

## Annex 22b: Adaptation Beneficiaries

### Total number of direct and indirect beneficiaries

Output	Activity	Direct beneficiaries			Indirect beneficiaries		
		Total	Male	Female	Total	Male	Female
Output 1.1 The Bridgetown Sewage Treatment Plant (BSTP) is upgraded to treat wastewater to a tertiary water-quality standard.	Activity 1.1.1: Design, procure and install a conventional activated sludge (CAS) biological treatment process with tertiary filtration and disinfection for the Bridgetown Sewage Treatment Plants to produce a tertiary reuse water-quality standard.	41,764 <sup>1</sup>	20,464	21,300	58,236 <sup>2</sup>	28,536	29,700
Output 1.2 Tertiary wastewater available to supplement non-potable use	Activity 1.2.1: Install reverse osmosis (RO) membrane filtration systems to reduce the total dissolved solids concentration of the reuse water produced at BSTP	155 <sup>3</sup>	93	62	125 <sup>4</sup>	75	50
	Activity 1.2.2: Install 9Km pipeline going from the BSTP to Waterford (Botanical Gardens) with take-off at Hothersal on to Friendship Plantation then turn south along ABC H'way and then turn north along Belle Road up to Lears (Roberts Manufacturing) for irrigation and aquifer recharge above the Spring Gardens.						

<sup>1</sup> 15% of population connected to the Bridgetown Sewerage Treatment Plant. Gender disaggregation is based on national proportions (49% males and 51% females)

<sup>2</sup> Remaining population of Bridgetown (100,000- 41,764).

<sup>3</sup> Farmers in the could Belle/Waterford area that will directly benefit for the reclaim water. Gender disaggregation is 60% males and 40% females.

<sup>4</sup> Farmers in other areas that will be trained but may not have direct access to the reclaim water.

Output 1.3 Decision-support tools and infrastructure implemented to mitigate potential climate change risks to the wastewater collection and treatment systems	Activity 1.3.1: Implement a sewer monitoring programme that will include the installation of flow measurement and rain-gauging equipment at the Bridgetown Sewage Treatment Plants to identify and address sources of inflow and infiltration to the sewer. Mechanisms that identify and reduce or mitigate vulnerabilities in the wastewater collection systems will also be developed.	58 <sup>5</sup>	49	9	41,764 <sup>6</sup>	20,464	21,300
	Activity 1.3.2: Establish on-site laboratory facilities and personnel at the BSTP to generate influent and effluent water quality data to inform operations control strategies that optimize operations and reduce energy consumption and GHG emissions.						
	Activity 1.3.3: Implement a Computerized Real-time Management System (CMMS) at the BSTP to inform decision making and climate resilient building						

<sup>5</sup> Staff of the wastewater division. Gender disaggregation 85% males and 15% females.

<sup>6</sup> 15% of population connected to the Bridgetown Sewerage Treatment Plant. Gender disaggregation is based on national proportions (49% males and 51% females)

Output 1.4 Decentralized treatment plants or cluster treatment facilities installed	Activity 1.4.1: Construct three small (cluster) decentralized wastewater collection and treatment demonstration projects in Zone A locations to produce reuse quality water for domestic/commercial non-potable water applications.	646 <sup>7</sup>	317	329	13,410 <sup>8</sup>	6,571	6,839
Output 2.1 Energy <sup>9</sup> efficiency and renewable energy technologies implemented	Activity 2.1.1: Install a grid-tied Photovoltaic (PV) Renewable Energy Systems to offset increased power consumption associated with the centralized treatment plant process upgrades using Category 3 hurricane resistant solar panels	41,977	20,606	21,371	58,236	28,536	29,700
	Activity 2.1.2: Implement automated controls and improved energy efficiency measured within the upgraded centralized treatment processes to reduce the overall energy footprint and reduce GHG emissions.						
	Activity 2.1.3: Install sludge dewatering equipment to reduce the overall GHG and CO2 emissions associated with the bio-solids.						

<sup>7</sup> Population of the 225 households that will be connected to the two decentralize systems. Gender disaggregated using 49% males and 51% females.

<sup>8</sup> Population of the remaining Zone A identify as requiring similar system. These areas will benefit from the lessons learnt from the two systems to be installed.

<sup>9</sup> Direct and indirect beneficiaries are the same as Output 1.1.

