\$ 73,500,000.00	5	Flow occurring but repairs needed
SUB TOTAL					\$ 257,360,000.00		
			Total Canal		\$ 743,721,742.77		

Appendix 4 Mal-Functioning Irrigation Infrastructure – Pipeline

ACTIVITIES	CURRENT STATUS	REMEDIAL PLAN	LGTH/NO (meter)	AMOUNT	Period (yrs)	PROGRESS OF RESTORATION, BARRIERS
LOCATION: MID CLARENDON						
Gravel Hill	14" AC Pipe	Replace with PVC	400	\$50,000,000.00	10	Low ag. Demand
Rhymesbury Pipeline	10" AC Pipe	Replace with PVC	300	\$30,000,000.00	12	Lack of funds
Parnasus	14" AC Pipe	Replace with PVC	700	\$80,000,000.00	12	Lack of funds
Vernamfield	Leaky AC Pipe network	Replace with PVC	7000	\$65,000,000.00	10	Rehab. project approved, rehab to commence shortly
SUB TOTAL				\$225,000,000.00		
LOCATION: RIO COBRE						
Block A, BERNARD LODGE, RCIW	Major pipe AC	Replace with PVC	9000	\$53,023,695.00	15	Flow occurring but repairs needed
Block B, BERNARD LODGE, RCIW	Old Isolation Valves and Hydrants	Replace Valves and Hydrants	12ea	\$2,627,000.00	3	Flow occurring but repairs needed
Block C, BERNARD LODGE, RCIW	Old Pipes, Valves and Hydrants	Replace with New	300	\$2,116,500.00	4	Flow occurring but repairs needed
Block E, BERNARD LODGE, RCIW	AC Pipes, Valves and Hydrants	Replace with PVC pipes	1800	\$8,967,000.00	5	Flow occurring but repairs needed
LOCATION: ST. DOROTHY						

ACTIVITIES	CURRENT STATUS	REMEDIAL PLAN	LGTH/NO (meter)	AMOUNT	Period (yrs)	PROGRESS OF RESTORATION, BARRIERS
Sandy Bay, St. Dorothy	Major pipe AC	Replace to PVC		\$20,000,000.00	7	Lack of funds, relatively low ag. Demand, lack of funds
Bowers, St. Dorothy	Major pipe AC	Replace to PVC		\$15,000,000.00	7	Flow occurring but repairs needed
Thetford, St. Dorothy	Old Pipes, Valves and Hydrants	Replace with New		\$5,000,000.00	4	Flow occurring but repairs needed
Spring Village/ Kilbies, St. Dorothy	Collapsed well, Leaky AC Pipes, Old Valves and Hydrants	Replace with PVC pipes, redrill well		\$95,000,000.00	12	Collapsed well, low ag. Demand, funds needed
				\$201,734,195.00		
WESTERN REGION						
Braco, Trelawny	Old Pipes, Valves and Hydrants	Replace Pipes, Valves and Hydrants		\$65,000,000.00	4	Flow occurring but Asbestos Pipe replacement needed over time
			TOTAL	\$491,734,195.00		

Appendix 5 Analysis of NIC's Administrative and Technical Staff complement

Departments	No. of Administrative Staff by Department	No. of Technical Staff by Department
CEO SUITE	3	-
CHAIRMAN	1	-
ADMINISTARTIVE	14	-
HUMAN RESOURCES	4	-
COMMERCIAL	5	-
NIDP	2	3
ACCOUNTS	8	-
AUDIT	3	-
INFORMATION SYSTEMS	3	2
PROPERTY & TRANSPORT	4	-
PUBLIC RELATIONS	2	-
PROCUREMENT	4	-
ST. CATHERINE OPC	7	9
ST. CATHERINE RIO COBRE	11	14
ST. CATHERINE ST. DOROTHY	11	14
MID-CLARENDON	11	19
ST. ELIZABETH HOUNSLOW	13	17
BRACO TRELAWNY	3	2
ST. THOMAS YALLAHS	2	1
ON-FARM UNIT	1	4
TOTAL	112	85
TOTAL STAFF COMPLIMENT	197	

Appendix 6 CDB Project Deliverables under the National Irrigation Development Programme (NIDP)

Factor	Project Target	Achieved	Remarks
COMPONENT 1			
Component 1: Irrigation Infrastructure Improvement -			
<ul style="list-style-type: none"> The procurement and installation of 40 km pipelines by 2003 Supply and installation of six (6) refurbished pump stations and four (4) new pump stations by 2004. Area under irrigation increasing to 750 ha by 2005 			
Land area impacted (ha)	750	892	Area Hounslow rehab: 658, Beacon: 203 and Seven Rivers 32. Completed in 2008
No of householders	550	655	Hounslow rehab: 484, Beacon: 139 and Seven Rivers 32.
Pump Stations	9	8	Three new wells drilled instead of the projected 4. Five (5) rehabilitated
On farm irrigation equipment delivered	Purchase & install	154 systems	Training completed and systems handed over to farmers in 2007 and 2010
Component 2: WUA Development			
<ul style="list-style-type: none"> Establishment and development of three Water Users Associations (WUAs) by 2006, through the engagement of a Social Organizer and Sociology Consultant 			
WUAs registered	3	3	WUAs established in 2007, capacity building incomplete
Component 3: Improvement of Agricultural Production and Productivity			
<ul style="list-style-type: none"> Provision of Agricultural Technical Services (ATS) to include management Agricultural Development Officers (ADOs) along with crop production and marketing services 			
ADOs and Agronomist engaged	engaged	ADO & agronomist engaged	ADO Contract completed in 2007, Consultant agronomist
Marketing Consultant	engaged	Not engaged	Marketing services of RADA utilized as needed
OTHER FACTORS			
Loan CDB Disbursement (US\$) mil	US\$8.114 million	US\$7.617 million	US\$534,366 of loan funds not drawn down
Project Duration	56 months	90 months	Non-cash time extensions granted for the period 2008 – 2010 to complete outstanding items

Appendix 7 IDB Loan Deliverables

i) Institutional Strengthening of the National Irrigation Commission (NIC)

The Program's resources will finance the development of a business strategy for the NIC that will focus on the following service delivery aspects: (i) identification and packaging products and services that may be offered to WUAs; (ii) development of a price structure for the provision of services based on marginal costs and (iii) identification of service units that might eventually stand on their own and might be spun off.

ii) Promotion and Formation of Water Users Association (WUA)

The establishment of a WUA Support and Regulation Unit at the NIC, within the program implementation Unit and the formation and consolidated process of WUAs in all NIDP irrigation systems. (US\$1,688,300).

iii) Farmers' Technical Assistance and Training

Training for the correct use of the relevant agricultural and marketing techniques to properly manage their natural and financial resources under irrigated conditions. Annual training plans developed by the WUAs includes (i) intensive technical assistance of 200 lead farmers and (ii) seasonal field days and other technical assistance activities for 1000 farmers.(US\$1,167,500)

iv) Irrigation Infrastructure

The construction and /or rehabilitation of five irrigation projects and pre-investment costs of the NIDP. The irrigation infrastructure includes wells, pump houses, power supply, pipe networks pumping equipment and on-farm irrigation systems in five irrigation areas: Yallahs, Colbeck, New Forest/Duff House, Essex Valley and St. Dorothy.