Caribbean Community
Climate Change Centre

Stakeholder Management and Engagement Plan

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ACRONYMS AND ABBREVIATIONS

Acronym/Abbreviation	Definition
BTSTP	Bridgetown Sewage Treatment Plant
BWA	Barbados Water Authority
CARPHA	The Caribbean Public HealthAgency
CCCCC	Caribbean Community Climate Change Centre
CCREEE	Caribbean Centre for Renewable Energy and Energy Efficiency
CEO	Chief Executive Officer
CIMH	Caribbean Institute for Meteorology and Hydrology
CReW	Caribbean Regional Fund for Wastewater Management
CReWS	Coral Reef Early Warning System
CWWA	Caribbean Water and Wastewater Association
CZMU	Coastal Zone Management Unit
EHD	Environmental Health Department
EPD	Environmental Protection Department
ESIA	Environmental and Social Impact Assessment
ESMP	Environment and Social Management Plan
GCF	Green Climate Fund
GEF	Global Environment Facility
GOB	Government of Barbados
GRM	Grievance Redress Mechanism
GWP	Global Water Partners
IWRM	Integrated Water Resources Management
MEAI	Ministry of Economic Affairs and Investment Division
MENB	Ministry of Environment and National Beautification
MESB	Ministry of Energy and Small Business
MESBE	Ministry of Energy, Small Business and Entrepreneurship
METVT	Ministry of Education Tech and Vocational Training

Acronym/Abbreviation	Definition
MFEI	Ministry of Finance, Economic Affairs and Investment
MHW	Ministry of Health and Wellness
MIBPA	Ministry of Information Broadcasting and Public Affairs
MIST	Ministry of Innovation, Science and Smart Technology
MoA	Ministry of Agriculture
MHW	Ministry of Health and Wellness
MPEA	Ministry of People Empowerment and Elder Affairs
MTIT	Ministry of Tourism & International Transport
MTWW	Minister of Transport, Works, and Water Resources
MYSCE	Ministry of Youth, Sports, and Community Empowerment
NGO	Non- Governmental Organisation
NFP	National Focal Point
O&M	Operation and Maintenance
PAHO	Pan American Health Organization
PDD	Planning and Development Department
PS	Permanent Secretary
SCSTP	South Coast Sewage Treatment Plant
SDG	Sustainable Development Goal
SGP	Small Grants Programme
SSA	Sanitation Service Authority
SWMU	Barbados Solid Waste Management Unit
SWPU	Solid Waste Project Unit
TCPD	Town and Country Planning Department
ToR	Terms of Reference
UN	United Nations
UNDP GEF SGP	United Nations Development Programme Global Environment Facility Small Grants Programme

Acronym/Abbreviation	Definition
UWI	University of the West Indies

Executive Summary

Integrated Sustainability was retained by the CCCCC for the: Consultancy to Produce Requisite Design, Studies and Plans – The 3R's for Climate Resilience Wastewater Systems in Barbados (3R CReW Barbados) Preparation Project (the "Project"). This Project has been examining reduce, reuse, and recycle resource recovery opportunities from wastewater, including biosolids solids (sludge), methane from biogas and reclaimed treated water from the BTSTP and the SCSTP.

The overall project will result in the delivery of several reports including:

1. A Baseline Study
2. A Conceptual Design
3. A Feasibility Study

Included as part of the project was a Stakeholder Analysis resulting in a Stakeholder Management and Engagement Plan. We are working under the principles of IWRM. This means involving stakeholders throughout the project and offering suggestions as to how they may be involved once implementation has commenced.

During the Stakeholder Analysis that was performed during the onset of the project, several activities were undertaken. These included:

- Identification of key stakeholders from government, the private sector, the public sector, NGOs, and community organizations. The general public was engaged through a Willingness to Pay study that will be reported separately.
- Development of a Matrix identifying the interests and influence of stakeholders;
- Identification of the key stakeholders from government who were invited to participate in workshops;
- Development, administration and reporting of a Stakeholder Questionnaire which solicited opinions on wastewater related topics such as:

- Perceived impacts of climate change on the water/wastewatersector;
- Priorities for thewater/wastewater services;
- Adequacy of environmental protection in regard to wastewater and the effects of wastewater effluent;
- Concerns regarding the effects of climate change on the quality and quantity of water in Barbados;
- The impact of wastewater effluent on groundwater;
- Concerns regarding the impact of climate change on the cost of wastewater and water treatment and availability;
- The impact of wastewater services on the economy of Barbados;
- The costs of wastewater treatment and who should pay; and
- Acceptability of wastewater reclamation and re-use.

It should be noted that 24 stakeholders responded to the questionnaire. As such, the statistical analysis that was obtained from their responses does not represent the opinion of the country, but rather provides some insight into potential issues and concerns to consider moving forward during thisProject.

- Facilitation of one Stakeholder Workshop, on February 4th for key government Ministries and BWA, with another Workshop tentatively scheduled for March 24th; and
- Consideration of disaggregateddata.

Following the Stakeholder Analysis, a Stakeholder Management and Engagement Plan was developed that identified actions required to engage stakeholders and manage expectations throughout the project cycle.

Key findings include:

- Disaggregated data shows:
  - 3.7% of the population is categorized as extremely poor, 13.8% as poor and 11.1% vulnerable. The research reveals a link between the lack of utilities, poverty and vulnerability;[1] and

[1] Barbados Survey of Living Conditions 2016-2017 Dr Diether W Beuermann (IDB) September 2017

- Only SDG 7, Affordable and Clean Energy, has been achieved. SDG 6 Clean Water and Sanitation, SDG 13 Climate Action, SDG 14 Life Below Water, and SDG 15, Life on Land, remain as having major challenges. SDGs #5 Gender Equality shows significant challenges remain as well.
- This Project can have a beneficial outcome on all these SDGs. Energy recapture assists even further with Affordable and Clean Energy[2].

- Responses from the questionnaire and Worksop 1 indicated:
  - A concern about the availability of water in the future and additional concern about water quality;
  - Nearly 90% of respondents were either very or moderately concerned about the effect of climate change on the economy, especially tourism and fisheries;
  - Lack of water and its effect on food security was also a concern;
  - 100% of the respondents rated the importance of investing more money in water supply as either important or very important, while wastewater slightly edged water supply as being of highest importance;
  - The consensus of the respondents felt that the GOB needs to invest more in water supply and wastewater management services;
  - 38% of the respondents expressed a level of concern regarding the use of reclaimed water for re-charging the groundwater;
  - While the respondents expressed support for some form of wastewater reuse, with appropriate treatment, there appeared to be a consensus that the practical aspects still need to be addressed;
  - 60% were very or moderately concerned with increased costs of water and wastewater services due to climate change; and
  - A higher percentage (almost double) of responders were more concerned with costs associated with the water sector, as compared to the cost impact on wastewater.

The Stakeholder Management and Engagement Plan addresses the interests and concerns of each of the stakeholder groups. It outlines what communication vehicles should be used to disseminate information to each group and what information would be useful.

[2] Country Risk Assessment CountryRisk.io October 15th, 2020, et al

Communication about this Project should be ongoing throughout the life of the Project. Public engagement, in the form of public information and education workshops, on the safety of wastewater reuse, otherwise referred to as reclaimed water, will be vital to the public's acceptance of this practice.

1 Introduction

The GOB, BWA and the CCCCC have developed a project, funded by the GCF, aimed at building climate resilience into the wastewater systems of Barbados (the "Project"). This Project concept aims to mitigate challenges facing the wastewater management systems and water availability, particularly those affected by climate change.

This report follows the principles of IWRM, a process which promotes the coordinated development and management of water, land, and related resources in order to maximise economic and social welfare in an equitable manner without compromising the sustainability of vital ecosystems and the environment[3]. As such, all relevant stakeholders (see Appendix 1) have been included throughout the Project life cycle.

Stakeholder involvement, and analysis, has been a continuous task throughout this Project, and is a critical function contributing to the success of the Project initiatives. The objective of this document (the "Report") is to illustrate the findings of the stakeholder analysis, the stakeholder management process as well as provide a stakeholder engagement plan. It documents the ways in which the consulting team has:

- Identified and involved relevant stakeholders who have an interest in and/or influence on the Project;
- Informed them of key findings, as well as seek review and approval from other Project deliverables; and
- Solicited feedback from general designconcepts.

[3] https://www.gwp.org/en/GWP-CEE/about/why/what-is-iwrm/

This Report also documents relevant disaggregated data and discusses how the Project contributes to the advancement of many of the SDGs. Among other things, it includes recommendations on how to engage stakeholders in every step of the Project, including decision- making and proposed activities.

The Logframe (included within the Conceptual Design report) outlines specific Components, Objectives, Outputs and Activities. The LogFrame Theory Inputs states: "This project contributes to building climate resilience in Barbados and to the reduction of greenhouse gas (GHG) emissions within the water and wastewater sectors." These challenges affect numerous stakeholders and excerpts from the Logframe are included in the Stakeholder Management and Engagement Plan.
In Section 2.5, the components of the Logframe are outlined as well as details of the Stakeholders consulted and input into the five components given. The Stakeholder Management and Engagement Plan builds on these inputs and provides specific tasks that support the Logframe and project objectives.

Gender analysis is also a key aspect of the project and was a significant part of the Stakeholder Analysis and Plan with substantial collaboration between the consultants responsible for the Gender and Stakeholder Analysis. While gender is covered comprehensively in Dr. Poyotte's Report, the Stakeholder Analysis alludes to specific parts of the Gender Analysis. The Stakeholder Management and Engagement Plan also ensures that gender communication is both considered and planned. The BWA will be responsible for considering the recommendations contained in all the reports associated with this project, including the Gender Analysis report. In the future, stakeholders, such as the GCF/CCCCC will be able to monitor and evaluate what recommendations have been implemented.

2 STAKEHOLDER ANALYSIS

This Report has been informed by:

- Stakeholder identification and contact information foreach;
- Identifying the interests (needs, concerns, priorities etc.), influence (degree of power) and capacities of keystakeholders;
- Stakeholders through one-on-one meetings, a questionnaire and a Stakeholder Workshop held on February 4th; and
- Using the Logframe and Gender Analysis Report, identifying how each stakeholder will be impacted by the Project and whose interests should be factored into the design and implementation of this Project, highlighting the socio-political, economic, and cultural aspects of climate change adaptation and mitigation: poverty, cost, etc.

To reach as many related stakeholders as possible, the variety of methods used to contact them included gathering contact information available from our local key experts, using internet searches, and follow-up telephone calls. Engaging with the stakeholders included workshops, phone interviews and a questionnaire.

2.1 Planned Activity Table

The following Table A documents both the methodology and the resulting activities that have been undertaken to deliver the requirements for this portion of the Project. Each of these are presented in further detail within the following sections.

Table A Table A. Project Activities Related to Engaging with Stakeholders

Main Activities	Description	Document Produced
Stakeholder Engagement and Analysis		
Identified All the Potentially Relevant Stakeholders	Identified a master list of relevant stakeholders from all relevant sectors with input from the consulting team, BWA and CCCCC.	Master Stakeholder List (see Appendix 1).
Developed Stakeholder Contact Information	Developed the contact information, utilizing our key experts from Barbados and their networks, as well as information obtained from websites to complete a spreadsheet containing stakeholder information such as names, phone numbers, emails, and addresses.	Master Stakeholder List (see Appendix 1).

Main Activities	Description	Document Produced
Developed a List of Key Stakeholders	With input from the BWA and CCCCC, a list of key stakeholders was shortlisted from the overall master stakeholder list for this Project.	Master Stakeholder List (see Appendix 1).
Development of a Mapping Matrix	Identified the interests (needs, concerns, priorities etc.), influence (degree of power) and capacities of each of the key stakeholders and what they could contribute.	Further discussed in Section 2.4.
Record of All Stakeholder Engagement Meetings	Developed a report card on the level of engagement at the time of reporting. This identified stakeholders engaged thus far, locations and dates of meetings, individuals, groups, and organizations consulted and key issues and concerns.	Further discussed in Section 2.5, **Error! Reference source not found.**.
Developed and Administered a Questionnaire to all Stakeholders	Developed and administered a questionnaire and a survey response mechanism to determine the knowledge and opinion of respondents. A summary report of the findings was compiled.	A report that illustrates the findings of the questionnaire is included in Appendix 3.
Stakeholder Workshop 1	Key stakeholders were invited to a Stakeholder Engagement workshop, on February 4th, to disseminate information from the Baseline and Conceptual Design Reports and to present the findings from the Stakeholder Questionnaire. Further input will be solicited.	Minutes of the meeting were recorded (see Appendix 2).
Stakeholder Workshop 2	The same key stakeholders will be invited to a Stakeholder Engagement workshop (scheduled for March 24th) to disseminate information from the Conceptual Design Report, present the findings from Feasibility Study and solicit feedback.	Minutes of the meeting will be recorded.
Document Disaggregated Data	Provided data disaggregated by age, socio economic wellbeing, vulnerable groups, and any other important geopolitical and cultural classification.	This information is provided within Appendix 4.
Willingnessto Pay Survey	The Willingness to Pay Survey was originally scheduled as part of this project. Subsequently it	The findings from the few who responded before the

Main Activities	Description	Document Produced
	was decided not to go ahead, by the BWA, with this portion of the project.	cancellation of the survey will be reported within the Feasibility Study.
Develop a Stakeholder Management and Engagement Plan		
Develop a Stakeholder Management and Engagement Plan	Identified actions required to engage stakeholders and manage expectations throughout the project cycle. These included: ○ Information dissemination and channels for feedback; ○ Conflict management andsettlement; ○ Key issues and concerns and how to address them; ○ Key individuals, groups, and organizations; and ○ Monitoring and reporting.	See Section 3.
Strategic Recommendations	Recommend a strategy to effectively implement the Stakeholder Management and Engagement Plan both in its entirety and pertinent actions contained within.	See Section 3.4 and 3.5.

2.2 Identification and Contact Information of Stakeholders

An initial master list of potential stakeholders, related to this project, (Appendix 1) was developed with input from the BWA and CCCCC. This was followed by an internet search of major businesses, public organizations, educational institutions, and community organizations that might have an interest in the project. This list was then populated with contact names, phone numbers, emails, and addresses. If this information was not available during an internet search, phone calls were attempted to secure the required information. Despite these efforts, there were some instances when no information could be gathered related to a limited number of government departments or other organizations.

As the project progressed and we obtained additional information, especially related to government ministries, the list was updated.

2.3 Key Stakeholder List

The Master Stakeholder List contains the names and contact information of all relevant stakeholders to the Project. This overall list was pared down to a separate file of key stakeholders and was used to invite participants to the workshop, held on February 4th.

The following information displays the result of refining the broad Master Stakeholder List wehad amassed into a more refined Key Stakeholder List (further details related to this list are included in Appendix 1):

- ☐ BWA
- ☐ CCCCC
- ☐ CZMU
- ☐ GCF
- ☐ METVT
- ☐ MESB
- ☐ MENB
- ☐ MESBE
- ☐ MFEI
- ☐ MHW
- ☐ MIBPA
- ☐ MIST
- ☐ MoA
- ☐ MHW
- ☐ MPEA
- ☐ MTIT
- ☐ MTWW
- ☐ MYSCE
- ☐ PDD
- ☐ SSA
- ☐ SWPU
- ☐ Dr. Hugh Sealy (Climate Change Advisor to the Government of Barbados)
- ☐ Nemus (Consultant who prepared the ESIA & ESMP)
- ☐ Saudia Rahat (Consultant for the CCCCC developing the Funding Proposal)

Once these Key Stakeholders were identified, the work of mapping out groups' specific interests and relationships to the project's direction was possible.

2.4 Mapping Matrix

Further to developing the key stakeholders related to this Project, the interests (needs, concerns, priorities etc.), influence (degree of power) and capacities of each of the organizations and individuals were developed. The Ministries, agencies and organizations identified in the list were used for the purposes of completing the matrix (0) below. The matrix was used to identify the level of influence of each stakeholder on a 1-5 scale with 1 being a very low level of influence, and 5 being a high level of influence related to the Project. Input from the stakeholders was requested to complete this matrix and gain their acceptance of the proposed ranking identified in 0.

The stakeholders identified as having the highest level of influence were the: EPD; EHD; CZMU; SWPU; MEWR; and the BWA. It is critical that these stakeholders are engaged on an ongoing basis as the project develops.

Table B Influence and Interest Matrix

Stakeholder	Project Influence		How could the stakeholder contribute to the project?
	Level 1-Low, 5-High	What is their function?	
KEY GOVERNMENT AGENCIES			
BWA	5	Provides oversight for water and wastewater management.	The BWA is the most significant stakeholder related to this Project and needs to be involved in every step of the design process. They will want to ensure correct solutions are implemented that are sustainable from both an economic and O&M perspective.
MTWW	5	Responsible for development of both transport, water, and wastewater infrastructure throughout Barbados. The BWA directly reports to this Ministry.	Would support the MHW and EPD in reviewing any design upgrades to the wastewater management system related to this Project, requiring approval before construction activities could commence. With being so tightly linked to the BWA, the MTWW could have significant input on this Project and should be invited to all Stakeholder engagements.
MHW	5	Responsible for regulating wastewater in Barbados. They are responsible to promote and manage health and ensure environmental concerns are considered in all aspects of national development.	Aspects of this project design related to wastewater management upgrades, would need to be reviewed and approved by this Ministry before construction activities could be granted. Like the MTWW, this Ministry should be invited to all Stakeholder engagements.

Stakeholder	Project Influence		How could the stakeholder contribute to the project?
	Level 1-Low, 5-High	What is their function?	
MENB	5	Promotes and facilitate the sustainable use of our resources by encouraging the involvement of all citizens and the integration of environmental considerations into all aspects of national development.	Would support the MHW and EPD in reviewing any design upgrades to the wastewater management system related to this Project, requiring approval before construction activities could commence.
MESBE	4	Responsible for regulating energy (especially renewable energy) related projects in Barbados.	Would have an interest in reviewing our proposed renewable energy design options, such as methane capture and solar.
MYSCE	1	Promotes sports as a worthwhile activity for all Barbadians by providing healthy lifestyles, social, psychological, and economic benefits.	Provide input on the vulnerable communities and the gender analysis.
MPEA	2	Contributes to the overall socio-economic development of Barbados and the empowerment of all members of society by fully utilizing all available human, financial and technological resources; formulating evidence-based policy; and implementing timely, effective, and equitably accessible social programmes and services.	Provide input on the vulnerable communities and the gender analysis. Impact on the elderly, women, children, and those with disabilities.
Environmental Health Department	5	Regulates drinking water quality. Examine proposed project impacts on the	Could provide input regarding the Project's ability to recharge the aquifer, related to drinking water quality,

Stakeholder	Project Influence		How could the stakeholder contribute to the project?
	Level 1-Low, 5-High	What is their function?	
		environment during and after construction.	impact on the environment (both during and after construction).
EPD	5	Responsible for regulating wastewater and the management of solid waste in Barbados. Also regulates emissions, monitors noise air quality etc. Issue permits.	Reports to the MENB. Would be involved in the review of any designs for approval applications related to this Project. It is key to involve the EPD in all stakeholder engagements to obtain buy-in regarding the overall concept of this Project before design applications is submitted. The EPD would also review and approve the ESIA and ESMP (prepared by another Consultant, Nemus).
Town and Country Development Planning Office	4	Responsible for regulating wastewater in Barbados.	Has oversight, but on matters pertaining to environmental impacts, groundwater zoning will defer to BWA and EPD & Drainage Division for advice regarding developments. Reviews how potential project may impact existing homes and businesses.
CZMU	5	Responsible for regulating wastewater in Barbados, especially related to any discharge into the marine environment.	The CZMU works closely with EPD when reviewing new projects that include a wastewater management component. Would therefore be involved in the approval of any future design applications, especially related to the change in

Stakeholder	Project Influence		How could the stakeholder contribute to the project?
	Level 1-Low, 5-High	What is their function?	
			ocean discharge piping. The CZMU should be invited to all Stakeholder engagements related to this project.
SSA	4	Responsible for the management of solid waste in Barbados.	The SSA would be interested in any potential changes to the current operation of dumping inorganic waste from the treatment facilities to the Mangrove landfill.
Barbados SWPU	5	Responsible for the management of solid waste in Barbados.	Like the SSA, the SWPU would specifically want to know how the deposit of inorganic waste to any landfill might be changed in comparison to existing operations. They may also be interested in the use of organic waste (sludge) that is being placed on Government owned lands (currently NE of the airport) as well as potential agricultural lands as a fertilizer.
OTHER RELATED GOVERNMENT AGENCIES			
MTIT	1	Create an environment that provides a high degree of safety and economic viability in respect of the operations of the civil aviation and maritime sectors, strategically using these sectors as major vehicles for the expansion and further social and economic development of Barbados.	Will likely want to review the concepts of this project and how cruise ships are being considered when they dump their septage to the BTSTP.

Stakeholder	Project Influence		How could the stakeholder contribute to the project?
	Level 1-Low, 5-High	What is their function?	
MFEI	2	Provides access to a wide range of information on economic and development policy issues, training and scholarship opportunities,key publications and documents on growth and development along with access to funding and lending agencies.	Should be interested in the cost implications (particularly cost savings in running a more efficient plant and renewable energy options) of this project, including the cost benefit analysis.
MIST	1	Responsible for the development and inspiration of new innovations related to science and smart technologies.	This Ministry could be interested in the tertiary treatment technologies proposed in the Feasibility Study, as well as the renewable energy techniques (such as methane capture and solar) to produce a renewable energy source.
MIBPA	1	Responsible for the broadcasting of information to the public	Could be involved in our communication strategy with the public, - although we believe the BWA will be the primary stakeholder responsible for disseminating the communication plan, using their "Water Wednesday" platform or on social media.

Stakeholder	Project Influence		How could the stakeholder contribute to the project?
	Level 1-Low, 5-High	What is their function?	
MoA	3	To transform and re-position the Agricultural sector in Barbados through the promotion of an Agri-business approach to farming, with particular attention being paid to the effective use of resources, as well as the adoption of appropriate technology and sound management practices in order to achieve internationally competitive production, processing and marketing enterprises, which contribute significantly to social and economic development and food security, as well as to the sustainable management of the natural resource base of the country.	This Ministry's interest would lie in the proposition to use treated wastewater for irrigation purposes, as well as sludge for fertilizer.
PRIVATE SECTOR AGENCIES			
Banks Brewery	3	A large commercial business in Barbados that produces wastewater that is currently discharging into the ocean.	They are concerned over their security of water supply and should conform to the standards set by their parent company, as well as the companies they have franchises with e.g., Coca Cola. They are looking at updating their Source Vulnerability work. They are also one of the largest potable water consumers in Barbados. They would be

Stakeholder	Project Influence		How could the stakeholder contribute to the project?
	Level 1-Low, 5-High	What is their function?	
			interested in the aquifer recharge aspect of this project.
Culligan Water	1	Another large commercial business in Barbados dependent on water resources.	Availability of water for their operations is important and would be interested in the aquifer recharge aspect of this project.
Barbados Agricultural Society	3	Seeks to represent the interests of the agricultural sector in all relevant forums. The Society is the secretariat for nine commodity groups representing over 500 farmers.	Advocacy group which claims to represent all farming interests. Their views on how to integrate sludge as a fertilizer, as well as use treated wastewater for irrigation, would be useful.
The Association of Women in Agriculture	2	Represent involving more woman in the practice of agriculture, as well as within the water and wastewater sector.	Provide input on the gender analysis, and how to integrate sludge as fertilizer, related to this Project.
UWI Institute of Gender Development Studies – Nita Barrow Unit	3	Represent the largest University institute in the Caribbean and includes a gender program.	The UWI Gender Equality Programme, headed by Dr. Tonya Haynes, is currently providing a gender related seminar to the BWA and this information, including an interview with Dr. Haynes will provide input into the Projects gender analysis.
OTHER RELATED AGENCIES			
Climate Change Advisor to the Government of Barbados	5	Dr. Hugh Sealy consults the GOB on water and wastewater issues in the Country.	One of the GOB's primary climate change advisors, Dr. Hugh Sealy, is responsible for many recent policy initiatives,

Stakeholder	Project Influence		How could the stakeholder contribute to the project?
	Level 1-Low, 5-High	What is their function?	
			water availability for business, cost implications, and potential disruptions to businesses. Dr. Sealy should be invited to all the Stakeholder engagements related to this Project.
CIMH	2	Assist in improving and developing the Meteorological and Hydrological Services, as well as providing the awareness of the benefits of Meteorology and Hydrology for the economic well-being of the CIMH member states.	Has positioned itself as a Climate Services provider. Supports national Met Services and archives data. They might be interested in the overall project and how Barbados plans to use reclaimed water to recharge the aquifer.
CCREEE	2	To increase the use of sustainable energy in the region and drive it through a more climate-resilient path without overlooking economic growth and social development.	Would be interested in reviewing the design options related to energy capture and reuse, such as methane capture and solar.
GCF	5	The GCF is a major stakeholder and will provide financing for the implementation of the project	Financing from the GCF is required to realise this project and during implementation flexibility of the Fund is needed to allow for the adaptive management and implementation of the project against the risks identified.

NGOs			
UNDP GEF SGP	2	Provides financial and technical support to projects that conserve and restore the environment while enhancing people's well-being and livelihoods	Mr. Bynoe formerly worked with Ministry of Agriculture. SGP interacts with the GOB and supports small projects that fall within its Country Programme priorities. Grants of up to US$50,000 can be made. As a funding agency, they may be interested in supporting future phases of this project.
CReW	2	CReW project actively pursues wastewater solutions and has funding	The CReW NFPs are appointed by the respective governments of the participating countries. Anthony Headley is the Barbados contact. CReW should be approached to consider funding opportunities related to the potential detailed design and construction phases of this project.
PAHO	1	Acts as the specialized international health agency for the Americas. It works with countries throughout the region to improve and protect people's health.	Have a presence and are opinion formers. Mr. Adrianus Vlugman has retired who had extensive knowledge and experience. They may be interested in this overall project and the outcomes that will benefit the country.

This matrix helped provide direction and strategy for planning stakeholder meetings and engagement for the Project.

2.5 Stakeholder Meetings and Engagements

2.5.1 Stakeholder Consultations Related Specifically to the Logframe Components

The Logframe contains 5 components that each required various levels of stakeholder engagement to develop. The Stakeholder engagement is summarised below for each component.

Table C Table D that follows this set of summaries describe a record of various stakeholder meetings that have taken place to date. These meetings have provided further data used to develop this Project, as well as solicit feedback and incorporate suggestions into the various reports delivered to date, including the Gender Analysis report.

Component 1 & 2:

These components relate to the design and type of treatment that will be required to deliver tertiary treatment and meet the GOB requirements for reclaimed water reuse. There were numerous consultations with stakeholders, both at the stakeholder workshops as well as meetings with BWA, and related groups. Stakeholders were invited to provide input into the design process and these inputs were considered in both the Feasibility Study and the Conceptual Design report.

Component 3:

This Component relates to incorporating the use of renewable energy into the project to lower operating costs for the BWA, as well as meet the countries 2030 goal of being carbon neutral. Key Stakeholders who provided input into this component were Dr. Hugh Sealy and Dr John Mwansa, with the BWA. The use of solar power (both rooftop and ground-mount) was discussed in addition to where solar panels could be located. Two options in particular that were offered:

1. Using the rooftops of several existing buildings owned by the BWA along the NW corner of the BTSTP site; and
2. Off-site ground-mount solar that would tie into the existing electrical grid.

   Discussions were also held with Dr. Sealy regarding a privately owned and run biogas facility that would involve the collection of solid waste (sludge) from the wastewater treatment plants,as well as other private commercial industries (such as distilleries and meat processing plants). The methane captured from this solid waste could be

used to produce liquid or condensed natural gas and sold to suppliers throughout Barbados (further discussed in the Conceptual Design report).

Component 4:

This component relates to required policy changes that may be required to support the development of this project. This component relied more on secondary data research. In the Stakeholder Workshop 1, the need for policy was discussed with a broad-based recommendation for adoption of draft policies as well as policy updates. For example, Activity 4.1.1 related to recommendations for a draft legislative framework to address wastewater effluent quality and re- use requirements and enable appropriate water reuse systems and applications. This will require liaising with governmental departments and good communication between the Ministries and BWA as per the Stakeholder Management and Engagement Plan.

The need for training to support onsite wastewater management was also identified in this component of the Logframe. The Stakeholder Management and Engagement Plan outlines how the BWA, and educational institutions can collaborate on education requirements.

Component 5:

This component focus on the public awareness that is required to support this project, especially related to gaining public acceptance in the reuse of reclaimed water. The Logframe states "While technically feasible, technologically robust and applied in many water-stressed areas of the world, Direct Potable Reuse of reclaimed water is generally not culturally acceptable in most countries. There is also a limited capacity of trained personnel to provide re-education of the community and businesses."

In addition, the Logframe states:

- A high degree of public acceptance is required for a reuse program to be acceptable which requires a high degree of transparency and the ability of the BWA to routinely and consistently publish flow and water quality results on their website;

- Service announcement and educational materials may be ineffective format to convey the importance of water protection, conservation, re-use and better management to the overall public;
- Weak enforcement mechanisms for source contamination. Incentives for conservation and re-use may not be sufficient to sway public to take water conservation efforts seriously.

