



Ministry of Water and Housing

Jamaica Water Sector Policy

Strategies and Action Plans



**Ministry of
Water & Housing**

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▶ 1 Introduction

Water is critical to the life, health and the economic well-being of a nation, and has real value as a commodity. Inadequate supplies can, and do have adverse social and economic consequences.

There is growing awareness and concern for the issues and problems in the water sector, which threaten the nation's health and which demand considerable sums for their resolution. These include the deterioration and malfunction of the municipal supply and sewage treatment infrastructure, management of industrial and toxic waste and its effect on water resources, rapidly increasing demand in water deficient areas, and the adverse effects of deforestation.

Jamaica has made significant progress in providing water services for its people. Across the country as a whole, the percentage of households with piped water has risen from 61% in 1990 to 71% in 2001. Over the same period, the percentage of households relying on water from rivers, springs and ponds has fallen from 5.7% to 3.1%, while the use of pit latrines and other types of sanitary conveniences has declined commensurately.

Unfortunately, the poorest 20% of the population has not shared in these improvements. One third of the poorest households rely on standpipes for their water, and 30% obtain water from untreated sources such as rivers. Only 21% of the poorest households have flush toilets.

The average Jamaican household spends 2.1% of its income on water services. This is approximately half of what the average household spends on electricity, and somewhat less than half the sum the average household spends on telephone services. The poorest 20% of households in Jamaica spend 3.2% of their income on water, while the richest 20% spend 1.8%.

While Jamaica has sufficient water to meet the overall demand, the resources are unevenly distributed in both time and location. The present shortfall is estimated at 126 million cubic metres per year (MCM/yr) - 53 and 73 MCM/yr for the non-agricultural and agricultural sectors respectively. The additional water requirement to the year 2015 is estimated at 790 MCM/yr. Of this, 172MCM is necessary for non-agricultural purposes and 618 for agricultural purposes. Related capital expenditure is estimated at US\$2.2 billion. The non-agricultural sector is estimated to require US\$1.3 billion, the agricultural sector US\$0.3 billion and sewerage systems US\$0.6 billion.

Future water development and the related capital expenditure will be driven by policy. The emphasis on water use efficiency and policies to encourage wise water usage and conservation practices serve to reduce the amount of water, which would otherwise be demanded.

The shifting of national priorities from water resource development to restoration of existing resources and enhancement of water quality, also serve to reduce the amount of capital otherwise required. Systematic planning as a matter of policy, based on reliable information and a range of plausible alternatives, has the potential to contain demand and reduce the amount of capital expenditure needed.

Legislation must, therefore be re-examined in light of contemporary water problems in order to establish an appropriate regulatory framework to protect consumers, investors and the environment.

This Policy was developed following a comprehensive desk study of the Water Sector, undertaken by an NIBJ team under the World Bank-funded Public Sector Modernisation Project. In the process of developing the policy, consultations were held with stakeholders in the Sector. The Water Sector Policy was developed to complement and be consistent with the National Industrial Policy, the National Land Policy, the Green Paper on Parks and Protected Areas, the National Environmental Protection Plan and the National Policy on Science and Technology. Data on service coverage, quality and costs were drawn from the Jamaica Survey of Living Conditions 2001. Following the completion of the first draft, comments were solicited and received from a number of interest groups and agencies. This final draft addresses the concerns and issues raised by those who commented on the earlier draft.

The Strategies indicate how the policy objectives will be implemented.

Following approval of the Policy by Cabinet in March 1999, work commenced on the Strategies and Action Plans. This work was facilitated through consultations with key stakeholders.

The assistance of the Inter-American Development Bank (IDB) has been invaluable in terms of funding the consultancies, which initiated work on the Strategies and Action Plans, as well as a subsequent working retreat to finalise them.

The completed policy document, along with the Strategies and Action Plans were presented to the general public in a series of consultations islandwide. The document was also widely circulated among the business community, non-government organisations, parish councils and other interest groups. It was also posted on the website of the Water Resources Authority (WRA). The document has since been updated, taking on board appropriate comments and suggestions from the consultations.

▶ 2 Water Resource Management

2.1 Current Situation and Problems in Water Resource Management

Water is essential to national prosperity, environmental sustainability and the quality of life. It is a catalyst for industrial and agricultural development and a vehicle for empowerment and poverty alleviation. However, water is a finite and vulnerable resource and has, therefore, to be properly managed to ensure its availability. Managing water as an economic good will not only contribute to efficient and equitable use, but also encourage conservation and protection of water resources.

The assessment of water resources indicates a reliable yield of 4,083 MCM/yr., groundwater providing 3,418 MCM/yr. and surface water providing 665 MCM/yr.

Present production from both ground and surface sources totals 920 MCM/yr., leaving a balance of 3,163 MCM/yr. available for development.

Since April 1996, the Water Resources Authority (WRA) has had responsibility for the regulation, control and management of the nation's water resources. In carrying out its mandate, the WRA has completed work in many important areas of water resource management.

i) Integrated Water Resource Planning and Development

It is responsible for planning and implementing the integrated management and development of Jamaica's water resources. In discharging this responsibility, the WRA has:

- formulated the Water Resources Development Master Plan, which defines the resources, supply and demand at the hydrologic basin level;
- prepared the National Irrigation Development Master Plan with the National Irrigation Commission. This plan defines the irrigable areas and the irrigation water demand; and
- worked with the National Water Commission (NWC) to prepare "parish plans" setting out time-frames for development of resources.

ii) Resource Monitoring and Assessment

Ongoing monitoring and assessment of the patterns of resource use, and the response of the resource to use, are critical to the WRA's capacity to manage and protect these resources.

There are 10 hydrological basins in Jamaica. Detailed assessments of seven have been completed. The WRA will assess the remaining basins and keep the assessments updated. Other tasks related to resource monitoring and assessment include:

- maintenance of the national hydrologic monitoring network on streams and rivers, groundwater, water quality, withdrawal of water and well construction; and
- research to determine aquifer-safe yield and to update the Master Plan.
- vulnerability maps, which show the risk of pollution to aquifers;
- source protection zones, to protect water sources and watersheds; and
- minimum downstream flows, which ensure that rivers contain enough water to sustain ecosystems and preserve their amenity value.

iii) **Natural Disasters**

The Government will continue to develop proactive and pre-emptive approaches in the field of water-related disaster prevention. Community involvement and Local Government participation will be emphasised.

The WRA is responsible for working with the Office of Disaster Preparedness and Emergency Management (ODPEM) and the National Meteorological Division to reduce the impact of natural disasters related to water.

The WRA assesses the likelihood of extreme hydro-meteorological events, such as floods and droughts. It contributes to the management and mitigation of such events, using flood warnings, flood plain mapping and drought plans.

iv) **Protection of Water Resources**

The WRA will ensure the sustainable use of water resources as well as the preservation of ecosystems and the aquatic environment through development of:

v) **Public Education**

The WRA is responsible for informing and educating the public about Jamaica's water resources. To do this, it has:

- established a website to disseminate information on Jamaica's water resources; and
- developed a Documentation Centre on water resources information.

vi) **Allocation**

The WRA is also responsible for the allocation of water resources. It uses the following criteria in allocating water use rights:

- historical water rights;
- availability of water;
- effect on existing wells and downstream users;
- water quality;

- economic considerations;
- efficiency of use; and
- protection of ecology and ecosystems.

Despite the improvements brought about by the WRA, there is still much work to be done in the area of water resource management and allocation. Watershed management is often inadequate. Integrated water resource planning is not always achieved in practice, often due to failures in institutional co-ordination. In many cases, water is still being used inefficiently.

