



Concept Paper for a National Policy for Treated Wastewater

Jamaica



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Abbreviations

CReW+	Caribbean Regional Fund for Wastewater Management
CSGM	Climate Studies Group, Mona
EOC	End of century
GEF	Global Environment Facility
GIZ	Deutsche Gesellschaft für Internationale Zusammenarbeit GmbH
GOJ	Government of Jamaica
l/s	Liters per second
MEGJC	Ministry of Economic Growth and Job Creation
MGD	Million gallons per day
Mm ³ /a	Million cubic meters per year
NIC	National Irrigation Commission Limited
NNPRS	National Nutrients Pollution Reduction Strategy
NWC	National Water Commission
SDG	Sustainable Development Goal
UN	United Nations
WB	World Bank
WHO	World Health Organization
WRA	Water Resources Authority
WWTP	Wastewater treatment plant



1 Background, Justification and Objective

The availability of water in sufficient quantity and quality “is at the core of sustainable development and is critical for socio-economic development, healthy ecosystems and for human survival itself” (UN, 2022a). However, in Jamaica, water resources have been and will be affected by climate change. Factors such as increase in temperature, decrease in daily rainfall, increase in intensity of extreme events and sea level rise will have a cumulative negative effect on quantity and quality of available water resources (CSGM, 2020).

The achievement of the fourth National Goal of the Vision 2030 “Jamaica has a healthy and natural environment” with its attributed National Outcomes ¹, as well as the related Sustainable Development Goals (SDG) on Clean Water and Sanitation (SDG 6), Responsible Consumption and Production (SDG12), and Climate Action (SDG 13) are directly linked with the sustainable management of water resources and adaptation to climate change.

In line with the National Water Sector Policy and Implementation Plan (2019), the Government of Jamaica (GOJ) will encourage the reuse of treated effluent where it is safe and economical. Reuse opportunities include irrigation, industrial processes and aquifer recharge.

The National Water Commission (NWC) provides water to approximately 2 million persons across Jamaica. The majority (84%) of the daily supply volume of 190 million gallons² comes

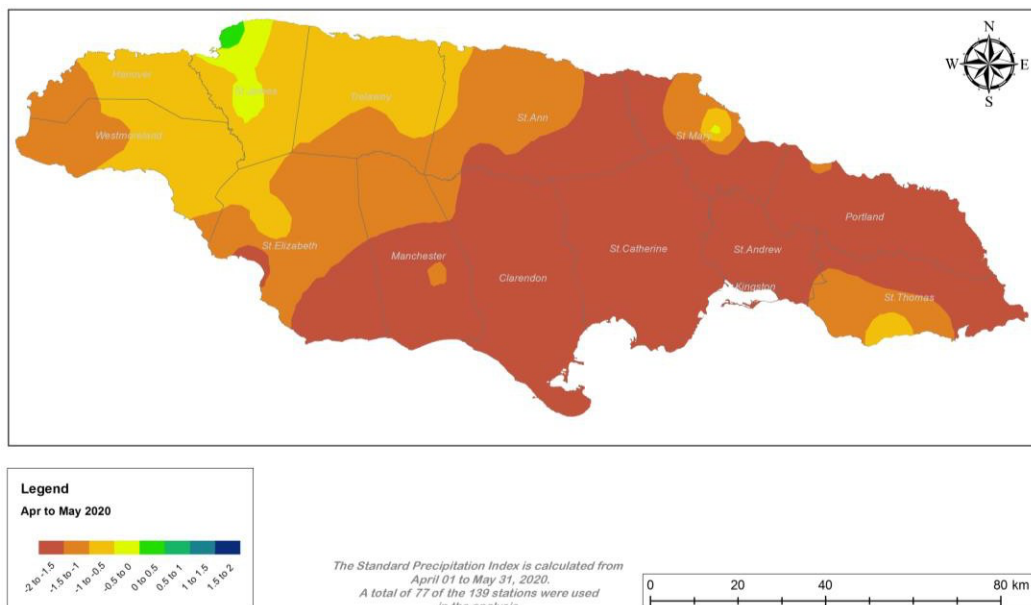
¹ 13. Sustainable Management and Use of Environmental Natural Resources; 14. Hazard Risk Reduction and Adaptation to Climate Change; and 15. Sustainable Urban and Rural Development.