This Logframe component, with the aspects stated above, are widely covered in the Stakeholder Engagement and Management Plan. Substantial input from and education of stakeholders as the project is implemented is required. Recommendations include Town Hall meetings and Workshops, in addition to bulletins and other material are laid out in the Stakeholder Management and Engagement Plan. Implementation of the Plan will be the responsibility of BWA. In particular, engagement and education of the public will be critical to the acceptance of reclaimed water as outlined in the survey results presented. The Workshops and Town Hall meetings are also costed in the Plan. Other aspects as detailed are part of the overall Communication Plan that the BWA will need to move forward.

Table C Record of Stakeholder Meetings(1)

Stakeholder	Purpose of Meeting	Key Outcomes from Meeting	Date
CCCCC	Project inception meeting with CCCCC to kick off the project.	This initial meeting helped align the expectations of the CCCCC with the Consultant in order to complete the Inception Report.	Aug. 11, 2020
BWA	Site meeting with the BWA to tour the BTSTP and associated lift stations.	This site visit at the BTSTP was critical in gathering existing information, including	Sept. 24, 2020

Stakeholder	Purpose of Meeting	Key Outcomes from Meeting	Date
		equipment data sheets that were used to complete the Baseline Study and the overall design concepts.	
BWA	Site meeting with the BWA to tour the BTSTP and associated lift stations.	This site visit at the SCSTP was critical in gathering existing information, including equipment data sheets that were used to complete the Baseline Study and the overall design concepts.	Sept. 25, 2020
Tyrone Lowe (Superintendent in the BWA Wastewater Division) and Brian Stuart (Senior Engineer in the BWA Wastewater Division)	Teleconference meeting to run through all the data gathering requests and aimed to fill further information gaps, as the team prepares the Baseline Study.	This meeting was called to further run through the long list of outstanding information that the design team requested to complete the Baseline Study and conceptual design. It was felt that more information could be gather through a meeting rather than e-mail correspondence.	Oct. 10, 2020
Dr. Virginia Poyotte, Valerie Jenkinson, Dr. Tonya Haynes, UWI	To solicit information related to how gender issues relate to the wastewater sector.	The UWI Gender Equality Programme examines issues throughout Barbados and other Caribbean countries. As such, it was great to hear a wider perspective of how gender issues are related to the wastewater sector from such an expert as Dr. Tonya Haynes and include this perspective within the Gender Analysis Report.	Nov. 6, 2020
Dr. Hugh Sealy, and representatives of CCCCC	Teleconference meeting to discuss changes to the project, related to the SCSTP and how a Design-Build and Finance contract, related to	There was a significant shift in the initial project inception, considering a Chinese Company was to complete the detailed design and	Nov. 13, 2020

Stakeholder	Purpose of Meeting	KeyOutcomesfromMeeting	Date
	upgrading the SCSTP, is being considered for a Chinese Company (named Compliant with financing from the Exim Bank of China), and how this will impact this Project.	construction of the SCSTP. This meeting was critical in understanding the details in this development and how it would impact the overall project. Recommendations were made by Dr. Hugh Sealy and the CCCCC to set the boundaries between the two teams, regarding their overlapping interests in design upgrades to the SCSTP.	
CCCCC, BWA staff (including Dr. John Mwansa (Technical Advisor to BWA), Shelley Parris (Project Manager (ag.)), and Brian Stuart), Dr. Hugh Sealy, Pedro Bettencourt (from Nemus consulting in charge of the ESIA and ESMP scope of work) and Saudia Rahat (assisting the CCCCC)	Teleconference coordination meeting to introduce the new consultants involved in this overall Project and how we can support each other. An update on the project's progress and challenges that we are facing to date was also provided.	At this stage in the project, the ESIA and ESMP had just been awarded to Nemus consulting. Additionally, Saudia Rahat had also been awarded a project to assist in completing the GCF Funding Proposal. This meeting was necessary to introduce the teams to ensure proper exchange of information occurred to benefit the overall project. Upon updating the BWA and Stakeholders on the progress and challenges currently being faced on the project, another focused meeting (scheduled for the day after) was recommended to discuss further details.	Jan. 13, 2021
CCCCC, BWA staff (including Dr. John Mwansa, and Brian Stuart), Dr. Hugh Sealy and Troy Vassos	Teleconference meeting to run through our assessment of the AECOM Pre-Feasibility Study.	During this focused meeting, the design team discussed a detailed breakdown of potential issues that we found with the AECOM Pre-Feasibility Study and how	Jan. 14, 2021

Stakeholder	Purpose of Meeting	KeyOutcomesfromMeeting	Date
		they may impact our scope of work. Issues such as the TDS limit were discussed, and recommendations were made to use the proposed 450 mg/L TDS limit.	
Pedro Bettencourt and Cesar Jesus (from Nemus)	Subsequent telephone call/meeting to further discuss environmental and social concerns that we have been made aware of during this project to make sure Nemus is off to a good start.	As a continuation from the Jan. 13th Stakeholder meeting, it was also recommended to have a more detailed discussion with the Nemus consultant to express our environmental and social concerns related to this project. All our notes to date were shared with Nemus to be captured within the ESIA and ESMP reports.	Jan. 15, 2021
CCCCC, BWA and Government Stakeholders included in Key Stakeholder List	Workshop #1 with the CCCCC, BWA and Government Stakeholders. (2)	This workshop was the first official meeting with the BWA, and the other Government Stakeholders and the main outcome was to share the findings of the Conceptual Design Report and discuss any initial concerns from the Stakeholders. Several recommendations were made and captured within the meeting Minutes (see Appendix 2).	Feb. 4, 2021
Dr Poyotte, Shelley Parris, from the BWA	Gender discussion.	Similar to the interview with Dr. Tonya Haynes, from UWI, it was important to also determine if there are any gender issues within the BWA. Speaking to a senior manager, who is a female, within the BWA gave us this perspective. Information	Feb. 19, 2021

Stakeholder	Purpose of Meeting	KeyOutcomesfromMeeting	Date
		from this interview was also used to develop the Gender Analysis Report.	
CCCCC	Progress meeting with the CCCCC to discuss existing challenges and solutions related to the project.	This meeting was called to introduce Oksana Kielbasinski, who is part of the Integrated Sustainability team from Calgary, who will be focused on filling in all the required GCF templates. Several recommendations from the CCCCC were made to assist in completing the various forms including the Log Frame, Detailed Budget and Indicative Implementation Timeline documents.	Mar. 5, 2021
CCCCC	Project meeting to discuss the GCF templates	Furtherdiscussions regarding the GCF templates were required and this meeting allowed the CCCCC to further run through the GCF requirements, as well as discuss other previous examples to better understand the overall expectations.	Mar. 15, 2021
BWA, Stakeholders and the CCCCC	Discussed comments related to the Conceptual Design Report.	This meeting was a focused discussion to examine the detailed comments and recommendations from the BWA and Stakeholders, such as Dr. Hugh Sealy, regarding the Conceptual Design Report. All comments and recommendations were noted and used to complete	Mar. 18, 2021

Stakeholder	Purpose of Meeting	KeyOutcomesfromMeeting	Date
		the final draft of the Conceptual Design Report.	
CCCCC and Saudia Rahat	Discussion on the development of the Log Frame	This meeting was essential to run through the draft Log Frame and confirm alignment between the CCCCC's expectations and the Consultants.	April 22, 2021
BWA, CCCCC, Saudia Rahat and Dr. Hugh Sealy	Discuss the Log Frame, and overall project development	A "BWA Technical Group" has been formed that is able to provide the Consultant with a wider perspective on other Government initiatives.	May 2, 2021
CCCCC	Discuss recent project developments	We were unable to sit in on the May 12th BWA Technical Group meeting, so this meeting was an opportunity for Dr. Donneil Cain to brief us on the highlights from this previous meeting with the BWA and stay up to date on project developments.	May 13, 2021
BWA, CCCCC, Saudia Rahat and Dr. Hugh Sealy	Discuss the Log Frame, and overall project development	Discussed various project development, and more specifically on three scenarios for the reclaimed water pipeline.	May 18, 2021
CCCCC	Willingness to Pay Study discussion	This study has been delayed by the BWA and this meeting was a discussion from Dr. Cane to update the Consultant on kick starting this study back up again.	May 26, 2021
CCCCC	Discussion to review the comments on the Gender Analysis Report	Great discussion with Dr. St. Luce (CCCCC – Gender Expert) and Dr. Poyotte (Consultant's Gender Expert) to review the comments on	May 27, 2021

Stakeholder	Purpose of Meeting	KeyOutcomesfromMeeting	Date
		the Draft report and confirm alignment on finalizing this report.	

Table Notes:

1. All meetings have been with Nick St-Georges unless otherwise indicated.

2.5.1 List of attendees and Minutes for Workshop #1 are included

In addition to these many meetings to ensure stakeholders had opportunity for input, we were able to cast the net more broadly through sending out a questionnaire.

2.6 Stakeholder Questionnaire

The questionnaire was sent to 49 stakeholder representatives. It resulted in 24 respondents completing the questionnaire (either partially or fully). It should be noted that the statistical analysis that was obtained from the 24 respondents does not represent the opinion of the country, but rather provides some insight into potential issues and concerns to consider moving forward during this Project.

The objectives of the questionnaire were to solicit opinions on the following:

- Perceived impacts of climate change on the water/wastewater sector;
- Priorities for the water/wastewaterservices;
- Adequacy of environmental protection in regard to wastewater and the effects of wastewater effluent;
- Concerns regarding the effects of climate change on the quality and quantity of water in Barbados;
- The impact of wastewater effluent on groundwater;
- Concerns regarding the impact of climate change on the cost of wastewater and water treatment and availability;
- The impact of wastewater services on the economy of Barbados;
- The costs of wastewater treatment and who should pay; and
- Acceptability of wastewater reclamation and re-use.

On certain questions, respondants were asked to provide commentary. These comments were summarized and have been taken into consideration in preparing the analysis. During a follow-up stakeholder engagement Workshop, held on February 4th, 2021, representatives of the key government stakeholders were asked to add any further comments. Although few additional comments were received, they were also included in

the analysis. A detailed breakdown of the results recorded from this questionnaire are provided within Appendix 3.

2.6.1 Questionnaire Analysis

The following summary primarily highlights themes in the responses to the questionnaire and notes areas for follow-up.

Climate change theme linked to the economy:

Nearly 90% of the respondents were either very or moderately concerned about the potential impact that climate change might have on water availability. This was flagged in the answers to questions concerning availability, quantity, and quality of water.

The question regarding potential impact on the economy may be related to questions of availability whereby less availability would adversely impact the performance of the economy. It is clear from the supplementary explanations provided by respondents that concerns are focused on the potential impacts, first on tourism being a major part of the economy. A second impact raised was food security. Notably, even when the impact on health was brought up, it too was linked to tourism.

Cost as a factor:

In contrast with climate change responses, there was less concern regarding cost related matters. A higher percentage (almost double) of responders were more concerned with costs associated with the water sector, as compared to the cost impact on wastewater. For future reference, it would be useful to explore the reason for this difference.

The supplementary questions in which respondents were invited to comment provide additional insight into the reasons behind the responses regarding cost concerns. Some responses acknowledged that costs may need to rise because of the need for additional treatment. In addition, there were social concerns as well. However, it was also noted that the cost of water at present is low.

Major themes:

Respondents expressed that it is important for the GOB to invest more money in the water supply and wastewater management services. This corresponds with concerns raised in the

comments that water availability is very important to the economy of Barbados and that current practices are not benefiting the environment.
100% of respondents rated the importance of investing more money in water supply as either important or very important, wastewater slightly edged water supply as being of highest importance.

Regarding the impacts of climate change, respondents expressed a high degree of concern around issues of water availability, and to a slightly lesser extent water quality. That said, these responses provide a more nuanced insight; the high concern over drought and ageing infrastructure do mirror previous concerns over water availability issues.

Education and communication planning:
A moderate amount of concern was expressed by 38% of respondents regarding the use of reclaimed water to recharge groundwater. Some stakeholders commented that they were sceptical of its safe use and should be a future topic of discussion (perhaps during the detailed design phase) that will need addressing. Education of the safety of reclaimed water, treated to regulatory standards, should form part of the communication plan to engage with those who may have concerns, particularly if there is a greater degree of scepticism among the public.

One comment about reclaimed water stated that using reclaimed water was not a concern if it was treated to adequate standards. The responses suggest that whilst there is support in theory for some form of wastewater reuse with appropriate treatment, there is a clear consensus among this group of respondents that the practical aspects still need to be addressed. If that is the case among what may be called a relatively well-informed group, then when it comes to the public, an education and public awareness programme will be necessary to gain acceptance in the use of reclaimed water. Not only should standards and regulations have to reflect best practices, but a critical component will be on testing and enforcement.

2.7 Workshops

Holding workshops with stakeholders is seen as one of the most engaging means to gather information as well as to vet previous reports submitted to date. The first workshop was held virtually on a Zoom platform on February 4th, 2021, where Dr. Troy Vassos presented the initial findings of the Conceptual Design Report. During this workshop, Ms. Valarie Jenkinson also discussed the responses from the stakeholder questionnaire (both the presentation and questionnaire are provided within Appendix 2). Invitations were sent by the BWA to the Key Stakeholders listed in 0 and meeting minutes were prepared (see Appendix 2). In total, excluding members of the Consulting Team, 21 people participated in the workshop inclusive of 4 individuals from CCCCC and 4 from the BWA.

Following Dr. Vassos' presentation, participants were invited to ask questions and give feedback. Several questions related to the Conceptual Design Report were raised and will be used to finalize this deliverable. Many of the questions were related to the impact of climate change on the countries water and wastewater management systems, while other questions were related to energy, policies, and finance.

A second workshop is tentatively scheduled for August 26th. The purpose of this workshop, with the same group of stakeholders, is to share the results and recommendations from the Conceptual Design and Feasibility Study reports as part of the Stakeholder Management and Engagement Plan.

2.8 Social Vulnerability Impacts

A targeted human rights-based approach is always essential if we are to safeguard and protect the interests of the most vulnerable including the elderly, women and girls, children, people with disabilities, migrants, persons in detention, the homeless as well as other marginalized and displaced groups[4].

We relied on the GCF's definition of vulnerable, understanding that their vulnerability definition stems from UNFCCC documentation, that states:

[4] https://news.un.org/en/story/2020/04/1060842

> *"Vulnerability is defined by the IPCC as "the degree to which a system is susceptible to, or unable to cope with, adverse effects of climate change, including climate variability and extremes. Vulnerability is a function of the character, magnitude, and rate of climate change and variation to which a system is exposed, its sensitivity, and its adaptive capacity"* (McCarthy et al., 2001, p. 6).

The implications of this project must include an understanding of the challenges faced by residents of Barbados due to poverty and vulnerability. Yet, there is limited georeferenced social data available for review in Barbados (Cumberbatch et al, 2020). In the case study, he reported that medium to high levels of social vulnerability appear to be widespread across Barbados with no discernible special pattern. This underscores the significance of island-wide efforts to reduce vulnerability. Increasing water availability through the use of reclaimed water can contribute to reducing vulnerability as will be shown.

2.8.1 Vulnerable Population and Living Conditions

To better understand the challenges experienced by vulnerable populations in Barbados, and how upgrades to the wastewater systems might help to mitigate these challenges, available data was collected during the onset of this Project. The focus on the potential impact was twofold: a) what limited access to utilities can have on poverty and vulnerability; and b) the potential benefits from outcomes of this Project to upgrade the wastewater systems.

The following data (illustrated in Table D and Table E) was compiled from research conducted by Dr. Diether Beuermann for the IDB (Beuermann, D, 2017). Definitions of poverty and vulnerability have been presented followed by a breakdown of poverty and vulnerability by each Parish. One important piece of the study undertaken by Dr. Beuermann was the relationship between the lack of utilities and poverty. He noted a strong correlation between a lack of flush toilets and piped water to households and poverty.

Upgrading wastewater systems resulting in an increase in water availability, using reclaimed water, will positively impact and benefit all Parishes throughout the Island. This will benefit those in poverty and the vulnerable who were shown in the Gender Analysis report (Poyotte, V., 2021) to be disproportionately affected by lack of water and sanitation services. Notably, of the various groups who are vulnerable, the gender analysis undertaken as part of this Project indicates women are more vulnerable than men to water shortages (Poyotte, V., 2021).

Table D Poverty and Vulnerability by Parish (Beuermann, 2017)

Definitions				
Extreme Poor or Indigent Poor	**Non-Extreme Poor (or Non-Indigent Poor)**	**Vulnerable**	**Non-Vulnerable**	**Vulnerability**
-Not able to meet WHO minimum caloric requirement -Considering age, sex, and pregnancy	-Non-extreme poverty line = extreme poverty line + basic non-food consumption	-Households with monthly per capita consumption above the non-extreme poverty	Households with monthly per capita consumption above 1.3 times the non-extreme poverty line 71.5%	-Extreme poor 4.1% female vs 2.7% male -Non extreme poor 16.9% Female vs 11.2%

Definitions				
Extreme Poor or Indigent Poor	**Non-Extreme Poor (or Non-Indigent Poor)**	**Vulnerable**	**Non-Vulnerable**	**Vulnerability**
incidence distributions in Barbados: 2,104 kilocalories per day (average person) -Valued aUS$148.64 per month per person (extreme poverty line)	=Valued at US$321.26 per month per person -Households with monthly per capita consumption above US$148.64, but below US$321.26	line but below 1.3 times such line -Non-poor but at risk of poverty 11.1%		-Poor females 21% vs males 14% -Vulnerable 12.9% vs 9.5%

-Households with monthly per capita consumption below US$148.64 = extreme poor 3.7%	= non-extreme poor 13.8%			

Table E Poverty and Vulnerability by Parish

Parish	Extreme Poor	Non-Extreme Poor	Overall Poverty	Vulnerability by Parish
St Joseph	6.48%	13.78%	20.26%	18.36%
St James	5.88%	18.01%	23.9%	18.75%
St George	1.73%	17.92%	19.65%	5.36%
St Michael	3.38%	15.27%	18.64%	12.7%
St Lucy	4.55%	13.26%	17.8%	13.38%
Christchurch	4%	13.38%	17.38	9.57%
St Andrew	4.04	13.05%	17.09%	17.49%
St Thomas	2.09%	13.84%	15.93%	12.9%
St Peter	2.26%	13.32%	15.5%	12.36%
St John	2.39%	11.07%	13.46%	9.73%
St Phillip	3.35%	9.28%	12.62%	9.25

The Gender Analysis report delved further into the impacts on the lack of water and sanitation services and their impact on poverty, vulnerability, and gender. Below (in Table F) are the key findings from the Social Impacts of Upgrading Wastewater from Section 4.1.4 of the Gender Analysis Report (Poyotte, V., 2021). These clearly indicate the many positive effects to be derived from upgrading the wastewater systems. The drawbacks, while noted, are mostly short term.

Table F Social Impacts of Upgrading Wastewater Systems

Social Impacts of Upgrading Wastewater Systems	
Pros	Cons
Improved wastewater collection.	Lacks the capacity to establish and utilize legal and administrative frameworks that define the responsibilities for the various government departments with a mandate to design and execute projects having a need for environmental impact and social assessments.
Higher treatment should result in improved health conditions for the public.	Construction efforts related to implementing the upgrades recommended in this Project could cause possible temporary disruption of business and residential activity.
Reducing the amount of wastewater discharged into the ocean should have a positive effect on the marine environment that relates to tourism.	Potential for construction efforts to temporarily (negatively) impact the tourism sector, residential and commercial enterprises. If key stakeholders are not involved in the Project, this could lead to little interest or commitment to support the Project.
If energy can be generated from the waste, this helps with the country's 2030 renewable energy goals, which should lead to a better quality of life for the citizens of Barbados.	None noted.
If reclaimed water (from the treatment plants) is used to recharge the aquifer, then this provides more water reliability to all the people in this country. It includes helping businesses, and residents as well as tourists. Importantly, this would also provide farmers with a more reliable water source, as the level	None noted.

Social Impacts of Upgrading Wastewater Systems	
Pros	Cons
of water in the wells is often negatively impacted during droughts.	
Short-term employment during the preparatory and construction phases of the Project would be a resulting benefit.	None noted.
Integration of gender across all adaptation and mitigation initiatives would be a benefit.	None noted.
Project activities could Improve capacity building and research for informed climate action and training for BWA employees.	None noted.

2.8.2 Sustainable Development Goals Related to Upgrading the Wastewater Management System

In 2015, alongside all the UN member states, Barbados adopted the 2030 Agenda for Sustainable Development, which includes the 17 SDGs. Progress towards these goals has been made but much still needs to be done according to the UN's Temporary Resident Coordinator in Barbados and the Organization of Eastern Caribbean States, Cleveland Thomas[5].

In examining the SDG goals, an insufficient supply of quality water would have a negative effect on most SDGs, thus using reclaimed water from an upgraded wastewater facility would rectify this. In this way, the Project could assist the country in delivering several SDG goals.
In addition to moving towards the obvious SDG goal on Clean Water and Sanitation, the upgraded treatment facility would have positive impacts environmentally, socially, and economically. Environmentally, reduced untreated or undertreated effluent discharge will contribute positively to SDG goal, Life on Land and Life. Sufficient water also impacts the SDG goals: Sustainable Cities and Communities, Decent Work and Economic Growth and Innovation, Industry and Infrastructure. Clean and Affordable Energy is also impacted if energy recapture is part of the upgraded wastewater Project. Socially, there is a linkage

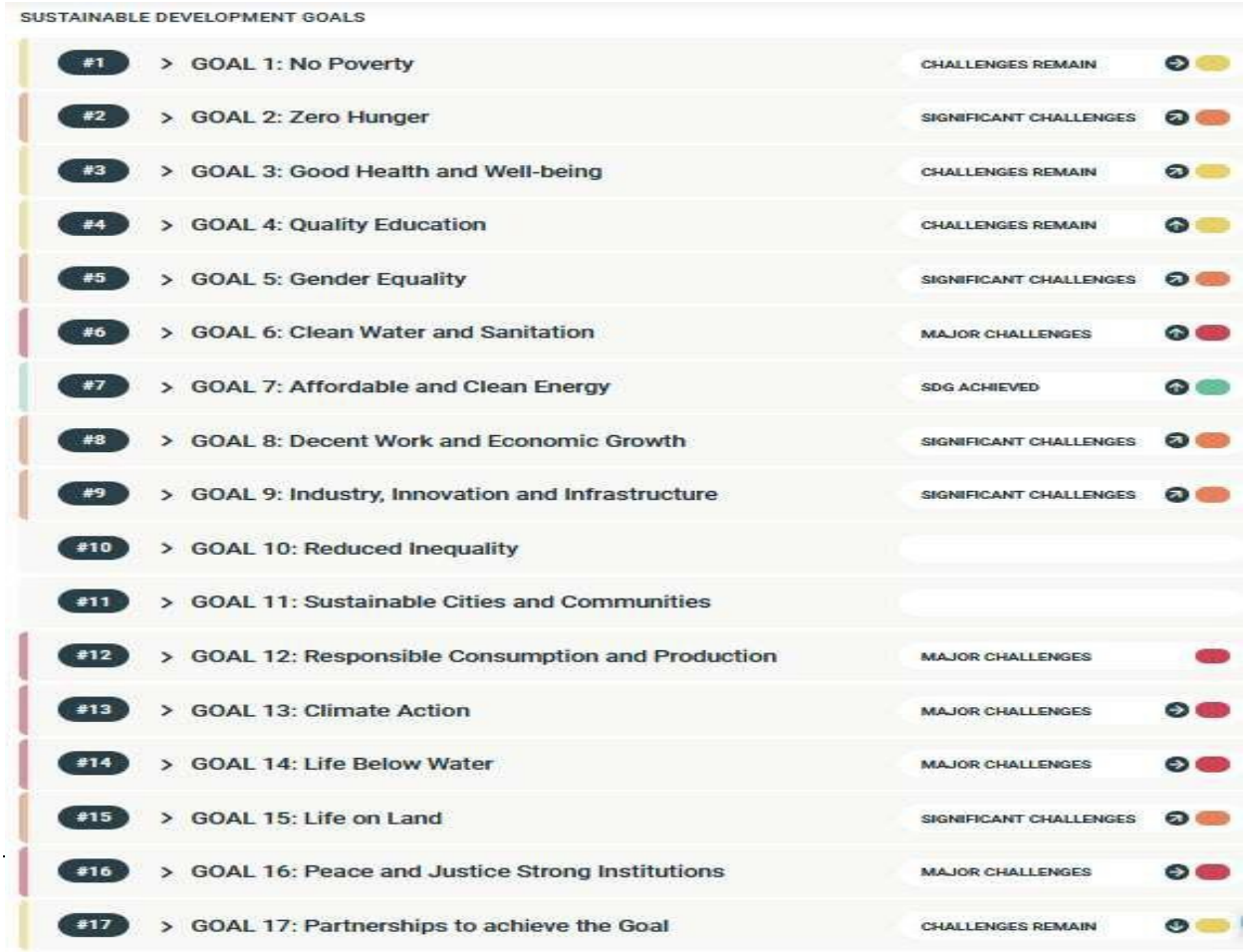
[5] https://barbadostoday.bb/2020/02/15/progress-made-more-to-be-done-on-sdgs/ April 2020

between lack of utilities such as flushing toilets and poverty which relates to SDG 1 as well as Good Health and Well Being, Zero Hunger, Gender Equality and ReducedInequality.

A Country Risk Assessment[6] pertaining to Barbados' progress on the SDG goals is presented in Figure A. The indices presented in this figure illustrate how Barbados is performing in relation to the various SDGs.

To date in Barbados, only SDG 7, Affordable and Clean Energy, has been achieved. SDG 6 Clean Water and Sanitation, SDG 13 Climate Action, SDG 14 Life Below Water and SDG 15 Life on Land remain as having major challenges. SDGs 5 Gender Equality shows significant challenges remaining as well. The Project can have a beneficial outcome on all these SDGs. However, to bring this about, stakeholders must work together to maximize the benefits of the upgraded wastewater system. This can be aided by adherance to the Stakeholder Engagement and Management Plan.

Figure A Sustainable Development Goals Attained for Barbados



3 Stakeholder Management and Engagement Plan

3.1 Overview

Taking into consideration the findings in the Stakeholder Analysis, a Stakeholder Management and Engagement Plan (the "Plan") was developed that:

1. Identified actions required to engage stakeholders and manage expectations throughout the project cycle. This Planincludes:
    - Information dissemination and channelsfor feedback;
    - Conflict management andsettlement;
    - Key issues and concerns and how to address them;
    - Key individuals, groups, and organizations; and
    - Monitoring and reporting.
2. Enables conscious and rational relationship management of key stakeholders; and
3. Recommends a strategy to effectively implement the Plan both in its entirety and pertinent actions contained within.

Many of the activities undertaken in the Stakeholder Analysis formed part of the engagement process. We refer to the following:

- 0 that, with stakeholder input, identified influences and capabilities;
- **Error! Reference source not found.** that provides a record of Stakeholder Meetings;
- The Stakeholder Questionnaire; and
- Workshops 1 and 2.

Each of these involved stakeholder consultation and solicitation of feedback/opinions.

3.2 Stakeholder Management and Engagement Plan

Table G identifies each stakeholder, their key interest related to the project, what vehicles could be used for the dissemination of information and engagement and what information could be provided.

Apart from the two workshops that are already budgeted as part of his overall project the vast majority of the Stakeholder Plan should be part of BWAs regular Communication Plan

to send out bulletins and information to stakeholders. The additional meetings and Town Hall events would be held at various stages as the project is implemented.