2.2 Objectives of Water Resource Management

The allocation and management of water resources will be guided by the following core principles:

- ensuring integrated and informed management of the country's water resources (development of water resources will not be done sectorally);
- ensuring that water for public supply will receive priority in the allocation of resources;
- ensuring that water is used as efficiently as possible (including promotion of conservation). Where possible, the conjunctive use of surface and ground water will be implemented. Priority must be given to demand management; and
- to ensure that measures are implemented to restore and enhance the quality and quantity of usable water to protect the aquifers, watersheds and other sources of water.

The following will be the specific focus of the strategies designed for water pollution prevention and control:

- maintenance of ecosystem integrity, through the protection of aquatic resources from negative impacts caused by development and natural processes;
- protection of public health against disease vectors and from pathogens;
- ensuring sustainable water use and ecosystem protection on a long-term basis; and
- implementing the *polluter pays* principle.

The focus of the policy will also be on developing mechanisms to ensure compliance, including public education, incentives and sanctions.

2.3 Implementation of Objectives in Water Resource Management

2.3.1 Institutional Responsibilities in Water Resource Management

The Government of Jamaica (GoJ) has recently amended the laws to vest in the Water Resources Authority, responsibility for the regulation, control and management of the water resource. The WRA shall continue to have responsibility for:

- management of water resources;
- maintenance of a timely, updated and comprehensive water resource database;
- raw water quality and monitoring assessments;

- planning and approval for water resource development;
- issuing and enforcing permits for well drilling and water abstraction; and
- public education, as appropriate.

The National Environment & Planning Agency (NEPA) and the Water Resources Authority have responsibility for developing and monitoring standards relating to water quality. Some of these standards have already been promulgated, while others are still being developed.

The Water Resources Authority will own only such assets as are necessary to carry out its regulatory function effectively, and shall in turn be owned 100% by the Government of Jamaica. The WRA will be funded by fees and government subventions.

2.3.2 Allocation Mechanisms

The Authority is responsible for operating a system

in which conflicts between water users are resolved in such a manner as to ensure that water resources are used as efficiently and economically as possible. In accordance with its Act, the WRA shall make use of both administrative (as at present) and market-based mechanisms in allocating water resources.

The WRA is responsible for the development of appropriate market-based allocation mechanisms. In line with this, it is implementing a system of fees for access to and use of ground and surface water. These include the following:

- a fee to process applications from persons seeking to access the water resources;
- an abstraction charge sufficient to recover the agency's cost in performing its functions; and
- a fee to cover monitoring and other administrative costs of the Authority.

▶ 3 Urban Water and Sewerage

3.1 Current Situation and Problems in Urban Water and Sewerage

The National Water Commission is responsible for the urban water supply throughout the island. It is also the largest provider of sewerage services. Other major sewerage providers include the Urban Development Corporation, and private as well as public housing developers.

The great majority of urban residents have access to safe, piped, potable water. In the Kingston Metropolitan Area (KMA), approximately 98% of households have piped water, and in other towns 86% have this facility (up from 73% in 1996). Urban households without piped water rely predominantly on standpipes. About half the standpipe users in urban areas travel 46 metres or less to fetch water.

While coverage is good, reliability of supply to urban households and industrial users is often erratic. As stated in the introduction, sufficient water exists in the island to meet all water demands, but the water resources are not necessarily located close to the major centres of water use. The infrastructure to move water to the areas where it is needed is inadequate in some parts of the country.

Sewerage services exist in most major urban areas, and are being improved. In the KMA, 93% of households have flush toilets, while in other towns 63% have this facility. In the KMA, 47% of households are linked to sewer systems, while in other towns the figure is 4%. The great majority of urban households without flush toilets use pit latrines. While coverage of sewerage services has

increased significantly in recent years, it is less extensive than the coverage of water services. Sewage disposal practices are also often inadequate. As such, significant investments and operational improvements are needed in this area.

The average household in the KMA spends 1.9% of its income on water services, while in other towns the figure is 2.3%. In most households, their expenditure on water is about half their expenditure on electricity.

The root of Jamaica's problems in the urban water sector are complex and inter-linked. However, some points should be highlighted. Difficulty in mobilising the necessary financial resources is clearly important. In recent years, the NWC has been incurring losses. Currently, it comes close to covering its operating costs, but does not generate any surplus, which could be used to finance investment. The practice has been for the NWC to rely on the Government to finance new infrastructure. However, competing demands on the Government's budget mean that this source has not been adequate to provide for the water infrastructural needs of the country.

In spite of numerous interventions by the GoJ to make the NWC more commercially focussed, the desired results have not been achieved for a number of reasons, including:

- the absence of timely and adequate tariff adjustments;
- an increase in the area served by the NWC and the demand for the service consequent upon the Company's taking over Parish Council systems; and

- insufficient capital to upgrade these facilities taken over from the Parish Councils.

The NWC's infrastructure is in a generally poor state and significant investment will be needed to rehabilitate it.

3.2 Objectives in the Urban Water and Sewerage Sector

The Government's objectives in the provision of urban water and sewerage are listed below.

3.2.1 Services to be Provided

In the area of services provided to consumers, the Government intends to:

- ensure availability of the minimum, necessary quantities of potable water and minimum standards of sanitation services to all -
 - in a cost-effective and efficient manner,
 - with due regard to health and environmental considerations, and
 - at a price customers can afford;
- ensure minimum standards/levels of service for the public supply of potable water. For municipal/urban households and other urban consumers, this will include potable water available 24 hours per day;
- focus the provision of water and sewerage services on meeting the needs of areas targeted by the National Industrial Policy, so as to have the maximum impact on growth and development;

- provide for expansion of the sewerage network in areas with high population densities, having regard to health and environmental considerations;
- ensure improvements in sewage treatment and disposal, to protect the environment; and
- control and reduce the production of industrial effluent, and ensure that such effluent are adequately treated, to avoid contamination of existing water resources.

3.2.2 Efficiency in Provision and Use

The Government intends to increase the efficiency in the provision and consumption of water services. It will, therefore:

- encourage the implementation of measures to ensure conservation by providers and consumers of water. This will include the introduction of measures for conservation, *viz.*-
 - reduction of system leaks by water providers,
 - adoption by consumers of water saving devices, and
 - education of consumers and public information;
- increase the efficiency of NWC operations, including the reduction of unaccounted for water, promoting more efficient use of electricity associated with the delivery of water; and
- encourage optimal utilisation of water through multi-purpose uses, such as hydro-power generation, recreation and recycling for other purposes.

3.2.3 Enabling Environment

To enable the achievement of the above objectives, the Government will promote:

- i) the mobilisation of additional sources of funding and investment support, both from the private sector and from external sources;
- ii) the introduction of cost recovery mechanisms, so as to ensure that the direct beneficiary pays and that the supply of services can be maintained and expanded; and
- iii) the effective and efficient operation of an appropriate regulatory framework to protect customers, investors and the environment.

The Government will update the legislative framework by amending existing laws, and where necessary, by passing new laws to reflect the policy and facilitate its implementation.

3.3 Implementation of Objectives in the Urban Water Sector

3.3.1 Institutional Responsibilities in Urban Water and Sewerage

Currently, the NWC is responsible for the provision of water and wastewater facilities to urban customers.

The Office of Utilities Regulation (OUR) is responsible for the approval of fees and tariffs based on prescribed/agreed water quality and service quality standards, minimum standards of sewerage services and other appropriate parameters. The OUR and NWC will both be responsible for public education as appropriate.

