
Cost pricing for water production and water protection services in Jamaica: a situational analysis



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Developing markets for watershed protection services and improved livelihoods

Based on evidence from a range of field sites the IIED project, 'Developing markets for watershed services and improved livelihoods' is generating debate on the potential role of markets for watershed services. Under this subset of markets for environmental services, downstream users of water compensate upstream land managers for activities that influence the quantity and quality of downstream water. The project purpose is to increase understanding of the potential role of market mechanisms in promoting the provision of watershed services for improving livelihoods in developing countries.

The project is funded by the UK Department for International Development (DFID).

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Acronyms and abbreviations

CANARI	Caribbean Natural Resources Institute
CASE	College of Agriculture, Science and Education
CBOs	Community-based organisations
CEHI	Caribbean Environmental Health Institute
CIDA	Canadian International Development Agency
DFID	Department for International Development
EIA	Environmental impact assessment
EFJ	Environmental Foundation of Jamaica
ENACT	Environmental Action Programme of Jamaica
FD	Forestry Department
GDP	Gross domestic product
GNP	Gross national product
GOJ	Government of Jamaica
GWIS	Ground Water Information System
IIED	International Institute for Environment and Development
IWCAM	Integrated Watershed and Coastal Area Management
IWRM	Integrated water resources management
JCDT	Jamaica Conservation Development Trust
KMA	Kingston Metropolitan Area
MBIs	Market-based instruments
MCM	Million cubic metres
NEEC	National Environmental Education Council
NEPA	National Environmental Protection Agency (NRCA until 2001)
NEST	National Environment Societies Trust
NGO	Non-governmental organisation
NICL	National Irrigation Commission Limited
NIDP	National Irrigation Development Programme
NIWMC	National Integrated Watershed Management Council
NMS	National Meteorological Services
NRCA	National Resources Conservation Agency (NEPA since 2001)
NWC	National Water Commission
OUR	Office of Utility Regulation
PEA	Public education and awareness
RADA	Rural Agricultural Development Authority
UNDP	United Nations Development Programme
UNEP	United Nations Environmental programme
WMUs	Water management units
WRA	Water Resources Agency
WRDMP	Water Resources Development Master Plan
WUAs	Water users associations

Executive summary

This report represents part of the deliverables of a regional project being implemented by the Caribbean Natural Resources Institute (CANARI) aimed at:

- Exploring the usefulness of market- and incentive-based approaches as tools for optimising watershed services and improving livelihoods, especially of the rural poor.
- Assessing the requirements for implementing market-based approaches, at both the supply and demand sides of the water cycle, in ways that internalise the costs of watershed protection relating to the production, protection, and delivery of water.

The regional project is part of a larger global project entitled 'Developing markets for watershed protection services and improved livelihoods', which is being implemented by the International Institute for Environment and Development with support from the Department for International Development (DFID) of the United Kingdom

The report reviews existing and planned developments in Jamaica's water sector that are of relevance to the objectives of the regional project, and specifically as they relate to:

1. Cost pricing for water production and protection.
2. The proposed use of market-based approaches in the sourcing, production, and delivery of water.

Accordingly, the report is structured in two (2) chapters. Chapter 1 assesses the existing situation as it relates to:

1. Water demand and supply dynamics.
2. The policy framework for water resources management.
3. The institutional arrangements for water resources management.
4. Developments relating to resource monitoring and assessment, disaster management, and ownership and management.

Chapter 2 offers conclusions and recommendations.

1. Review of the current situation in water resources management¹

For water management purposes, Jamaica is divided into 26 watershed management units (WMUs) comprising all the land from the mountains to the sea, and containing over 100 rivers and streams. These watersheds are essentially composites of river basins which fall within 10 hydrological basins (regions). Surface water predominates on the outcrops of basement rocks and interior valley alluviums, and groundwater dominates in karstic limestone and coastal alluvium. The geology of Jamaica plays an important role in determining the occurrence of water resources and their availability. The rock formations of Jamaica are grouped into six hydrostratigraphic units. The three dominant units are: basement aquiclude, limestone aquifer and alluvium aquifer/aquiclude.

1.1 Water supply and demand dynamics

Jamaica's *Water Resources Development Master Plan* (WRDMP) (1990, in the final stages of redesign) identifies two main water demand sectors: agricultural and non-agricultural. It further divides the non-agricultural sector into: domestic urban, domestic rural, industrial, and tourism. Water used for hydroelectricity or recreation is not quantified as these are considered non-consumptive uses.

Regular water shortages occur during the annual drought period in Jamaica, and this points to the need to develop new water supplies². The demand assessment for 1985 indicated a water shortage of 216 MCM/year and the projected shortage for 2015 is 813 MCM/year if no new water supplies are constructed or made available. This shortage was based on the following projections:

- An increase in rural demand is based on a projected increase in population of 14%.
- An increase in urban demand (including tourism-based) is based on a projected 22% increase in urban population, and a plan to improve the service to 15% of the population now receiving less than 100 cubic metres/year per capita.
- An increase in industrial demand is due to expected industrial development.
- An increase in agricultural demand is based on a projected increase in irrigated area by 100%.