Table G Preliminary Stakeholder Management and Engagement Plan

Stakeholder	Key Interest	Engagement Dissemination Vehicles	Information to Provide	Budget ($US)
Cabinet	Project information, financial viability, impacts on SDG's 5, 6, 7, 13, 14, 15 and 17, as well as impacts on water availability, public buy-in,	Briefing document, survey results, ands access to project reports.	All information pertaining to the project reports.	No additional cost

Stakeholder	Key Interest	Engagement Dissemination Vehicles	Information to Provide	Budget ($US)
	contribution to the 2030 renewable energy goals.			
BWA Board of Directors	Project information, financial viability. Costs to upgrade and how to fund. Impact on water availability, as well as any potential rate changes that may occur as a result of the suggested upgrades to the wastewater management system. Impact on SDG's 5, 6, 7, 13, 14, 15 and 17	Briefing document, presentations, and access to project reports.	All information pertaining to the project reports.	No additional cost
BWA Management	Project information, such as any proposed changes / upgrades proposed that would impact their current operations. Required higher levels of trainingto operate an upgraded facility. How this may impact current salaries. Job security. Financial	2 Stakeholder Workshops, emails, direct meetings, Project reports, and O&M Plan.	Provide information related to the potential upgrades to the wastewater management system, including Operation and Maintenance recommendations. These two workshops were part of this project. The first was held	Workshops included in project. No additional cost

Stakeholder	Key Interest	Engagement Dissemination Vehicles	Information to Provide	Budget ($US)
	viability, rates to support full cost of service impact on SDG's 5, 6, and 7.		to inform stakeholders of the results of the Conceptual Plan and garner feedback. The second is due later when the final report is presented to inform stakeholders of the final direction.	
BWA Employees	Project information on how any upgrades would impact current operations. Will they need to upgrade their skills through additional education job security.	Gender sensitivity training workshops, memos, bulletins, O&M plan, and social media (e.g. BWA Water Wednesday advertised on social media platforms, such as Facebook).	Provide information related to the potential upgrades to the wastewater management system, including Operation and Maintenance recommendations, and provide mechanism for employee input.	No additional cost Gender analysis workshops already underway
MTWW	Project information, financial viability, impact on SDG 6, impact on water availability, potential traffic disruption, and related roadworks planning.	2 Stakeholder workshops, emails, direct meetings, and Project reports.	Updates on the Project, dissemination of reports, opportunities to provide feedback and input.	Included in project No additional cost

Stakeholder	Key Interest	Engagement Dissemination Vehicles	Information to Provide	Budget ($US)
MHW	Safety of reclaimed water usage, other health benefits, legislation to ensure safe standard SDG 3, and SDG 5, impacts, sufficient water for cleaning related to the current pandemic and seasonal safety measures.	Reports, best practices information on reclaimed water, workshops, and briefing notes.	Updates on the Project, dissemination of reports, opportunities to provide feedback and input. Information on the safety of reclaimed water.	2 workshops @ US$5000 each = US$10,000
MENB	Impact on environment and SDG's 5, 13, 14, and 15. Positive impacts on the environment, and including the marine environment.	Reports, best practices information on reclaimed water, workshops, and briefing notes.	Updates on the Project, dissemination of reports, opportunities to provide feedback and input. Information on the safety of reclaimed water.	Workshop US$5000
MTIT	Reassurance of reduce the risk (if not eliminate) of a re-occurrence when raw sewage overflowed onto the streets that most likely impacted tourism, health concerns, SDG's 6, 7 and 8 impacts. Positive impacts on the marine	Workshops, briefing notes, and financial impacts.	Updates on the Project, dissemination of reports, opportunities to provide feedback and input.	No additional cost. Included in above workshops

Stakeholder	Key Interest	Engagement Dissemination Vehicles	Information to Provide	Budget ($US)
	environment (coral reefs) and how this will positively impact tourism.			
MFEI	Financial viability, availability of water and effect on economy, business attraction, and impact on SDG 8, 9 and 11.	Workshops, briefing notes, and financial impacts.	Updates on the Project, dissemination of reports, opportunities to provide feedback and input.	No additional cost. Included in above workshops
MESBE	Energy conversion from BTSTP financial viability, availability of water and effect on economy, business attraction, impact on SDG goal, and contribution to the 2030 renewable energy goals.	Fact sheets, briefing notes, workshops, and memos.	Updates on the Project, dissemination of reports, opportunities to provide feedback and input.	No additional cost. Included in above workshops
MIBPA	Public education and dissemination of information.	Assistance with briefing notes, press releases, press conferences, Town Hall meetings.	Updates on the Project, dissemination of reports, opportunities to provide feedback and input.	3 x Townhall meeting @ US$5000 each = US$15,000
MAFS	Sufficient water availability, use of reclaimed water for agriculture, cost of water for agriculture, and	Reports, best practices information on reclaimed water, workshops, and briefing notes.	Updates on the Project, dissemination of reports, opportunities to provide feedback and input.	No additional cost. Included in above workshops

Stakeholder	Key Interest	Engagement Dissemination Vehicles	Information to Provide	Budget ($US)
	SDG 3, 6, 12, 13 and 15.		Information on the safety of reclaimed water.	
METVT	Opportunities for diverse workplaces in water & wastewater sector, training, SDG 4, 5, 10, 16 and 17.	Fact sheets, briefing notes, workshops, and memos.	Updates on the Project, dissemination of reports, opportunities to provide feedback and input.	No additional cost. Included in above workshops
MFEI	Financial viability, availability of water and effect on economy, business attraction, impact on SDG's 8, 9,10 and 11.	Financial information and project updates.	Updates on the Project, dissemination of reports, opportunities to provide feedback and input.	No additional cost.
Environmental Health Department	Impact on environment, including the marine environment (related to marine outfalls, where wastewater is currently discharged at two locations) and SDG 13,14 and 15.	Reports, best practices information on reclaimed water, Workshops, briefing notes, and phone.	Updates on the Project, dissemination of reports, opportunities to provide feedback and input. Information on the safety of reclaimed water.	No additional cost. Included in above workshops
EPD	Impact on environment, including the marine environment and SDG goals.	Reports, best practices information on reclaimed water, Workshops, and briefing notes.	Updates on the Project, dissemination of reports, information on Environmental compliance, opportunities to	No additional cost. Included in above workshops

Stakeholder	Key Interest	Engagement Dissemination Vehicles	Information to Provide	Budget ($US)
			provide feedback and input.	
TCPD	Impact of increased footprint, impact on community, discussion regarding on-site sewage improvement recommendations, financial viability, input in GRM development and SDG 11, and 15.	Workshop presentation, briefing notes, emails, and phone.	Updates on the Project, dissemination of reports, and opportunities to provide feedback and input.	Workshop US$5000
CZMU	Benefits of decreasing the ocean discharge associated with the wastewater treatment plants and the effect on the marine environment, SDG's 13, 14, and15.	Workshop presentation, briefing notes, emails, and phone.	Updates on the Project, dissemination of reports, opportunities to provide feedback and input.	No additional cost. Included in above workshops
CARPHA	Safety of reclaimed water usage, other health benefits, legislation to ensure safe standard SDG goal impacts, sufficient water for pandemic and seasonal safety	Workshops, and briefing notes.	Impact of the Project, concerns, and ways to improve delivery of education/outrea ch materials.	No additional cost. Included in above workshops

Stakeholder	Key Interest	Engagement Dissemination Vehicles	Information to Provide	Budget ($US)
	measures, SDG's 3, and 5.			
CCREEE	Energy conversion from BTSTP financial viability, availability of water and effect on economy, business attraction, solar use/incorporation into the project, impact on SDG's 7 and 13.	Fact sheets, briefing notes, workshops, and memos.	Updates on the Project, dissemination of reports, opportunities to provide feedback and input.	No additional cost. Included in above workshops
CIMH	Climate change impacts SDG 13.	Fact sheets, briefing notes, workshops, and memos.	Impact of the Project.	
SSA	Impact on industry, costs, disposal impacts SDG 11 and 15, and any discussion on potential recommended rate/levy changes.	Fact sheets, briefing notes, workshops, and memos.	Updates on the Project, dissemination of reports, opportunities to provide feedback and input.	No additional cost.
SWPU	Impact on industry, costs, disposal impacts, and SDG 11, and 15.	Fact sheets, briefing notes, workshops, and memos.	Updates on the Project, dissemination of reports, opportunities to provide feedback and input.	No additional cost.
Tourism Private Sector to include:	Availability of clean, reliable water and	Meetings and presentations, bulletins, press	Disruption schedule, ways to learn more about	No additional cost.

Stakeholder	Key Interest	Engagement Dissemination Vehicles	Information to Provide	Budget ($US)
Barbados Tourism Marketing Inc., Barbados Hotel and Tourism Association Intimate Hotels of Barbados Carib. Tourism Organization Tourism Develop-ment Corporation (Barbados),	sanitation services, cost of service SDGs 6, 7, 8 ,9 11, and positive impacts on the marine environment (and minimizing the risk of sewage flowing down the streets again, due to improvements to the wastewater collection system and infrastructure).	releases, BWA website, and social media.	the Project, ways to engage with project, and grievance mechanism.	Included in above workshops
Institution, Commercial and Industrial Sector	Availability of clean, reliable water and sanitation services, cost of service, and SDGs 6, 7, 8 ,9 and 11.	Meetings & presentations, bulletins, press releases, BWA website, social and media.	Timetable, disruption schedule, ways obtain further information about the Project, ways to provide input, and grievance mechanism. Information on the safety of reclaimed water.	Updating of website and social media: US$7000
Fisheries Association & Fisherfolk	Impact on fisheries SDG 6 and 14, improvements to	Meetings and presentations,	Statistics on fisheries from	No additional cost.

Stakeholder	Key Interest	Engagement Dissemination Vehicles	Information to Provide	Budget ($US)
	the marine environment due to minimizing any sewage discharge from the wastewater treatment plants.	bulletins, and BWA website.	reduced effluent discharge.	
Agricultural Associations and Farmers	Impact on agriculture, safety of reclaimed water, greater water source availability, cost impacts (savings) due to using less fertilizer, andSDG 6 and 15. Also the use of any organics (sludge) to be used as fertilizer, associated with the wastewater treatment process.	Meetings and presentations, and bulletins workshop.	Information on safe effluent reuse for irrigation and cost implications. Information on the safety of reclaimed water.	No additional cost. Included in above workshops
The Association of Women in Agriculture	Impact on agriculture, safety of reclaimed water, greater water source availability, cost impacts (savings) due to using less fertilizer, and SDG 6 and 15. Also, the use of any organics (sludge) to be used as fertilizer,	Meetings and presentations, and bulletins workshop.	Information on safe effluent reuse for irrigation and cost implications. Information on the safety of reclaimed water.	No additional cost. Included in above workshops

Stakeholder	Key Interest	Engagement Dissemination Vehicles	Information to Provide	Budget ($US)
	associated with the wastewater treatment process.			
UWI	Training of workforce, diversity sensitivity workshops, and workplace opportunities.	Meetings, emails, and BWA website.	Employee qualification requirements. Initial and ongoing training requirements.	No additional cost.
Regulators (Fair Trading Commission for Water Services - although not for wastewater as of yet)	Cost to customers, water availability and quality, and health impact on the environment and the public.	Meetings and presentations, bulletins, Briefing notes.	Project reports impact assessments. Grievance and community concerns.	No additional cost.
NGOs	Social and environmental impact of project all SDGs.	Briefing notes, workshops, and BWA website.	Impact of the Project, concerns, and progress on SDGs.	No additional cost. Included in above workshops
Local Community/General Public	Availability of water, disruptions to daily life during construction. Cost of water and sanitation services. Improved cleanliness at beaches for bathing and recreational use. Elimination of wastewater flowing above	Town hall meetings, stakeholder consultations, social media, community meetings, newspaper & radio, social media platforms to discuss project and inconveniences for local community, if any.	Disruption schedule, ways obtain further information about project, ways to provide input, and grievance mechanism. Information on the safety of reclaimed water.	No additional cost. Included in above workshops

Stakeholder	Key Interest	Engagement Dissemination Vehicles	Information to Provide	Budget ($US)
	ground (down streets).	Engage prior to, during, and after project in community.		
Media	Impacts on and benefits to the community, cost to consumers, and disruptions to daily life.	Media information centres. social media engagement, pressreleases,and press conferences.	Media reports, good news stories, and dissemination of disruptions. Information on the safety of reclaimed water.	No additional cost.
CCCCC/GCF	Milestones met, challenges and solutions, report quality, and GCF proposal.	Ongoing dialogue and project updates. Workshops, and debriefing.	Progress reports, barriers, and challenges, dissemination of reports, and opportunities to provide feedback and input.	No additional cost. Included in above workshops
			Total Cost	$37,000

3.3 Grievance Redress Mechanism

Having an effective and operational-level GRM for the 3R-CReWS Project will provide a means by which individuals and/or communities affected by the wastewater management systems implemented by the project can raise questions, concerns, and problems to an independent entity, and get them addressed in a prompt, transparent and consistent manner.

The proposed GRM will not replace judicial or other non-judicial forms of remedy, but rather will be an efficient, immediate and low-cost project-specific alternative to existing remedial solutions provided by the partners. Strong and trusted project-specific GRMs can help address problems proactively as they arise, and can offer invaluable data that can in turn be used to enhance existing operations.

This said, any stakeholder who feels affected or impacted by activities relating to the implementation of the 3R-CReWS project can at any time present a complaint or statement to the GCF's own Independent Redress Mechanism (IRM), to the CCCC complaint mechanism and/or the BWA complaint mechanism.

Any person, group of persons or community that has been or may be affected negatively by the 3R-Crews project may file a complaint to any of the entities mentioned above or to the project-specific GRM; the affected person(s) can authorise their government or representative to file and pursue the complaint on their behalf.

The IRM's contact details are as follows:

GCF Independent Redress Mechanism
Email: irm@gcfund.org
Telephone: (+82) 324586186
Address: Songdo Business District, 175 Art center-daero, Yeonsu-gu, Incheon 22004, Republic of Korea

The CCCC complaint mechanisms contact details are as follows:
Email: complaints@caribbeanclimate.bz
The specific form, and further details can be found here: https://www.caribbeanclimate.bz/contact-us/complaints/

The BWA complaint mechanism's contact details are as follows:
Email: customercare@bwa.gov.bb

Governance structure

The 3R-CReWS GRM will be an independent body– separate from the existing grievance redress systems and processes currently in place and described above - and will be formed of a Secretariat of selected representatives from the BWA, the CCCCC, the Barbados Government Information Service (BGIS), the Ministry of Transport, Works and Water Resources, and the Ministry of Finance, specifically the Public Investment Unit, supported by an administrative assistant. Each member will be elected by the respective body for a one-year period, subject to renewal.

The GRM will be chaired on a yearly rotating basis by each member representative. The chair will lead all deliberations and have the responsibility to manage communications with the project, the complainants and their representatives and the GCF. The chair will also have final decision-making power on the direction and decisions taken by the GRM.

Operations

Activity by the GRM will beghin with an official complaint, statement or report submitted by an affected person, persons or community to the GRM. Complaints can be submitted via email or letter, by the complainant themselves or by an authorised representative. Once the complaint has been received, the GRM Secretariat will have a period of 5 working days to confirm reception of the statement or complaint, and up to 8 weeks to review and investigate the allegations within, and communicate the findings, and pertinent resolution if applicable, to the person submitting the statement or complaint. Should any extension be required due to the gravity of the complaint or statement received, the GRM Secretariat will secure the advice of the GCF IRM and this will be duly communicated to the complainant, together with an updated timeline.

All cases received by the GRM will be handled in close confidentiality and with transparency towards the individual submitting the statement or complaint. However, a log of all resolved complaints received shall be stored in a SharePoint for members of the GRM, with all data identifying the complainant removed for data protection. Non identifying data may be used for project assessment purposes. A yearly report of all cases received (anonymised identifying information), process undertaken for resolution and overall operations of the GRM, will be compiled into a yearly report, reviewed by the 3R-CReWS Board and published on the website.

A specific thumbnail will be provided on the website of the 3R-CReWS project which will include this information, the finalised governance structure of the GRM Secretariat including names of members, as well as detailed descriptions on how to submit a statement or complaint, and the avenues available for redress.

3.4 Monitoring and Reporting

Stakeholders have been engaged throughout the process of developing this Project. In the case of the deliverables (reports) completed to date, the process followed has been to submit a draft report to the CCCCC for initial review and dissemination to the appropriate Stakeholders for comments. Once all the comments are consolidated, the report has been sent back to the Consultant to address all the comments in order to issue the final draft. When issuing the final draft of the deliverable, a "blackline" version is included that tracks all the changes that were made to the document to address the stakeholder's comments and feedback.

In addition to this, significant stakeholder meetings, such as workshops, have minutes prepared and circulated to the attendees for review and approval. These methods of monitoring engagements with stakeholders to manage expectations has proven to be an effective.

3.5 Implementation

Throughout the course of this Project, the Consulting team has engaged with stakeholders on an ongoing basis to ensure the implementation of the Plan, with the supervision of the CCCCC. Once the Project has been completed, it is recommended that the BWA takes ownership of the Plan implementation and continue to report back to the CCCCC on the ongoing status. It is recommended that the BWA, on project completion, also plan for and take responsibility for any inter-departmental or inter-sectoral issues that may arise.

4 CLOSURE

Integrated Sustainability would like to thank the Caribbean Community Climate Change Centre for the opportunity to work on this project and for your support. We trust that this report meets your needs and expectations. If you have any questions, please contact the undersigned at any time.

Sincerely,

Valerie Jenkinson

5 REFERENCES

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- J. Cumberbatch, C. Drakes, T. Mackey, M. Nagdee, Jehoum Wood. A. Karima D. Pages 505-5266 Published August 10th, 2020 Social Vulnerability Index: Barbados.
- Klohn Crippen 1997 Water Sensitive Urban Design Analysing the Possibility of Green Stormwater Management Practices in Barbados.
- McCarthy J., Canziani O., Leary N., Dokken D., Climate Change 2001: Impacts, Adaptation, and Vulnerability.
- Poyotte, V., 2021. Gender Analysis and Gender Action Plan.
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Appendix 1 Master Stakeholder List

Master Stakeholder List

Project Name: The 3R's (Reduce, Reuse and Recycle) for Climate Resilience Wastewater Systems in Barbados

KEY STAKEHOLDERS	NAME
GOVERNMENT AGENCIES	
Ministry of Transport, Works and Water Resources	Francine Blackman (PS)
Ministry of Transport, Works and Water Resources	Debra Dowridge (Deputy PS)
Ministry of Transport, Works and Water Resources	Mr Mark Cummins
Ministry of Health and Wellness	Janet Phillips
Ministry of Environment and National Beautification	Rickardo Ward
Ministry of Environment and National Beautification	Daphne Kellman PS
Ministry of Tourism & International Transport	Ms. Donna Cadogan
Ministry of Economic Affairs and Investment	Ricardo Marshall
Ministry of Economic Affairs and Investment	Ms. Nancy Headley PS
Ministry of Economic Affairs and Investment	Mr. Alyson Forte
Ministry of Energy, Small Business and Entrepreneurship	Andrew Gittens Renewable Energy PS
Ministry of Energy, Small Business and Entrepreneurship	Francine Blackman (PS)
Ministry of Energy, Small Business and Entrepreneurship	Mr Esworth Reid
Ministry of Youth, Sports, and Community Empowerment	Yolande J. Howard (Mrs.)
Ministry of Innovation, Science and Smart Technology	Charley Browne Acting PS
Ministry of Information Broadcasting and Public Affairs	Sandra Phillips PS
Ministry of People Empowerment and Elder Affairs	Gabrielle Springer (PS)
Ministry of People Empowerment and Elder Affairs	Jacqueline Wiltshire-Gay (Deputy PS)
Ministry of People Empowerment and Elder Affairs	Ms. Rean Gibson
Ministry of Agriculture	Anthony Waltshare
Ministry of Education Tech and Vocational Training	Ms Betty Alleyne Headley
Ministry of Small Business Entrepreneurship and Commerce	Esworth Reid PS
Ministry Of Finance, Economic Affairs and Investment	Ms. Annette Weekes
Environmental Health Department	Deputy Chief Environmental Health Officer Ronald Chapman
Environmental Protection Department (EPD)	Mr Anthony Headley

Planning and Development Department (PDD) - (formerly known as the Town and Country Development Planning Office)	George Browne
Coastal Zone Management Unit (CZMU)	Dr Leo Brewster
The Caribbean Public Health Agency (CARPHA)	Dr. Joy St. John
Climate Change Advisor to the Government of Barbados	Dr Hugh Sealy
Caribbean Institute for Meteorology and Hydrology (CIMH)	Dr David Farrell
Caribbean Centre for Renewable Energy & Energy Efficiency (CCREEE)	Dr Gary Jackson ED
Sanitation Service Authority (SSA)	Mis Janice Jones
Barbados Solid Waste Management Programme (SWPU)	Thora Lorde
BWA	Brian Stuart
BWA	Charles Leslie Manager Engineering
BWA	Dr. Bwalya (john) Mwansa
BWA	Keithroy Halliday GM
BWA	Allison Jordan
BWA	Tyrone Lowe (WWTP Superintendent)
PRIVATE SECTOR AGENCIES	
Banks Brewery	Called and requested contact person and email
Culligan Water	Have emailed for contact person
Barbados National Union of Fisherfolk Organizations	Nadine Nembhard. Administrative Officer
The Barbados Game Fishing Association (BGFA),	Mr Joshua Demas
Barbados Agricultural Society	Emailed for contact person. No reply

The Association of Women in Agriculture	Oneta Phillipe
UWI (Gender program)	Dr. Tonya Haynes
UWI (Gender program)	Dr. Leigh-Ann Worrell
UWI (Gender program)	Dr. Leisa Perch
OTHER PUBLIC AGENCIES	
Indigenous Peoples	None present in Barbados
NGOs	
WASH/UNICEF representatives for Caribbean	Cathal O'Connor
UNDP GEF Small Grants Programme	Mr David Bynoe
OAS	Mr Francis Anthony McBarnette
OECS	Didier Trebucq UN Resident Coordinator for Barbados
PAHO	Dr. Yitades Gebre PAHO/WHO Representative Barbados and Eastern Caribbean Coordination
Jesus Cesar	Nemus

Appendix 2 Minutes for Workshop #1


BWA
BARBADOS
PROCESSING UNIT
PROCESSING UNIT
CLIMATE entre (CCCCC)
and the Barbados Water Authority

Agenda

TIME	ITEM	RESPONSIBILITY
1:00 pm	Welcome and Opening Remarks	Dr. Donnell Cain - CCCCC
1:05	Introduction of Team	Valerie Jenkinson
1:10	Overview of Project	Troy Vassos/Nick St-Georges
1:20	Findings and Assumptions to date	Troy Vassos
1:40	Feedback from participants	Valerie Jenkinson/Participants
2:30	Responses from Stakeholder Questionnaire and feedback from participants	Valerie Jenkinson/Participants
3:45	Next Steps	Nick St George
3:50	Closing Remarks	Dr. Donnell Cain - 5Cs
4:00pm	Meeting Adjourned	

Purpose of Workshop

To introduce the project to the Government Stakeholders and better inform them on the details related to this project.

We also plan to list assumptions and results (both Design & from the Questionnaire) obtained to date, in hopes to receive further information and feedback from the Stakeholders.

DRINKING WATER

1. THE HYDROLOGIC CYCLE DETERMINES WATER RESOURCES

2. CLOUDS PRODUCE PRECIPITATION

- Absorbed into the ground
- Groundwater Ocean
- Runs over the ground Ocean

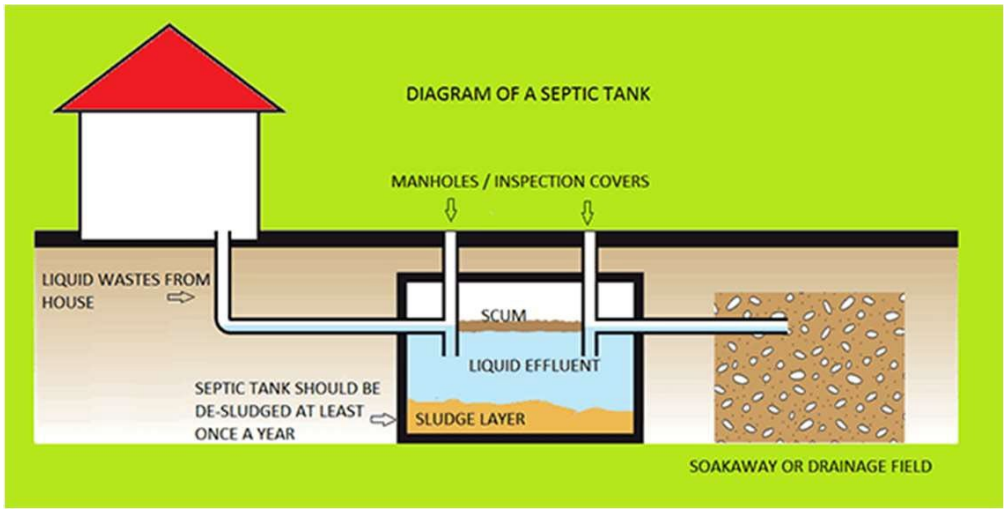
3. WATER SOURCES

- Groundwater Wells
- Surface-water Impoundments
- Ocean/Brackish-water Desalination (Energy Cost)

WATER WASTEWATER MANAGEMENT

ONSITE MANAGEMENT

- Septic Tank
  - Limited Treatment (Solids & Fats/Oils Separation)
  - Liquid Ground Discharge
  - Septage Hauled to Treatment Plant



WATER WASTEWATER MANAGEMENT

CENTRAL MANAGEMENT

1. Collection System
2. Treatment Levels
   - Preliminary – Removes screenings and grit
   - Primary – Removes settleable solids and fats/oils
   - Secondary – Removes soluble organics
   - Tertiary – Removes nutrients and colloids
3. Disposal
   - Surface Water (River, Lake, Ocean)
   - Ground Discharge

WATER SUPPLY CLIMATE CHANGE IMPACTS

EXTREME WEATHER EVENTS

- Droughts
- Intense rainstorms
- Hurricanes
- Sea-level rise

WATER SUPPLY IMPACTS

- 90% of the water supply is from groundwater
- Barbados is already classified as water scarce (390 m^3/person)
- Requires extreme water resource management & adaptation-strategies

WASTEWATER CLIMATE CHANGE IMPACTS

ONSITE MANAGEMENT

- Saturated Soil → Surfacing Wastewater (Health Risk)

CENTRAL MANAGEMENT

- Sewer Inflow & Infiltration (Flooding)
  - Sewer and treatment plant Overload
  - Reduced treatment capacity
  - Higher treatment capital and operating costs
  - Raw wastewater diversion to ocean (Health Risk)
  - Sewer overflows (Health Risk)
- Power Failures & Plant Damage (Hurricane)

BARBADOS WASTEWATER MANAGEMENT

Population: 287,000 PE

AverageGroundwater&BWROExtraction: 156,200 m^3/d (BWA, 2019)

MeteredDomesticWaterUse: 60,395 m^3/d

MeteredNon-DomesticWaterUse: 27,160 m^3/d

WaterLosses(NRW): 68,645 m^3/d (44%)

DomesticWaterUsePerPerson: 210 Litres per day

Estimated Barbados Wastewater Volumes

- **ONSITESYSTEMS**: 244,500 PE 79,500 m^3/d (85%)
- **CENTRALSYSTEMS**: 43,000 PE 14,000 m^3/d (15%)

BRIDGETOWN WASTEWATERFOCUS

BRIDGETOWN POPULATION: 98,500 PE

WASTEWATER MANAGEMENT

- **ONSITESYSTEMS**: 86,700 PE 28,200 m^3/d (88%)
- **CENTRALSYSTEM**: 11,800 PE 3,800 m^3/d (12%)

WASTEWATER TREATMENT
SecondaryTreatmentwithAerobicSludgeDigestion

- Ocean Outfall

COSTS/BENEFITSOFTWOTREATMENTPLANTUPGRADE

EXTREMES:

1) 12%; and 2) 100% SEWER SERVICE

CENTRAL WASTEWATER MANAGEMENT

0.155 % Dissolved Metals, Pharmaceuticals, Chemicals & Salt

DISPOSAL → LAND & ATMOSPHERE (CO_2)

0.020 % Biodegradable Solids

0.020 % Biodegradable Soluble Organics

0.005 % Non-Biodegradable Solids

DISPOSAL → LANDFILL

3.000 % Grit (Seeds, Sand Gravel, etc.)

1.000 % Screenings (Wipes, Rags, Plastics & Debris)

ONSITE WASTEWATER MANAGEMENT

95.800 % Water

0.155 % Dissolved Metals, Pharmaceuticals, Chemicals & Salt

0.020 % Biodegradable Soluble Organics

SEPTIC TANK SEPTAGE WASTEWATER TREATMENT PLANT

3.000 % Grit (Seeds, Sand Gravel, etc.)