The OUR will develop acceptable service standards for urban potable water and waste-water services provided to consumers. The OUR will also develop the appropriate enforcement mechanisms.

The Ministry of Water and Housing in consultation with the OUR and other stakeholders is effecting all legislative reforms required to give effect to its policy.

In the area of water quality standards, the World Health Organisation guidelines and the Interim Jamaica guidelines will continue to apply, and will be monitored by the Environmental Control Division of the Ministry of Health (MoH).

Effluent standards, which set the permissible limits on discharge of treated sewage, have already been developed by the WRA and the NEPA. The NEPA will continue to have responsibility for monitoring and enforcing compliance with these standards.

3.3.2 Financing and Cost Recovery for Urban Water and Sewerage

Cost recovery mechanisms will be used to ensure that the direct beneficiary pays and that the supply of service can be maintained. The costs associated with the provision of water, sewerage and sewage disposal services may be divided into operations and maintenance costs and the cost of financing new infrastructure. A regulatory regime is required to ensure that only efficient cost levels are recovered from consumers.

3.3.2.1 Recovering Operating Costs

The NWC will continue to recover operating costs through tariffs. Where necessary to achieve social

objectives, the Government will provide subsidies equal to the tariffs, fees and charges otherwise payable by the consumer for "social water" (see section 3.3.3). Recovery of these costs is fundamental to the sustained viability of the entity providing the service.

3.3.2.2 Financing Capital Costs

Up to now, most financing for the expansion of infrastructure has been provided by grants from the Government to the NWC. The Government intends the sector to be able to access financing from a wider range of sources in the future. These sources will include:

- millage (charges levied on consumers in addition to the tariff to fund new projects from which they will benefit);
- financing provided by the private sector; and
- government grants for specific works with high social or environmental value.

3.3.2.3 Financing Infrastructure for New Housing or Other Developments

In discrete new developments, the developer will be required to meet all on-site infrastructural costs. The developer should be able to recover these costs through the sale price of the units.

Where off-site infrastructure is undertaken to benefit a clearly identified new housing development, industrial park or individual residence exclusively, the capital cost will be met by the developer. Again, these costs should be recovered in the sale price of the units.

The cost of off-site infrastructure, which serves new or existing developments, as well as other

neighbouring communities will be recovered via normal tariffs.

Having regard to the administrative implications of applying the above approach to funding and cost recovery with respect to major projects, the areas requiring attention will be identified and the appropriate funding and method of cost recovery prescribed ahead of time. Private sector involvement in sourcing the necessary funds and carrying out the project may then be solicited.

3.3.2.4 Tariff Structure

The amount chargeable for the public supply of water and wastewater services for domestic or industrial use may include, among other things, the following:

- i) a lifeline rate;
- ii) full-cost recovery; and
- iii) differential tariffs, depending on the areas served.

The objective will be to reflect in the tariff, the cost of providing the service, while also taking into account social considerations where appropriate.

3.3.2.5 Tariff Regulation

The OUR will be responsible for setting tariffs at a level which allows the service providers to fully recover efficient cost levels (including both capital and operating costs). The service providers will be responsible for increasing the efficiency of their operations, thus reducing costs to the lowest efficient levels.

Where exceptional circumstances dictate the need for additional funds for systems improvements or rehabilitation, the OUR will take this into account in setting tariffs.

The service providers and the OUR will implement a public awareness campaign whenever tariffs are adjusted. This will include information on reducing bills through increased water conservation by consumers.

3.3.3 Social Water

Potable water should be available to all citizens in such quantity and quality to sustain life, irrespective of the citizen's ability to pay. Minimum standards of sewerage service, particularly in urban communities where there is no viable alternative, must be provided for reasons of public health and environmental conditions, irrespective of the citizen's ability to pay. Social water refers to the provision of these minimal levels of water and sewerage services to persons who cannot afford to pay their full cost. This definition is also expanded to include water supplied to the public at large in circumstances where collecting payment from the user is impractical, for example, water provided from hydrants for fire-fighting.

The Government's policy is that minimum standards of water and sanitation services necessary for the sustenance of life and good public health will be made available to all at an affordable price. To implement this policy, the following agencies will work together to define the minimum standards of service for social water:

- National Water Commission;
- Ministry of Water and Housing;
- Ministry of Health;
- Office of Utilities Regulation; and
- Consumer Affairs Commission.

This group will recommend the appropriate levels of service necessary for households. They will also consult with the Ministry of Finance to determine the appropriate mix of revenue sources to cover the cost of the recommended levels of social water. The following sources of revenue will be considered:

- tariffs and user fees;
- cross-subsidies (this means some customers pay more than the cost of the service provided, so that other customers can receive service at below cost); and
- direct subsidies from the Government of Jamaica's Budget.

In quantifying the social water commitment in the Water Sector Strategy, the following principles will be used:

- the determination of eligibility should be based on either a means test, or by reference to the national poverty map;
- the unit of consideration should be the household; and
- the desirable minimum quantity of water refers to the well accepted concept of the lifeline quantum. Reference to the international, as well as local experience will inform the determination of this figure.

3.3.4 Ownership and Private Participation in Urban Water and Wastewater

The provision of water is capital intensive. To relieve Government of the full burden of financing the sector, private investment in new infrastructure and private operation of water services will be

encouraged. However, the Government of Jamaica will continue to own and/or control (directly or through designated entities such as the NWC), the natural resources and existing infrastructural assets.

The privatisation is but a part of the Government's strategy to secure economic benefits for Jamaica, and not an end in itself. Private participation in the Water and Sewerage Sector is expected to bring improvements in the availability, quality and cost-effectiveness of the services being delivered. Private participation arrangements should meet the following criteria:

- i) terms for privatisation that are in the country's best interest;
- ii) improved economic efficiency in the sector, in both operating performance and the use of capital investment;
- iii) technical and managerial expertise and new technology into the sector to achieve productivity improvements;
- iv) the injection of large-scale investment capital into the sector and/or access to private capital markets, thereby reducing public investment;
- v) insulation of the sector from short-term political intervention in utility operations and limitation of opportunities for intervention by powerful interest groups;
- vi) transfer of the risks and responsibilities of ownership from Government to the private sector over the long-term;
- vii) delivery of a reliable and efficient service to communities throughout the island; and

viii) making the sector more responsive to consumers' needs and preferences.

The following options for private sector participation will be investigated by the Government:

- service contracts;
- management contracts;
- leases;
- concessions; and
- Build Own Operate Transfer (BOOT), Rehabilitate Operate Transfer (ROT) and similar arrangements.

The specific option to be used in any given instance will depend on the mix of the above objectives, which the Government wishes to achieve at any given time. In addition, the Government will encourage private initiatives to supply areas, which currently do not have adequate service.

In order to implement these policies the Ministry of Water and Housing will develop a strategy for private participation in the sector. It is intended that the OUR will be responsible for licensing all participants in the industry.

▶ 4 Rural Water and Sanitation

4.1 Current Situation and Problems in Rural Water and Sanitation

In rural areas, 45% of households have piped water. This is an increase from 33% in 1990. Twenty-four percent (24%) of rural households get water from standpipes, and 23% use rainwater tanks. Often these solutions are appropriate. However, the Government is concerned that too many people in the rural areas still do not have access to safe drinking water, or must make excessive efforts to fetch water.

Eight percent of rural households obtain water from rivers, streams and ponds. Of those rural households, which rely on standpipes, more than half have to travel over 46 metres, and 10% need to go more than 914 metres. The NWC trucks water to its customers when systems break down or the supply is intermittent. Parish Councils also truck water, as do private firms.