² This equals 0.32 km³/a.

from ground water (CSGM, 2020).³ However, water supply to Kingston and St. Andrew largely depends on storage in the Mona Reservoir and Hermitage Dam, which represent the largest water holding facilities in the country (NWC, 2022a).

Due to the limited rainfall in the south, the agriculture sector depends on irrigation. The National Irrigation Commission Limited (NIC) is the largest single user of potable water providing irrigation services to the agricultural sector, and partially also to industrial and commercial operations (NIC, 2022a). Significant quantities of water are sourced from rivers; the remaining water is pumped from deep wells (NIC, 2022b). As several Wastewater Treatment Plants (WWTPs) are close to existing irrigation infrastructure their effluent could be channeled into the irrigation systems with minimal additional infrastructure.

Figure 1: Drought April/May 2020



Source: Meteorological Service of Jamaica

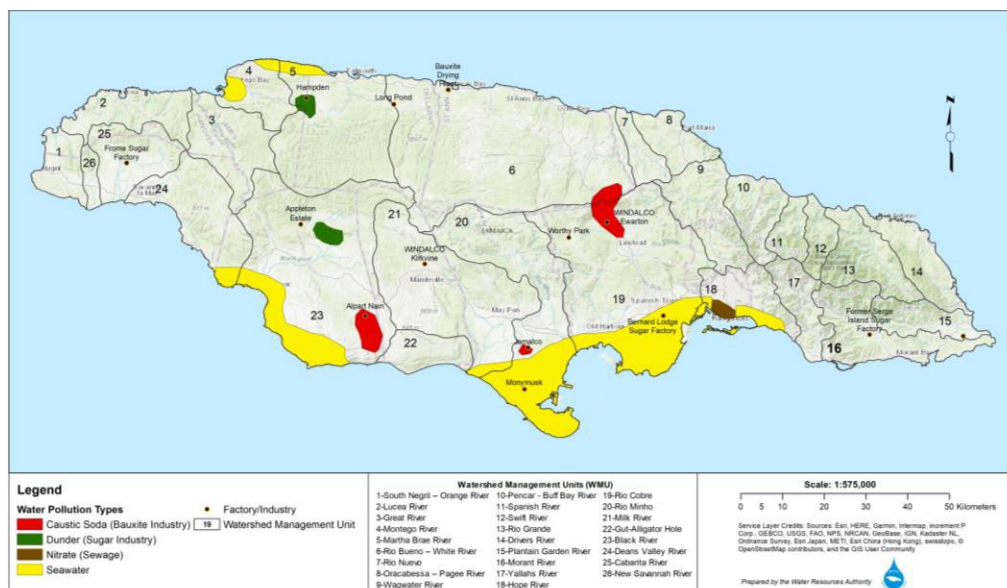
Jamaica faces very serious threats from hotter temperatures, droughts and floods, and an existential threat due to sea level rise (WB, 2022a). Scenarios simulated by the Climate Studies Group, Mona (CSGM) for the 2050s and the end of century, predict a drastic decrease in

³ This equals an average of 95 GPD per capita. Thus, indicating certain potential for reducing water demand through more efficient water distribution and consumption.

annual rainfall, whilst mean temperatures will continue to increase.⁴ Therefore, severe droughts⁵ as experienced in April/May 2020 (see Figure 1) will affect the island more frequently.

Considering the effects of climate change, the WRA forecasts a constant safe yield (water available for exploitation) for surface water until 2050. In contrast, the forecast for ground-water resources available for exploitation shows drastic declines, even reaching a negative value in 2080. Furthermore, the proximity of basins to the coast is likely to increase saltwater intrusion into aquifers (see Figure 2; CSGM, 2020).