1.000 % Screenings (Wipes, Rags, Plastics & Debris)

0.020 % Biodegradable Solids

0.005 % Non-Biodegradable Solids

CENTRAL RESOURCE RECOVERY POTENTIAL

CENTRAL WWTP RESOURCE RECOVERY

- Water Reclamation, Reuse and Groundwater Recharge
- Energy Recovery (Anaerobic Digestion Methane)
- Nutrient recovery (Nitrogen and Phosphorus)
- Soil Amendment (Digested Biosolids)

COGENERATION – ENERGY RECOVERY

- Biosolids (Bridgetown & South Coast WWTP)
- Food & Food-Processing Waste
- Septage Treatment

ONSITE RESOURCE RECOVERY POTENTIAL

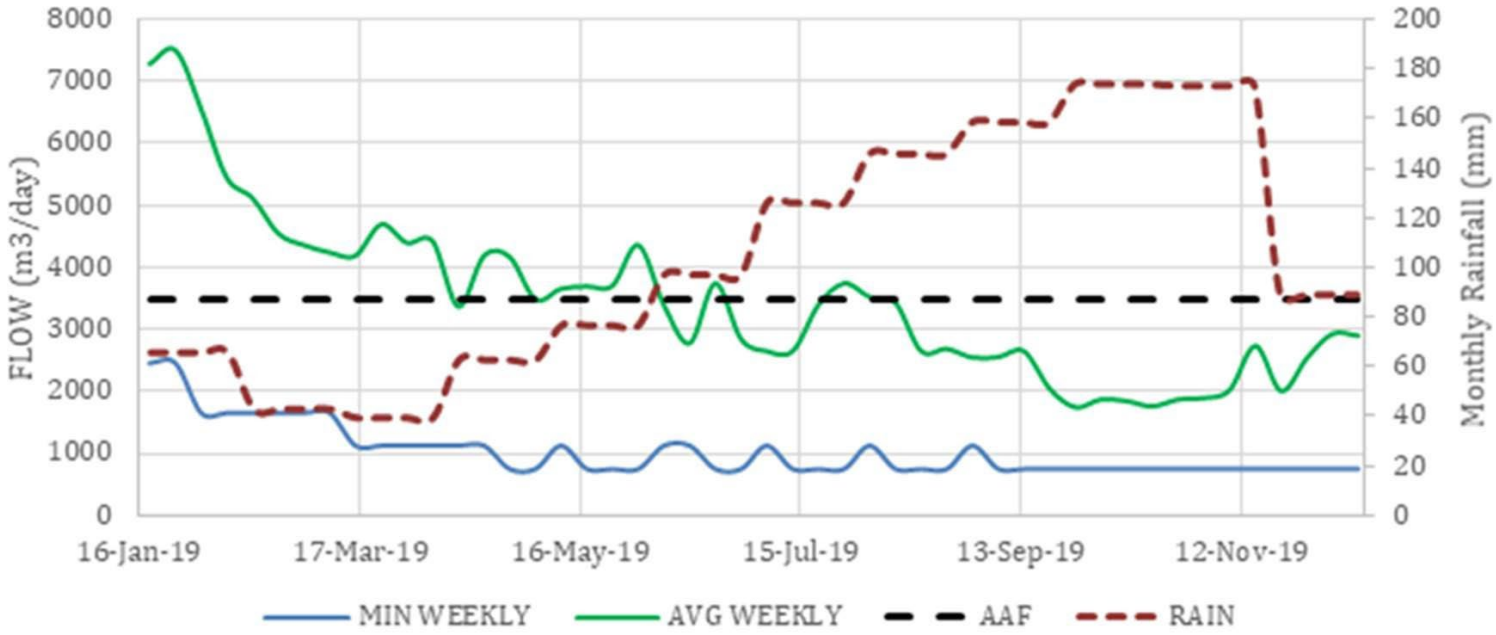
ONSITE RESOURCERECOVERY

- Water recycling to groundwater (Recharge)
- Energy Recovery (Septage Central Digestion)
- Nutrient Recovery (Septage Central Treatment)
  - Soil Amendment (Septage Central Digestion)
  - Reclaimed Water for Reuse (Add Onsite Treatment)

CENTRAL UPGRADE CHALLENGES

1. High Capital Cost to Achieve Reclaimed Water Quality for Ground Recharge
2. High Operating Cost for Sewage Collection (Pumping) & Treatment
3. Sewer Construction Road & Transportation Disruptions
4. Distribution of Non-Potable Reuse Water (Capital and Operating Costs)
5. Increased Operating Complexity
6. Challenging Wastewater Flow Variation Conditions to Achieve High Quality Effluent

CENTRAL UPGRADE CHALLENGES



SOUTH COAST WASTEWATER FLOW VARIATIONS

CENTRAL UPGRADE ADVANTAGES

1. Greater Central Control of Water Quality (Operator Expertise)
2. Enables Large-Scale Water Reuse Applications (e.g. Agricultural Irrigation and Aquifer Recharge)
3. Enables Energy/Nutrient Resource Recovery for Both Central and Onsite Systems
4. Enables Energy Co-Generation
5. Lower Overall Energy Cost and GHG Emissions (Energy Consumption) than Onsite Management Due to Scale of Application

ONSITE UPGRADE CHALLENGES

1. Higher Treatment Capital Cost
2. Higher Total Operating Cost & Energy Requirement for Treatment
3. Higher Energy → Higher GHG Emissions
4. Limited Existing Service Capability for Onsite Treatment Systems
5. Will Require Financial Subsidy for Capital Cost
6. Operation & Maintenance Concerns

ONSITE UPGRADE ADVANTAGES

1. Eliminates Central Sewage Collection Capital & Operating Costs
2. Eliminates Construction & Traffic Disruption
3. Eliminates Need for Non-Potable Water Distribution System
4. Facilitates a Broad Spectrum of Potential Onsite Non-Potable Water Applications (e.g. toilet/urinal flushing, vehicle/property washing, irrigation, building cooling, etc.)
5. Improves ground discharge water quality
6. Dbutes residual contaminants over large area
7. Replenishes extracted groundwater

CONCLUSIONS

There is no flow or wastewater quality data available for the Bridgetown sewer or WWTP to establish a baseline condition to determine whether climate related impacts have occurred to date affecting the collection system capacity or treatment plant performance.

The baseline condition was established using water consumption data and population estimates, flow records obtained for the South Coast WWTP, typical domestic wastewater quality characteristics and a simulation model.

The South Coast highest flow of 7,500 m^3/d occurred during peak-tourism dry-weather (January) of about 7,500 m^3/d, and the lowest flow of 1,800 m^3/d occurred during wet-weather (October), suggesting climate effects (rain) have less of an effect on average flows than tourist-related activities for the South Coast.

CONCLUSIONS

The South Coast WWTP design capacity is 9,000 m^3/d; however, 15,000 m^3/d occurred during a rain event on January 7, 2021, believed to be due to surface flood water draining into the sewer, not infiltration.

Based on water consumption and population served, the average current wastewater flow at the Bridgetown plant, without the influence of rain, is expected to be in the order of 3,800 m^3/d.

Variations in rainfall affect groundwater resources, making water management a critical requirement to address the impact of climate change on water resources. Once the water has been extracted, the only management tool available is to reclaim and reuse the water.

CONCLUSIONS

Integrated Resource Management Strategies are Required to Address the Impact of Climate Change on Wastewater Systems

Climate Change Impact on Water Supply is Directly Interrelated with Wastewater Management Due to Water Scarcity

Water & Wastewater Management are also Directly Related to Energy Management & GHG Emissions

Central Wastewater Management Treatment Upgrades for Resource Recovery Are Expected to Have Higher Capital & Operating Costs Than for Onsite Management System Upgrades,

Particularly Considering Sewage Collection Sustainable Upgrades to Achieve Wastewater Climate-Change-Resiliency Objectives May be Best Achieved by Considering Integrating Central and Onsite Wastewater Management and Resource Recovery Strategies

CONCLUSIONS

Water reclamation and reuse is practiced globally to address limited water resource conditions and drought. Thirty-eight countries are members of ISO Technical Committee 282, developing international agricultural, municipal, and industrial water reuse standards. Reclaimed wastewater is being used in urban homes and commercial buildings for such applications as toilet/urinal flushing and landscape irrigation, and by agriculture for both non-food and food crops internationally.

CONCLUSIONS

Although 15 % of the wastewater is currently being treated and discharged to the ocean, 85 % of the wastewater is currently being recycled and reused to replenish groundwater resources through onsite wastewater septic systems.

If the sewage collection system is to be extended, the wastewater will have to be treated to reclaim and reuse it to meet non-potable water demands and continue to return the water to the ground, as is currently practiced with onsite septic systems.

Wastewater can also be reclaimed and reused using onsite wastewater treatment plants.

CONCLUSIONS

A key advantage of onsite water reuse is that it does not require a sewage collection system or a non- potable water distribution network that a central plant would require to provide non-potable reuse water for community use.

Disadvantage of onsite water reuse includes the need for greater operator resources than for central systems which also have the advantage of scale with respect to lower treatment capital and operating costs in comparison with onsite systems.

Wastewater contains organics that can be converted to energy (methane), and nutrients (nitrogen and phosphorus) that could be recovered at a central plant.

CONCLUSIONS

Bioenergy and fertilizers recovery with onsite treatment is impractical; however, the septage could be transported to a central facility for energy and nutrient recovery.

A central plant with energy and nutrient recovery capabilities could also be used to recover the same from organic food wastes within a co-generation plant.

Scenarios being consider are: 1) status quo (i.e. 85 % onsite, 15 % central with energy and nutrient recovery); and 2) extending sewers to collect, treat and recover water, energy and nutrients at a central facility.

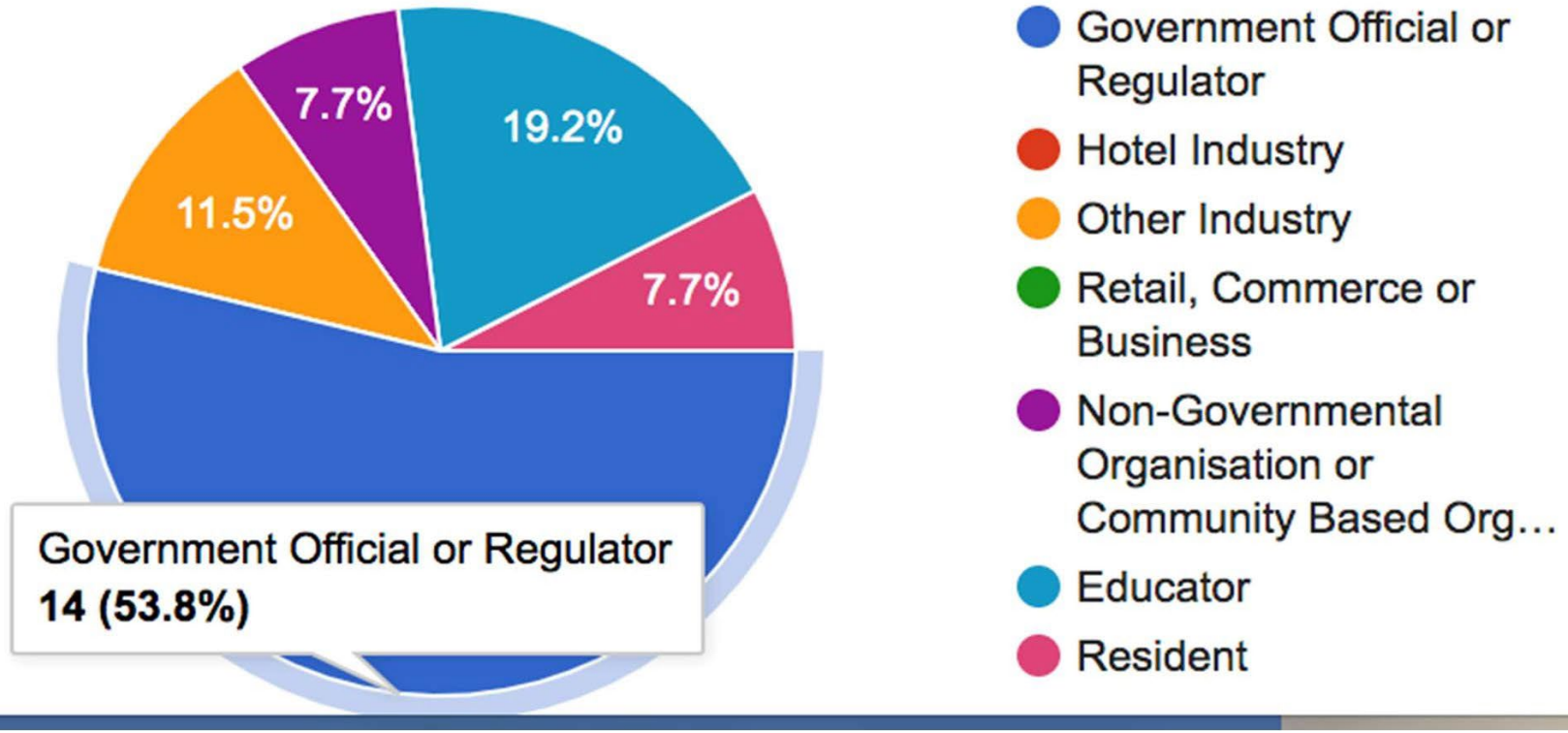
Sustainability considerations may result in Bajans determining the optimal condition is somewhere between these extremes, but the two scenarios will help to clarify the extent and cost of resource recovery considerations.

Questionnaire

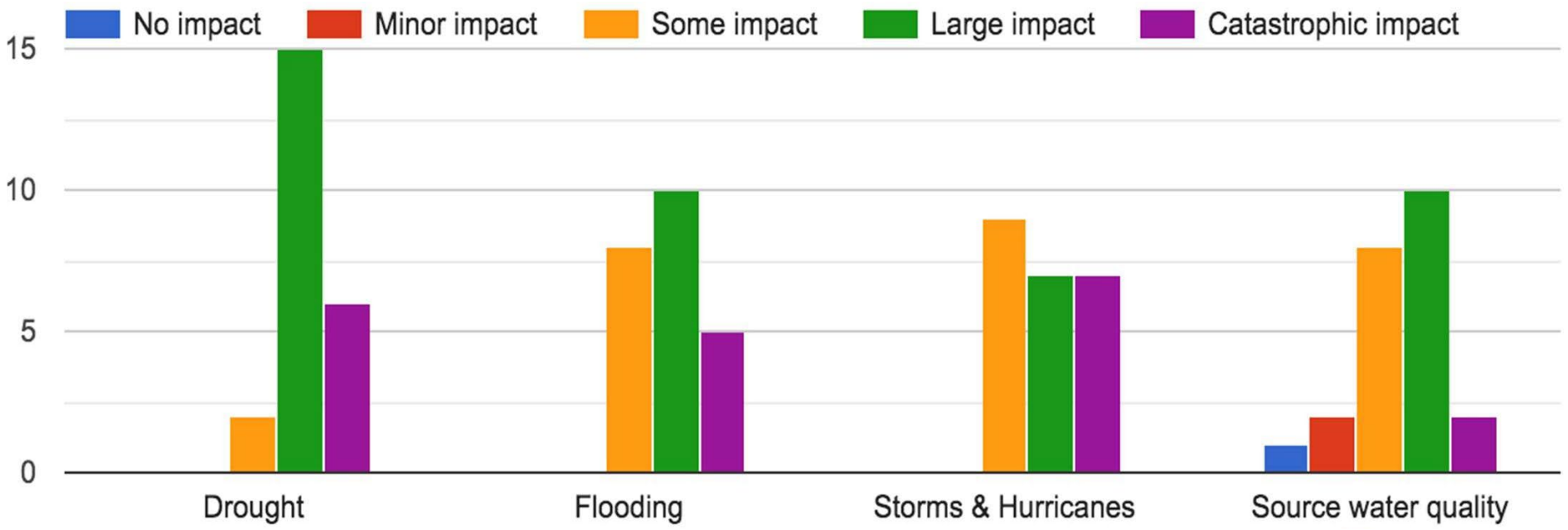
Survey Results

- The consulting team developed an opinion survey
- Sent to 49 stakeholders within Government agencies, the private sector and NGOs
- Sent a reminder followed by a minimum of two phone calls and another email
- 26 respondents

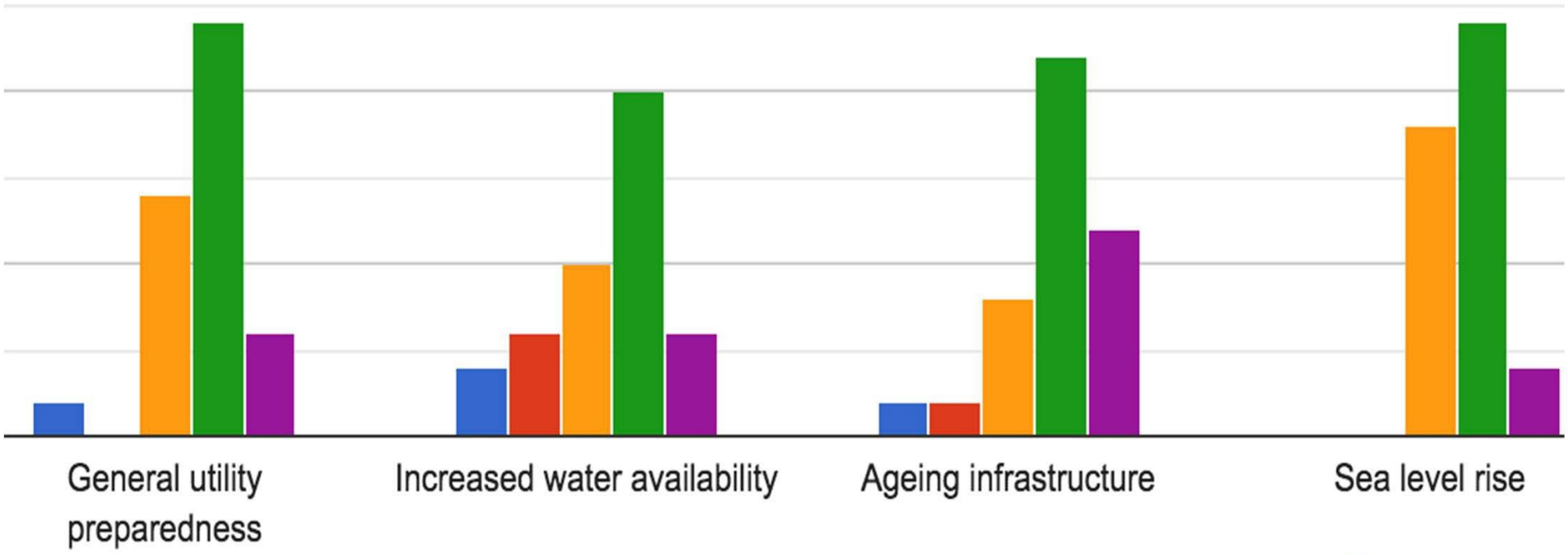
Responses by category



What are the climate change impacts on the water/wastewater sector?



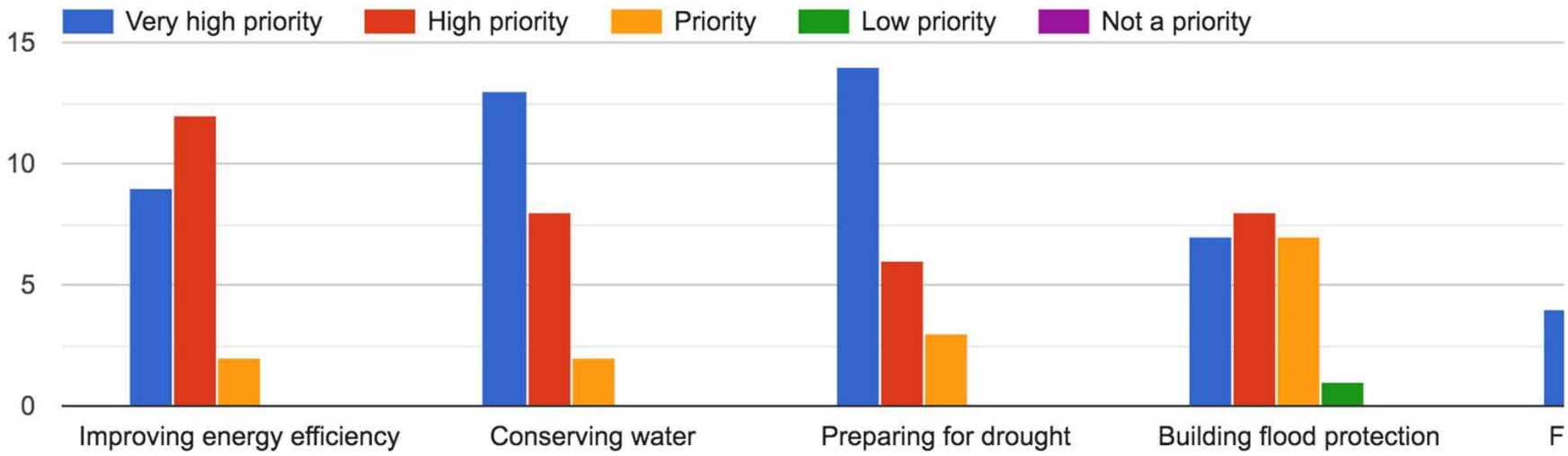
What are the climate change impacts on the water/wastewater sector?



Other impacts*

- Supply of water to accommodation and hospitality industry
- Funding/Finance
- Inflow and infiltration into wastewater systems
- More frequent electrical supply interruptions
- Increasing competition between economic, social; and environmental uses of water
- Management
- Increase in general temperature leads to increased water usage

What are the priorities for the water/wastewater sector?



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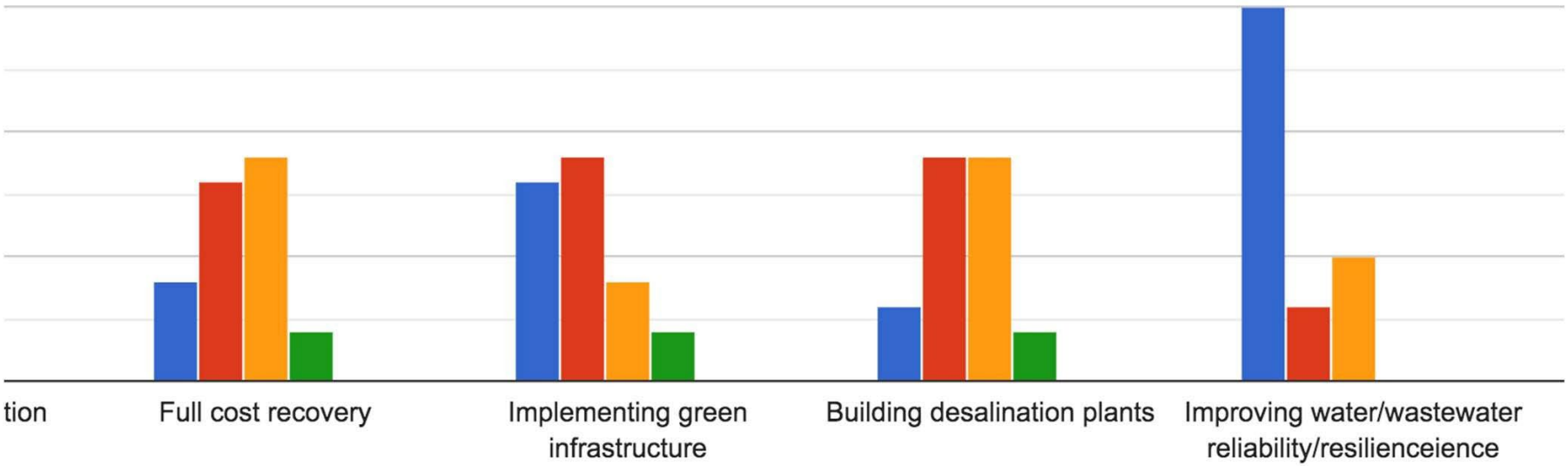

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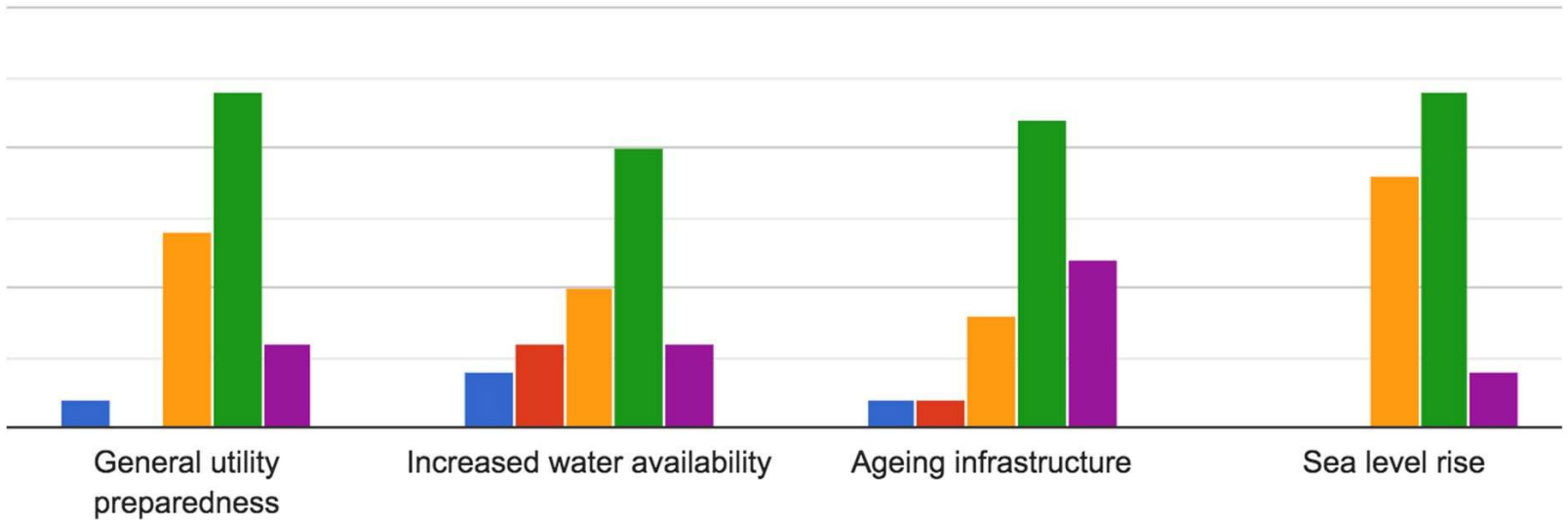
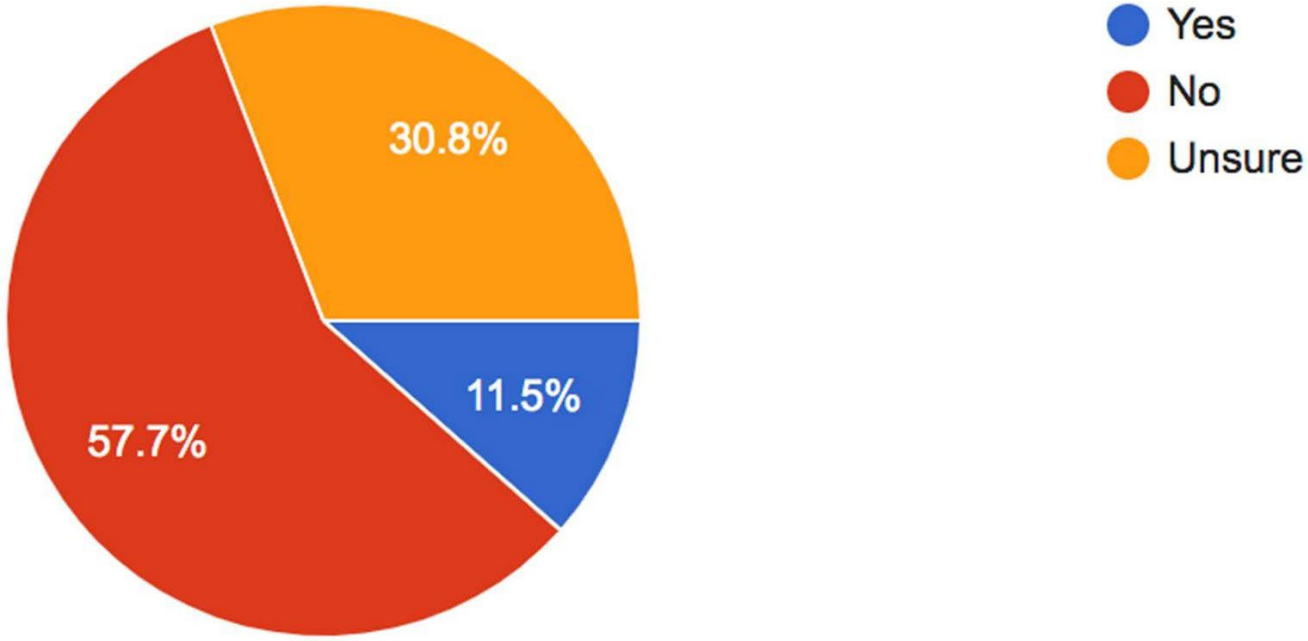


Other priorities*

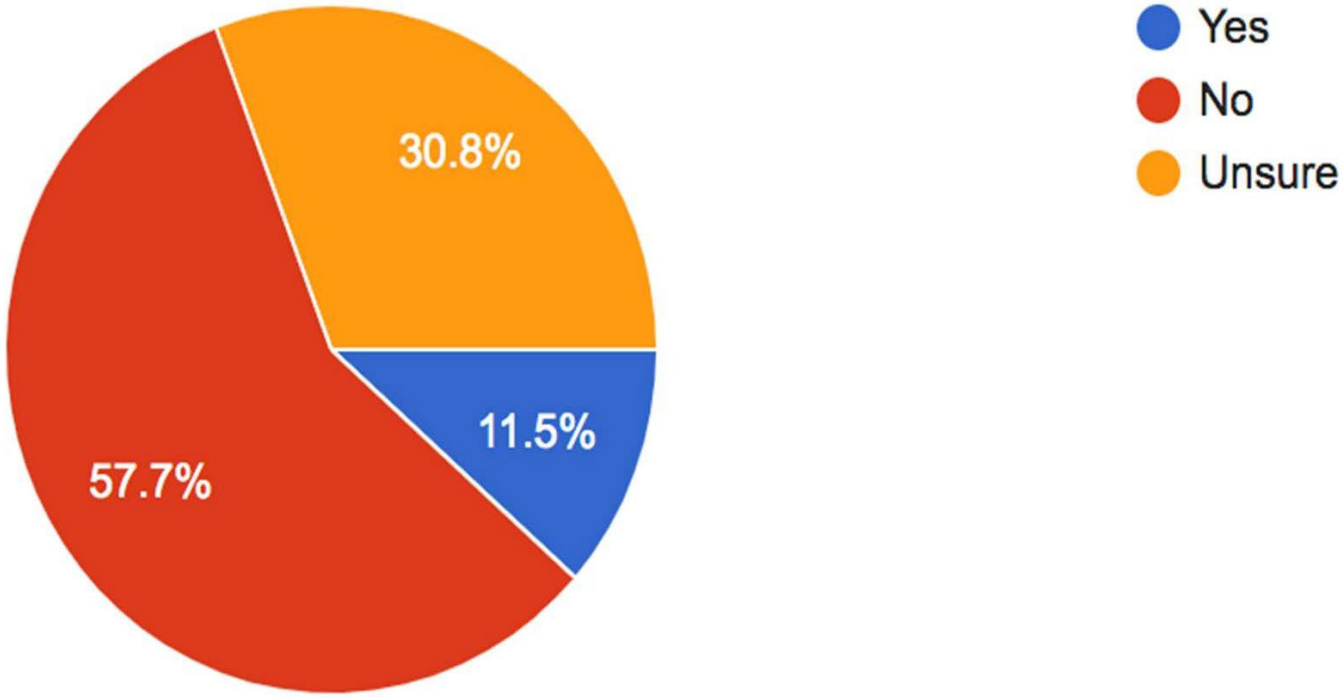
- Adequate water supply for the agricultural and domestic sectors
- Tertiary treatment
- Achieving sustainable financial viability
- Equality of water access
- Continual training and certification of staff

Do the current wastewater collection systems and treatment plants adequately protect the environment?