Over the past decade, Jamaica has recorded significant progress in providing water services to its people. Nearly 81.2% of households have access to safe water, compared with 61% in 1990 (GOJ 2002). The percentage of people relying on water from rivers, streams and ponds has dropped to under 3% from 5.7% in 1990. However, the poorest 20% of the population are still not adequately served with piped water. One-third of the poorest households rely on standpipes; 30% of them get their water from untreated sources such as rivers.

Table 1 confirms that Jamaica has enough water to supply its population of 2.6 million through to the year 2015.

¹ The information provided in this chapter is drawn from the *Water Sector Policy* prepared by Jamaica's Ministry of Water and Housing (1999) unless otherwise indicated.

² The term 'water shortages' (or 'deficits') refers to the inability of the existing capacity of the infrastructure to deliver the required quantities of water to where it is needed.

Table 1: Estimates of present and future water use (MCM/yr) (Source: Water Resources Agency of Jamaica 2000)

Time frame	Non agricultural sector MCM/yr (%)	Agricultural sector MCM/yr (%)	Total all sectors MCM/yr (%)
Present	231 (25%)	682 (75%)	913 (100%)
Future (to 2015)	346 (21%)	1,382 (79%)	1,684 (100%)

The last assessment of water resources in Jamaica in 1997 indicated total exploitable water resources of 4,085 million cubic metres per year (MCM/yr), with groundwater providing 3,419 MCM/yr and surface water providing 666 MCM/yr. In 1997, production from both sources totalled 939 MCM/yr leaving a balance of 3,163 MCM/yr for development. However, the state-owned National Water Commission (NWC) is hampered in its commitment to make water accessible to every Jamaican because of the financial hardships being faced by the government. It is estimated that Jamaica is using less than one-fifth of total available water. Approximately 10% of the island's water resources have been lost to saline intrusion and pollution.

Table 2: Exploitable water resources (Source: Water Resources Agency of Jamaica 2000)

Source	Quantity (MCM/yr)	Percentage
Exploitable surface water runoff (reliable yield) ³	666	16%
Exploitable groundwater (safe yield) ⁴	3,419	84%
Total exploitable water	4,085	100%

Access to pipe-borne water by urban households is relatively good. Nearly 98% of households within the Kingston Metropolitan Area (KMA), and 85% of households in other towns, have access to piped water. Those urban households without piped water rely predominantly on standpipes. About half of standpipe users in urban areas travel 50 yards or less to collect water. However, the reliability of the water supply within the urban setting has been described as erratic. This is mainly due to the fact that the major water resources are not located in close proximity to the major population centres, necessitating costly investments in installing and maintaining the distribution system.

Moreover, the lack of spare parts, combined with blocked, leaking and rusty pipes, and damaged infrastructure, is hampering the work of the NWC. The water storage system for the KMA is no longer able to serve the almost 1 million people living in the area. The government has been striving to expand access to water in new housing developments. However, the Office of Utilities Regulation (OUR) has questioned the sustainability of this programme and regards it as an added burden on existing operations, and as minimising the NWC's quality of service, unless there is a rate increase to take care of additional expenses.

In the rural areas, less than 40% of households have access to piped water. Approximately 25% of rural households get water from standpipes and nearly 20% use rainwater stored in tanks. Sewerage is not normally provided in rural areas. Fewer than 15% of rural households are connected to the sewerage supply. The predominant form of sewerage disposal is the pit latrine, which is used by about 65% of rural households.

³ 'Reliable yield' is the daily water flow that is exceeded 90% of the time. This level of reliability is sufficient for irrigation; the domestic and industrial water supply usually needs a higher level of reliability.

⁴ The 'safe yield' is the quantity of groundwater that can be safely withdrawn over a long period without injuring the aquifer as a water source, or causing contamination by intrusion of saltwater into the aquifer.

Of the 90,000 ha of land that is potentially irrigable, approximately 25,000 ha (or 10% of Jamaica's cultivated lands) is currently irrigated. The main irrigated crop is sugar cane, which accounts for 70%-80% of the irrigated land area (NIDP 1998).

In 1985 it was estimated that 75% of the nation's total water demand went to agriculture (WRDMP 1990). In 1997, the NIDP estimated that the demand of the agricultural sector was 60% (645 MCM/yr) of the total water demand. This decline in sector demand is also confirmed by preliminary in-house evaluations conducted by the Water Resources Authority. Fifty percent of the 10% (25,000 ha) of cultivated land that is currently irrigated is served by public irrigation systems managed by the National Irrigation Commission Limited, the other 50% is irrigated by private individuals.