Figure 2: Water Pollution Sources



Source: Water Resources Authority

The water portfolio falls under the responsibility of the Ministry of Economic Growth and Job Creation (MEGJC). The objective of the GOJ’s water sector strategy is to balance the availability and demand of water in adequate quantity and quality.

⁴ Rainfall may reduce by up to 31% (2050) and 52% (EOC); mean temperatures may increase by 2.4°C (2050) and 3.8°C (EOC) in comparison to the 1961-1990 baseline.

⁵ For the Caribbean region, a meteorological drought event occurs if the SPI is negative for at least two consecutive months and reaches a bi-monthly value of -1.30 during wet season and -0.80 during dry season.

Water for domestic use needs to fulfill highest exigencies for water quality; therefore, the provision of municipal water services shall be prioritized in the attribution of groundwater resources.

In order to reduce the pressure on the available water resources and thus limit groundwater depletion and its adverse effects, it is imperative to promote treated wastewater as a resource, aiming at substituting freshwater use in agriculture, industry and recreational areas (such as parks, golf courses and other green spaces) with treated effluent from WWTP. Especially in coastal areas, artificial infiltration of treated wastewater (aquifer recharge) can prevent saline water intrusion and thus limit degradation of groundwater quality. Also in other areas, aquifer recharge can counteract groundwater depletion.

As a co-benefit, the use of treated wastewater in agriculture, industry as well as recreational areas will reduce the discharge of treated effluents into streams and rivers, thus reducing the nutrient inflow into the Caribbean Sea. This provides a link to the National Nutrients Pollution Reduction Strategy (NNPRS) currently being elaborated by the National Environment and Planning Agency (NEPA).

Therefore, the objective to be achieved through the National Policy is:

Reduce the demand for potable water resources through reuse of treated wastewater for different purposes.

Reduce nutrients inflow into the Caribbean Sea through reuse of treated municipal wastewater to protect coastal and marine ecosystems.⁶

⁶ No detailed data is available to inform on the specific impact of WWTP effluents on the overall nutrient inflow into the Caribbean Sea, especially in comparison to the impact of agricultural effluent.

2 Status Quo, Opportunities and Risks

2.1 Status quo and best practices

Currently there are only a few examples of reuse of treated wastewater in Jamaica. The Rose Hall Developments Ltd. successfully combines the treatment of wastewater and provision of irrigation water at the Rose Hall Plantation in Montego Bay, St. James. The private Rose Hall WWTP (2.5 MGD) treats the wastewater of hotels and residential areas, and commercializes the treated effluent for irrigation purposes, including golf courses. As especially during rainy season, not the full effluent volume is destined to beneficial uses, the WWTP fulfills the quality standards for irrigation (stricter on bacteriological indicators) and discharge into receiving waters (stricter on nutrient loads) alike. Yet, the necessity of adhering to both standards increases treatment costs and reduces the nutritional value of treated wastewater for the irrigated lands.

Up to 2015, reuse of treated wastewater was also practiced at Bogue WWTP, which provided treated effluent (44 l/s) as cooling water to Bogue Power Plant operated by JPS Co Ltd. However, due to high costs as well as concerns regarding Occupational Health and Safety this practice was discontinued.

In 2006, the World Health Organization (WHO) developed a guideline for safe reuse of wastewater in agriculture, addressing basic requirements to promote safe use, including health-based targets and minimum procedures. The paper distinguishes three groups to be protected: agricultural workers, members of communities where wastewater-fed agriculture

is practiced and consumers. This approach has been applied in various reuse policies, including the Draft Standard for Wastewater Reuse, recently elaborated for Trinidad and Tobago.