Sewerage is not generally provided in rural areas, except in small housing developments. In total, 3% of rural households are connected to a sewer system. The percentage of rural households with flush toilets has increased from 28% in 1990 to 39% in 2001. The most common sanitary convenience in rural areas is the pit latrine, used by 60% of rural households. Septic tanks, pit latrines and other types of on-site conveniences can be effective and safe. However, if not constructed, used and maintained properly they can pose a threat to health and the quality of aquifers and surface water.

Lower population densities mean that the cost of water provision in rural areas is often higher than in urban areas, while lower incomes in many rural areas make it difficult for some customers to meet

the full cost of high quality services.

Responsibility for provision of water services in rural areas has been transferred back and forth between the NWC and Parish Councils over the past two decades. Between 1988 and 1993 water provision throughout the island was the NWC's responsibility. In 1993, the NWC transferred some systems to Parish Councils for operation. Simple systems without mechanical and electrical equipment were transferred, while systems, which were more complex and expensive to operate and maintain were retained by the NWC. The relationship between the Parish Councils and the NWC has often been ill-defined and unsatisfactory.

The importance of gender-sensitive approaches will be critical to meeting the objectives outlined below. These approaches include capacity enhancement of men and women, for the effective, efficient and equitable solutions to the challenges of water resource management and development.

4.2 Objectives of Rural Water Supply

The Government's objectives for the provision of rural water supply include:

- i) ensuring that by 2010 all Jamaican households, rural as well as urban, have access to potable water and adequate sanitation -
 - in a cost-effective and efficient manner,
 - with due regard to health and environmental considerations,
 - using approaches which result in costs households can afford;
- ii) upgrading of minor systems being operated by the Parish Councils;

- iii) expansion of the water supply in rural areas through a dedicated rural water supply company, partnering with various groups and entities to design, construct and manage sustainable systems;
- iv) encouraging the implementation of measures to ensure conservation by providers and consumers of water;
- v) increasing the efficiency of operations; and
- vi) mobilising additional sources of funding and investment support, introducing cost-recovery mechanisms, and ensuring the smooth operation of an appropriate regulatory framework to protect customers, investors and the environment.

Given the particular circumstances and needs of rural communities, the service standards for rural water and sanitation may vary from those set for urban areas. The Government will promote the use of appropriate technologies and approaches in rural water provision, and a mix of the following options will be employed, depending on remoteness and other special characteristics:

- house connection with running water;
- water shops;
- wayside tanks and loading bays;
- community catchment tanks;
- standpipes;
- trucking;
- self-provision through individual household rainwater tanks and wells; and
- other appropriate methods.

4.3 Implementation of Objectives - Rural Water Supply

4.3.1 Institutional Responsibilities for Rural Water Supply

The Ministry of Water and Housing and the Ministry of Local Government will formally determine the responsibilities of the NWC, the Parish Councils and other water operators in relation to the water supply in each Parish. The Government and Parish Councils will encourage community participation in the operation and management of community water supply systems such as catchment tanks.

Where the NWC is responsible for rural service provision, it will be regulated by the OUR, as will be the case for urban provision. The OUR will develop service standards for such cases, as well as the appropriate enforcement mechanisms and necessary legal reforms.

In cases where the Parish Councils or other operators are responsible for service provision, the Councils or operators will be required to publish the level of service they plan to achieve, and to report on their performance against these standards. Potability standards will be set and enforced by the Ministry of Health. The OUR will monitor service standards and tariffs and make recommendations for regulation if necessary.

The Ministries of Health, Water and Housing, of Local Government and Environment and Housing will work together to set standards and targets for rural sanitation, and to ensure that these are achieved.

4.3.2 Financing and Cost Recovery for Rural Water Supply

The general principles applied to urban customers will also be applied to rural customers, in cases in

which NWC is the provider. However, the higher costs and lower incomes in rural areas mean that on an average, subsidies in rural areas may be higher than those in urban areas. Policies on tariff structure and the recovery of infrastructural costs for new development will also be the same in rural as in the urban areas.

Where Parish Councils provide water, they will be required to recover at least the operating costs of the system through user charges. Capital costs may be met from internally generated funds, Government grants, or private participation where feasible.

4.3.3 Rural Social Water

Rural customers rely on social water through sources such as catchment tanks, standpipes and trucking, as well as piped water. These sources must provide the minimum standards necessary for the sustenance of life and good public health, at a price which rural customers can afford.

In developing the Water Sector Strategy, the following agencies will define the minimum standards of service for rural social water:

- National Water Commission;
- Ministry of Water and Housing;
- Ministry of Local Government;
- Ministry of Health;
- Office of Utilities Regulation; and
- Consumer Affairs Commission.

This group will recommend the appropriate levels of service necessary for each household. In consultation with the Ministry of Finance, they will

determine the appropriate mix of revenue sources to cover the cost of the service. These sources may include tariffs and user fees, cross-subsidies and direct subsidies from the Government of Jamaica or Parish Council budget.

4.3.4 Ownership and Private Participation in the Rural Water Sector

The Government's policy is to encourage private participation in the rural water and sewerage sectors, where this is likely to benefit consumers and the country. The benefits which will be sought include improvements in efficiency of operations and investment, technical and managerial expertise, access to new technology and the injection of investment capital (thereby reducing public investment). Private participation should also contribute to the insulation of the sector from short-term political intervention, a transfer of the risks and responsibilities of ownership from Government to the private sector, delivery of a reliable and efficient service to rural communities and increased responsiveness to rural consumers.

As noted above, low population densities and low incomes impact negatively on the viability of water and sewerage projects in rural areas. This decreases the likelihood that the private sector will be willing to participate. In developing its recommendations on private participation, the Ministry of Water and Housing will be required to recommend ways in which rural consumers can benefit from private participation where appropriate. This may include requiring private operators to take responsibility for service provision in an entire area, not just in the urban centers. The Government may provide incentives to encourage private participation, which will benefit rural people. Where appropriate, the Government will promote the involvement of co-operatives and small entrepreneurs.

▶ 5 Urban Drainage

5.1 Current Situation and Problems in Urban Supply

In urban areas, the high proportion of land space covered with hard, non-absorbent materials such as asphalt and concrete means that rainwater cannot soak into the ground, or be left to run-off into natural water courses. Special systems are needed to collect, channel and dispose of rainwater in urban areas. This is referred to as urban drainage.

Up to now in Jamaica, responsibility for provision of urban drainage has been shared in a fairly ill-defined way between the Ministry of Works and the Parish Councils. It has been treated largely as an adjunct to road construction. The Water Resources Authority has responsibility for determining drainage needs in its hydrological cycle approach. The Ministry of Works is involved in planning to ensure that drainage is sufficient to prevent flooding, and in taking remedial action when flooding occurs.

The Government is aware of a number of problems and missed opportunities in the area of urban drainage. Institutional responsibilities are poorly defined and co-ordination between institutions is often less than optimal. Provision for drainage and maintenance of drainage systems are often inadequate. The result is deterioration of road surfaces and flooding in some cases. The impact of drainage on the quality of the receding waters is often overlooked; while at the same time opportunities to reuse drainage water, for example for aquifer recharge, are seldom considered.

5.2 Objectives and Policy in Urban Drainage

In line with best practice internationally, the Government will ensure that urban drainage is treated as an integral part of the water sector. Key objectives in the sector include:

- improving co-ordination between the various institutions involved in the sector;
- improving the quality of urban drainage, both in its initial provision and its maintenance;
- maximising efficiency in the provision of urban drainage; and
- reducing harmful effects on the environment by better planning for drainage discharges, and putting them to beneficial uses where this is feasible and economic.