Studies of the surface irrigation systems indicate that between on-farm and conveyance, 32% irrigation efficiency is achieved. It is expected that with physical improvements of the system and training of farmers as water managers, irrigation efficiencies could increase to 57% (Bos and Nugteren 1990).

The agriculture sector is a major user of water resources for irrigation. However, the prospects for cost recovery in the sector are extremely poor. In addition, operating efficiencies are low, with high levels of wastage due to inadequate irrigation infrastructure on farms. Presently the sector does not generate enough funds to finance its expansion.

The *Water Sector Policy* (1999) speaks of the government's commitment to achieve cost efficiencies, mobilise additional sources of funding for investment support, and introduce cost recovery mechanisms to ensure that the direct beneficiary pays and that the supply of services can be maintained and expanded.

1.2 The *Water Sector Policy* framework

The framework for the management of Jamaica's water resources and for future water development and related capital expenditure is provided in the *Water Sector Policy* which was prepared by the Ministry of Water and Housing in January 1999. This policy was developed to complement and be consistent with the *National Industrial Policy* (1996) the *National Land Use Policy* (1996); the *Green Paper on Parks and Protected Areas* (1995); the *National Environmental Protection* (1995); and the *National Policy on Science and Technology*. This has helped to promote an integrated approach to policy implementation and has allowed for the knock-on effects of the respective policies to be carefully assessed.

The *Water Sector Policy* emphasises water-use efficiency and conservation. It promotes, among other things, a shift of national priorities from water resources development to the restoration of existing resources and enhancement of water quality. The policy seeks to:

1. Ensure integrated and informed management of water resources.
2. Ensure water for public supply receives priority in the allocation of resources.
3. Ensure that water is used as efficiently as possible.
4. Ensure implementation measures to restore and enhance the quality and quantity of usable water and protect the aquifers, watersheds, and other sources of water.

In respect of water pollution prevention and control, the *Water Sector Policy* outlines the following specific strategies:

- Maintenance of ecosystem integrity through the protection of aquatic resources from the negative impacts of development and natural processes.
- Protection of public health against disease vectors from pathogens.
- Ensuring sustainable water use and ecosystem protection on a long-term basis.
- Enforcing the 'polluter pays' principle.

The *Water Sector Policy* also focuses on developing mechanisms to ensure compliance, including public education, incentives, and sanctions.

There are several other pieces of legislation which govern some aspect of watershed management. They include:

The Natural Resources Conservation Authority Act (1991)

The Forest Act (1996)

The Rural Agricultural Development Act (1990)

The Water Resources Act (1995)

The Town and Country Planning Act (1988)

The Land Development and Utilization Act (1966)

The Mining Act (1947)

The Wildlife Protection Act (1945)

Reviews of these Acts have indicated areas of overlap or duplication, which highlights the need for further clarification and agreement on roles and areas of jurisdiction, as well as the need to review and update some pieces of legislation.

In November 1997, the Government of Jamaica approved a policy framework for the National System of Protected Areas. This policy framework defines a protected area as: 'an area of land or water that is managed for the protection and maintenance of its ecological systems, biodiversity and/or specific natural, cultural or aesthetic resources' (GOP 1997 p.5).

The policy framework recognises that with its 'diversity of flora and fauna, land and water habitats, and wild and human landscapes', Jamaica needs a system of protected areas as part of its national development strategy. One goal of the policy framework is given as 'economic development' (the others are: environmental conservation, sustainable resource use, recreation and public education, public participation and local responsibility, and financial sustainability as). Jamaica presently has two types of designated protected area: 'national park' and 'marine park'.

Other types of protected areas will include:

National nature reserves/wilderness areas	Natural landmarks/national monuments
Habitat/species management areas	Managed resource protected areas
National protected landscapes/seascapes	Natural forests

Natural forests support biodiversity of native plants and animals; preserve water supply, water quality, and flood protection; provide erosion control; and support scientific research, education, recreation and tourism.

1.2.1 Land policy and watershed management

Jamaica's *National Land Use Policy* (approved in July 1996) acknowledges the direct relationship between the use of land for domestic, commercial, industrial, or agricultural purposes, the generation of waste by these uses, and the impact on the quality of both surface and groundwater resources. The *National Land Use Policy* recognises the nexus between land-use policies and water resource management as being of major importance in the optimisation of the country's land and water resources. The *National Land Use Policy* addresses specific land-use and water resource management issues and speaks to the following:

- Expanding/developing new sources of water supply to meet present and future demands.
- Preserving and reforesting watersheds to ensure the recharge of aquifers, and reduce the problems of flooding and turbidity in rivers.
- Implementing programmes to eliminate the pollution of rivers and streams by pesticides, herbicides, and other pollutants.
- Banning the use of fire to clear hillside land.
- Preserving vegetation along water courses.
- Maintaining buffer zones around major reservoirs i.e. making these areas free of squatter settlement, and maintaining these areas as natural forests with minimum activity.
- Protecting private lands within catchment areas, and the acquisition by the state of these lands, if necessary. Incentives will be considered to encourage environmentally-friendly activities on private lands.
- Prohibiting the dumping of solid waste within a certain proximity to water bodies.
- Carefully assessing the impacts of open-face and other mining activities on water resources.