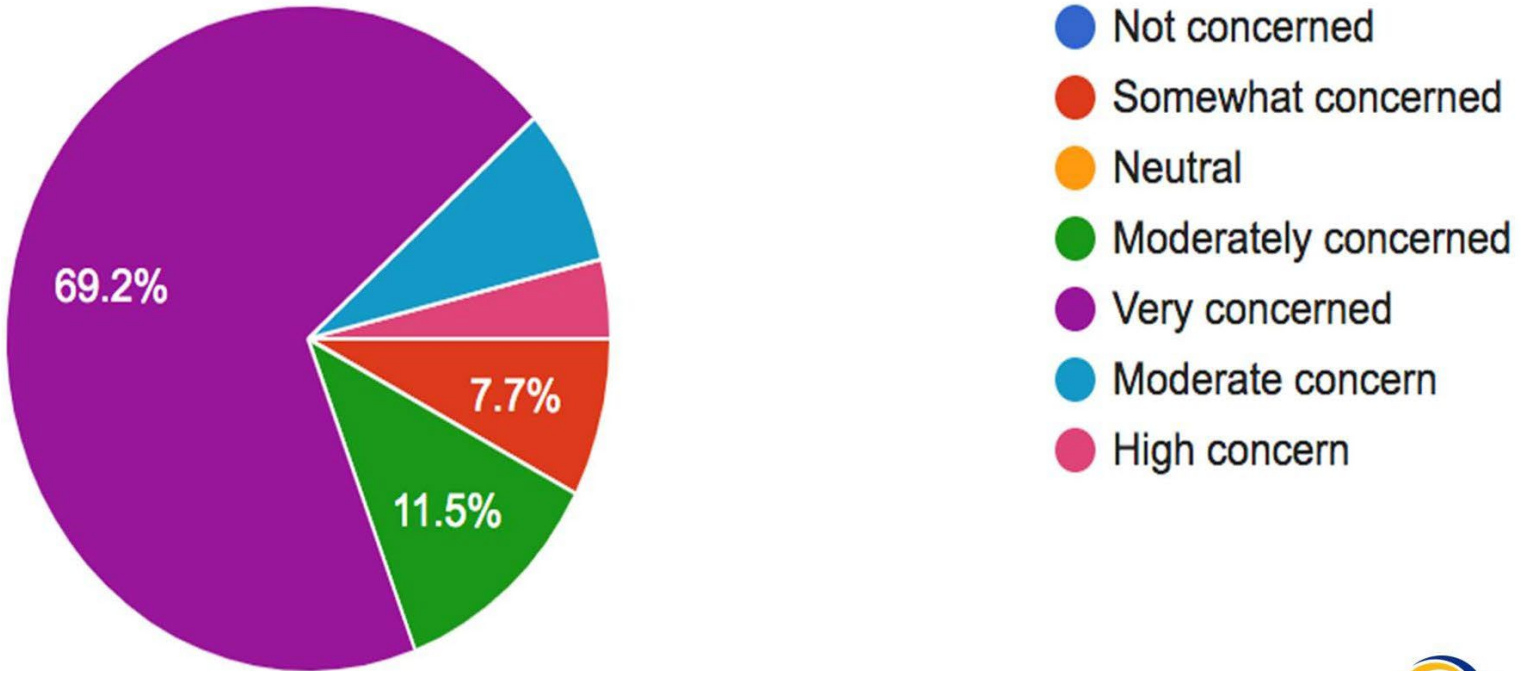


INTEGRATED SUSTAINABILITY

Does the general practice of discharging untreated wastewater to the ground protect the island groundwater quality?



How concerned are you that climate change could reduce the QUANTITY of drinking water available?

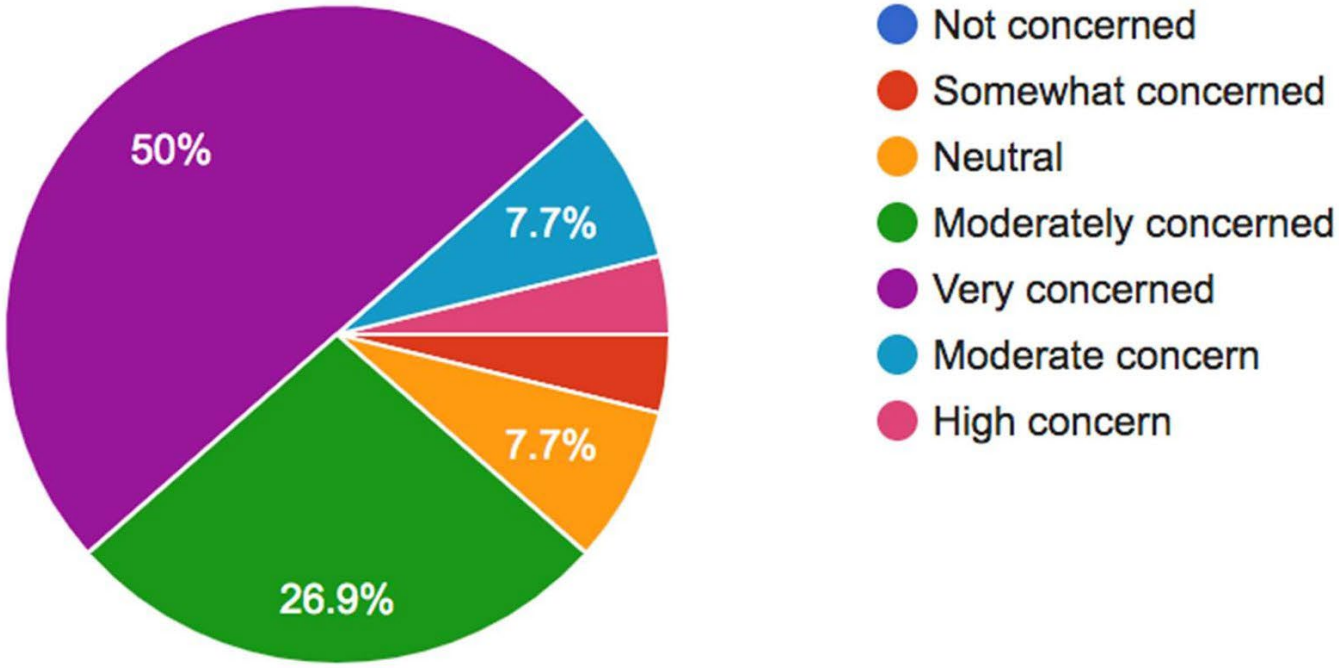


Commentary*

- Climate change may lead to decrease in water availability
- Possible water shortages leading to cutting off the system as on other Islands
- Climate change impact on ground water availability and predictions this will worsen
- Increased salinity affecting water quality and groundwater recharge

There were 18 comments in all each of which reflected that the situation was not good now and climate change would have further negative impacts on quality and availability

How concerned are you that climate change could reduce the QUALIITY of drinking water available?



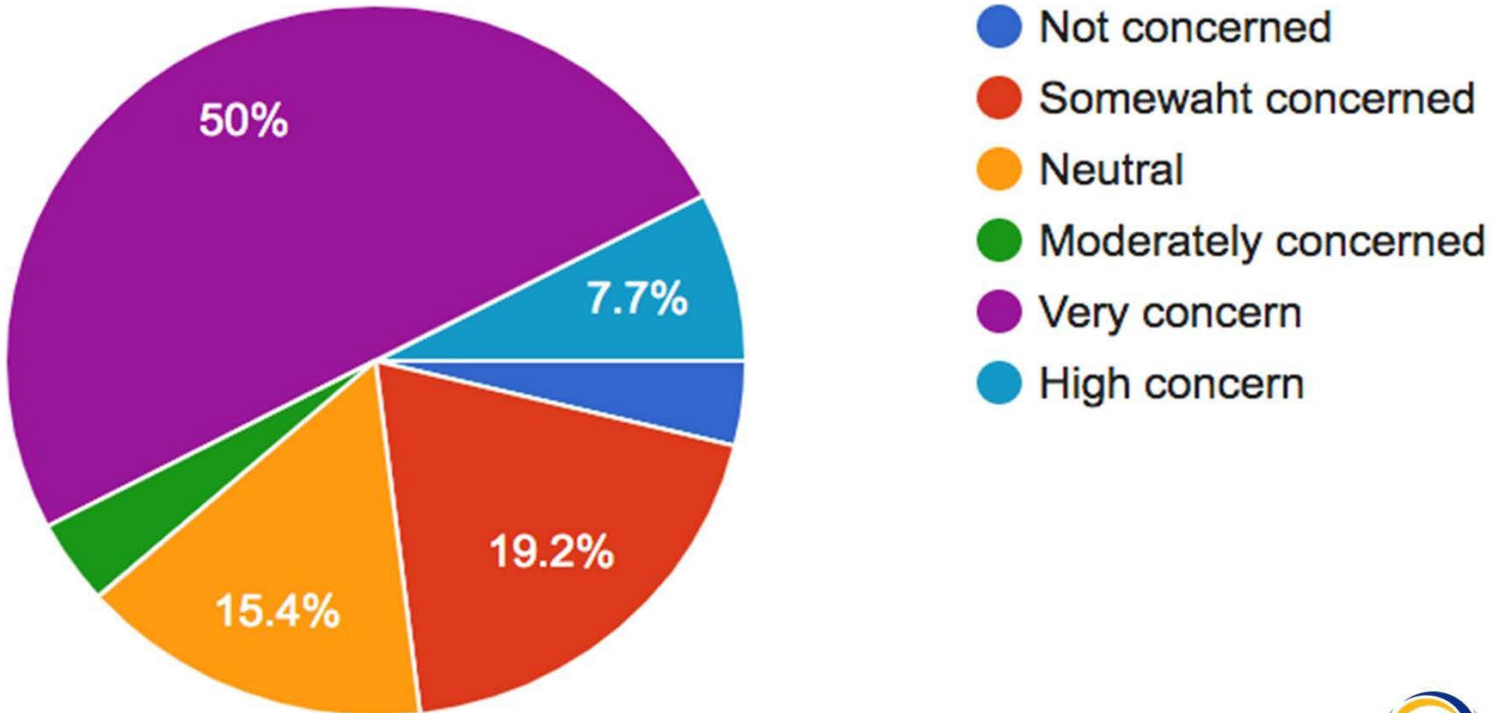
Commentary*

- The comments mirrored their responses on quantity of water
- E.g. water shortages, increased salinity plus

PLUS

- impact on health
- Reliance on bottled water as in other islands

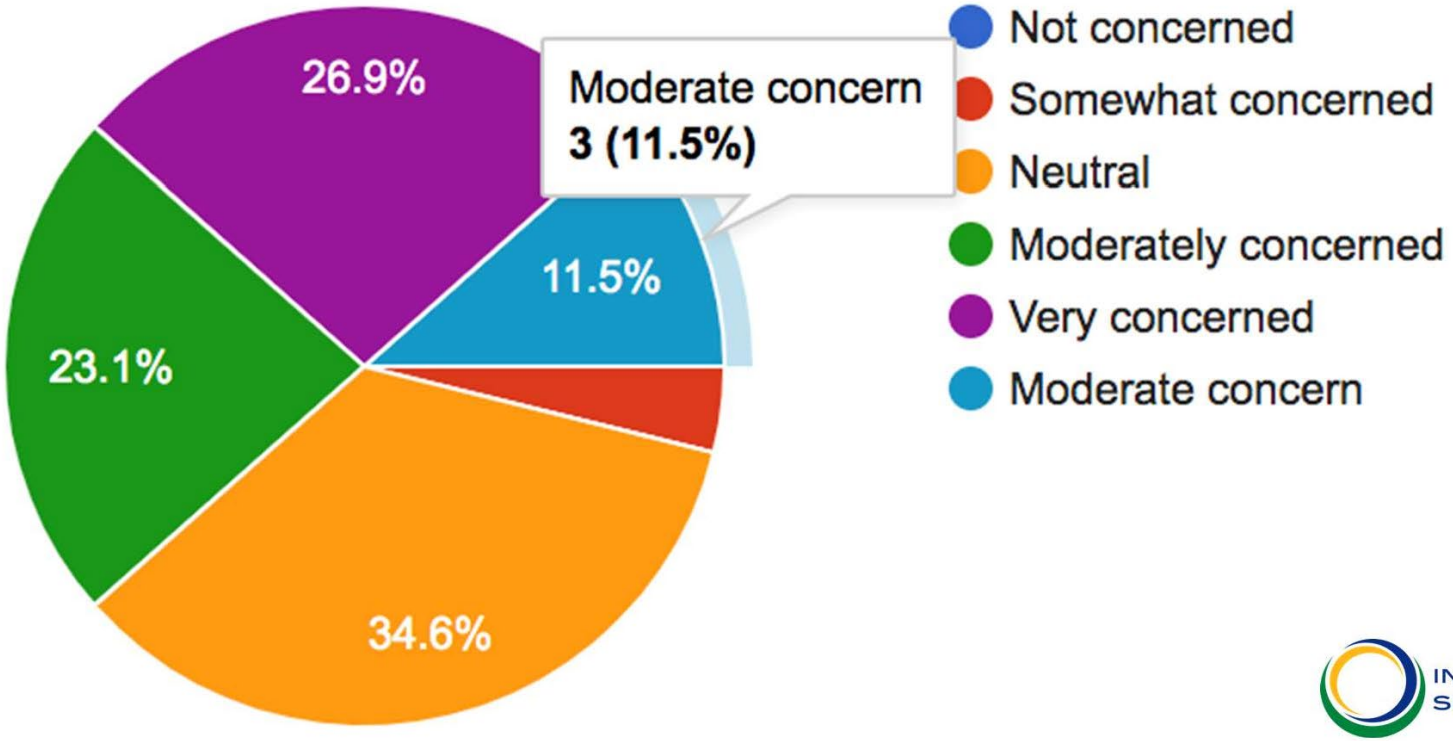
How concerned are you that climate change could increase the cost of drinking water?



Commentary*

- Costly technology, need for desalination, reuse of reclaimed water will be more expensive
- Lead to tariff increases
- Not in our control
- Water is currently undervalues
- An essential commodity may be out of reach for the average working-class person leading to exploitation

How concerned are you that climate change could increase the cost of wastewater collection and treatment?

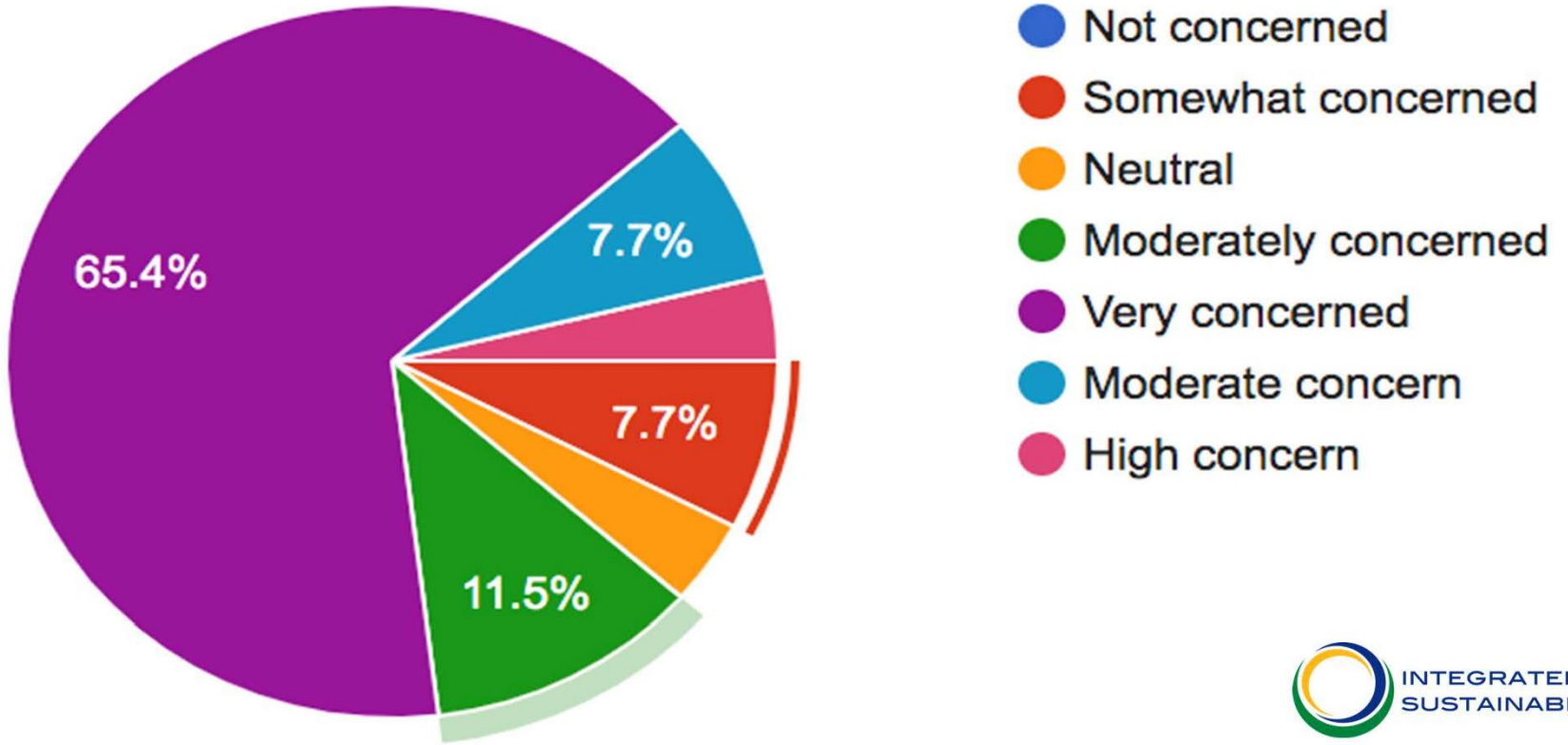


INTEGRATED SUSTAINABILITY

Commentary*

- Increasing demand for component will drive prices up
- Flash floods further drive need for upgrading treatment plants to handle volume
- Cost most likely to increase as much of the island is not connected to the wastewater system
- Infiltration will require higher treatment to meet irrigation standards
- Need to mitigate against storm surges which climate change will increase
- Concern for the country, if connection is not mandatory I'm not concerned as an individual

How concerned are you that decreased drinking water availability could affect Barbados economy?

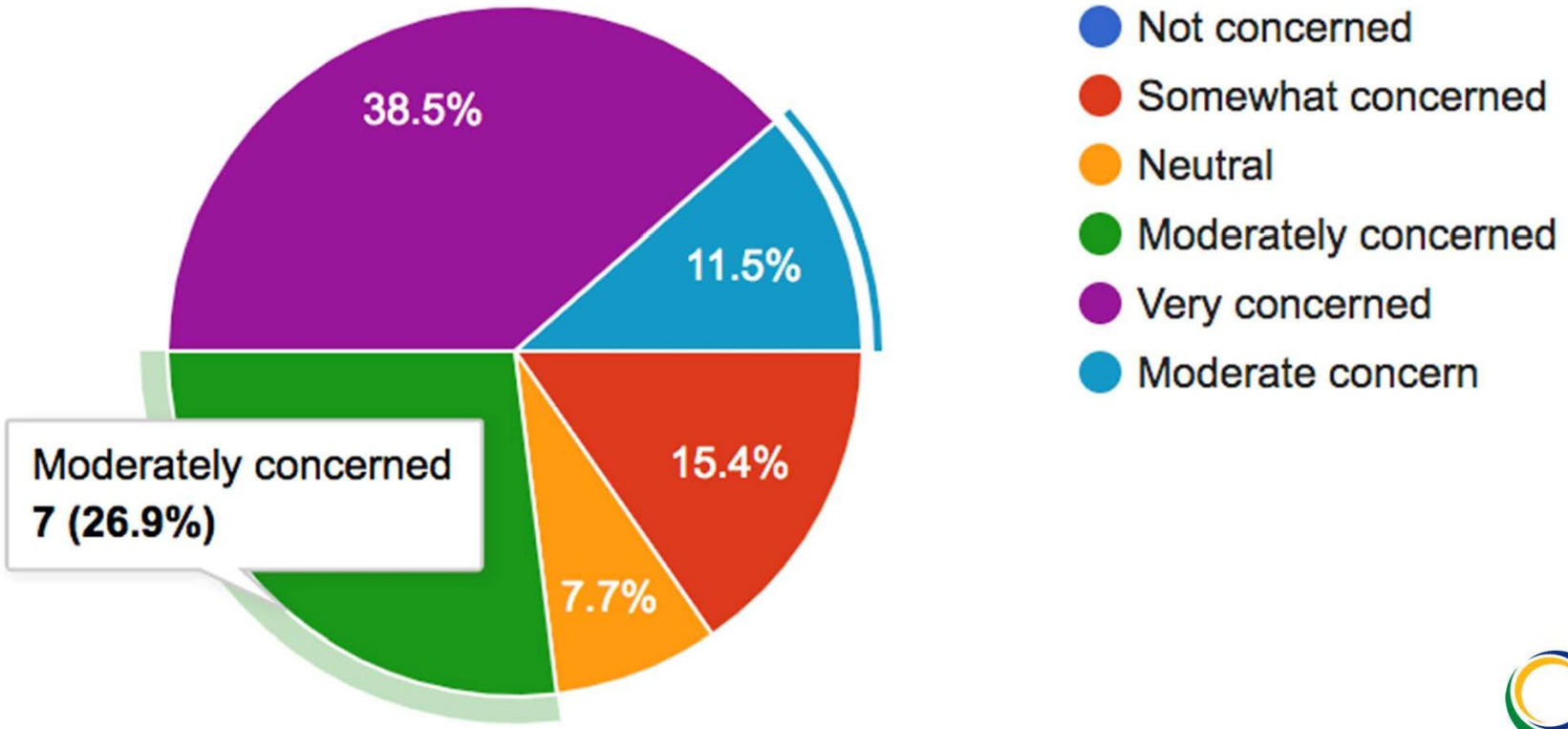


INTEGRATED SUSTAINABILITY

Commentary *

- High quality potable water a major marketing pillar for tourists
- Possible closure of schools and businesses
- Unsanitary health conditions
- Possible socio-economic stresses and imbalances
  - resulting in reduced national productivity and efficiency
- Water scarcity can lead to:
  - Food shortages
  - Hinder trade impacting tourism
  - Eventuallycause civil unrest
  - Direct impact on rainfed and irrigated agriculture and livestock
  - Indirect impact on food processing industries
  - Businesses faced with higher costs and long-term viability
  - Costs passed toconsumers

How concerned are you that the lack of sewage collection and affect Barbados economy?

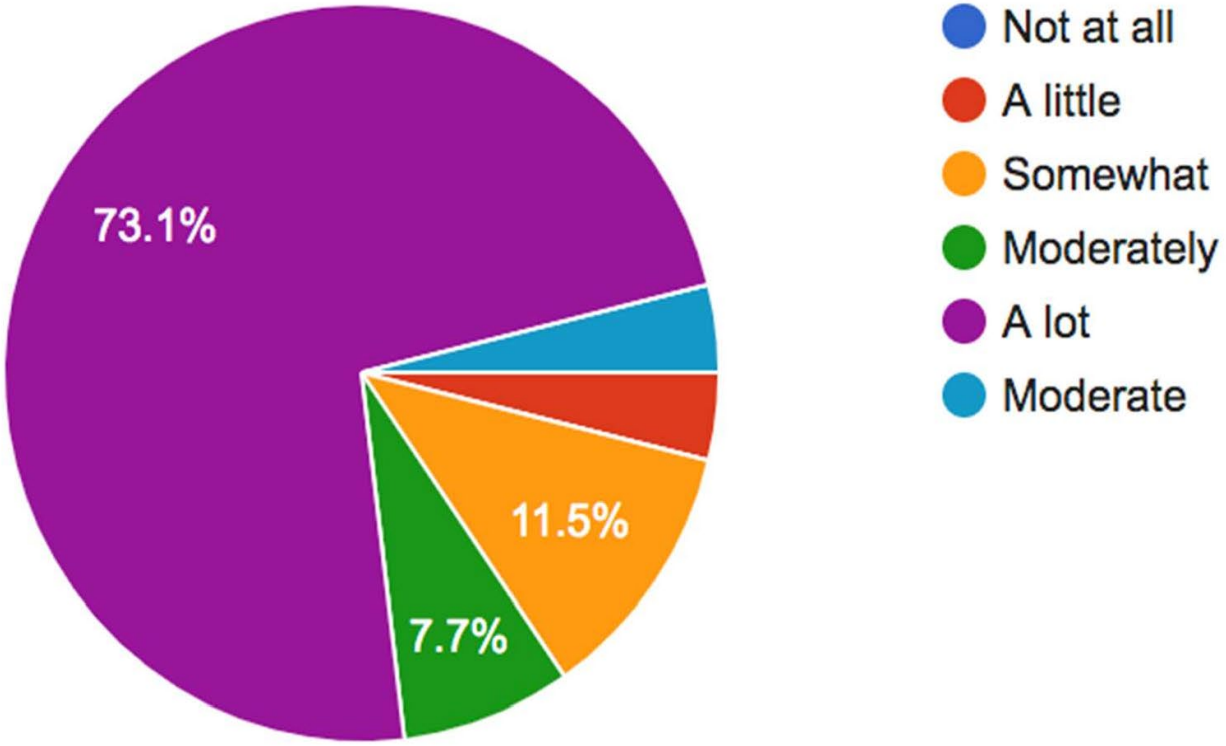


INTEGRATED SUSTAINABILITY

Why?

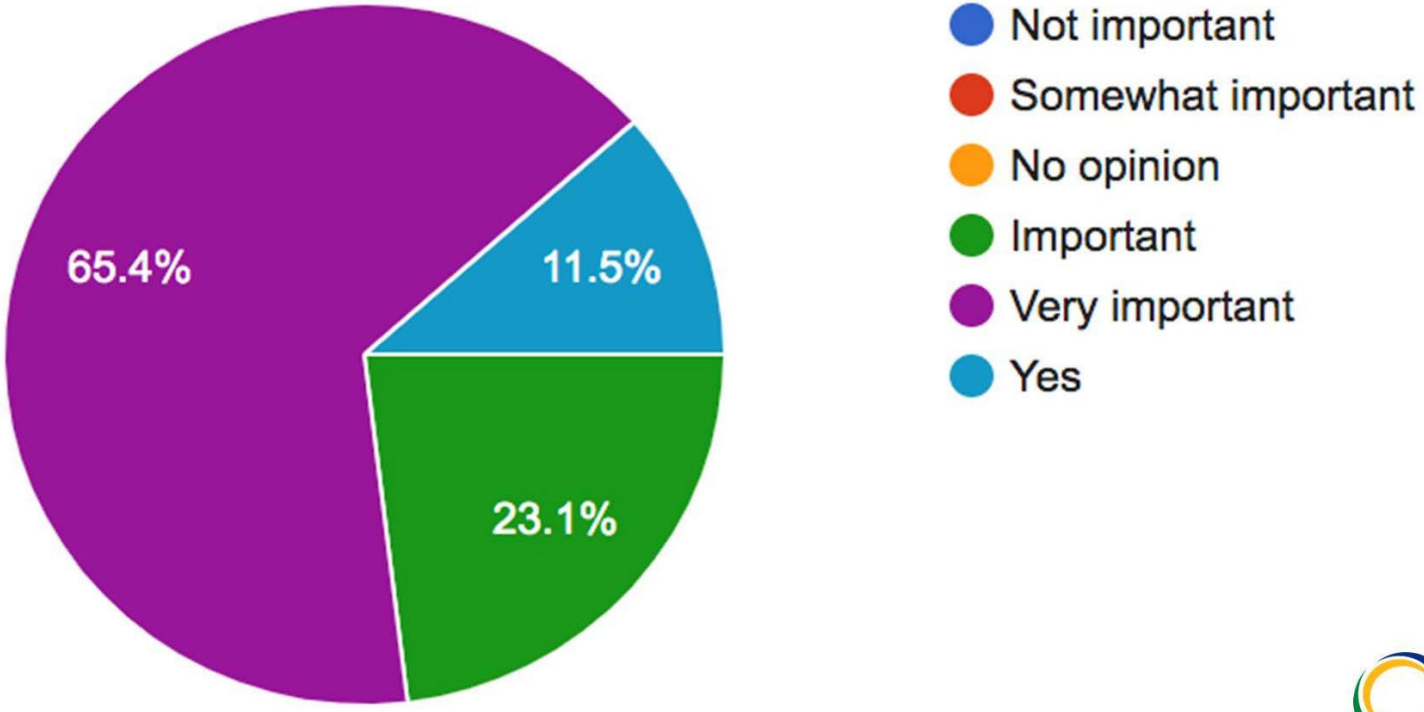
- Grey water will not be reused and more domestic supply used, negatively affecting conservation and recycling
- Most persons have on-site disposal facilities
- Can lead to major environmental and public health disasters leading to impact on tourism (South Coast situation)
- Destroy Barbados image as a premier tourist destination
- Can result in:
  - extensive pollution
  - Increase in rodents
  - Negative health impacts
  - Social and economic issues
  - Impact on women as water managers and caregivers
  - Impact on coral reefs

Do you think wastewater treatment benefits the environment?