In water-scarce Abu Dhabi, UK-based Waterscan Ltd. supported the Premier Inn in the installation of a greywater recycling system. Today, for example 100% of toilet flushings use recycled water. In total, the hotel's freshwater consumption was reduced by 24%.⁷

Also, in Latin America, there are various initiatives and best practices for reuse of treated wastewater. At the coastal area of Peru large areas are destined to agricultural production for export, which has been contributing to the overexploitation of groundwater. In 2017, the regulatory framework was adapted to allow the commercialization of untreated wastewater. Since 2021, the privately owned Agrokasa WWTP buys and treats 50% of the municipal wastewater for reuse in agriculture.⁸ Thus, directly contributing to the protection of water resources.⁹

Aquapolo Ambiental S.A. produces and commercializes treated wastewater to the companies of the Capuava Petrochemical Park in São Paulo state. With an installed capacity of 1 m³/s it provides 97% of all water consumed in the park. Especially in the drought of 2014 and 2015, when water rationing was implemented, prioritizing human supply, this set-up saved the companies from temporary paralysis, showing the long-term significance of sustainable water management in the face of climate change.¹⁰

In Israel, 97% of the total produced sewage (510 million m³/a) is collected and 85% of the treated wastewater is reused for agricultural irrigation; thus, treated wastewater represents 45% of the water volumes used for agricultural irrigation and about 21% of total yearly water consumption.¹¹

⁷ Source: Green Key, 2022.

⁸ 5% of the treated water is given to smallholders.

⁹ Source: Rotaria, 2022.

¹⁰ Source: RETEMA, 2022.

¹¹ Source: Ministry of Environmental Protection, Israel, 2022

2.2 Opportunities at short, mid and long-term

In Jamaica, there are 344 WWTPs with a total treatment capacity of 164,658 m³/d which are licensed under the Natural Resources Conservation (Wastewater and Sludge) Regulations, 2013 for the treatment and discharge of sewage effluent. Of this number, 52 WWTPs (15%) are currently licensed for irrigation; their treatment capacity represents 22% of the total installed treatment capacity. Thus, approximately 80% of treated wastewater volumes (approx. 130,000 m³/d) are available for additional reuse.

Currently an aquifer recharge pilot project is being developed, Innswood WWTP. Out of 16 NWC WWTPs evaluated, Innswood WWTP is the best option for a pilot plant. With a very short pipeline to be installed (approx. 350 m) the treated effluent can be transported to the Aquifer Recharge Plant. The implementation of an online system for quality control can facilitate a diversion of flow if water treatment standards are not met in order to prevent contamination of the aquifer.

Table 1 gives an overview of further reuse opportunities, indicating the main challenges and risks for the respective types of reuse, as well as the feasible timeframe for implementation.

Table 1: Reuse opportunities at short, mid and long-term

Type of reuse	Challenges and risks	Timeframe*
Aquifer recharge (e.g., protection from saline intrusion)	Infrastructure for aquifer recharge. Accidental contamination of aquifer.	Short-term
Irrigation of green spaces (incl. golf courses and cemeteries)	Infrastructure to connect WWTP to points of use. Accidental contamination of green areas.	Short to mid-term
Non-potable industrial uses (e.g., cement industry, cooling)	Infrastructure to connect WWTP to points of use. High requirement for treatment quality and reliability.	Short to mid-term

Toilet flushing in tourism sector	Investment costs for separate water infrastructure within the complexes.	Mid-term
Irrigation of agricultural lands	Infrastructure to connect WWTP to points of use. High requirement for treatment to required standard as well as consistency of supply. Possible rejection due to health concerns of the farming community and population.	Mid-term
Potable use	Very high requirement for treatment to required standard as well as consistency of supply. Possible rejection due to health concerns by the general population.	Long-term

* Short-term: up to 2 years; mid-term: 2 to 5 years (requires policy and subsequent measures); long-term: over 5 (requires change of perceptions and behaviours)

Source: @GIZ/AKUT

2.3 Risks

As displayed in Table 1 the main risks identified for the reuse of treated wastewater are related to lack of acceptance, elevated investment and running costs, and potential contamination. The identified risks, their probability, potential impact and respective mitigation measures are presented in Annex 2: Risks and mitigation measures.