1.3 Institutional arrangements for water resources management

The management of Jamaica's water sector is shared by:

The Water Resources Agency (WRA)

The National Water Commission (NWC)

The Office of Utility Regulation (OUR)

The National Environmental Protection Agency (NEPA)

The National Irrigation Commission Limited (NICL)

1.3.1 The Water Resources Agency (WRA)

The WRA was established under the *Water Resources Act* of 1995, which became law on April 1, 1996. The WRA now operates under the portfolio of the Ministry of Housing,

Transport, Water and Works (formerly the Ministry of Water and Housing, and later the Ministry of Land and the Environment). The Act gives the WRA the responsibility for:

1. Management of water resources.
2. Maintenance of an appropriate, updated, and comprehensive database.
3. Undertaking raw water quality and monitoring assessments.
4. Planning and approval for water resources development.
5. Issuing and enforcing permits for well drilling and water abstraction.
6. Public education, as appropriate.

The WRA interprets its mission broadly as: ensuring the sustainability of the island's water resources through continual assessment and proper management, promotion, conservation and protection, and optimal development of these resources; ensuring rational and equitable allocation of the nation's water resources; and reducing conflicts among water users.

1.3.2 The National Water Commission (NWC)

The NWC is responsible for the urban water supply. It is also the largest provider of sewerage services. The NWC has been plagued with financial difficulties which have constrained its ability to perform its mandate.

Whilst the NWC has been able to cover its operating costs, it has not been able to generate an adequate operating surplus to enable it to finance new investments in the water sector, and has had to rely heavily on government support. However, competing demands on government have meant that its assistance has been limited and sporadic. Efforts by the government to improve the NWC's financial performance have met with only limited success. This is mainly due to: the absence of timely and adequate adjustments in the water tariff; the expansion of the areas covered by the NWC without a commensurate increase in operating revenue; and the insufficiency of capital to upgrade the infrastructure inherited from the parish councils.

The GOJ intends that the NWC will be able to access a wider range of sources of finance including:

- Charges levied on new customers in addition to the tariff, to fund new projects from which they will benefit.
- Finance provided by the private sector.
- Government grants for specific works with a high social or environmental value.

Developers of new discrete housing projects are required to meet the full costs of infrastructure provision and to recover these costs from the selling price of the units. The policy allows the cost of off-site infrastructure serving new or existing housing development and/or neighbouring communities to be recovered via nominal tariffs.

1.3.3 The Office of Utility Regulation (OUR)

The OUR is responsible for the approval of tariffs and fees based on the prescribed/approved water quality and service quality standards; minimum quality of approved sewerage services; and other appropriate parameters for urban potable water and

sewerage services offered to urban users. The tariffs set by OUR must allow the NWC to fully recover efficient cost levels, including capital and operating costs. The NWC is fully responsible for increasing the efficiency of its operations and thus reducing its cost to the lowest efficiency levels. Whenever tariffs are adjusted, the NWC and the OUR are required to implement a public education campaign, including information on ways on reducing water bills through increased water conservation by consumers.

The general principles that apply to the urban water sector also apply to those parts of the rural water sector served by the NWC. In particular, the guidelines on the tariff structure and the recovery of costs of infrastructure for new development are the same. However, the higher cost of serving the rural sector, and the lower revenues and thus lower cost recovery prospects, demand higher subsidies than in the urban sector.

1.3.4 The National Environmental Protection Agency (NEPA)

NEPA – formerly the National Resources Conservation Agency (NRCA) – is responsible for the management, conservation and protection of the natural resources of Jamaica. NEPA operates under the *Watersheds Protection Act* of 1963 which provides for the protection of watersheds and areas adjoining watersheds, and the conservation of water resources. The Act provides for conservation of watersheds through the implementation of provisional improvement plans whereby soil conservation schemes are carried out on the land. The Act has not been substantially revised since its promulgation and is deemed to be outdated, especially in respect of the participatory approaches currently being utilised in watershed management.

There is considerable overlap in the authority of agencies engaged in watershed protection. In addition to the need for rationalisation of the functions of these agencies, there is also the need for these institutions to receive adequate levels of funding.

The need for a National Watershed Action Plan to systematically and strategically implement the protection of Jamaica's watersheds has been recognised.

In 2001, a new funding mechanism – The Forest Management and Conservation Fund – was established as a supplement to the resources provided by the government to provide long-term funding for reforestation and forest conservation. The fund is used exclusively for activities in the *Forest Management and Conservation Plan*. Another mechanism, the Tropical Forest Conservation Fund, was created to receive funds from a planned debt-for-nature swap.