Output 3.1 Improved technical capabilities of waste water technical personnel to operate, maintain and monitor and implement climate change adaptation planning strategies for wastewater management	Activity 3.1.1: Develop and provide specialized and customized training to support the operations and maintenance of wastewater collection and treatment facilities including photovoltaic equipment.	400 <sup>10</sup>	280	120	41,764 <sup>11</sup>	20,464	21,300
	Activity 3.1.2: Update SOPs and Operational Manual with operational duties and responsibilities documentation that addresses the requirements of the upgrades, preventative maintenance, operator safety, and environmental monitoring, including specific risks posed by to climate change and gender and social inclusion considerations adaptation and preventative maintenance.	58 <sup>12</sup>	49	9	41,764	20,464	21,300
	Activity 3.1.3: Develop and implement a risk management framework to support the sustainable management of BWA's operations. This risk management framework will be developed in consultation with all departments to identify the risk register, existing controls and further actions needed and opportunities for improvement. The latter will be implemented by	70 <sup>13</sup>	60	10	115,000 <sup>14</sup>	56,350	57,500

<sup>10</sup> Number of BWA staff that will be trained. Gender disaggregation 70% males and 30% females, which is aligned with the current staffing of BWA.

<sup>11</sup> Customers connected to the BSTP.

<sup>12</sup> Staff of the wastewater division. Gender disaggregation 85% males and 15% females.

<sup>13</sup> Staff of the wastewater division and Management of BWA. Gender disaggregation 85% males and 15% females.

<sup>14</sup> All metered customers of the BWA. Gender disaggregation by 49% males and 51% females.

	BWA during the course of the project and assessed at the end of the project as a gauge of the level of sustainability built into the BWA's operations						
Output 3.2 A strategic plan is developed to guide the replication of the brackish water RO treatment plant along the west coast corridor	Activity 3.2.1: Investigate and develop a strategic plan for the installation of RO water treatment facilities along the west coast corridor.	70 <sup>15</sup>	60	10	14,249 <sup>16</sup>	6,982	7,267
Output 4.1: Governance and planning roadmap developed to enable wastewater reuse in the public and private sectors.	Activity 4.1.1: Undertake a legislative review to promote the Proclamation of the Planning and Development Act, Wastewater Reuse Bill and other related legislations for enhancing wastewater effluent quality, treatment options and re-use requirements and applications.	58	49	9	115,000	56,350	57,500
	Activity 4.1.2: Develop a potable water and sanitation master plan	58	49	9	115,000	56,350	57,500

<sup>15</sup> Staff of the wastewater division and Management of BWA. Gender disaggregation 85% males and 15% females.

<sup>16</sup> 50% of the population of St. James, which is along the west coast. Gender disaggregation 85% males and 15% females.

Output 4.2: Mechanisms developed/expanded to encourage the adoption of wastewater treatment and reuse applications by private individuals and businesses	Activity 4.2.1 : Develop a strategy and action plan to engage the private sector in the provision and adoption of wastewater treatment technology and the utilization of wastewater by-products	120 <sup>17</sup>	60	60	1,000 <sup>18</sup>	500	500
	Activity 4.2.2: Undertake a review and identify recommendations for a gender sensitive and socially inclusive incentive programme to encourage conservation, recycle, re-use.	280 <sup>19</sup>	168	112	115,000	56,350	57,500
	Activity 4.2.3: Expand the Revolving Adaptation Fund Facility (RAFF) to provide resources for the adoption of decentralized onsite wastewater systems.	280	168	112	115,000	56,350	57,500
Output 4.3 Gender Sensitive Public Education and Awareness Campaign Implemented.	Activity 4.3.1: Re-educate communities, teachers, students, farmers and businesses about the impact of climate change on water resources and their impact on water quality and quantity	3,000 <sup>20</sup>	1,530	1,499	92,786 <sup>21</sup>	45,465	47,321
	Activity 4.3.2: Develop and implement a Gender Sensitive Public Awareness Campaign for community and visitors (tourists) through workshops, videos, community town hall meetings, site tours		45,203	47,048			

<sup>17</sup> Estimated number private entities that will be trained/engaged. Gender Disaggregation 50% male led and 50% female led.

<sup>18</sup> Estimated number of private entities that will adopt wastewater treatment technologies.

<sup>19</sup> Total number farmers that will be trained.

<sup>20</sup> 750 students from school programme and 2250 community persons. Gender disaggregated using 49% males and 51% females.

<sup>21</sup> Estimated at 50% of the remaining population of Barbados. Assumption is that communication champagne will have knock-on effect reaching at least another 50% of the population. Gender disaggregated using 49% males and 51% females.