The Ministries of Water and Housing, Works and Local Government will develop recommendations for the achievement of these objectives.

▶ 6 Irrigation

6.1 Current Situation and Problems in Irrigation Supply

The provision of water for irrigation makes an important contribution to agricultural production in Jamaica. It is, therefore, a key element in rural development. However, the Government recognises that the sector suffers from a number of weaknesses. Cost recovery is low, and the sector does not generate funds to finance its own expansion. Operating efficiency is also often low, with high levels of wastage due to the lack of funding to effect efficiency improvements, such as canal lining and leakage reduction from pressurised systems. In some cases, farmers use inefficient irrigation techniques. Because of these problems it is often difficult to respond to farmers' needs as desired and furthermore, there are sometimes harmful environmental effects. Critical areas of the country, which could benefit from irrigation currently do not have access to this service. The exploration of appropriate technology to incorporate the reuse of waste water in irrigation will also be considered in the expansion of services.

6.2 Objectives

The Government is intent on ensuring that the provision of water for agricultural purposes is done:

- in a cost effective and efficient manner;
- in a manner to facilitate sustained social and economic growth and development;

- with due regard to health and environmental considerations; and
- at a price based on economic considerations.

The Government will promote:

- achievement of cost-efficiencies;
- mobilisation of additional sources of funding and investment support from the private sector and external sources;
- introduction of cost recovery mechanisms to ensure that the direct beneficiary pays and that the supply of services can be maintained and expanded;
- encouragement of farmer participation in the management and distribution of irrigation water;
- introduction of conservation measures, including those to improve irrigation efficiencies and reduce system losses;
- expansion of irrigation facilities on a phased basis to agricultural belts across the country, with particular emphasis on the arid, but highly productive southern agricultural parishes; and
- development of ways and means to facilitate the needs of small hillside farmers.

6.3 Implementation of Objectives in Irrigation

6.3.1 Institutional Responsibilities for Irrigation

The National Irrigation Commission (NIC) is currently responsible for the operation of irrigation systems.

The Government has decided that its objectives in the sector can best be achieved by delegating responsibility for irrigation systems to Water Users' Associations (WUAs) comprised of the farmers who benefit from them.

There will, therefore, be a transitional period in which the NIC will encourage the formation of WUAs throughout the country, and will progressively delegate responsibility for operating and maintaining irrigation systems to the WUAs. During this transitional period, the NIC will provide technical and other forms of support to these Associations, to ensure that they function effectively. During the transition, the NIC will also continue to fully operate systems which have not yet been delegated to WUAs.

The longer-term objective is that the NIC's role will become one of planning, regulating, monitoring and evaluating the irrigation sub-sector. The question of the form of the regulation appropriate for irrigation systems will be addressed. The Government has mandated the Ministry of Water and Housing (including the NIC), the Ministry of Agriculture and the OUR to consider, report, and make recommendations on this issue.

6.3.2 Financing and Cost Recovery for Irrigation Systems

To ensure that the irrigation systems are financially viable, the Government has decided that their operations and maintenance costs should be met from charges paid by the users. This policy objective will be phased in within five years.

In the case of new systems to be constructed under the National Irrigation Development Plan, users will also be required to pay a reasonable proportion of the capital costs. The proportion will depend on the ability of the users to pay, and will be decided on a case by case basis.

6.3.3 Irrigation Subsidies

Irrigation water has to be provided for farmers from time to time at prices below cost, to ensure continued operation of farming activity, having regard to the wider economic consequences.

In developing the water sector strategy the following agencies will determine the circumstances under which subsidised irrigation water will be provided for farmers and define the minimum standards of service in such cases:

- Ministry of Water;
- Ministry of Agriculture;
- National Irrigation Commission;
- Office of Utilities Regulation; and
- sector stakeholder groups.

In consultation with the Ministry of Finance, they will determine the appropriate mix of revenue sources to cover the cost.

6.3.4 Ownership and Private Participation in Irrigation

The current practice of vesting assets in the NIC will continue. Private sector and co-operative involvement in public irrigation will, in due course come about through the formation of Water Users' Associations as legal entities (e.g. co-operatives or limited liability companies), where this is deemed to be the best model for any particular system. Farmers will be members and shareholders, with the power to govern these organisations. Responsibility for local management, water

distribution, monitoring and maintenance of these systems will be assumed by those WUAs, which have attained legal status. There will be provisions to facilitate continual accession of WUAs to independent status as they prove themselves capable of assuming full responsibility. Other forms of private involvement in irrigation will also be encouraged.

WUAs will be pivotal to the process that will ensure a greater rate of cost recovery, lessen the burden on central government and promote the sustainability of irrigation-fed agriculture, through decentralised self-governance as far as is possible and practicable.



Strategies and Action Plans

Water Resources - Regulation and Management

▶ 1 Introduction

In growing recognition of the importance of water to Jamaica's socio-economic development, including its importance to the sustainability of the island's natural environment, the Government of Jamaica has over the years, accorded increasing importance to the appraisal, development, management and protection of its water resources.

The preparation of a National Water Resources Development Master Plan in 1985 provided the framework for the allocation of water resources. The promulgation of the Water Resources Act (1995) provided the legal basis for management, conservation, protection and allocation of these resources. The Water Resources Act (1995) is a progressive and comprehensive piece of legislation. The Water Resources Act is the response to the acknowledged deficiencies of:

- a unified and cohesive legislative framework for the proper administration, development and optimal use of the island's water resources;
- adequate water resource planning to ensure its rational development and equitable allocation;

- the control and management of water quality in aquifers and stream channels; and
- the interaction of surface and ground water resources.

Notwithstanding the comprehensive nature of the Act, there still remain areas of overlapping jurisdictions and functions, as well as legislative gaps that affect the operations of several related agencies in the water sector. For example, four agencies, namely NEPA, MoH, ODPEM and WRA, all have emergency powers to deal with pollution. In addition, the institutional and financial sustainability of the Water Resources Authority needs to be ensured.

The WRA requires substantial strengthening to enable it to effectively execute its mandate under the Water Resources Act (1995). The focus of the Water Resources Strategy is to address the issues of institutional/legal overlaps, capacity strengthening and to improve the financial sustainability of the Water Resources Authority. This will allow for an integrated and broad-based approach to the realisation of the sub-sector's objective.

2 Objective

The objective of the Water Resources Strategy was determined as:

the management and regulation of the water resources of Jamaica with a view to its sustainable development and optimal use to satisfy all of the water supply needs of the island in an efficient, cost effective and timely manner.

This objective will be achieved through the implementation of the strategies listed below.

3 Strategies

3.1 Legal and Institutional Framework

Overlapping jurisdictions and gaps in the legislative framework governing the operations of the institutions, which constitute the water resources component of the water sector will be addressed as follows:

- promulgation of a Meteorological Services Act, to give force of law to the establishment of a GoJ institution responsible for the provision of weather, climate and agro-meteorological services in support of safe air and sea transportation, sustainable water resource development, agricultural production, ecological protection, disaster preparedness and mitigation to Jamaica;
- rationalisation of the legal framework for flood water control through amendment of the Water Resources Act (1995), to include the regulation of floodwater control. Simultaneously, the Flood Water Control Act (1958) will be reconciled to establish a single responsibility for the design, construction and maintenance of flood water control structures;
- harmonising inter-agency responsibility for water quality, to avoid potentially negative impacts, through the development of a Memorandum of Understanding (MOU) among the related agencies - NEPA, ODPEM, MoH and WRA. The MOU would clearly set out the lead agency in each circumstance and the extent of the support to be provided by the others;
- activation of the Water Resources Advisory Committee, as provided for in Sections 14 and 15 of the Water Resources Act (1995). This committee will advise the Minister on the Water Resources Strategy and Action Plan, in addition to other statutory responsibilities assigned by the Water Resources Act (1995) – see Schedule 2 of the Regulations; and
- initiation by the Ministry of Water and Housing, of the rationalisation of the regulatory framework for watershed management currently shared among the WRA, NEPA, the Forestry Department and the Ministry of Land and Environment.