3 Conclusion and recommendations

In order to reduce the demand for potable water resources and to reduce the nutrients inflow into the Caribbean Sea, the reuse of treated municipal wastewater for a variety of purposes should be increased. Due to several constraints, including investment costs, lack of automatized quality control and rejection by stakeholders, treated wastewater is not currently considered a reliable water resource. Therefore, a policy is required to promote treated wastewater as a resource in Jamaica.

The Policy governing the reuse of treated wastewater will:

- + **Specify the objective:** Define, which quantities of treated wastewater shall be reused for which purposes and until when.
- + **Identify strategies:** In order to achieve the objective, rules (e.g., obligation for reuse) and incentives (e.g., subsidies) can be applied. The more ambitious the objective, the stricter the rules need to be.
- + **Define the actions:** Specific actions can include:
 - Amend the *Natural Resources Conservation (Wastewater and Sludge) Regulations* to enable and incentivize different forms of reuse, including:
 - Definition of different reuse classes for irrigation and respective effluent standards; and
 - Definition of effluent standards for aquifer recharge and other types of reuse (e.g., reuse in industry or mining);

- Amend the *Water Resource Act* and related regulations to implement a set of incentives and disincentives that encourage the use of treated wastewater, including:
 - Increase of abstraction costs for surface and underground water (e.g., add aquifer recharge costs to the extraction costs) as disincentive for water abstraction;
 - Establish the use of a certain percentage (e.g., 20%) of treated wastewater as basic condition for the emission of new licenses for surface and underground water abstraction for non-potable uses; and
 - Forbid the abstraction of surface and underground water for irrigation of green areas in places where treated wastewater is available; where treated wastewater is not available request that the user compensates the extraction in another location (e.g., through aquifer recharge with equivalent volumes of treated wastewater);
- Amend the *Building Act* and related regulations to establish water reuse requirements for new buildings in the tourism sector (e.g., hotels, touristic complexes or attractions), including:
 - Requirement to implement separate piping for grey water (water from showers and sinks) and black water (water from WCs); the grey water is then to be treated to reuse quality either for toilet discharge or irrigation of green areas;
- Amend the *National Water Commission Act* to define investments into infrastructure and processes that enable reuse as chargeable costs to be included in the calculation of the water tariff.
- + **Define control mechanisms:** Ensuring quality standards of treated wastewater will be crucial to the long-term success of the policy.

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Annexes

Annex 1: Relevant Policies

Name	Description	Year	Reference
National Policy (Green Paper) on Environmental Management Systems (EMS). In Pursuit of a Green Economy	Aims to improve environmental performance in support of sustainable development and the development of a green economy as outlined in Vision 2030 Jamaica - National Development Plan.	2017	Government of Jamaica (2017) ¹²
The Vision 2030 Jamaica – National Development Plan	Vision 2030 Jamaica is the strategic guide or roadmap to achieve development.	2009	Government of Jamaica (2009) ¹³
The National Sanitation Policy	Consists of situation analysis which provides a background on sanitation at the local and national levels. The institutional framework for sanitation was outlined, including the role of non- governmental organizations (NGOs) and Community Based Organisations (CBOs) and highlighted the importance of stakeholders in the improvement of sanitation	2005	GEF CReW (2015) ¹⁴ .
Jamaica National Environmental Action Plan	Documents the major environmental problems facing Jamaica and formulates the appropriate policy framework, institutional arrangements, legal instruments, strategies, programmes and projects to address and mitigate these problems.	1999-2002 2006-2009	Government of Jamaica (2014) ¹⁵
The National Watershed Policy	Is administered by the NEPA. The policy guides watershed management by developing a legislative and institutional framework, identifying financing options, and encouraging initiatives for proper land use	2003	FAO (2016)