1.3.5 The National Irrigation Commission Limited (NICL)

The NICL is charged with the responsibility for operating irrigation systems through the use of water users associations (WUAs) comprising farmers who benefit from the systems. The intention is that these WUAs will operate as legal entities (e.g. co-operatives or limited liability companies). Farmers will be members and shareholders with the power to govern these organisations. The intention is that over time, the WUAs will assume full responsibility for operating their irrigation systems, with the NICL assuming responsibility for planning, regulating, monitoring, and evaluating the irrigation sub-sector.

The NICL is pursuing the implementation of Phase 1 of its National Irrigation Development Programme (NIDP). The programme is expected to complement the GOJ's long-term agricultural development plan to the year 2015, advancing the government's aim of increased farmer participation in irrigation and thus making the NICL more efficient. As part of the NIDP exercise, over 125 projects island-wide were evaluated. Fifty-one (51) of these projects were selected for implementation by 2015, at a cost of US\$106.3M. The programme also proposes that the current irrigated area of 25,000 hectares be increased by 60% to 40,000 hectares.

A new major irrigation scheme is under construction in Pedro Plains, St. Elizabeth. Work on two additional flagship projects in the Seven Rivers and Hounslow areas are to start by the end of the 2005/2006 financial year. A second phase of the NIDP (estimated to cost J\$21M) is planned which will bring total investment by the NICL to over J\$2B (US\$33M).

At the end of the 2004/2005 financial year, the NICL generated a net surplus of approximately J\$21M and increased its gross operating surplus to J\$91.9 M (NICL 2005). This performance was achieved through a combination of revenue enhancement and expenditure control measures, including the sale of non-serviceable equipment and a reduction in energy costs, the latter being informed by a comprehensive energy audit on the irrigation system.

NICL applies a single rate structure for all its irrigation systems, which does not reflect the differential costs associated with delivering irrigation water to farms. Generally, the rates charged do not provide the necessary funds to fully cover the operational, maintenance, or capital costs. The NICL has applied to the OUR for a full rate and tariff review and expects to be able to introduce incremental increases in irrigation rates to allow the full recovery of operational and maintenance costs by the year 2010, as stipulated in the *Water Sector Policy*.

In an attempt at boosting the financial viability of irrigation systems, the government requires that the operational and maintenance costs of existing irrigation systems should be met from user charges. In the case of new systems built under the National Irrigation Development Programme, users are required to pay a reasonable proportion of the capital cost in addition to the operational and maintenance costs. Despite these requirements, water for irrigation is generally provided below cost to ensure food security.

1.4 Resource monitoring and assessment

The Water Resources Agency (WRA) is required to ensure the sustainable use of water resources, and the preservation of ecosystems and the aquatic environment, through the development of:

- Vulnerability maps which show the risk of pollution to aquifers.
- Source protection zones for freshwater sources and watersheds.
- Minimum downstream flows which ensure that rivers contain enough water to sustain ecosystems and preserve their amenity value.

Recognising that continuous monitoring and assessment of the patterns of water use – and the response of the resource to that use – are critical to its ability to fulfil its mandate effectively, the WRA maintains a database of its 10 hydrological basins and provides data, information, and technical assistance to government and NGOs. Stream flow data have been generated since 1954. A water balance has been generated for each basin based primarily on 30-year mean rainfall data generated by the National Meteorological Service (NMS).

However, weaknesses exist with the monitoring of water quality. The cost of laboratory analyses is high and thus the cost of generating the quality of data to adequately monitor and manage water quality throughout the island is beyond the budget of any one government agency. The result has been a piecemeal monitoring of water quality in areas of the island considered most critical. Each agency with a mandate to monitor water quality collects its own set of water quality data and stores this data in separate storage systems, in both paper and computer-based formats.

Over the last five years, the WRA has made a concerted effort to collect comprehensive water quality data from several other agencies. A co-ordinated system has been established to ensure the pooling of data generated by government agencies.

Limited studies have been undertaken to assess the levels of selected pesticides in the Hope River watershed, which is a major source of drinking water to the nation's largest metropolitan area, Kingston and St. Andrew. Some sections of the upper watershed are agricultural lands where pesticides are applied. It is recognised by all the relevant government agencies involved with water quality monitoring, that there is a need for current pesticide studies in those watersheds that provide major drinking water sources. Despite the recognition of this need, the costs associated with conducting such studies are prohibitive to most government agencies.

A Ground Water Information System (GWIS) has been established containing information on the Rio Minho, Black River and Rio Cobre river basins. The GWIS is to be used to generate aquifer vulnerability maps, and facilitate the development of protection zones around water sources.

1.5 Natural disaster management

References in Jamaica's *Water Sector Policy* to disaster management within the water sector, and its impact on sectors that depend heavily on water, are light and brief. However, it is well known that Jamaica's water sector has been routinely affected by climate-related disasters, the impacts of which are usually exacerbated by inappropriate land-use policies and practices.