3.2 Technical Programme

The technical mandate of the WRA will be fulfilled by the implementation of the following strategies:

- introduction of technical performance standards, which will be used annually to evaluate the effectiveness of the hydrological data programme for each hydrological basin and the general performance of the WRA;
- rehabilitation and expansion of the hydrological data network, to provide adequate and reliable data for assessing the water resources of each hydrological basin and overall water availability;
- development and implementation of a National Water Quality Programme to provide information on prevailing trends, the status of ground and surface water quality, delineation of areas where pollution is occurring and the development of strategies to mitigate contamination;
- design and construction of hydrologic databases to improve digitising, data storage, retrieval and regular and rapid analyses;
- revision and promulgation of the Water Resources Development Master Plan. Cognisance will be taken of the water supply plans of the National Water Commission and the National Irrigation Commission;
- accelerated licensing of water abstractors to bring them into compliance and improve the reporting of abstraction to better define water use and availability;
- publication of a Water Quality Atlas to guide the processing of applications for environmental permits and effluent licences, as well as to serve as a public education tool on water quality issues;
- publication of Pollution Risk Maps to identify sources of pollution, categorise and characterise the physical vulnerability of hydrologic units and propose a policy for the rehabilitation of contaminated sites, while minimising future pollution. These maps will be used primarily by the NEPA and the Town Planning Department;
- development of a Flood Water Control Master Plan, which will identify flood-prone areas and flood boundaries, and prioritise measures to reduce the impact of flooding. This will include the continuation of flood plain mapping;
- increased promotion of stakeholder participation in water resource management through consultation and public education;
- promotion of water resource conservation and protection through public education and use of permits/licences;
- determination of water availability to satisfy domestic and agricultural water demands; and

- determination of the ecological water demand associated with surface streams, inland and coastal wetlands.

3.3 Financial Sustainability

The WRA is funded primarily by a subvention from the GoJ budget. In order for the WRA to carry out its mandate fully, more sustainable financing will be necessary. The following strategies will be implemented to secure funding and ensure financial sustainability:

- maintaining the Government of Jamaica’s (GoJ) contribution at current levels in real term; and
- increasing the contribution from cost-recovery programmes through:
 - water licence application fees from unlicensed abstractors and
 - the introduction of an annual licensing fee.

3.4 Organisational Strengthening

Water resource regulation and management is a highly technical and specialised field. To attract and retain the calibre of staff necessary to fulfill the mandate of the Authority, it is imperative that appropriate compensation and other incentives be put in place. Simultaneously, the structure of the organisation must be modified to reflect the changes in responsibilities as outlined in the strategies above. The following strategies will be employed to effect the strengthening of the organisation:

- a) reclassification of positions within the Authority to increase compensation, and
- b) modifying the organisational structure to include a Flood Water Regulation Unit, a Permit and Licensing Unit and making other changes to improve staff morale and production.

4 Action Plan

The Water Resources Action Plan consists of a set of projects to give effect to each strategy. The Action Plan is set out below.

A. Legal and Institutional

Description of Action/Project	Planning Horizon	Duration (yrs)	Cost (US\$M)	Funding Source	Implementing Agency	Remarks
Promulgation of a Meteorological Act	Short-term 2003-2005	2.0	0.025	Grant from WMO	MoWH/PIOJ	Now being pursued by MoWH
Amendment of Water Resources Act and Flood Control Act	Short-term 2003-2005	2.0	0.060	UNDP (OUR) Grant/WRA Budget	PIOJ/MoWH MTW (NWA)	To separate the responsibility for the regulation of floodwater control from the design, construction and maintenance of floodwater control structures
Drafting of Water Quality MOU	Short-term July 2003	0.5	0.005	OAS Grant and WRA Budget	WRA (with NEPA, ODPEM and MoH)	Legal Officer to be employed to draft MOU. First and second drafts completed. Awaiting comments from NEPA to finalise
Activation of Water Resources Advisory Committee	Medium-term 2004-2005	0.5	0.001	GoJ Budget	WRA/MoWH	Nominations to be submitted to Minister after agreement on nominees have been settled. To be tied to IWRM policy
Harmonisation of Regulatory Framework for Watershed Management	Medium-term 2004-2005	2.0	0.50	Grant from CIDA/GoJ Funds	MoWH/FD/PIOJ	Pursue with portfolio Minister and Cabinet
			0.591			

4 Action Plan cont'd

B. Technical Programme

Description of Action /Project	Planning Horizon	Duration (yrs)	Cost (US\$M)	Funding Source	Implementing Agency	Remarks
Introduction of Technical Performance Standards	Short-term April 2001	0.5	-	WRA Budget	WRA	Implemented
Rehabilitation and Expansion of the Hydrological Data Network	Short-term 2003-2004	1.0	0.35	Grant/GoJ Subvention WRA Budget	WRA	No funding in 2002/2003 Project to be completed in 2003/2004 FY
Development/Implementation of a National Water Quality Programme	Short-term 2003-2004	1.0	0.025	NEPA/WRA Budget	WRA/NEPA	Being pursued jointly with NEPA-This will be an ongoing project.
Design and Construction of Hydrologic Databases	Short-term 2003-2004	1.0	0.018	Grant/GoJ WRA Budget	WRA	Design has begun in-house.
Revision and Promulgation of the Water Resources Development Master Plan	Short-term May 2003	1.5	0.170	IDB Grant/WRA Budget	WRA/MoWH	Consultant selected and contract being drafted
Accelerated Licensing of Water Abstractors	Short-term 2002	1.5	-	WRA/GoJ Funds	WRA	Implemented and underway - ongoing effort.
Publication of Water Quality Atlas.	Short-term April 2004	0.5	0.025	Grant (UNESCO) WRA Budget	WRA	Final editing in progress to be printed thereafter
Publication of Pollution Risk Maps and Water Sources Protection Zones	Short-term 2004-2005	1.5	0.10	Grant to be obtained	WRA	To be a project within the WRA utilising the services of a consultant
Development of Floodwater Control Master Plan	Short-term 2004-2005	2.0	0.50	Grant (CIDA)	WRA	As above
Public Education Programme	Short-term 2003	0.6	0.175	GoJ/WRA Funds	WRA	Underway - insufficient funds to fully implement
Promotion of Water Conservation and Protection	Short-term 2004	0.6	0.15	Grant/WRA/EFJ with NGO support	WRA	Start made - not enough funds consultant required
Determination of Water Availability to Satisfy Domestic and Irrigation Water Demands *	Medium to Long-term 2004	10-15	10.0	Grant/Cost Recovery	WRA	Projects with consultants and WRA Staff
Determination of Ecological Demand	Short-term	0.75	0.50	Grant IDB	WRA	Tied to IDB Master Plan project.