¹² Government of Jamaica (2017) NATIONAL POLICY (GREEN PAPER) ON ENVIRONMENTAL MANAGEMENT SYSTEMS (EMS) In Pursuit of a Green Economy. Available from: <https://megjc.gov.jm/api/wp-content/uploads/2018/10/draft-national-policy-on-ems.pdf>

¹³ Government of Jamaica (2009) Vision 2030 Jamaica: national development plan/Planning Institute of Jamaica

¹⁴ GEF CReW (2015) Baseline Assessment Study on Wastewater Management Jamaica

¹⁵ Government of Jamaica (2014) Jamaica National Environmental Action Plan. Available from: http://nepa.gov.jm/new/legal_matters/policies_standards/policy_3.php

The National Irrigation Development Plan (NIDP)	<p>Assessed the state of the irrigated agricultural sector, identified and prioritized projects for implementation, proposed the establishment of Water Users' Associations (WUAs) to increase farmer participation, and proposed strategies for making NIC self-sustainable. The NIDP was used by the Government as a basis for future irrigation developments.</p>	<p>1998</p>	<p>FAO (2016)</p>
The Jamaica Water Sector Policy	<p>It describes the current situation, objectives, and implementation and strategy plans for the various sectors in water resource management including urban water and sewerage, rural water and sanitation, urban drainage, and irrigation. The Draft Water Sector Policy (2014) updates the 2004 policy in light of the objectives of the Vision 2030 Jamaica – National Development Plan. Major additions include the commitment to Integrated Water Resources Management (IWRM) to improve climate change resilience. It updates coverage and quality targets, and encourages private sector involvement in all service areas of the water sector where applicable. It will be administered by MWLECC.</p>	<p>2004 (Being updated - 2014)</p>	<p>FAO (2016)</p>
The Water Resources Development Master Plan	<p>Developed and enforced by WRA, defines the resources, supply and demand at the hydrologic basin level. An update to this master plan was drafted in 2005. Currently a project supported by IDB is under implementation to update this Master Plan¹⁶.</p>	<p>1990 (Being updated)</p>	<p>FAO (2016)</p>
The Wastewater Management Policy	<p>In process of developing policy guidelines for planning, development, operation and management, financing and delineation of role and responsibilities of different stakeholders in wastewater management</p>	<p>2006</p>	<p>GEF CReW (2015)</p>
National Land Policy	<p>The Policy acknowledges the important nexus between land use policies and water resource management</p>	<p>1996</p>	<p>Government of Jamaica (2003)¹⁷</p>

¹⁶ See <https://www.iadb.org/en/project/JA-T1111>

¹⁷ Government of Jamaica (2003) Watershed Policy for Jamaica

Forest Policy for Jamaica	<p>The policy governs all forests in Jamaica whether owned by the State or by private interests. Its scope covers land with reforestation potential and forests in urban settings and addresses national priorities as well as international obligations and commitments relating to climate change, biodiversity conservation, and the sustainable use of wetlands.</p>	<p>2016</p>	<p>Government of Jamaica (2016)¹⁸</p>
National Forest Management and Conservation Plan 2001	<p>Outlines the manner in which the GOJ will conduct activities to protect and manage the forests in Jamaica.</p>	<p>2001</p>	<p>Government of Jamaica (2016)</p>
The Strategic Forest Management Plan 2010 – 2014	<p>Seeks to ensure implementation of Vision 2030 and includes a number of objectives and indicators in relation to the management of Jamaica’s state-owned forests</p>	<p>2010</p>	<p>Government of Jamaica (2016)</p>
Protected Areas System Master Plan: Jamaica 2013 – 2017	<p>Provides the road map for making the vision for Jamaica’s protected areas a reality.</p>	<p>Draft</p>	<p>Government of Jamaica (2012)¹⁹</p>
The National Strategy and Action Plan on Biological Diversity in Jamaica	<p>The Strategy and Action Plan will guide the national efforts for conservation and sustainable use of the island’s biodiversity and resources.</p>	<p>2003</p>	<p>Government of Jamaica (2003)²⁰</p>