Flooding poses a major risk to the financial and operational sustainability of water services provision in Jamaica. The passage of Hurricane Ivan in September 2004 rendered the distribution system and pumping equipment unserviceable for lengthy periods. The irrigation system was heavily affected by the deposition of silt and debris into the distribution network, while erosion breached canals in several locations. The damage necessitated the implementation of a J\$28M rehabilitation programme.

Jamaica is seeking to adopt a sustained disaster mitigation programme through its participation in regional efforts at vulnerability and risk assessment, and adaptation to climate-related risk – in particular the risks posed by climate change and climate variability to:

- Human health and sanitation.
- Agriculture and food.
- Coastal zones and marine eco-systems.
- Hydrology and water resources.
- Insurance and financial services.

Of direct relevance to the water sector are the following projected effects of climate change on hydrology and water resources:

- A decrease in stream flow and groundwater re-charge rates.
- An increase in irrigation demands due to higher temperatures and higher crop evaporative demand.
- An increase in flood magnitude and frequency (especially in coastal and low-lying areas) and landslides.

- The degradation in water quality through higher water temperatures, and increased pollution loads from runoff and overflows of waste facilities.
- A significant disruption of ecosystems.
- Accelerated erosion, loss of wetlands and mangroves, and seawater intrusion into freshwater resources.

Coping and adaptation strategies must of necessity be rooted in integrated water resources management (IWRM) techniques and approaches that are designed and implemented with the full and active participation of all stakeholders.

1.6 Allocation and pricing mechanisms

The *Water Sector Policy* addresses the need to identify and implement cost recovery mechanisms. However, there are no targets or guidelines to support the pursuit of these objectives. The government institutions that currently depend on government subventions to fund their operations are being hampered by the reduction in the level of annual funding allocations. In this context, watershed management and water quality are often the first areas to be curtailed.

Although the concept of cost recovery in the provision of water services is not new to Jamaica, attempts by some agencies to recover the costs of their operations and maintenance will continue to be plagued by difficulty if water rates do not support the attainment of this objective.

The WRA is responsible for operating a system in which conflicts among water users are resolved in such a manner as to ensure that water resources are used as efficiently and as economically as possible. In accordance with the *Water Resources Act (1995)*, the WRA is required to use administrative and market-based instruments and mechanisms to allocate water. A major element of this strategy is a system of fees for access to, and use of, groundwater and surface water. The fee system includes:

1. A fee to process applications from people seeking to access water resources.
2. An abstraction charge sufficient to allow the WRA to recover the cost of performing its water resource management functions.
3. A fee to recover the monitoring and other administrative costs of the authority.

In allocating water use rights, the WRA is required to take account of the following:

- Historical water rights.
- Availability of water.
- Effect on existing wells and downstream users.
- Water quality.
- Economic considerations.
- Efficiency of use.
- Protection of ecology and ecosystems.

Despite these requirements and the improvements that they have allowed, the WRA acknowledges that there is still considerable inefficiency in the use of water resources and that significant work needs to be done in water resources management and allocation. A laudable first step is the adoption of a revised Water Resources Management Plan which aims to increase water efficiency. A new fee structure has been adopted which is based on the amounts of water requested by a user and not on actual amounts used.

1.7 Ownership and private sector participation

The strategy of the GOJ is to encourage private sector participation in the urban and rural water sector where this is likely to benefit consumers and the country.

The benefits sought include: improvements in the efficiency of operations and investment; technical and managerial expertise; access to new technology; and the injection of capital investment. Private investment is also seen as: helping to insulate the sector from short-term political intervention; facilitating the transfer of risks and responsibilities of ownership from government to the private sector; and delivering a reliable and efficient service to the urban and rural sectors.

Despite this recognition, private sector participation in Jamaica's water sector remains negligible.

1.8 Public education and awareness programmes in the water sector

Over the past decade in particular, the level of awareness of environmental issues – particularly watershed and coastal zone management issues – among the general public has increased. This heightened awareness is attributed to consistent efforts by several government agencies to inform and educate the public through a wide range of media. These public education and awareness (PEA) activities include:

- Annual exhibitions.
- Production and distribution of brochures and pamphlets.
- Regular articles published in the national newspapers.
- Use of national television stations for broadcasting short educational films on watershed/coastal area management issues.
- Lectures and field trips for students.
- 'Teacher on the job experience' – where teachers, particularly geography and science teachers, are invited to work at a government agency responsible for some aspect of watershed or coastal area management.
- The National Environmental Education Committee (NEEC).

However, there are no known studies which have examined the effect of these PEA programmes on the management of watersheds and coastal areas.