4 Action Plan cont'd

Description of Action /Project	Planning Horizon	Duration (yrs)	Cost (US\$M)	Funding Source	Implementing Agency	Remarks
Reduction of Saline Intrusion into Coastal Karstic Aquifers	Medium-term 2002-2004	3.0	0.256	OAS Grant/WRA Budget	UWI Cave Hill BWRA/JWRA/APUA	Regional project with Barbados & Antigua & Barbuda started
Differentiation of water quality around bauxite/alumina plants in Jamaica and contaminant fingerprinting/tracing	Short-term 2003-2006	3.0	0.23	Grant from IAEA and WRA Budget	WRA	Project funded by International Atomic Energy Agency (IAEA) - startup in 2003
			12.499			

- Details From Above*.

Priority Rank	Category/Project	Basin	Resources Quantity (MCM/yr)	Implementation	
				Period (years)	Cost (US\$M)
1m	Wellfield Re-design Long Mountain Lst. Aquifer	Kingston	3.0	0.5	0.16
2m	Assessment - Flint River Lst. Aquifer	Great River	1.5	1.5	0.07
3m	Artificial Recharge-Martha Brae Lst. Aquifer	Martha Brae River	20.0	2.0	0.45
4m	Assessment - Montego River Lst. Aquifer	Great River	12.6	2.5	0.45
5m	Assessment - Lucea River	Great River	2.5	3.5	0.25
6m	Assessment - Roaring River Blueholes/Springs	Cabarita River	2.3	1.5	0.20
7m	Assessment - Dry Harbour Mtns. Lst. Aquifers	Dry Harbour Mtns.	10.0	1.5	0.25
8m	Assessment - Cockpit Country	Black River	2.3	1.5	0.20
9m	Assessment - Lst. Aquifers	Blue Mtn. South	1.3	0.75	0.20
10m	Assessment - Dallas Mtn. Lst.	Kingston	-	3.0	0.65
			52.5		2.88
1a	Wellfield Re-design Clarendon Lst. Aquifer	Rio Minho	51.0	1.0	0.42
2a	Wellfield Re-design Lower Rio Cobre Lst.	Rio Cobre	-	1.0	0.32
3a	Assessment - Plantain Garden River	Blue Mtn. South	30.0	3.5	0.50
4a	Artificial Recharge - Lower Rio Cobre Lst. Aquifer	Rio Cobre	17.0	3.0	0.32
5a	Assessment - Essex Valley Lst. Aquifer	Black River	61.0	2.0	0.35
6a	Artificial Recharge - Lower Rio Cobre Alluvium Aquifer	Rio Cobre	8.3	3.0	0.72
7a	Assessment - Morant River	Blue Mtn. South	14.8	3.5	0.60
8a	Artificial Recharge - Rio Minho Lst.	Rio Minho	-	-	0.70
9a	Assessment - Pedro Plains Lst.	Black River	-	-	0.30
10a	Assessment - Rio Minho Alluvium	Rio Minho	16.0	3.0	0.70
11a	Assessment - Yallahs Alluvium	Blue Mtn. South	10.0	2.0	0.68
	All projects		208.1		5.61
			260.1		8.49

1m-municipal demand: 1a-agricultural demand

4 Action Plan cont'd

C. Financial Sustainability

Description of Action/Project	Planning Horizon	Duration (yrs)	Cost (US\$M)	Funding Source	Implementing Agency	Remarks
Maintain GoJ Contribution at Current Levels in Real Terms	Medium-term 2004	1	0.20	MoWH and/or WRA with Grant Funding	MoWH/MoFP WRA	Financial Analysis to be done - decision to be made by all parties
Increase Cost Recovery * a) Well licence application fees b) Annual licence fee	Short to Medium-term 2004-2005	1.5 2.0	0.15	As Above	WRA MoWH/WRA	Minister to make decision after discussion with MoFP and Cabinet
			0.35			

* Details from above

- ◆ Both Actions/Projects for Financial Sustainability will be carried out concurrently after financial analysis to set targets and determine the level of licence fees that can be implemented without affecting the consumer price for water. The IDB has indicated that it would be willing to have an economist come in for six months to do the analysis and determine the true value of water (the basis for the fees).

Scenarios

- ◆ Cost recovery will provide 50% of the WRA's annual budget. This will be sufficient to fund the capital works programme and the monitoring programmes of the Authority.
- ◆ Well licence application fees will generate US\$0.134M (J\$7.50M) in the first two years for 500 unlicensed sources at J\$15,000 each. This income will fall and will then depend on the annual number of applicants for well drilling/water abstraction (approximately 20 applications).
- ◆ There will be an annual licence fee of J\$0.30/1000 gals/annum (J\$0.66/10m³/annum). This will bring in J\$90 Million annually. This assumes 100% collection from the public and private sectors.
- ◆ Payments will be as follows: NWC - J\$26.4M; NIC - J\$21.15M; Sugar Company of Jamaica - J\$9.45M and private sector - J\$33.0M.

4 Action Plan cont'd

D. Organisational Strengthening

Description of Action/Project	Planning Horizon	Duration (yrs)	Cost (US\$M)	Funding Source	Implementing Agency	Remarks
Reclassification of Staff Positions - Increase Salaries	Short-term	1	-	WRA/MoWH	MoWH/MoFP WRA	Completed and submitted to MoFP
Modify Organisational Structure	Short-term	1	-	WRA/MoWH	MoWH/MoFP WRA	New structure submitted to MoFP after approval by WRA Board

Water Supply and Sewerage

▶ 1 Introduction

1.1 General

The provision of adequate potable water and sewerage services is a cornerstone of the economic policy of the Government of Jamaica (GoJ). In keeping with this commitment, the GoJ established a Ministry of Water (now the Ministry of Water and Housing) the primary function of which, is to ensure the efficient development of the water sector, so that all citizens will have access to potable water by the year 2010, and all major towns will have adequate sewerage services by the year 2020.

Remedying the infrastructural deficiencies in the provision of potable water and sewerage services will be a major factor in the achievement of the GoJ's objectives for providing the necessary inputs to sustain economic activity, and to improve productivity and efficiency, while contributing to the general quality of life in the country.

1.2 Present Institutional Arrangements

The NWC is the largest provider of potable water and sewerage services. NWC has a legal responsibility to provide and improve the water supply and sewerage services throughout the island. Operational control of the NWC has been decentralised into five regions, with investments and business administration at its headquarters in Kingston.

As stated earlier, the Parish Councils are important suppliers of potable water in rural areas, using springs, rainwater catchments and wayside tanks.

In addition, there are a number of private suppliers of water. These include Four Rivers Development, the bauxite companies, Rio Bueno Water Company, some private estates and Runaway Bay Water Company, a publicly-owned, private company. However these operations only account for a small

<i>Type of Access</i>	<i>Present</i>
Urban	
Piped Water	97% (Kingston) 79% (other towns)
House connections	85% (KMA)
Standpipes	8% (KMA)
Other water services	6% (KMA)
No public services	1% (KMA)
Rural	
Piped water (inside)	20%
Piped water (outside, private tap)	18%
Standpipes	26%
Rainwater harvesting	23%
Wells	1%
Surface water	8%
Other sources	4%

portion of the potable water produced. The policy of the Government, therefore, seeks to expand opportunities for the participation of private operators.

A number of contractors provide services to the Parish Councils, the NWC and the MOWH (Rapid Response Programme). This includes the trucking of water.

The NWC operates about 50% of the sewage treatment plants across the island. In addition to the NWC, there are a number of other organisations, such as the UDC, which provide sewerage service for housing schemes.

The OUR regulates utilities, including those providing water supply and sewerage services. Under the OUR Act, all service providers are required to be licensed.

The NWC has so far been the principal provider of potable water in Jamaica. However, given the resource constraints, the adequacy and reliability of the service needs to be improved. A significant infusion of capital, as well as institutional strengthening are essential. One way of achieving this is by private participation.