¹⁸ Government of Jamaica (2016) Forest Policy for Jamaica. Available from: http://www.forestry.gov.jm/sites/default/files/Resources/forest_policy_of_jamaica_final_nov_2016.pdf

¹⁹ Government of Jamaica (2012) Protected Areas System Master Plan: Jamaica 2013 – 2017. Available from: [https://info.undp.org/docs/pdc/Documents/JAM/Jamaica%27s%20Protected%20Areas%20System%20Master%20Plan%202013-17\(Final%20Submission%20to%20the%20PAC\).pdf](https://info.undp.org/docs/pdc/Documents/JAM/Jamaica%27s%20Protected%20Areas%20System%20Master%20Plan%202013-17(Final%20Submission%20to%20the%20PAC).pdf)

²⁰ Government of Jamaica (2003) The National Strategy and Action Plan on Biological Diversity in Jamaica

Annex 2: Risks and mitigation measures

Risk	Probability	Impact	Mitigation measure
Users do not accept wastewater as substitute for surface water or ground water	High	High	<p>Condition extraction licenses for surface and ground water with a percentage use of treated wastewater.</p> <p>Provision of treated wastewater at a competitive price; i.e.; usage fee for treated wastewater significantly lower than extraction fees.</p>
Costs for adequate wastewater treatment are not covered	High	High	<p>Implement a cost-covering tariff structure for wastewater collection and treatment.</p> <p>Implement governmental subsidy programme to cover costs for operation and maintenance of WWTP.</p>
Treated wastewater does not meet required water quality standards	Medium	Medium	<p>Improve operation and maintenance, through prioritization and adequate budgeting.</p> <p>Implement online quality measurement and automatic valves to stop wastewater distribution, as soon as quality standards are not attained.</p>
High investment costs to conduct treated wastewater to the points of use	Medium	High	<p>Provision of governmental funds for implementation of infrastructure to conduct treated wastewater to points of use.</p> <p>Re-financing of investments through fees for treated wastewater.</p>
Hotels oppose costs for greywater treatment	Medium	Medium	<p>Implementation of governmental subsidy for the implementation of greywater treatment facilities.</p>

Source: © GIZ/AKUT

Annex 3: Action Plan

This action plan indicates the tentative timing of major milestones and activities. Also, it identifies the institutions responsible for implementation.

#	Activity	Lead	Support	Time frame
1	Policy Preparation and Analysis			
1.1	Formation of Policy Steering Committee (PSC)	MEGJC		
1.2	Identification of stakeholders	PSC	MEGJC	
1.3	Definition of stakeholder consultation plan, incl. methods to facilitate stakeholder participation and review	PSC	MEGJC	
1.4	Elaborate communication strategy ²¹ to the broader public as part of the policy			
1.5	Regular meetings of the Policy Steering Committee	MEGJC	PSC	
1.6	Implementation of methods to facilitate stakeholder participation and review	MEGJC	PSC	
1.7	Iterative elaboration of draft policy			
1.8	Submission of draft policy to the responsible Cabinet Committee for endorsement as a Green Paper	MEGJC	PSC	
2	Public Consultations (Green Paper)			
2.1	Tabling in Houses of Parliament	MEGJC	PSC	
2.2	Public sector consultations	MEGJC	PSC	
2.3	Revision of draft	MEGJC	PSC	
2.4	Submission of draft policy to the responsible Cabinet Committee for approval as White Paper	MEGJC	PSC	
3	Final Tabling in Parliament			

Source: © GIZ/AKUT

²¹ Including an awareness raising campaign to address the general opposition of people in Jamaica against the use of treated wastewater and information of stakeholders that benefit of wastewater reuse / the policy.

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