INTEGRATED SUSTAINABILITY

How important do you think it is for the government to invest more money to increase water supply?



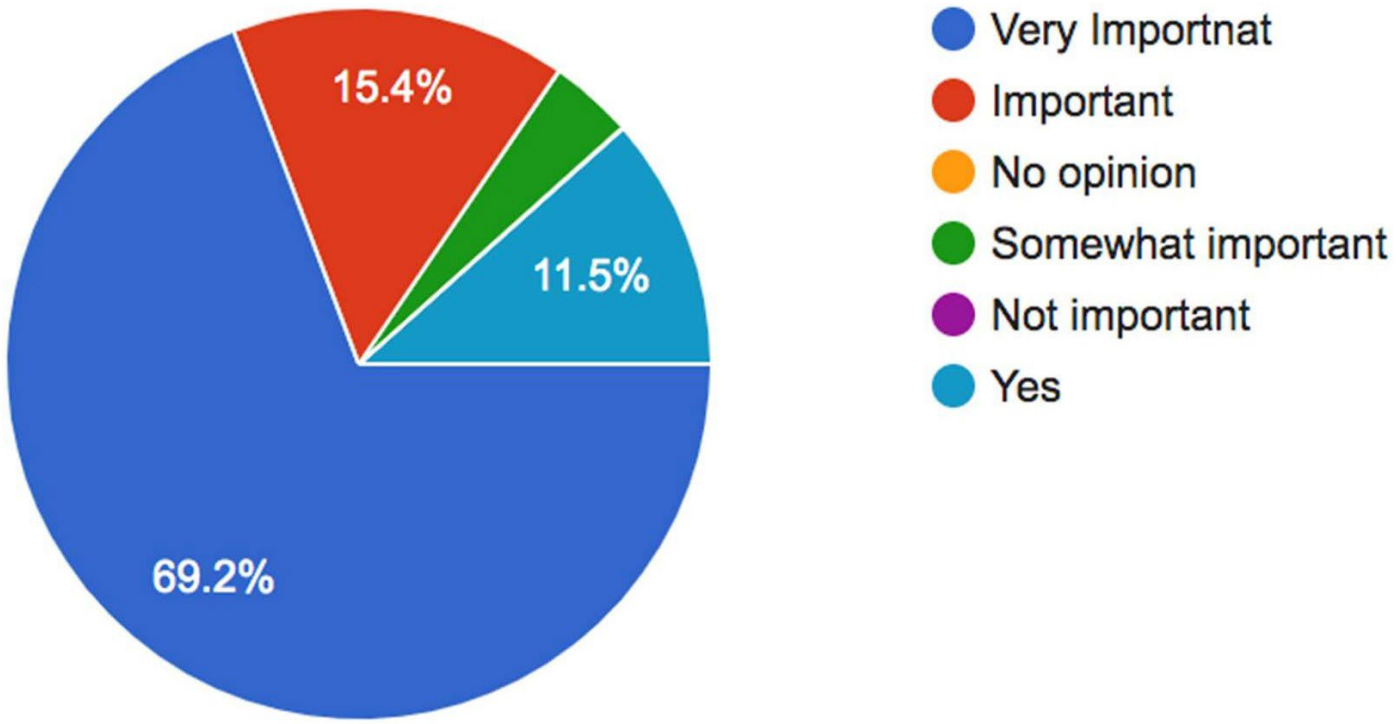
INTEGRATED SUSTAINABILITY

Commentary*

- Improved water supply boosts economy and lifts more out of poverty
- Results in increased productivity and
- Economy more resilient to external shocks such as rainwater availability
- Has to be a priority Water essential for life
- One of main development issues in the next decade
- Investment should target rehabilitation of aging water supply infrastructure
- Need significant reduction in NRW
- Water coverage insufficient especially in areas including some female headed households
- Demand not currently being met
- Needs to be given priority

- Affects all country's major earning sectors

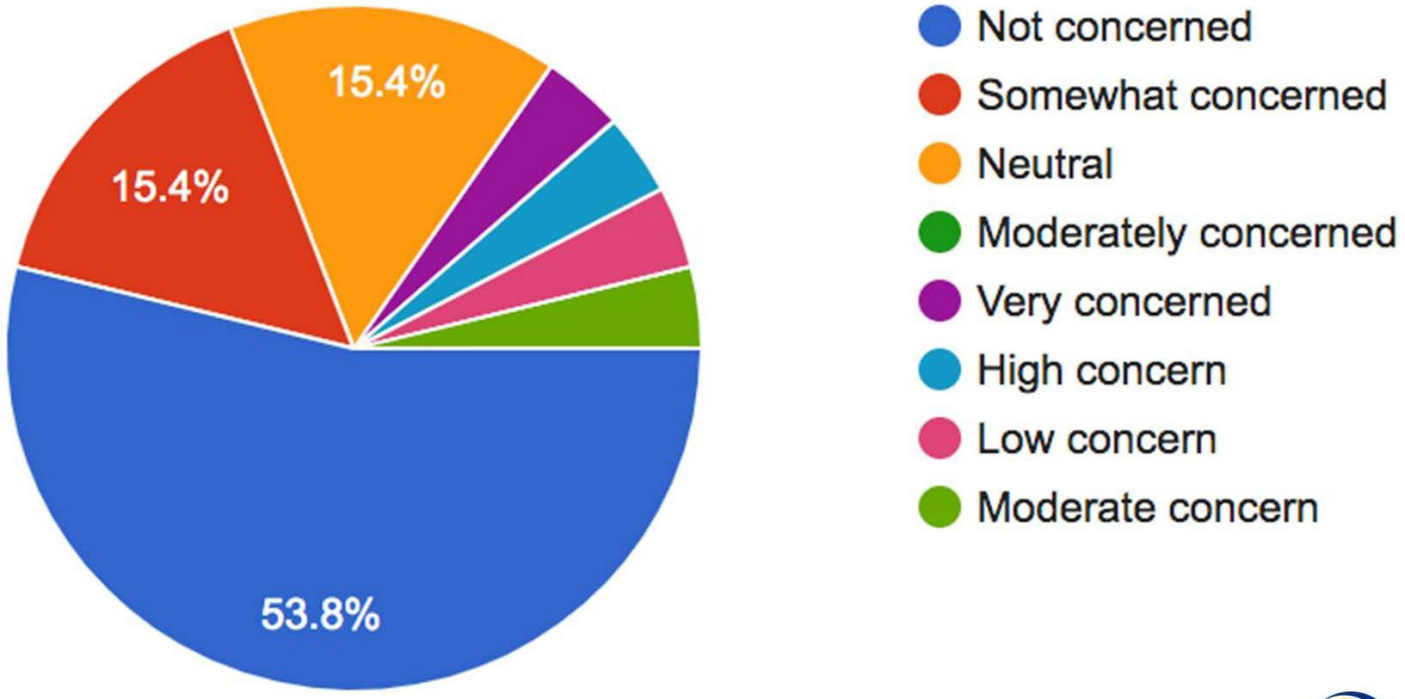
How important do you think it is for the government to invest more money to provide wastewater collection and treatment?


15.4%
11.5%
69.2%
Very Importnat
Important
No opinion
Somewhat important
Not important
Yes

Commentary*

- Contributes to Improved health
- Generates household savings
- Reduces national health budgets
- One of the main development solutions in the next decade
- Reuse is a no brainer
- Potential benefits ultimately outweigh all associated costs
- Protects groundwater quality
- Reduces wastewater discharges to the marine environment
- Increase quantity for non-potable use
- Investment direly needed

How concerned are you about using reclaimed and treated wastewater to satisfy non-potable (e.g. irrigation) water demands?

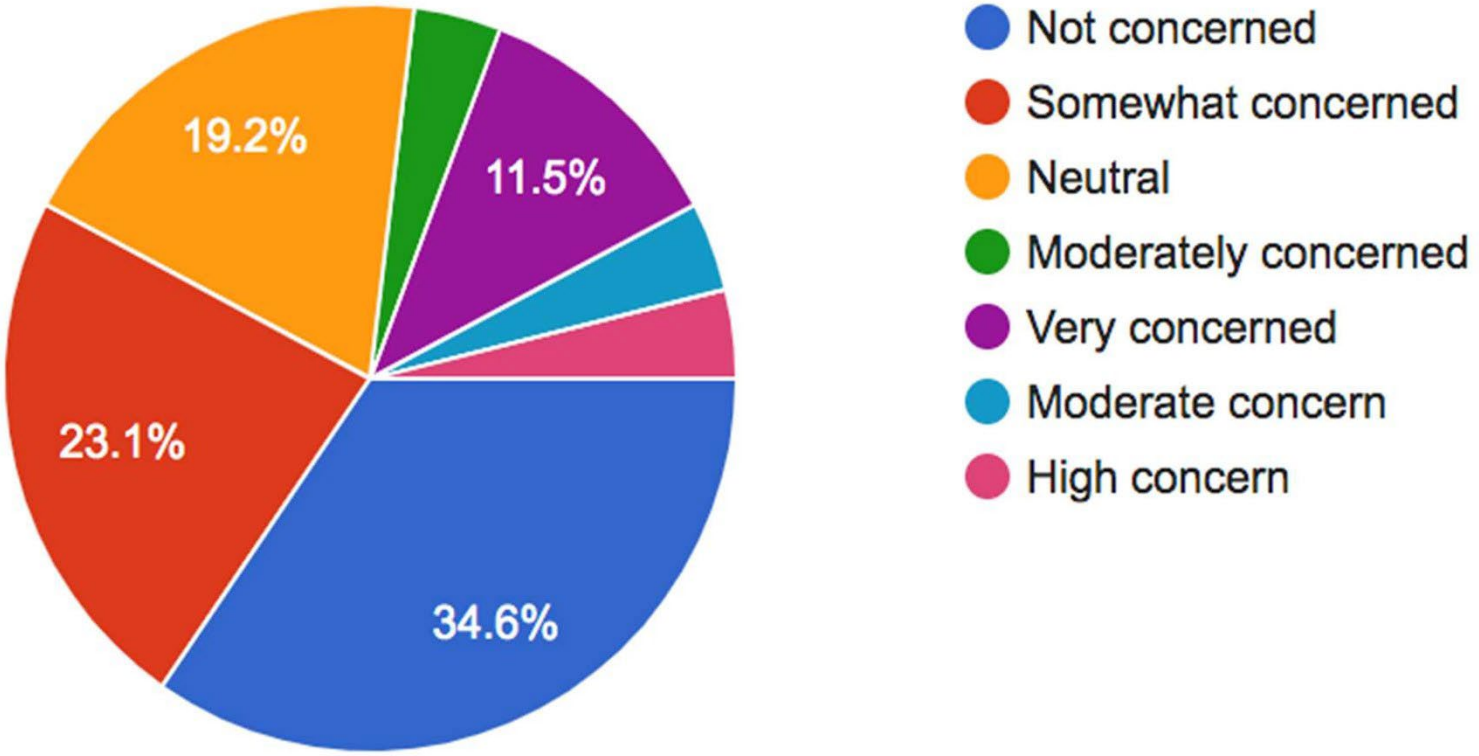


INTEGRATED SUSTAINABILITY

Commentary

- Highest quality water not required for irrigation
- No concerns
- Concern about health with use on items like raw salad
- Concern about wastewater being inhaled by people working on plantations
- Correct maintenance is critical
- It happens naturally - this would just speed up the process
- A no brainer- common practice
- Need public education or there could be problems
- Irrigation vital in the tourism sector- concerned there is an appropriate balance

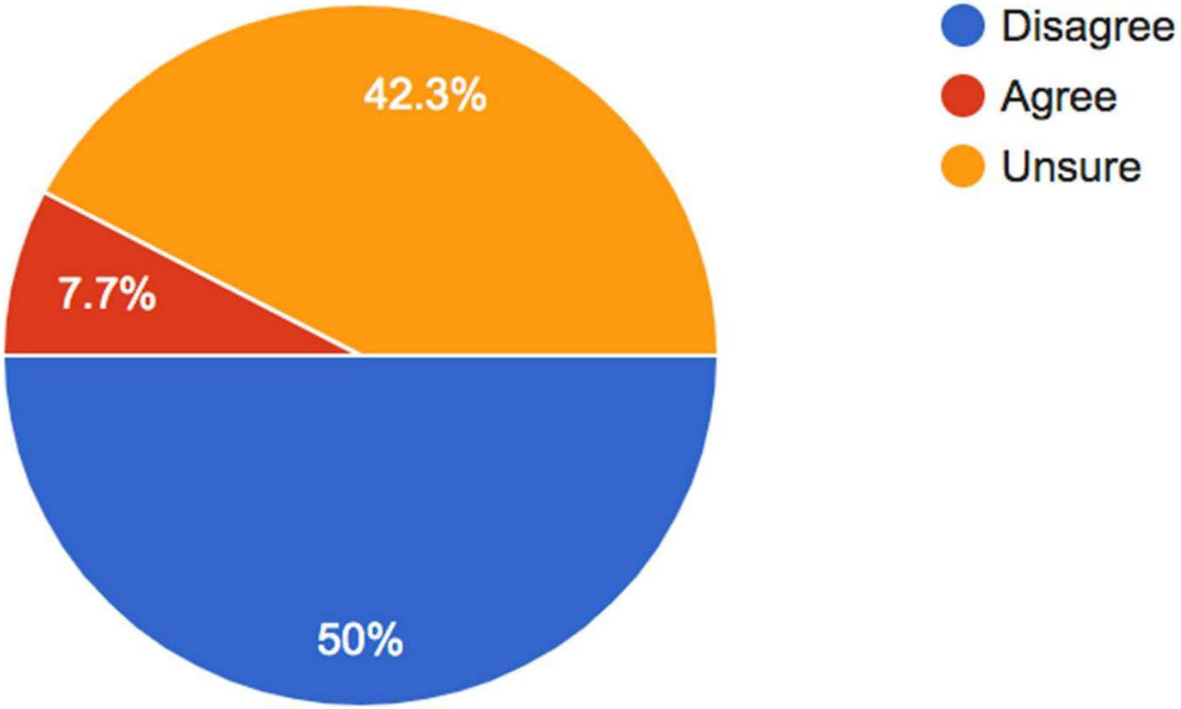
How concerned are you about using highly treated reclaimed and water to recharge groundwater?



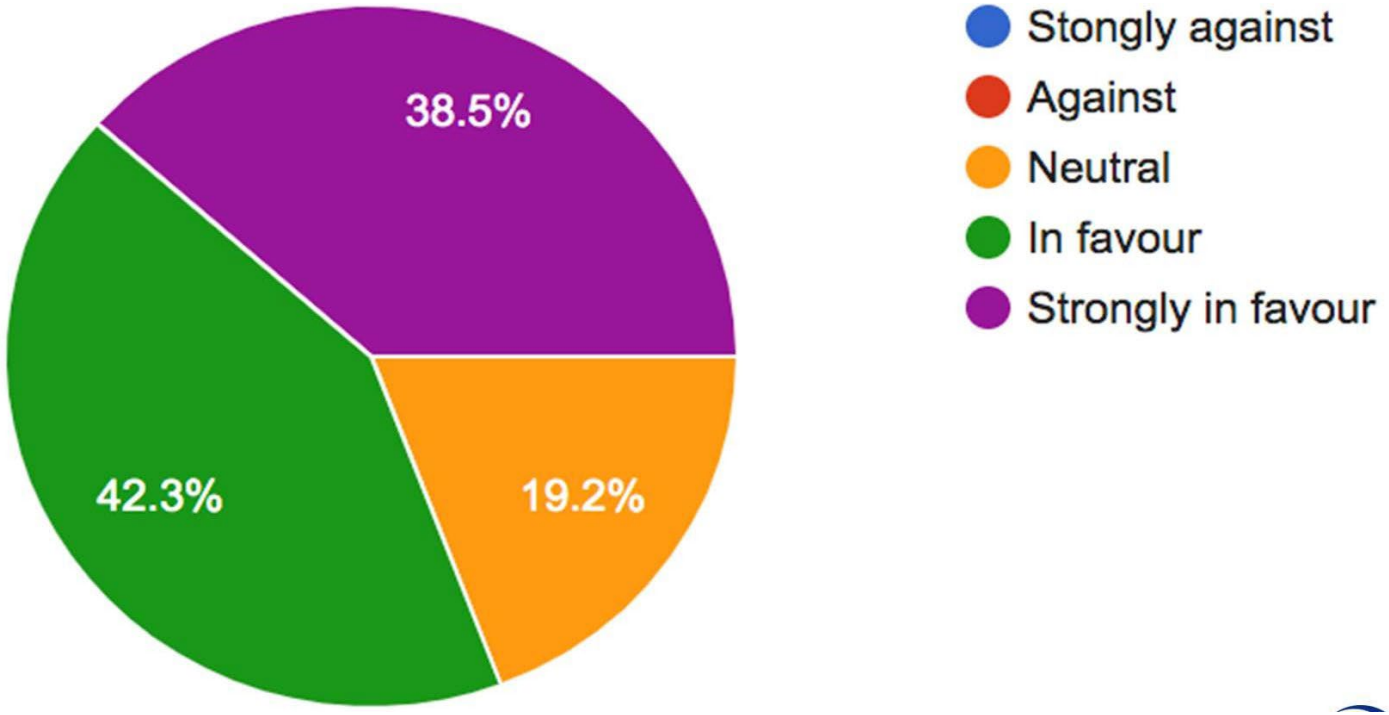
Commentary

- Skeptical as to how healthy it is
- Systems have to be well managed with regulations and enforcement top ensure no decline in groundwater quality
- May have negative health aspects
- Common practice
- Skeptical of the output quality
- Provided it is well treated

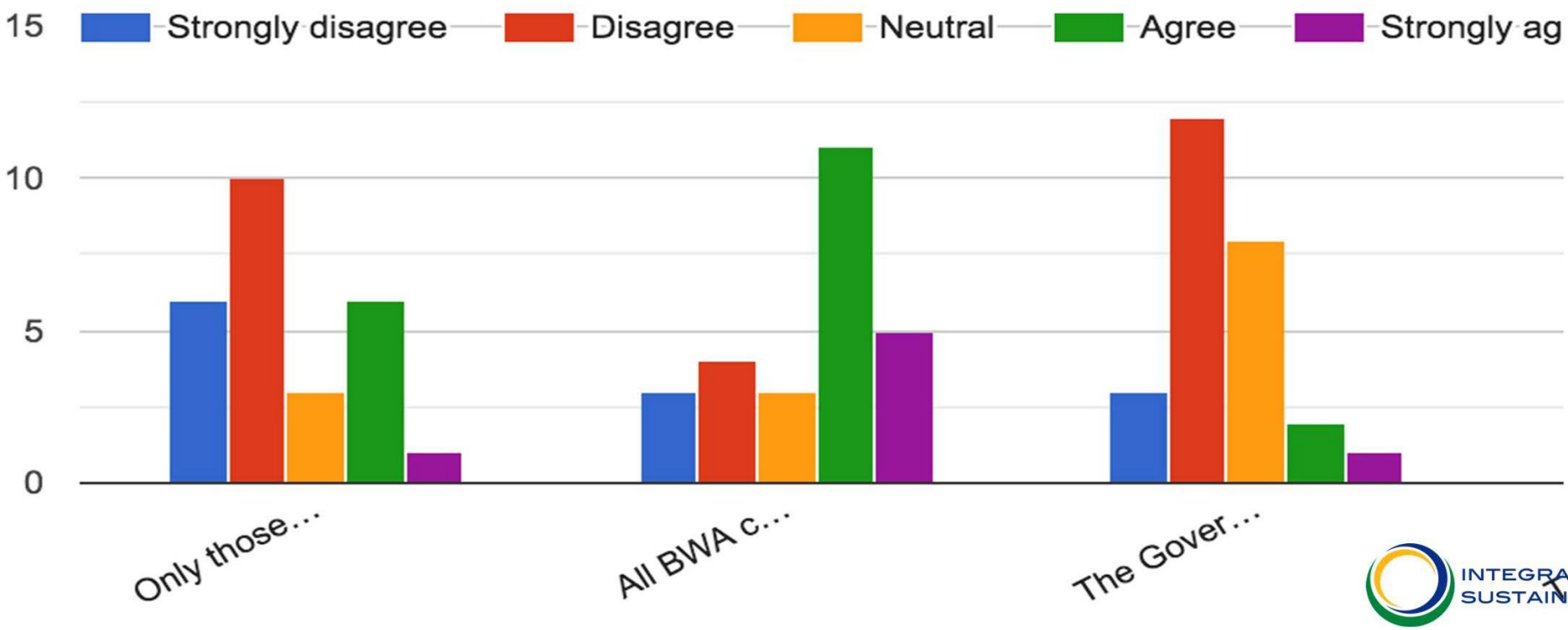
There are adequate government standards and regulations in place to safely enable reclaimed water to be used to satisfy non-potable water demands



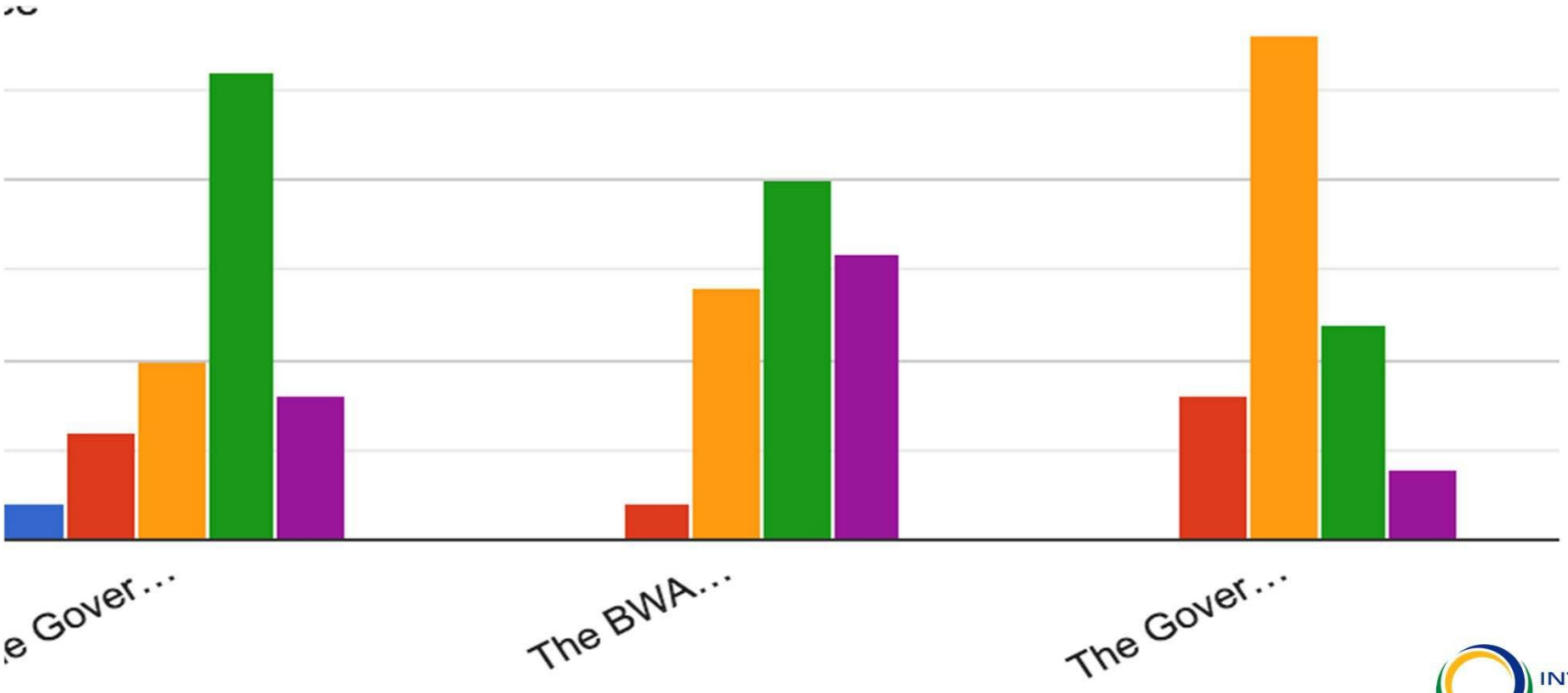
How much in favour are you of implementing treatment technologies to recover water, energy and nutrients from wastewater?



For each of the following statements please indicate how strongly you agree or disagree



For each of the following statements please indicate how strongly you agree or disagree



Final Comments*

- Water and wastewater utilities must be properly resources to avoid inefficiencies and potentially catastrophic events
- A crisis in water is a crisis for government and then the whole nation
- Most wastewater concerns are because of incorrect use of system (FOGs etc.)
- As well as engineering solutions must be penalties for misuse
- Wastewater only used for energy and nutrients not re-use
- Public must understand their role
- Need Full Cost of Service rates and tariffs not government subsidies

Consultancy to Produce Requisite Design, Studies and Plans – The 3R's for Climate Resilience Wastewater Systems in Barbados (3R Crew Barbados) Preparation Project

Stakeholder Engagement Workshop Minutes

Date: February 2nd 2021. Platform: Zoom

List of Attendees

Alex Harewood, CCCCC

Elon Cadogan- CCCCC

Donneil Cain, (CCCCC)

Kelly Hunte, CCCCC

Saudia Rahat, consultant with

CCCCC John Mwansa, BWA.

Allison Jordan, Finance Officer, Project Management Office, Barbados Water Authority Shelley Parris, Project Manager (ag.), Project Management Office, BWA

Brian Stuart; Barbados Water Authority, Wastewater

Division Michael Nicholls, Sanitation Service Authority

Charles Cyrus, Ministry of Innovation Science and Smart Technology César Jesus, NEMUS (Consultant for the ESIA)

Rean Gibson, Ministry of People Empowerment and Elder Affairs Ricardo Marshall Economic Affairs and Investment

Sandra Greenidge, Community Development Department, Ministry of Youth, Sports and Community Development, Barbados.

Mark Cummins, MTWW

Dr. Leo Brewster, Director Coastal Zone Management Unit, Ministry of Maritime Affairs and the Blue Economy

Michael Nicholls

Thora Lorde, Waste Management Coordinator, Project Management Coordination Unit, Ministry of Environment and National Beautification

Hugh Sealy, Special Advisor - GoB

Charles Marville, Consultant Integrated Sustainability Nick St-Georges, Integrated Sustainability

Troy Vassos, Technical Director / Senior Environmental Engineer - Integrated Sustainability

Valerie Jenkinson Consultant Integrated Sustainability

Summary of Presentation and Discussion

Dr. Troy Vassos from Integrated Sustainability delivered a PowerPoint presentation to the participants presentation outlining results from the Conceptual Report. Following his presentation, the slides of which can be found in the Stakeholder Engagement Report, the floor was open fordiscussion.

Following the discussion of the Report Findings, Valerie Jenkinson presented the questionnaire results. She requested that comments and questions be submitted in the chat box due to time constraints. These comments are added to the commentary in the questionnaire results section of the Stakeholder engagement Report. Ms. Jenkinson requested that participants look at the Stakeholder Matrix, which outlines influences and challenges, that had previously been sent to them. She asked for any changes to the matrix be sent to her.

Summary of Q&A Topics

- More linkage was requested between the effect's climate change has had on Barbados and wastewater and managing wastewater.

- The impacts of climate change on ground contamination and water use will be more expensive than in a community that does not have to take climate change into consideration. This was stated as a key link.

- Sea level rise and storm surges as well as rainfall must be addressed especially as both wastewater plants are located in low lying areas.

- Although Barbados has been collecting rainwater for both residential and commercial building since 1996, the challenge is current legislation speaks to re-use as secondary and is not utilized in the best manner or put to good use.

- The Ministry of Transport and Water Resources is looking at the possibility of having retention ponds to collect stormwater and re-charge aquifers. Could CCCCC help in both the financial area and in technical support.

- It was recommended the Consulting team review the report from the Adaptation Measure to Counter Effects of Climate Change project. This study revised the Stormwater
  Management Plan for Barbados. It looks at the intensity and duration of rainfall, ways in which stormwater is managed, specifically it referenced the size of channels and the volume that could be handled through those channels and made recommendations for improvement.

- The importance of showing the effect of what this project proposes on the carbon footprint was suggested

- With reverse osmosis being very energy intensive it was asked what type of technology to offset carbon footprint should be included?

- It was stated policies need to be strengthened, It was asked whether recommendations for policy and education can be addressed for funding proposals.

- Tariffs could be set up to consider the new climate change regime. Part of tariffs should go into a fund for disaster relief and infrastructure rebuild.
- What systems could be put in place regarding policies, manuals, and operation plans.

Dr. Vassos addressed each question and concern and stressed that this Conceptual Report was not the final report. Concerns mentioned would be addressed in the Feasibility Report to come.

On behalf of CCCCC, Dr. Cain thanked the participants for making the time to attend the workshop, especially with the challenges presented by COVID. He outlined the next step in the project would be the submission of the Conceptual Design Report next Monday. This will be shared with BWA who may pass on to any stakeholders for feedback. After consultation with the stakeholders will be the Feasibility Study. He also informed participants that the Willingness to Pay Study Questionnaire is being sent out and encouraged people to fill it out themselves and encourage others to do so.