	(demonstration of the plant technology and by-product reuse) and consultations.	92,250 <sup>22</sup>					
	Activity 4.3.3: Develop a 3R-CReWS Project Web Page, which is dedicated to transparent measures of reporting, knowledge products, identify/host a link to the Redress Mechanism and provide update to all stakeholders on the project activities.						
Total		136,220	66,748	69,472	141,601	69,384	72,217

Direct beneficiaries per ARA								
Component	Output number	Output name	GCF Adaptation Results Area (ARA 1-4)					
			ARA 1		ARA 2		ARA 3	
			Most vulnerable people and communities		Health, well-being, food and water security		Infrastructure and built environment	
			Male	Female	Male	Female	Male	Female
Component 1: Wastewater Reclamation and Reuse	Output 1.1 The Bridgetown Sewage Treatment Plant (BSTP) is upgraded to treat wastewater to a tertiary water-quality standard.	Activity 1.1.1: Design, procure and install a conventional activated sludge (CAS) biological treatment process with tertiary filtration and disinfection for the Bridgetown Sewage Treatment Plants to produce a tertiary reuse water-quality standard.	20,464	21,300			20,464	21,300
	Output 1.2 Tertiary wastewater available	Activity 1.2.1: Install reverse osmosis (RO) membrane filtration systems to reduce the total dissolved solids concentration of the reuse water produced at BSTP			93	62		

<sup>22</sup> 92,250 community persons from community consultations and public education and awareness efforts. Gender disaggregated using 49% males and 51% females.

	to supplement non-potable use	Activity 1.2.2: Install 9Km pipeline going from the BSTP to Waterford (Botanical Gardens) with take-off at Hothersal on to Friendship Plantation then turn south along ABC H'way and then turn north along Belle Road up to Lears (Roberts Manufacturing) for irrigation and aquifer recharge above the Spring Gardens.						
	Output 1.3 Decision-support tools and infrastructure implemented to mitigate potential climate change risks to the wastewater collection and treatment systems	Activity 1.3.1: Implement a sewer monitoring programme that will include the installation of flow measurement and rain-gauging equipment at the Bridgetown Sewage Treatment Plants to identify and address sources of inflow and infiltration to the sewer. Mechanisms that identify and reduce or mitigate vulnerabilities in the wastewater collection systems will also be developed.					49	9
		Activity 1.3.2: Establish on-site laboratory facilities and personnel at the BSTP to generate influent and effluent water quality data to inform operations control strategies that optimize operations and reduce energy consumption and GHG emissions.						
		Activity 1.3.3: Implement a Computerized Real-time Management System (CMMS) at the BSTP to inform decision making and climate resilient building						
	Output 1.4 Decentralized treatment plants or cluster treatment facilities installed	Activity 1.4.1: Construct three small (cluster) decentralized wastewater collection and treatment demonstration projects in Zone A locations to produce reuse quality water for domestic/commercial non-potable water applications.					317	329
Component 2: Renewable Energy and Energy Efficiency in Wastewater Treatment	Output 2.1 Energy efficiency and renewable energy technologies implemented	Activity 2.1.1: Install a grid-tied Photovoltaic (PV) Renewable Energy Systems to offset increased power consumption associated with the centralized treatment plant process upgrades using Category 3 hurricane resistant solar panels	20,464	21,300			20,464	21,300
		Activity 2.1.2: Implement automated controls and improved energy efficiency measured within the upgraded centralized treatment processes to reduce the overall energy footprint and reduce GHG emissions.						
		Activity 2.1.3: Install sludge dewatering equipment to reduce the overall GHG and CO2 emissions associated with the biosolids.						
Component 3: Capabilities to operate, maintain,	Output 3.1 Improved technical capabilities of waste water technical personnel	Activity 3.1.1: Develop and provide specialized and customized training to support the operations and maintenance of wastewater collection and treatment facilities including photovoltaic equipment.					280	120