1.9 Collaborative management in the water sector

Within the last ten years, several national and community (parish-based) organisations have increasingly become involved in co-management projects within and around watersheds in Jamaica. The primary national entities include:

- A. The National Environmental Societies Trust (NEST), an umbrella organisation for some forty non-governmental organisations (NGOs). NEST was formed to assist the small local NGOs technically and financially.
- B. The Jamaica Conservation Development Trust (JCDDT), a registered charity formed in 1987 and responsible for the management of the Blue and John Crow Mountains area.

C. The Environmental Foundation of Jamaica (EFJ), which was created from a debt-for-nature swap agreement between the GOJ and the US Government. The aim was to provide a funding mechanism for environmental, child survival, and child welfare projects.

The efforts of these NGOs are being supported by environmental protection agencies established in the parishes of Portland, St. Thomas, Negril, and St. Elizabeth. These NGOs and community-based organisations (CBOs) have collaborated in the execution of several water sector projects, some of which are highlighted in Table 3 below. The growing presence and vibrancy of these organisations provide an excellent foundation for an institutional approach to collaborative watershed management, and for exploring the use of pricing mechanisms that reflect the contribution of CBOs located within and around watersheds.

Table 3: Summary of selected collaborative watershed management projects (Source: Jamaica National Report to IWCAM Workshop 2000)

Project	Objectives	Donor	Stakeholders
Environmental Action Programme of Jamaica (ENACT) Local Sustainable Development Planning	1. Environmental management and education 2. Sustainable development planning 3. Capacity building in communities	CIDA	1. Ministry of Local Government, Youth and Community Development 2. NEPA 3. Parish councils 4. Portland Parish Development Committee
Green Fund Small Grants	1. Establishing biological waste treatment facilities on CASE Tutorial Farm 2. Improved sanitation for the Naylor Hill community	CIDA	1. College of Agriculture 2. Portland Environment Protection Association 3. Naylor's Hill United Club
Trees for Tomorrow	Sustainable forest and watershed management	CIDA	Forestry Department
Eastern Jamaica Agriculture Support Project	Promotion of improved farming systems and watershed management principles	European Union	Rural Agriculture Development Agency (RADA)
Banana Support Project	Farmer certification based on use of integrated pest management, and safe use of chemicals	European Union	Farmers, banana companies
Institutional strengthening of Trail Guide Association Project	Capacity building in ecotourism	EFJ	Valley Hikes (an ecotourism organisation)
Ecosystem Management Preservation and Conservation Project	1. Ecosystem management curriculum in schools 2. Building greenhouses, tide pools, and aquarium systems	EFJ	North Eastern Education Development Organisation
Forest Capacity Building Project	1. Capacity building of the forestry sector 2. Rehabilitation, protection and management of forestry resources	UNDP	1. Forestry Department 2. RADA 3. Forestry NGOs 4. NEST
Jamaica Ridge to Reef Watershed Project	1. Promoting effective watershed management 2. Establishing environmental programmes in selected geographical areas	USAID	1. Ministry of Agriculture 2. NEPA
Coastal Water Quality Improvement Project	Promotion of sound environmental management practices through integrated coastal resources management approach	USAID	1. NEPA 2. NWC 3. NGOs

Current efforts at forming a Jamaica Water Users Association should contribute significantly to the rationalisation of approaches to water resources management. Furthermore, a collaborative agreement between the NWC and the Forestry Department (FD) is receiving consideration. Under the proposed agreement, the FD may be entrusted with the management of NWC lands, including watershed areas, in consideration of a management fee.

Whilst all the major national policy instruments acknowledge the significant potential of collaborative water resources management arrangements, sustained and focused investment of resources is required to create an appropriate operational framework within which government regulators, private business, community leaders, community members, non-government environmental agencies, and the other relevant groups can pursue these opportunities. This will require and demand a significant cultural shift in the traditional management approaches used in public sector agencies. Public sector managers will need to be equipped with appropriate skills in areas such as group facilitation, problem solving, conflict-resolution, and related techniques. This training should also provide insight into, and understanding of, the perspectives of each stakeholder group.

2. Prospects and challenges for improving cost pricing for water production and protection

The situational analysis suggests that a reasonably informed and steady policy and institutional basis for effective water resources management exists in Jamaica. An integrated policy landscape is gradually emerging and definitive attempts are being made in several critical areas, especially in resource monitoring and assessment. In these and several other respects, Jamaica's water resources management could be described as being more advanced than that of many other Caribbean countries

However, the many and diverse challenges that plague Jamaica's water sector reflect the depth and scope of the improvements that need to be made in other Caribbean countries, especially in the area of financing water production and protection services.

In this regard, a strong focus of Jamaica's *Water Sector Policy* is on securing private sector participation in the water sector. Such participation has not been forthcoming, at least not in the traditional form of large-scale, foreign equity investment. However, there are instances where private hotel companies that have received abstraction licences to provide water for their own private operations, have in turn provided water to surrounding communities at rates that are cheaper than the national rates. There are also instances where co-operative and/or friendly societies secured financing for supplying water to communities to which they are attached.