Appendix 3 Questionnaire Report

Questionnaire Report

As part of Stakeholder Engagement the Consulting Team developed a questionnaire to be administered to key stakeholders in Government Ministries, the private sector, community associations, the University of the West Indies Gender Studies Department and NGOs. A list of invitees is presented in Addendix? of the Stakeholder Engagement Report. In total, the survey was sent by email to 49 key stakeholders. Obtaining responses was challenging. Two reminder emails were sent followed by a up to 3 phone reminders. The link to the survey was also resent at that time. Total responses after these efforts were 24. The Consulting Team thanks those who were able to respond.

The general public were not included in this questionnaire but will be part of the Willingness to Pay survey.

The objectives of the quesitonnaire were to solicit opinions on the following:

- What are the perceived impacts of climate change on the water/wastewater sector
- What are the priorities for the water/wastewater sector
- Protection of the environment in regards to wastewater and the effects of wastewater effluenrt
- Concerns of the effects of climate change on the quality and quantity of water in Barbados
- The effect of wastewater effluent on groundwater
- Concerns regarding the cost climate change impact on the cost of wwastewater treatment and water tratment and availability
- The impact to the economy of Barbados
- The costs of wastewater treatment and who should pay
- Wastewater re-use

It should be noted that some respondants did not complete every question.

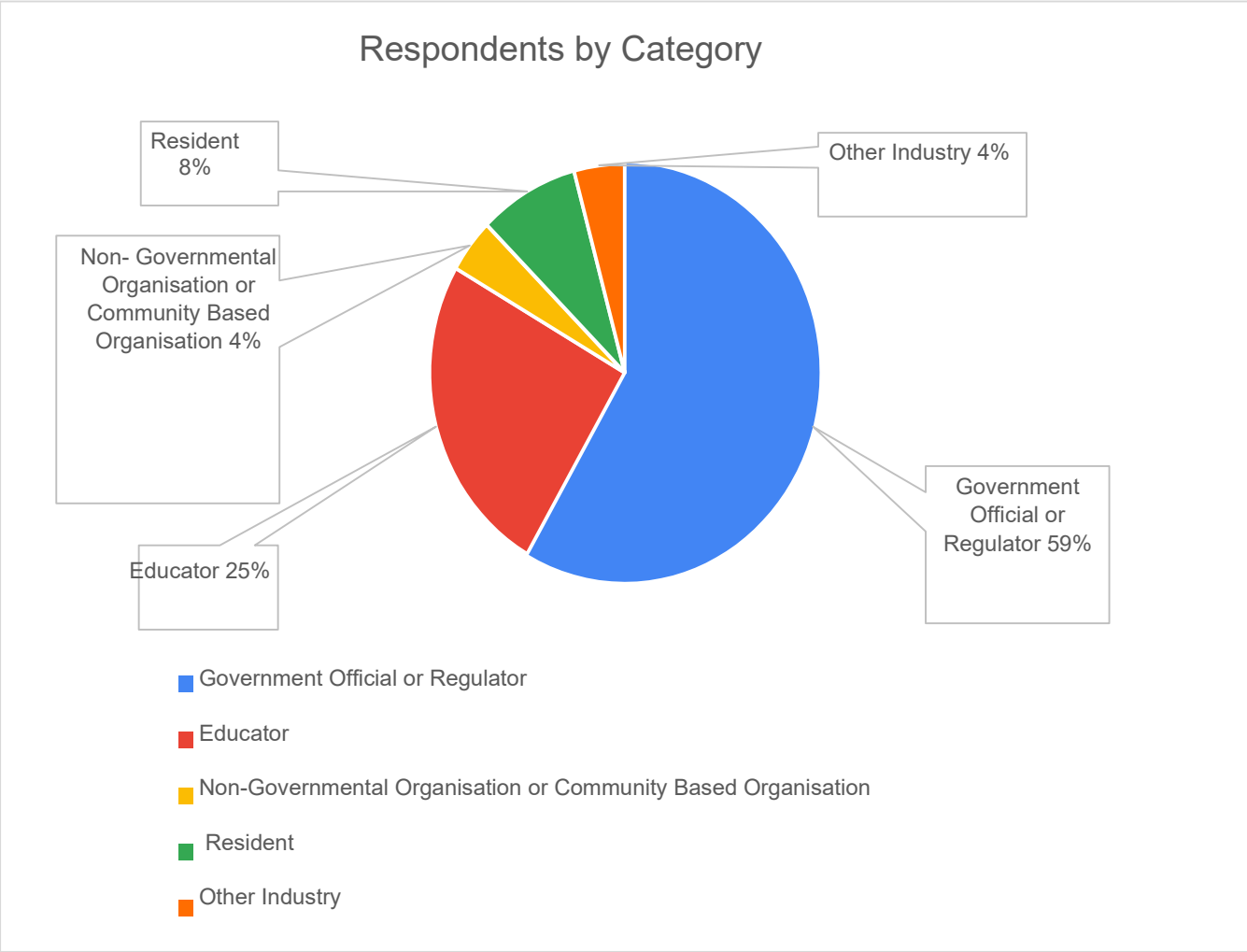
On certain questions respondants were asked to provide commentary. These comments were summurized and are included in the analysis. In the subsequent Stakeholder Engagement Workshop for the key government stakeholders participants were asked to add any further comments. Although few, these have been added to this report.

As noted the majority of the respondant were civil servants (~60%) who have some administrative connection and responsibility for the provision of wastewater management services. Their responses may be interpreted as reflecting current thinking among this group though not necessarily 'political thinking'. Looking at the responses in broad, it does suggest that there is an important body of support for changing the way wastewater services are provided and managed.

General

Question: Which of the following categories best descrtibes you?

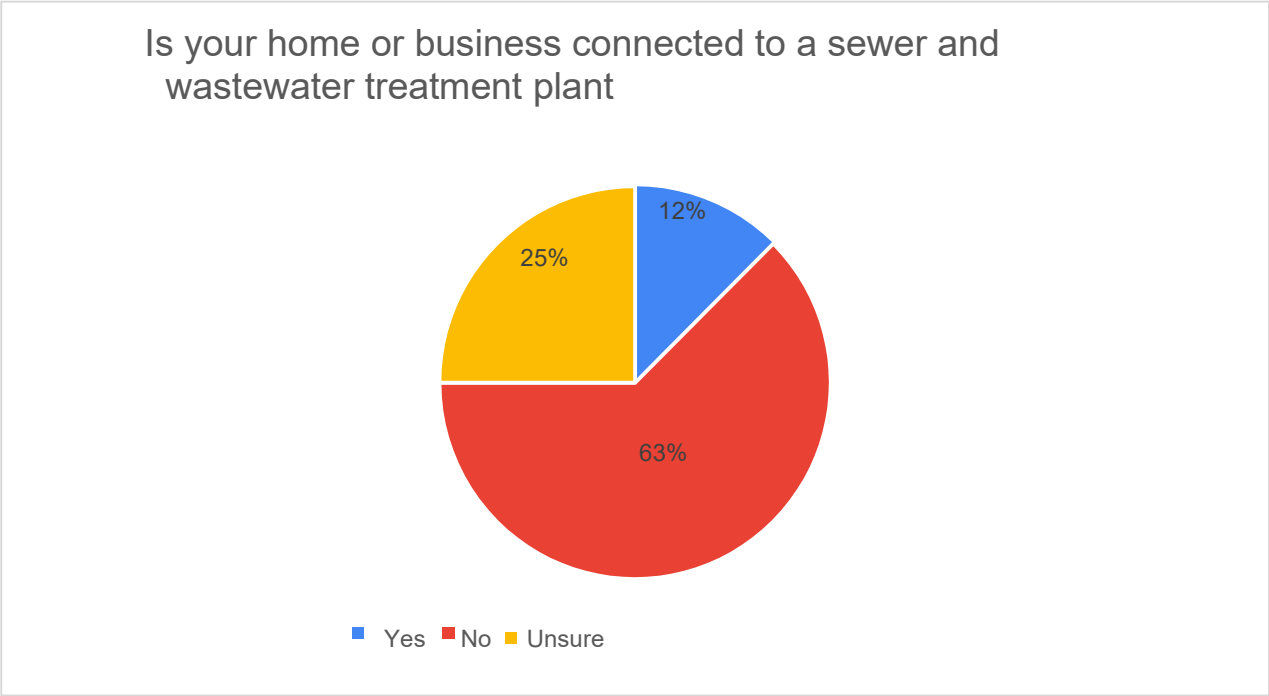
Respondants were primarily government officials or regulators. This is expected as the majority of key stakeholders to whom the invitation was sent were in this category. However, responses were received from a broad sector though they should not be interpreted as reflecting the views of other than a select group of persons.



Questionnaire Report

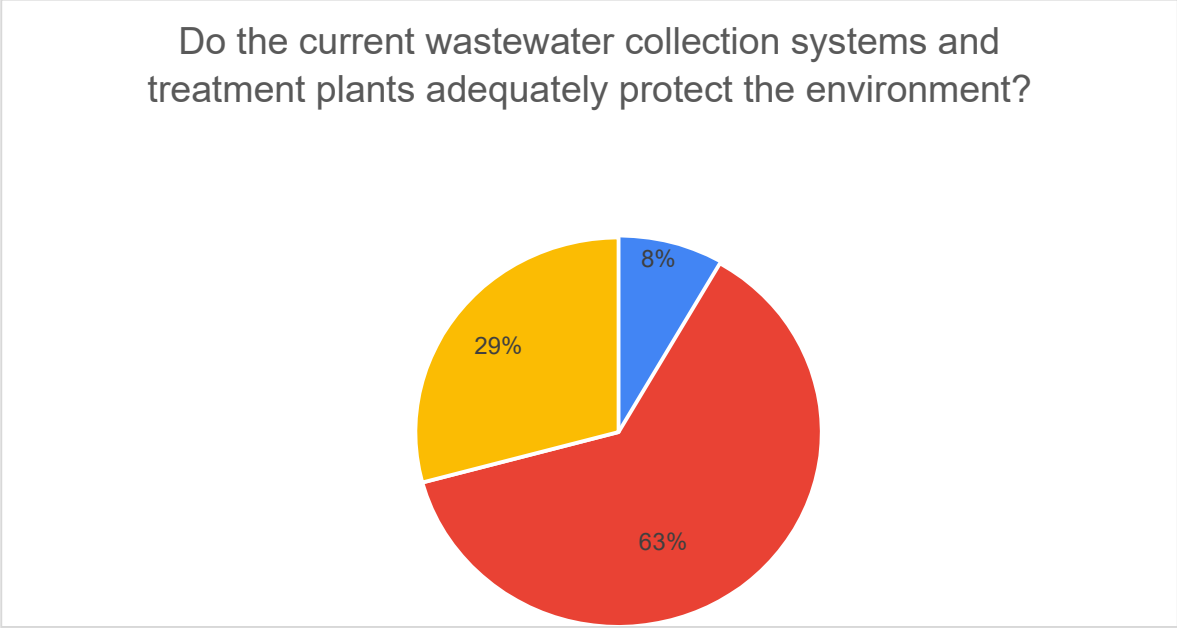
Question: Is your home or business connected to a sewer and wastewater treatment plant?

The majority of respondents (63%) were not connected with only 12% stating they were connected. A large number (25%) were unsure. This broadly reflects the situation in the country as a whole.



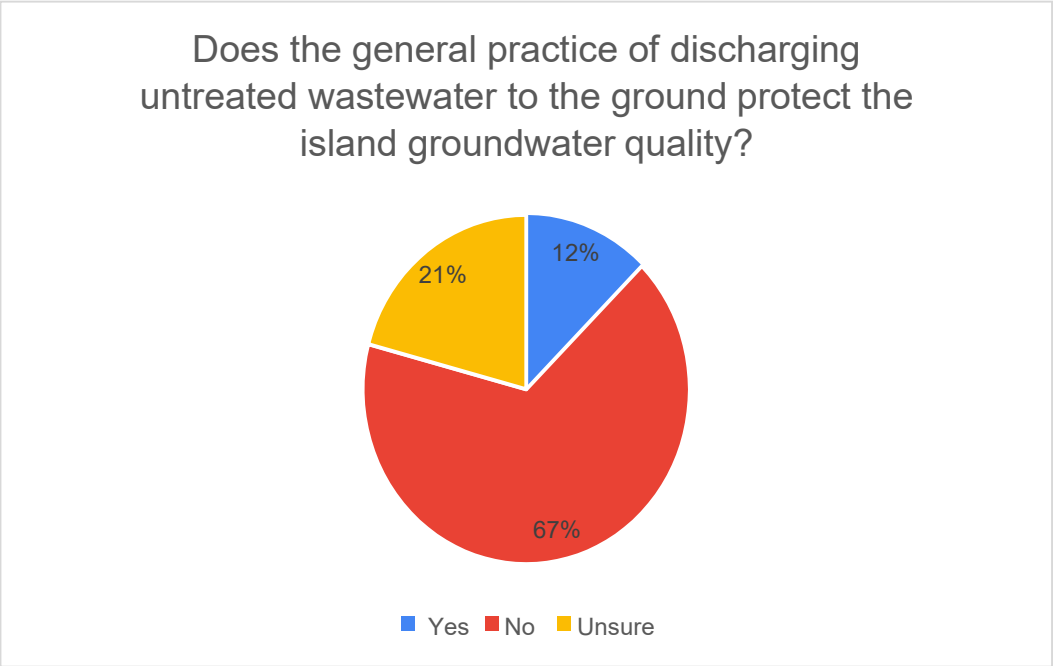
Question: Do the current wastewater collection systems and treatment plants adequately protect the environment?

The majority of respondents (63%) feel that the current systems do not protect the environment. With 29% stating they were unsure. Only 8% felt the environment was adequately protected.



Question: Does the general practice of discharging untreated wastewater to the ground protect the island's groundwater quality?

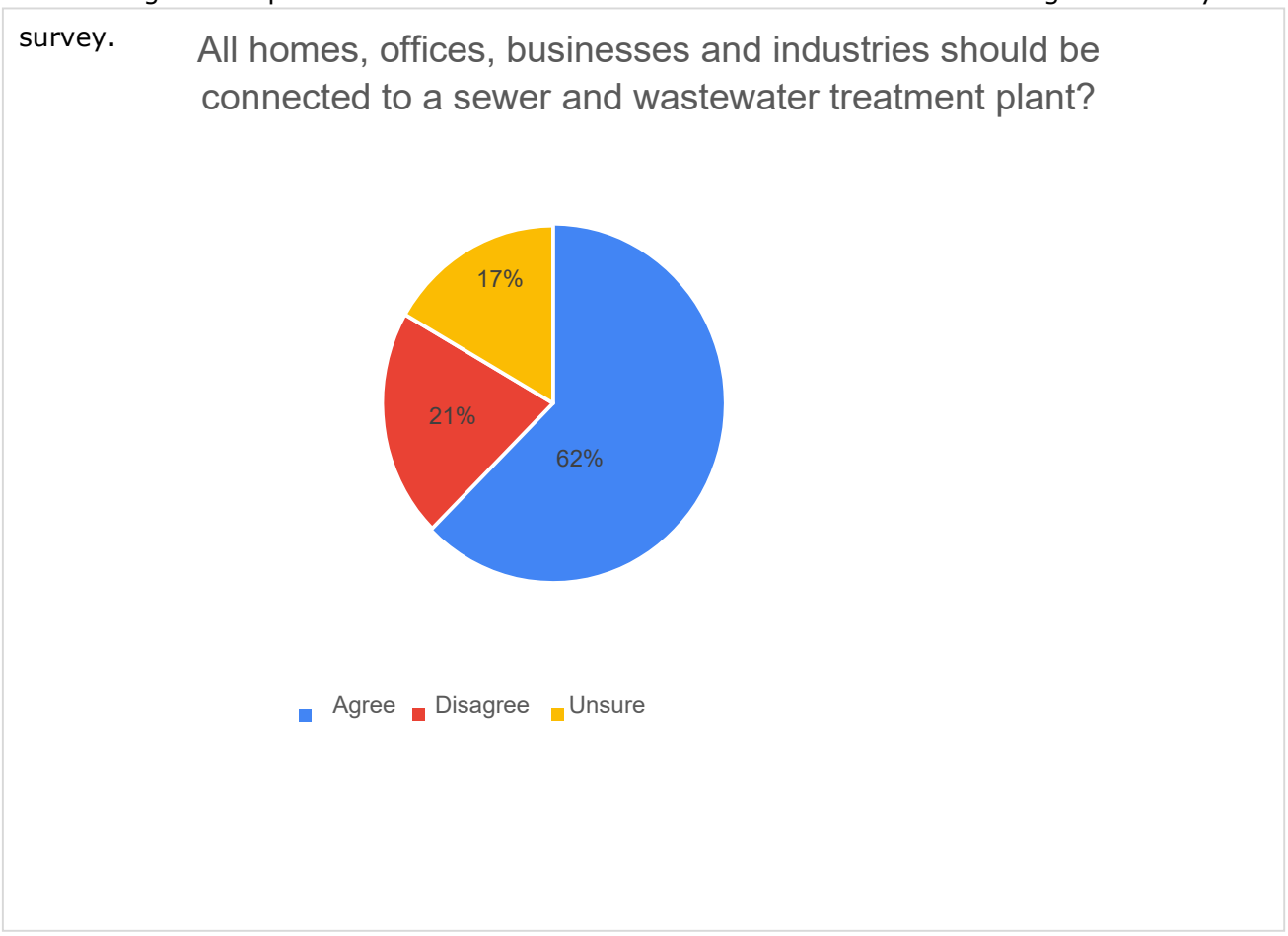
As in the last few questions a large number (21%) were unsure. However, similar to the last question as to whether the systems protect the environment a significant majority, (67%), who expressed an opinion stated discharging untreated wastewater did not protect the environment.



Question: All homes, offices, businesses and industries should be connected to a sewer and wastewater treatment plant?

A majority of respondents (62%) agreed that connection to a sewer or wastewater treatment plant should be universal. Fewer respondents (17%) were unsure and 21% disagreed. Taken together

these three questions suggest a degree of unease with the current situation and among an important grouping and a degree of tacit support for exploring alternatives. It will be interesting to compare this outcome with that to be derived from the Willingness to Pay survey.



Concerns

Respondents were asked about their level of concern on a number of questions. Many of the questions related to the effect climate change might have related to water and wastewater. A pattern can be seen in the responses in that concerns were focused on the potential impact climate change might have on water availability; this can be in the answers to the questions concerning availability, quantity and quality of water. Nearly 90% or respondents were either very or moderately concerned. The question regarding potential impact on the economy may be related to questions of availability whereby less availability would adversely impact the performance of the economy. It is clear from the supplementary explanations that concern is focused on the potential impacts firstly on tourism being as it is a major part of the economy and secondly impact on food security was mentioned also. It is of interest to note that even when the impact on health was brought up that this too was linked to tourism. Other more general concerns were mentioned.

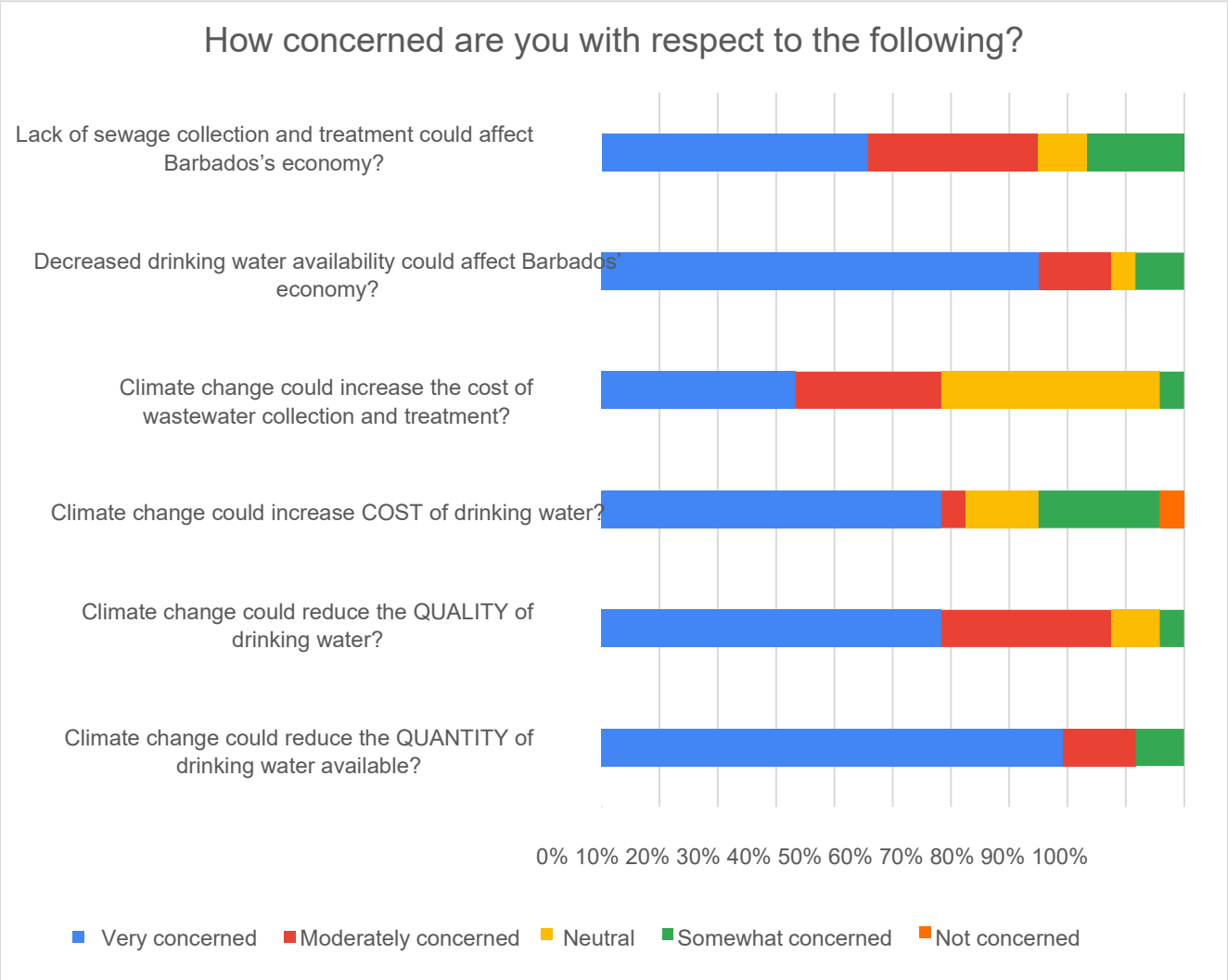
In contrast there was a lesser degree of concern regarding cost related matters, ~60% were very or moderately concerned. An interesting difference though is that in the case of potable water, there were a higher percentage (almost double) who were very concerned with cost as compared to the cost impact on wastewater – it would be instructive to explore the reason for this difference. The supplementary questions where respondents were invited to comment provides some insight into the reasons behind the responses regarding cost concerns. There is an acknowledgement that costs may well have to rise because of the need for additional treatment or increased scarcity, and there were social concerns as well. However, it was also noted that the cost of water at present is low.

Question: How concerned are you that the lack of sewage collection and treatment could affect Barbados's economy?

The largest concern with 80% of respondents indicating they were very concerned that climate change will reduce the quantity of drinking water. This is followed closely by 74% of respondents indicating a they are very concerned that decreased water availability could affect Barbados' economy. This is not surprizing given the dependence of Barbados on the tourism sector.

58% of respondents are also very concerned that climate change will also reduce the quality of drinking water as well as the same percentage being very concerned that climate change could increase the cost of drinking water.

Of less concern and important to the study the Consulting Team has undertaken is less people are concerned with the lack of sewage collection and treatment could harm Barbados' economy (45% very concerned). Also, only 34% of respondents rated climate change affecting the cost of wastewater collection and treatment as very important. This is not to say they are not concerned as rating these factors as of moderate concern was a further 30% and 25% respectively. Both water and wastewater are of concern to respondents but as is typical the concern over water availability is greater than wastewater.



Respondents' comments

- Grey water will not be reused and more domestic supply used, negatively affecting conservation and recycling
- Most persons have on-site disposal facilities
- Can lead to major environmental and public health disasters leading to impact on tourism (South Coast situation)
- Destroy Barbados image as a premier tourist destination
- Can result in:
    - Extensive pollution
    - Increase in rodents
    - Negative health impacts
    - Social and economic issues
    - Impact on women as water managers and caregivers
    - Impact on coral reefs

Question: How concerned are you that decreased drinking water availability could affect Barbados' economy?

Respondents' comments

- High quality potable water a major marketing pillar for tourists
- Possible closure of schools and businesses
- Unsanitary health conditions
- Possible socio-economic stresses and imbalances resulting in reduced national productivity and efficiency
- Water scarcity can lead to:
    - Food shortages
    - Hinder trade impacting tourism

- Eventually cause civil unrest
- Direct impact on rain fed and irrigated agriculture and livestock
- Indirect impact on food processing industries
- Businesses faced with higher costs and long-term viability with costs passed to consumers

Question: How concerned are you that climate change could increase the cost of wastewater collection and treatment?

Cost of wastewater treatment and collection was not nearly as important to respondents Respondents' Commentary

- Increasing demand for component will drive prices up
- Flash floods further drive need for upgrading treatment plants to handle volume
- Cost most likely to increase as much of the island is not connected to the wastewater system
- Infiltration will require higher treatment to meet irrigation standards
- Need to mitigate against storm surges which climate change will increase
- Concern for the country, if connection is not mandatory I'm not concerned as an individual

Question: How concerned are you that climate change could increase the cost of drinking water?

- Costly technology, need for desalination, reuse of reclaimed water will be more expensive
- Lead to tariff increases
- Not in our control
- Water is currently undervalued
- An essential commodity may be out of reach for the average working class person leading to exploitation

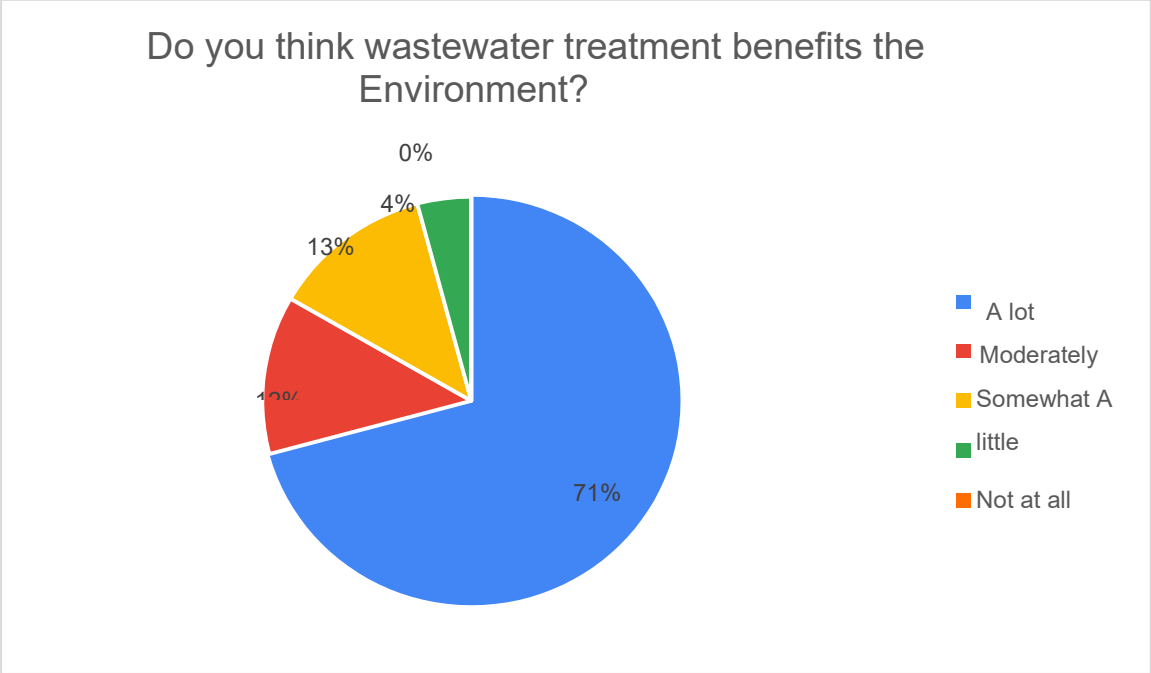
Questions: How concerned are you that climate change could reduce the QUALITY and QUANTITY of drinking water?

There were 18 comments in all each of which reflected that the situation was not good now and climate change would have further negative impacts on quality and availability The comments are summarized into the following categories.

- Climate change may lead to decrease in water availability
- Possible water shortages leading to cutting off the system as on other Islands
- Climate change impact on ground water availability and predictions this will worsen
- Increased salinity affecting water quality and groundwater recharge
- E.g. water shortages, increased salinity plus
- impact on health
- Reliance on bottled water as in other islands

Question: Do you think wastewater treatment benefits the environment?