expand and monitor wastewater and related renewable energy technologies	to operate, maintain and monitor and implement climate change adaptation planning strategies for wastewater management	Activity 3.1.2: Update SOPs and Operational Manual with operational duties and responsibilities documentation that addresses the requirements of the upgrades, preventative maintenance, operator safety, and environmental monitoring, including specific risks posed by to climate change and gender and social inclusion considerations adaptation and preventative maintenance.					49	9
		Activity 3.1.3: Develop and implement a risk management framework to support the sustainable management of BWA's operations. This risk management framework will be developed in consultation with all departments to identify the risk register, existing controls and further actions needed and opportunities for improvement. The latter will be implemented by BWA during the course of the project and assessed at the end of the project as a gauge of the level of sustainability built into the BWA's operations					60	10
	Output 3.2 A strategic plan is developed to guide the replication of the brackish water RO treatment plant along the west coast corridor	Activity 3.2.1: Investigate and develop a strategic plan for the installation of RO water treatment facilities along the west coast corridor.					60	10
Component 4: Capacities (regulatory, governance, awareness), buy-in and ownership within the private and public sectors improved for climate resilient development planning for	Output 4.1: Governance and planning roadmap developed to enable wastewater reuse in the public and private sectors.	Activity 4.1.1: Undertake a legislative review to promote the Proclamation of the Planning and Development Act, Wastewater Reuse Bill and other related legislations for enhancing wastewater effluent quality, treatment options and re-use requirements and applications.					49	9
		Activity 4.1.2: Develop a potable water and sanitation master plan					49	9
	Output 4.2: Mechanisms developed/expanded to encourage the adoption of wastewater treatment and reuse applications by	Activity 4.2.1 : Develop a strategy and action plan to engage the private sector in the provision and adoption of wastewater treatment technology and the utilization of wastewater byproducts			60	60		
		Activity 4.2.2: Undertake a review and identify recommendations for a gender sensitive and socially inclusive incentive programme to encourage conservation, recycle, re-use.			168	112		

the water sector	private individuals and businesses	Activity 4.2.3: Expand the Revolving Adaptation Fund Facility (RAFF) to provide resources for the adoption of decentralized onsite wastewater systems.			168	112		
	Output 4.3 Gender Sensitive Public Education and Awareness Campaign Implemented.	Activity 4.3.1: Re-educate communities, teachers, students, farmers and businesses about the impact of climate change on water resources and their impact on water quality and quantity	1,470	1,530				
		Activity 4.3.2: Develop and implement a Gender Sensitive Public Awareness Campaign for community and visitors (tourists) through workshops, videos, community town hall meetings, site tours (demonstration of the plant technology and by-product reuse) and consultations.	45,203	47,048				
		Activity 4.3.3: Develop a 3R-CReWS Project Web Page, which is dedicated to transparent measures of reporting, knowledge products, identify/host a link to the Redress Mechanism and provide update to all stakeholders on the project activities.						
Total Direct Beneficiaries			45,717	47,583	168	112	21,121	21,759

Indirect beneficiaries per ARA									
Outcome number	Output number	Output name	GCF Adaptation Results Area (ARA 1-4)						
			ARA 1		ARA 2		ARA 3		
			Most vulnerable people and communities		Health, well-being, food and water security		Infrastructure and built environment		
			Male	Female		Male	Female	Male	Female
Component 1:Wastewater Reclamation and Reuse	Output 1.1 The Bridgetown Sewage Treatment Plant (BSTP) is upgraded to treat wastewater to a tertiary water-quality standard.	Activity 1.1.1: Design, procure and install a conventional activated sludge (CAS) biological treatment process with tertiary filtration and disinfection for the Bridgetown Sewage Treatment Plants to produce a tertiary reuse water-quality standard.	28,536	29,700				28,536	29,700
	Output 1.2 Tertiary wastewater available	Activity 1.2.1: Install reverse osmosis (RO) membrane filtration systems to reduce the total dissolved solids concentration of the reuse water produced at BSTP				75	50		