However, it is clear that traditional forms of private sector participation are unlikely to ameliorate the impacts of low population densities, low income, high poverty levels, and high unemployment and under-employment rates; neither will they remove the need for some level of government subsidisation of the cost of water production and protection.

One criticism of Jamaica's *Water Sector Policy* is that it does not adequately locate water allocation strategies within the broader context of Jamaica's national development goals. Whilst the links with other national policies have been indicated, the links between allocation decisions and national development and economic planning processes appear to be missing.

A critical issue that needs to be addressed in arriving at a balanced and appropriate pricing and allocation mechanism within the water sector is the relative contribution of the respective economic sectors to social and economic development. In this regard, the incentives granted to the tourism sector vis-à-vis agriculture and manufacturing would need to be weighed against the incentives granted to various groups of water users, and their positive and/or negative contributions – to water resources management in particular, and to national development in general.

Tourism actors have repeatedly complained that they carry an inordinate tax burden compared to farmers – who pay little or no tax but continue to receive heavy incentives and subsidies with few conditions attached. Furthermore, hoteliers point to the sizeable net contribution of the tourism industry to Jamaica's gross national product (GNP) and gross domestic product (GDP) relative to the contribution of the agriculture and manufacturing sectors.

Against this background, the offer of additional incentives to farmers to encourage sound farming practices (including prudent water use) is unlikely to go unchallenged by hoteliers.

The heavy use of water by the agriculture sector justifies concern. Jamaica's National Irrigation Commission Limited (NICL) has a clear mandate to encourage water-use efficiencies in the sector. The NICL's 2004/2005 Annual Report suggests that slow but

steady progress is being made in this regard. However, it is acknowledged that introducing supply efficiencies – such as reducing unaccounted-for-water, rehabilitating irrigation systems, and introducing innovations such as drip irrigation and dried sewerage – requires a significant capital outlay of the type that is not readily available to water service providers and governments in Jamaica and elsewhere in the Caribbean.

The situation is compounded by the high volatility in the prices that farmers receive for their produce, especially on the international market. The imminent reduction in the price paid to sugar cane farmers on the European market, and the uncertainty in the future of the region's sugar industry, dictate that any responsible rate and tariff policy for the irrigation sector must contemplate a working partnership with the sugar and banana industries.

While the concerns and arguments of tourism actors have considerable merit, the contribution of the agriculture sector to food security, poverty reduction, and rural development must also be taken into account in determining an appropriate pricing and allocation mechanism. However – except for its limited treatment within the contexts of health and sanitation, and rural development – the centrality of poverty reduction to the success of cost recovery initiatives in the water sector has not been adequately addressed in the *Water Sector Policy*.

Although data on water use in the agriculture and non-agriculture sectors are available, there is no indication that these data have been incorporated into poverty analyses. Such analyses would be particularly useful in informing allocation decisions concerning agriculture and the rural economy in general. While there are undoubtedly food productivity and nutritional gains from irrigated agriculture – and while the subsidies from under-priced water received by farmers can be justified on the basis of cheap food for the poor, irrigation coverage, and crop productivity levels – the benefits from these developments may not be reaching the poor. Unless these efforts are targeted at the poor, valuable subsidies will continue to be wasted, the plight of the poor will worsen, and the financial position of water service providers will continue to deteriorate.

There is considerable scope for market-based instruments (MBIs) to be used to promote the reuse and recycling of water, especially in the major economic sectors. Generally, in the Caribbean there is not a strong ethic of reuse and recycling of water. This could be interpreted to mean that a dysfunction exists between allocation and pricing of water, and that tariffs are not set at a level that induce consumers to manage their demand for water and to use water efficiently. Such an ethic is unlikely to emerge if there is not a clear appreciation of the economic value of water on the part of water providers and consumers alike, and if water recycling and reuse incentives are not built into water tariffs. However, it is noted that the recycling and reuse of water for irrigation would first require that critical challenges are addressed, such as controlling pollution, preventing soil and water salinisation, and eliminating public health risks.

Furthermore, the critical role of water in livelihood provision and protection would need to be properly analysed within the context of issues relating to the degradation of soils, forests, biodiversity, water quantity and quality, and the relationship between these parameters and environmental costs and protection measures. Ideally, pricing mechanisms in the water sector should be informed by the results of analyses of:

- A. The costs of the deterioration and loss of environmental assets to economic, social, and environmental sustainability.
- B. The benefits that may be derived by the introduction of different water resources management approaches on the one hand, and price and non-price mechanisms on the other.

2.1 Conclusion

Improving water allocation efficiency in Jamaica and the rest of the Caribbean will require a range of measures that include allocating water to the 'highest value' uses through water markets, water rights systems, or other economic or regulatory allocation mechanisms, as well as through adequate, cost-benefit assessments. Highest value uses must take into account social, environmental and economic considerations. Likewise, costs and benefits need to be assessed in social and economic terms.

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