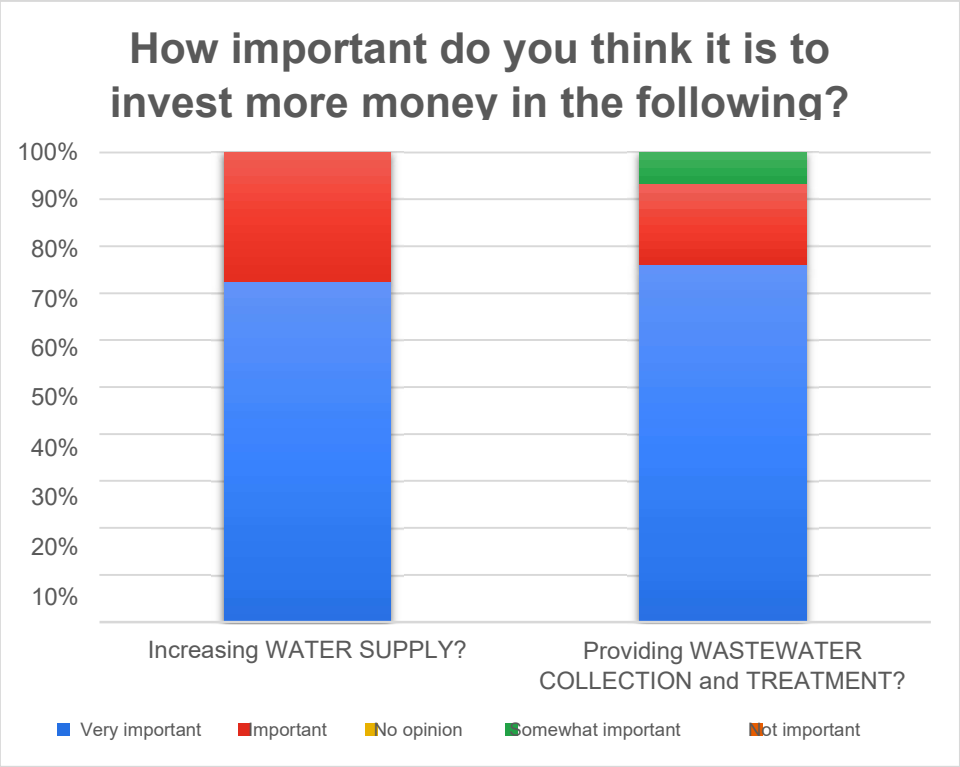
Overall 96% of respondents think that wastewater treatment benefits the environment.



Question: How important do you think it is to invest more money in the following?

Respondents overwhelmingly believe that it is important for the government to invest more money in the water supply and wastewater services. This corresponds with concerns that water availability is very important to the economy of Barbados and that current practices are not benefiting the environment.

What is of interest in the responses to this question is, whereas 100% of respondents rated the importance of investing more money in water supply as either important or very important, wastewater slightly edged water supply as being of highest importance



Respondents' comments

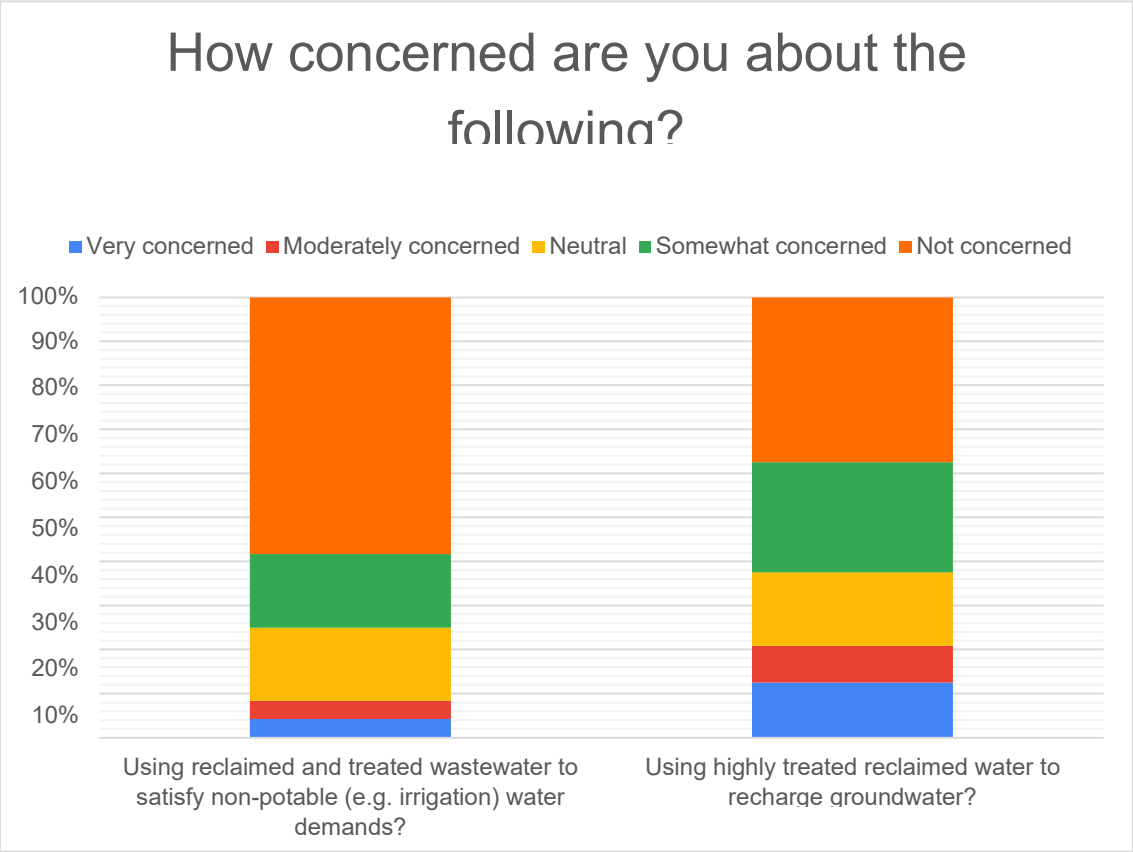
- Improved water supply boosts economy and lifts more out of poverty
- Results in increased productivity and
- Economy more resilient to external shocks such as rainwater availability
- Has to be a priority Water essential for life
- One of main development issues in the next decade
- Investment should target rehabilitation of aging water supply infrastructure
- Need significant reduction in NRW
- Water coverage insufficient especially in areas including some female headed households
- Demand not currently being met
- Needs to be given priority
- Affects all country's major earning sectors

Reclaimed Water

There were two questions about the use of reclaimed water. The first was on the use of highly treated reclaimed water used to recharge aquifers and the second to satisfy non-potable demands.

As can be seen on the chart below there is very little concern amongst respondents for using reclaimed water for the use for non-potable demands with very few stating a very or moderate level of concern. There was slightly more concern for the use of reclaimed water for recharging groundwater with a majority of people stating they were not concerned or only somewhat concerned.

It should be noted that, although in the minority, 9 0f 24 respondents indicated they were neutral, moderately or very concerned about the use for the re-charging of groundwater. As these are key stakeholders ,some of whom in their comments indicated they were sceptical of its safe use, this is a topic that will need addressing. Education of the safety of reclaimed water, treated to regulatory standards, should form part of the communication plan to engage



with those who may have concerns, particularly if there is a greater degree of scepticism among the general public.

Question: How concerned are you about using highly treated reclaimed and water to recharge groundwater?

Comments

- Skeptical as to how healthy it is
- Systems have to be well managed with regulations and enforcement top ensure no decline in groundwater quality
- May have negative health aspects
- Common practice
- Skeptical of the output quality
- Provided it is well treated

Comments from Stakeholder Workshop

Development of dual-reticulation systems being considered under the GOB approved water reuse policy

The Water Reuse Policy 2018 makes accommodation for water reuse.

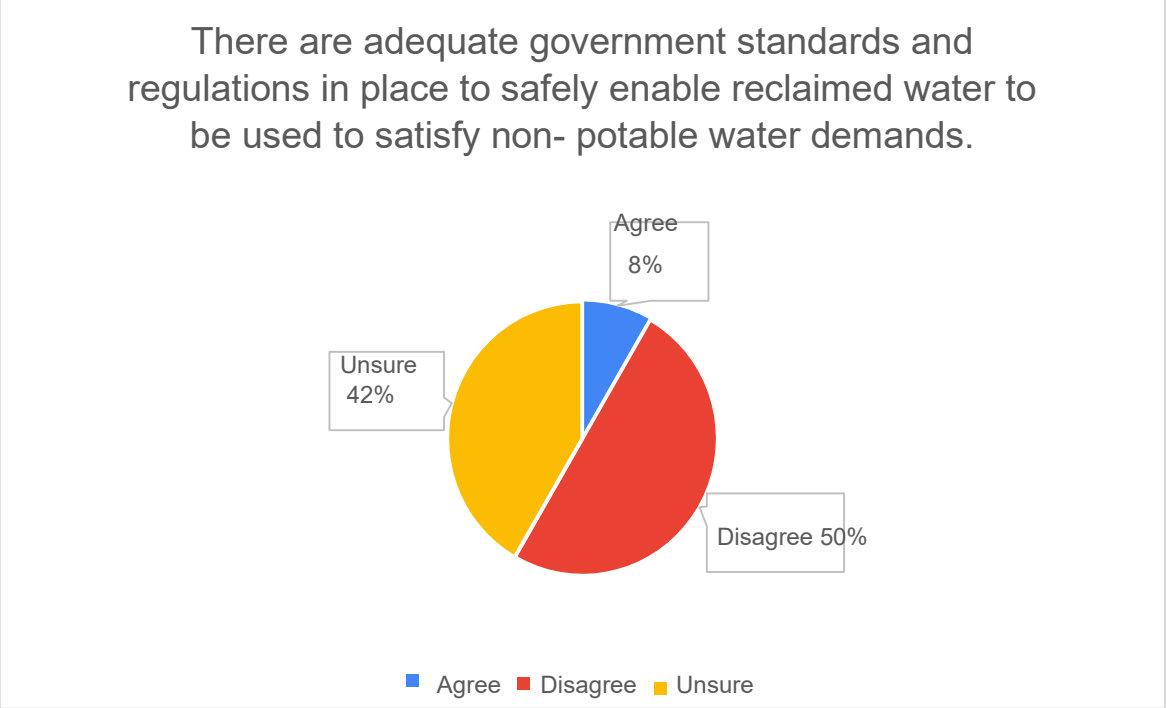
Question: How concerned are you about using reclaimed and treated wastewater to satisfy non- potable (e.g. irrigation) water demands?

Comments

- Highest quality water not required for irrigation
- No concerns
- Concern about health with use on items like raw salad
- Concern about wastewater being inhaled by people working on plantations
- Correct maintenance is critical
- It happens naturally - this would just speed up the process
- A no brainer- common practice
- Need public education or there could be problems
- Irrigation vital in the tourism sector- concerned there is an appropriate balance

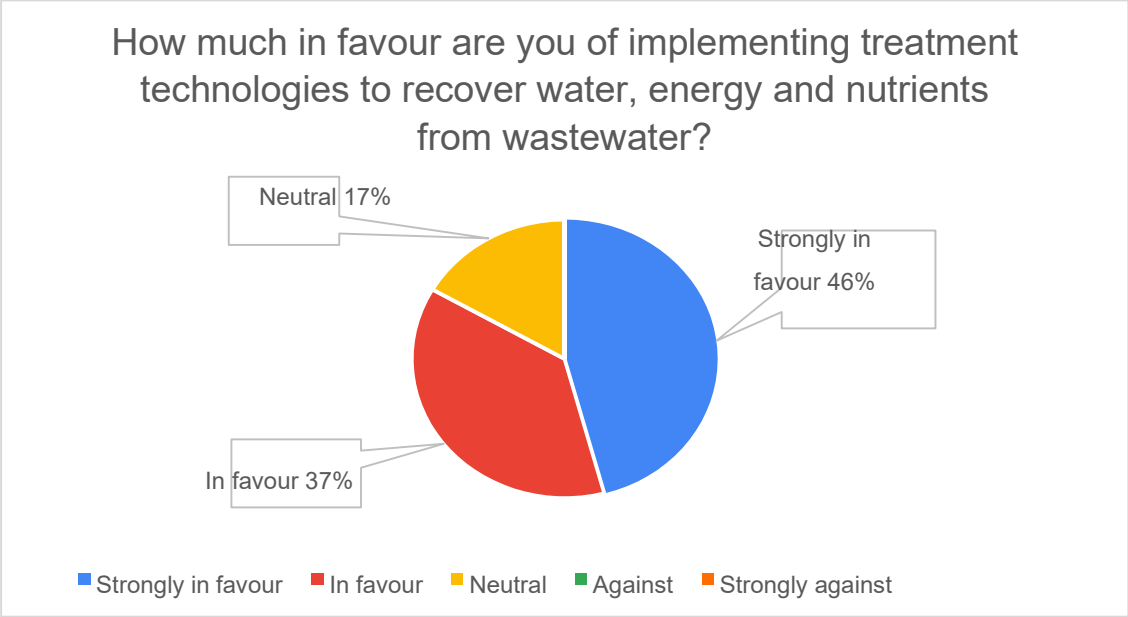
Question: There are adequate government standards and regulations in place to safely enable reclaimed water to be used to satisfy non-potable water demands.

Only 8% of respondents stated they believed there are adequate government regulations to govern reclaimed water use with 92% either disagreeing or unsure. One comment about reclaimed water in a previous question stated that using reclaimed water was not a concern as long as it was treated to standards. The responses suggest that whilst there is support in theory for some form of wastewater reuse with appropriate treatment, there is a clear consensus among this group of respondents that the practical aspects are a long way from being addressed. If that is the case among what may be called a relatively well informed group, then when it comes to the general public the challenge will be even greater in convincing them of the efficacy of reuse. Not only should standards and regulations have to reflect Best Practices but a critical component will be on testing and enforcement.



Question: How much in favour are you of implementing treatment technologies to recover water, energy and nutrients from wastewater?

Eighty three % of respondents are either strongly or in favour of implementing treatment technologies to reclaim water, energy and nutrients from wastewater. No respondent expressed they were either against or strongly against.

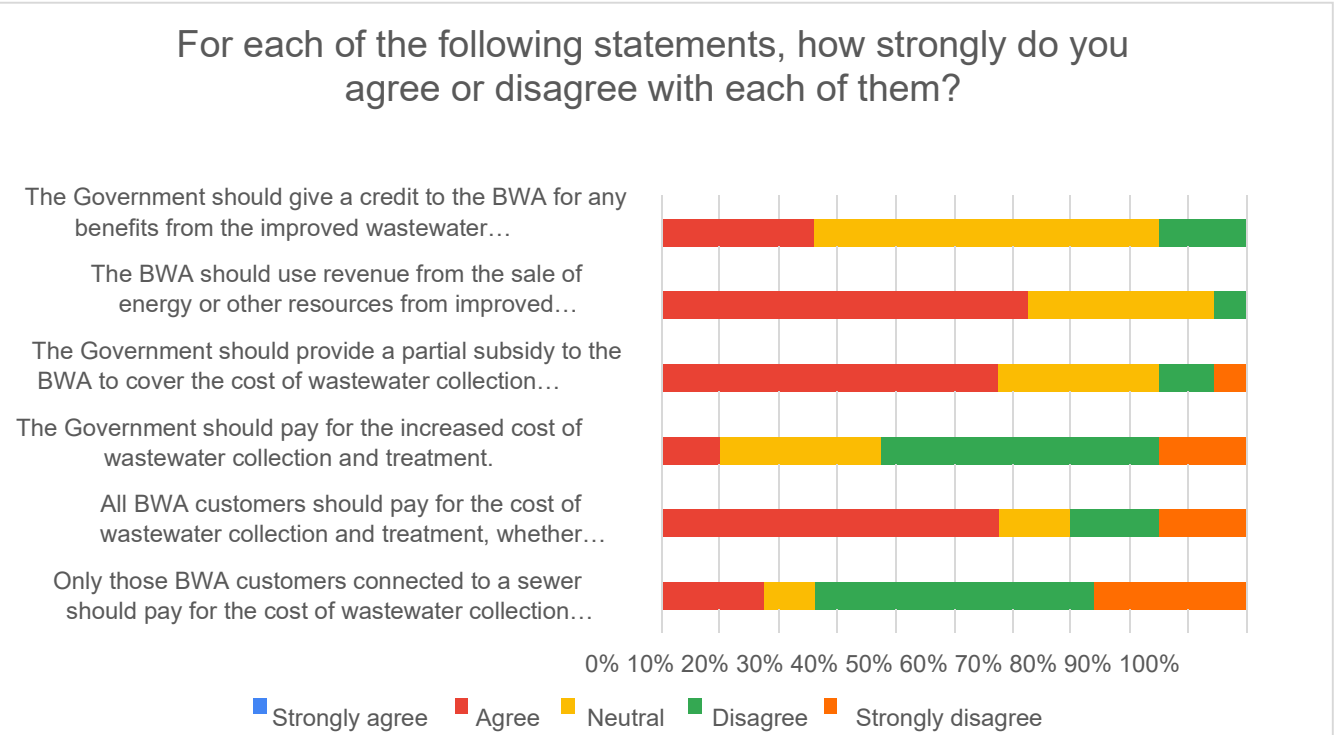


Who Should Pay?

Respondents were asked how strongly they agreed or disagreed with a number of statements regarding who should pay for increased treatment/service as shown in the following chart.

The responses indicate that there is support ~ 60% agree, for a mix of financing options that spread the cost between all BWA customers and cross-subsidisation whether in the form of targeted government support or internal cross-subsidisation within BWA – should they have the ability and opportunity to generate addition revenue streams. There is a clear feeling that reliance on forms of government subsidy would not be the best option; ~25% in one case (credit) and less than10% in the other (subsidy). There is also a clear agreement against the proposition that only those connected should pay. However, a degree of caution needs to be exercised over these question, given that 25% of the respondents work for BWA, which may well have skewed the results.

These results from key stakeholders can be checked against the opinions of customers in the Willingness to Pay survey.

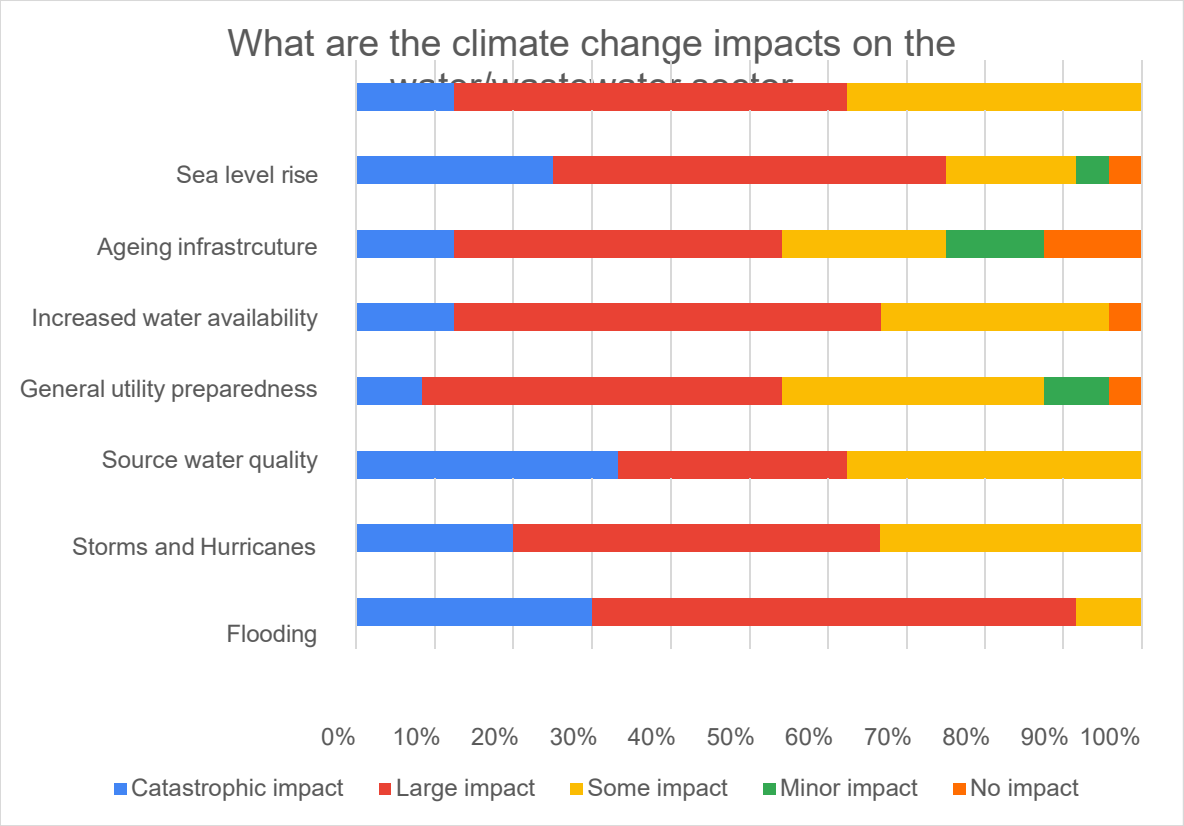


Question: What are the climate change impacts on the water/wastewater sector?

In descending order of priority, adding together catastrophic and large impacts, respondents rated thefollowing:

1. Drought
2. Aging infrastructure
3. Flooding
4. Sea level rise
5. Storms and hurricanes
6. Increased water availability
7. Source water quality

If one only looks at the highest ratings that have a catastrophic impact the three natural disasters alongside aging infrastructure still take the highest rankings. Contrasting these responses with those from th earlier questions regarding the impacts of climate change it can be seen that whereas in the previous responses there was a high degree of concern around issues of water availability and to a slightly lesser extent water quality, this is not reflected to the same extent here. That said these responses provide a more nuanced insight; the high concern over drought and ageing infrastructure do mirror previous concerns over water availability issues.



Other Impacts provided by respondents

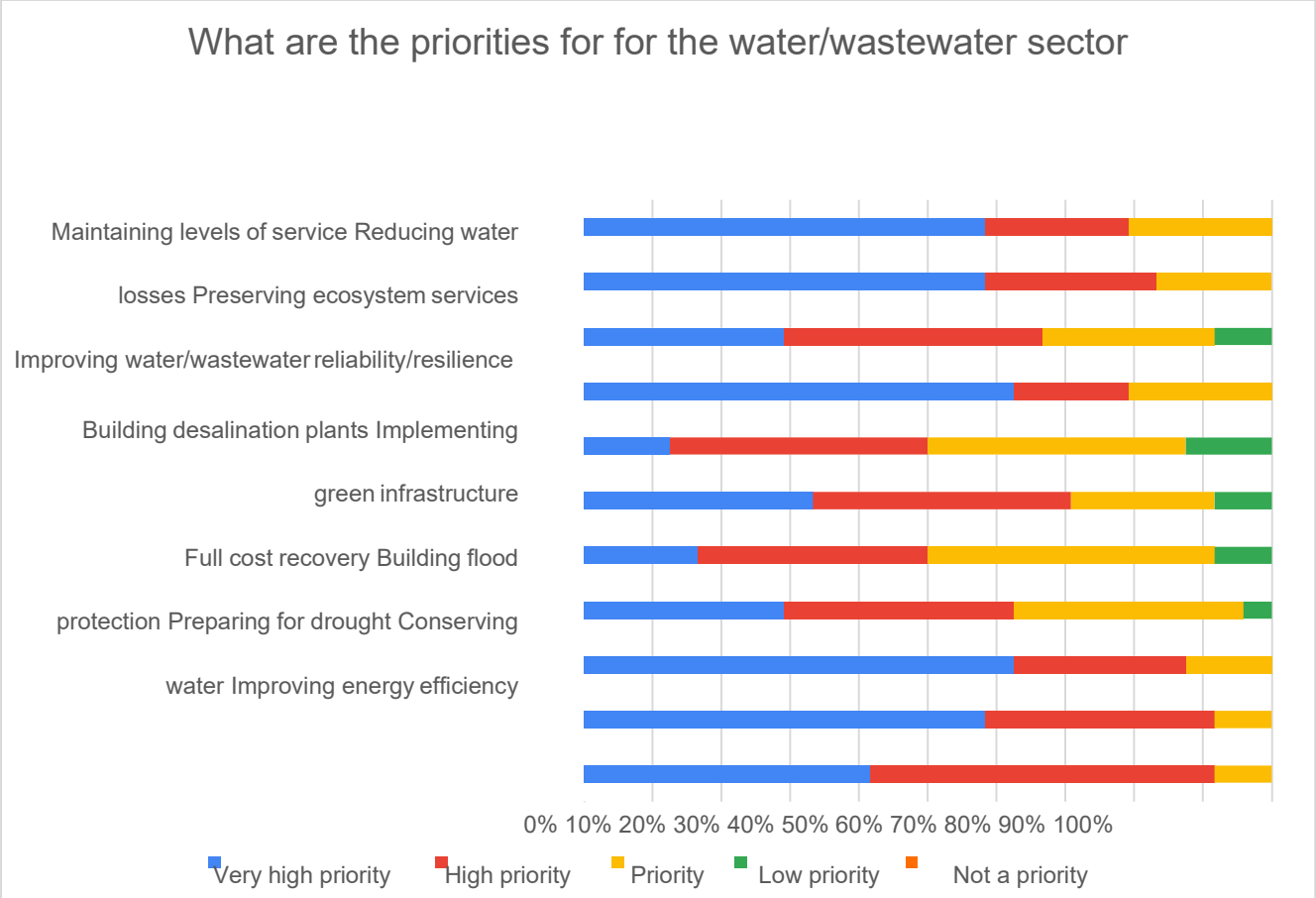
- Supply of water to accommodation and hospitality industry
- Funding/Finance
- Inflow and infiltration into wastewater systems
- More frequent electrical supply interruptions
- Increasing competition between economic, social; and environmental uses of water
- Management
- Increase in general temperature leads to increased water usage

Question: What are the priorities for the water/wastewater sector?

The highest priorities seem by respondents when adding together very high and high priority rankings are in descending order are:

1. Conserving water
2. Energy efficiency
3. Prepare for drought
4. Reduce water losses
5. Maintain levels of service
6. Improving water and wastewater reliability and resilience
7. Green infrastructure
8. Ecosystem services

Respondents found many issues to be high priority. The first four are all connected to availability of water supply. The answers here link to the earlier concerns about qualtity an quantity of water. One respondent mentioned achieving financial viability. This could be linked with Full Cost of Service and it is somewhat surprizing that full cost of service is listed so much further down on the priority list.



Other priorities mentioned

- Adequate water supply for the agricultural and domestic sectors
- Tertiary treatment
- Achieving sustainable financial viability
- Equality of water access
- Continual training and certification of staff

Appendix 4 Disaggregated Data

Barbados Water Authority Wastewater Division Names and Gender of Staff

No	Name	Location	Gender
1	Brian Stuart	BSTP/SCSTP	Male
2	Shenelle Bayley	BSTP/SCSTP	Female
3	Tyrone Lowe	BSTP/SCSTP	Male
4	Coswin Carrington	BSTP/SCSTP	Male
5	Verrol-Ann Scott	BSTP/SCSTP	Female
6	Dionne Clarke	BSTP	Female
7	Nicole Thorne	SCSTP	Female
8	Andrew Maloney	BSTP	Male
9	Alvin Walcott	BSTP	Male
10	Ian Cadogan	SCSTP	Male
11	Hakeil Lowe	SCSTP	Male
12	Ryvan Mottley	BSTP	Male
13	Henry Codrington	BSTP	Male
14	Ryan Webster	BSTP	Male
15	Patrick Waterman	BSTP	Male
16	Alexis Maynard	BSTP	Male
17	Orian Kirton	BSTP	Male
18	Carl Gill	BSTP	Male
19	Keon King	BSTP	Male
20	Anthony Layne	SCSTP	Male
21	Jefferson Russell	SCSTP	Male
22	Cedric Agard	SCSTP	Male
23	Troy Reid	SCSTP	Male
24	Roger Rock	SCSTP	Male
25	Justin Luke	SCSTP	Male
26	Kevin Phillips	SCSTP	Male
27	Anthony Goddard	BSTP	Male
28	Miguel Brathwaite	BSTP	Male
29	Jeremy Flemming	BSTP	Male
30	Anderson Holder	SCSTP	Male
31	Laron Pilgrim	SCSTP	Male
32	Calvin Hoyte	BSTP	Male

33	Ricardo Knight	BSTP	Male
34	Brian Smith	BSTP	Male
35	Dario Layne	SCSTP	Male
36	Shane Callender	SCSTP	Male
37	Dwayne Dottin	SCSTP	Male
38	David Bedford	BSTP	Male
39	David Roach	BSTP	Male
40	Joseph Hinkson	BSTP	Male
41	Anderson Hackett	BSTP	Male
42	Kenson Rice	BSTP	Male
43	Jason Boxill	BSTP	Male

44	Steve Nurse	BSTP	Male
45	Orlando Bourne	BSTP	Male
46	Cheyenne Ward	BSTP	Male
47	Michael Mason	BSTP	Male
48	Michelle Inniss	BSTP	Female
49	Rosemarie Small	BSTP	Female
50	Maylene Gunning	SCSTP	Female
51	Kathyann Reece	SCSTP	Female
52	Clarissa Austin	SCSTP	Female
53	Gregory Brathwaite	SCSTP	Male
54	Kevin Sealy	SCSTP	Male
55	Ricardo Marcellin	SCSTP	Male
56	Clevis Ward	SCSTP	Male
57	David Skeete	SCSTP	Male
58	David Lynch	BSTP/SCSTP	Male

Total No. of Males	**49**
Total No. of Females	**9**

BWA Wastewater Division Disaggregated Data of Staff (January, 2021)

Location	Male	Female	Gender Gap
BST/SCSTP	4	2	2:1
BSTP	26	3	8.6:1
SCSTP	19	4	4.8:1
Total	84.5%	16.4%	