	to supplement non-potable use	Activity 1.2.2: Install 9Km pipeline going from the BSTP to Waterford (Botanical Gardens) with take-off at Hothersal on to Friendship Plantation then turn south along ABC H'way and then turn north along Belle Road up to Lears (Roberts Manufacturing) for irrigation and aquifer recharge above the Spring Gardens.							
	Output 1.3 Decision-support tools and infrastructure implemented to mitigate potential climate change risks to the wastewater collection and treatment systems	Activity 1.3.1: Implement a sewer monitoring programme that will include the installation of flow measurement and rain-gauging equipment at the Bridgetown Sewage Treatment Plants to identify and address sources of inflow and infiltration to the sewer. Mechanisms that identify and reduce or mitigate vulnerabilities in the wastewater collection systems will also be developed.						20,464	21,300
		Activity 1.3.2: Establish on-site laboratory facilities and personnel at the BSTP to generate influent and effluent water quality data to inform operations control strategies that optimize operations and reduce energy consumption and GHG emissions.							
		Activity 1.3.3: Implement a Computerized Real-time Management System (CMMS) at the BSTP to inform decision making and climate resilient building							
	Output 1.4 Decentralized treatment plants or cluster treatment facilities installed	Activity 1.4.1: Construct three small (cluster) decentralized wastewater collection and treatment demonstration projects in Zone A locations to produce reuse quality water for domestic/commercial non-potable water applications.						6,571	6,839
Component 2: Renewable Energy and Energy Efficiency in Wastewater Treatment	Output 2.1 Energy efficiency and renewable energy technologies implemented	Activity 2.1.1: Install a grid-tied Photovoltaic (PV) Renewable Energy Systems to offset increased power consumption associated with the centralized treatment plant process upgrades using Category 3 hurricane resistant solar panels	28,536	29,700				28,536	29,700
		Activity 2.1.2: Implement automated controls and improved energy efficiency measured within the upgraded centralized treatment processes to reduce the overall energy footprint and reduce GHG emissions.							
		Activity 2.1.3: Install sludge dewatering equipment to reduce the overall GHG and CO2 emissions associated with the biosolids.							
Component 3: Capabilities to operate, maintain,	Output 3.1 Improved technical capabilities of waste water technical personnel	Activity 3.1.1: Develop and provide specialized and customized training to support the operations and maintenance of wastewater collection and treatment facilities including photovoltaic equipment.						20,464	21,300

expand and monitor wastewater and related renewable energy technologies	to operate, maintain and monitor and implement climate change adaptation planning strategies for wastewater management	Activity 3.1.2: Update SOPs and Operational Manual with operational duties and responsibilities documentation that addresses the requirements of the upgrades, preventative maintenance, operator safety, and environmental monitoring, including specific risks posed by to climate change and gender and social inclusion considerations adaptation and preventative maintenance.						20,464	21,300
		Activity 3.1.3: Develop and implement a risk management framework to support the sustainable management of BWA's operations. This risk management framework will be developed in consultation with all departments to identify the risk register, existing controls and further actions needed and opportunities for improvement. The latter will be implemented by BWA during the course of the project and assessed at the end of the project as a gauge of the level of sustainability built into the BWA's operations						56,350	58,650
	Output 3.2 A strategic plan is developed to guide the replication of the brackish water RO treatment plant along the west coast corridor	Activity 3.2.1: Investigate and develop a strategic plan for the installation of RO water treatment facilities along the west coast corridor.						6,982	7,267
Component 4: Capacities (regulatory, governance, awareness), buy-in and ownership within the private and public sectors improved for climate resilient development planning for	Output 4.1: Governance and planning roadmap developed to enable wastewater reuse in the public and private sectors.	Activity 4.1.1: Undertake a legislative review to promote the Proclamation of the Planning and Development Act, Wastewater Reuse Bill and other related legislations for enhancing wastewater effluent quality, treatment options and re-use requirements and applications.						56,350	58,650
		Activity 4.1.2: Develop a potable water and sanitation master plan						56,350	58,650
	Output 4.2: Mechanisms developed/expanded to encourage the adoption of wastewater treatment and reuse applications by	Activity 4.2.1 : Develop a strategy and action plan to engage the private sector in the provision and adoption of wastewater treatment technology and the utilization of wastewater byproducts				500	500		
		Activity 4.2.2: Undertake a review and identify recommendations for a gender sensitive and socially inclusive incentive programme to encourage conservation, recycle, re-use.				56,350	58,650		

the water sector	private individuals and businesses	Activity 4.2.3: Expand the Revolving Adaptation Fund Facility (RAFF) to provide resources for the adoption of decentralized onsite wastewater systems.			56,350	58,650		
	Output 4.3 Gender Sensitive Public Education and Awareness Campaign Implemented.	Activity 4.3.1: Re-educate communities, teachers, students, farmers and businesses about the impact of climate change on water resources and their impact on water quality and quantity	45,465	47,321				
		Activity 4.3.2: Develop and implement a Gender Sensitive Public Awareness Campaign for community and visitors (tourists) through workshops, videos, community town hall meetings, site tours (demonstration of the plant technology and by-product reuse) and consultations.						
		Activity 4.3.3: Develop a 3R-CReWS Project Web Page, which is dedicated to transparent measures of reporting, knowledge products, identify/host a link to the Redress Mechanism and provide update to all stakeholders on the project activities.						
Total			69,384	72,217	56,850	59,150	63,332	65,911