In addition to the above challenges, a number of operational issues need to be addressed. These include the following:

- i) inadequate customer service;
- ii) the high levels of unaccounted for water (UFW);
- iii) the deficient management and customer information systems;
- iv) the inadequate metering of sources and customers;

- v) the low levels of collection relative to billing;
- vi) the inability to recover capital and operating costs at current tariff and efficiency levels;
- vii) inadequate monitoring of water quality after treatment;
- viii) the limited maintenance of many water supply and sewerage systems;
- ix) the extremely low levels of coverage of sewerage systems and, to a lesser extent, potable water systems;
- x) the absence of appropriate operating procedures and performance standards; and
- xi) inadequately trained staff.

2 Objectives

The objectives to be achieved for the sub-sector relate to improvements in supply coverage, system reliability, water quality, operational efficiency, customer service, capital project implementation, environmental compliance and financial performance.

The strategies designed to achieve the objectives identified are listed below.

3 Strategies

3.1 Legal and Institutional Framework

The NWC will continue to be the main provider of potable water and sewerage services in Jamaica. Private sector participation will be encouraged to generate additional capacity through BOOT, join-

venture and other appropriate configurations, as well as to increase the number of licensed providers in new areas. In an effort to improve efficiency, certain aspects of NWC's operations will be outsourced to the private sector.

Under the proposed Water Supply and Sewerage Services Act, a Director of Water will be appointed within the Ministry with responsibility for water, with the mandate to undertake macro-planning for the sector and to perform the functions previously carried out by the NWC, in respect of the developmental approval process.

A new institution, devoted exclusively to expand access to water in rural areas has been proposed. This entity will partner with the Private Sector, Community Groups, the Parish Councils and NGOs to design and construct sustainable solutions, consistent with available water resources and the socio-economic profile of beneficiary communities. After construction, these systems will be operated by the partner organisation.

The OUR will function as the regulator for the sector. Its responsibility will include setting tariff and service standards and recommending the award of licences to service providers.

The following legislative changes will be implemented:

- i) the amendment of the NWC Act to:
 - designate the OUR as regulator;
 - remove the power of the NWC to issue licences;
 - remove the anomalies arising from the merger of the Water Commission (KSA) and the National Water Authority (rural areas); and
- ii) enact industry-specific legislation, which will define the policy and regulatory framework for the entire sector.

3.2 Water Systems Development Strategies

The basic tenet of the Water Sector Policy is universal access to potable water by 2010. To achieve this objective, significant expansion of the service is required, as well as extensive rehabilitation work to improve service to existing consumers. The current un-met demand is estimated at 220 million litres per day. It is projected that by the year 2010, the un-met demand for potable water will be 320 million litres per day, if no additional capacity is put in place. The Government's strategy is to satisfy this demand, using a combination of modalities including household taps, catchment tanks and the trucking of water.

The intention is to install piped systems in the first instance, subject to the economic viability and availability of financial resources. The specific strategies to be employed are:

- i) the development of a Master Plan for the supply of potable water. This plan will propose solutions, taking into consideration the projected demand the status of existing systems, water resource availability and the socio-economic profile of communities;
- ii) the securing of funds for the implementation of the Master Plan through the following means -
 - Government's budget;
 - internally generated funds from the relevant agencies;
 - multilateral donor/lender agencies;
 - commercial lending sources; and
 - private sector participation.

In respect of GoJ investments in the water sector, these will be targeted at rural water development where health and environmental concerns are paramount, as well as projects with wider socio-economic implications. The private sector will be encouraged to participate in developing the combinations of schemes, which are economically viable.

Agencies operating in the sector will continue to improve their efficiencies, the gains from which, will go towards funding water supply projects.

In respect of private housing developers, developments will only be approved if the necessary arrangements are in place to ensure the availability of an adequate supply of potable water.

Concomitant with system expansion, the GoJ will be placing the requisite emphasis on reducing unaccounted for water and on encouraging demand-side management.

Demand-Side Management

The key activities to be pursued under the above areas are as follows:

- i) encouraging and supporting the installation of water-saving devices at customers' premises;
- ii) encouraging water reuse or recycling wherever possible;
- iii) providing investment incentives to companies to invest in plant equipment to conserve potable water;
- iv) providing auditing services and advice to customers, indicating areas where water conservation is possible and recommending appropriate measures;
- v) implementing a public education programme to inform customers of the importance and benefits of water conservation;
- vi) implementing programmes to encourage the teaching of water conservation in schools; and
- vii) encouraging water use efficiency through

appropriate legislation, building codes and tariffs.

Reduction of Unaccounted For Water

Strategies to achieve this will include:

- i) completion of diagnostic studies to provide a breakdown of the major contributors to UFW and facilitate better targetting and monitoring of UFW reduction programmes;
- ii) network zoning and metering to identify and address the geographic areas of highest priority;
- iii) replacement of mains in areas designated as priority areas;
- iv) completion of a customer survey to update the billing database, to include customers who are now receiving water, but are not represented in the billing system;
- v) intensifying the programme of leak detection and repairs, by strengthening the capability of the regions and assuming a more proactive approach to leak repairs;
- vi) the introduction of better monitoring and control systems to reduce overflow and other losses at storage facilities and treatment plants;
- vii) the complete metering of production sources to ensure more accuracy in measuring UFW;
- viii) metering of all consumers, except those in areas where it is not considered to be cost-effective;

- ix) general institutional strengthening to support the core UFW reduction effort; and
- x) the use of private sector entities under incentive-based contracts to provide the initial acceleration to UFW reduction, state-of-the-art technologies and training for NWC personnel.

3.3 Wastewater Systems Development Strategies

In order to mitigate health risks and environmental degradation, it will be necessary to ensure that all major towns have proper sewerage services. Twenty (20) towns have been identified as requiring major additional sewerage infrastructure. These have been prioritised and a schedule for sewerage has been developed.

In addition to the construction of new facilities in major towns, the GoJ will support efforts to rehabilitate existing non-compliant facilities to bring them into compliance with environmental standards, as promulgated by the NEPA.

The GoJ and NWC will take the lead role in mobilising financing for construction and rehabilitation of large central systems in urban centres.

In addition to the major systems, the GoJ will also be seeking to improve the operations of smaller sewerage systems associated with housing developments.

The NWC or other licensed providers will be encouraged to assume the operation and maintenance of these systems. Where the systems are uneconomical to rehabilitate and operate, the GoJ will provide financial incentives to the service providers.

In respect of new developments, developers will be obliged to ensure that the necessary arrangements are put in place to facilitate the sustainable operation of associated sewerage facilities.

This may be achieved by:

- i) contracting service providers being contracted to design, build and operate the system at the developer's cost;
- ii) contracting service providers being contracted to operate and maintain the system on behalf of the developer, prior to takeover during the statutory operational period;
- iii) the developer's designing, building and operating the facility for the statutory operational period and handing it over to a service provider expeditiously; and
- iv) the developer's designing, building and seeking a licence to operate the facility.

The regulation governing development and operation of sewerage systems will be set out in the industry-specific legislation for the sector.

3.4 Operation and Maintenance of Facilities

Improvement strategies will include the following:

- i) a review of operation and maintenance practices to clarify requirements;
- ii) the preparation of operation and maintenance manuals for the respective facilities;
- iii) the acquisition of the necessary tools and equipment;
- iv) training of technical staff;
- v) strengthening the supervision/monitoring of operation and maintenance;
- vi) the implementation of a computerised maintenance management system; and
- vii) improvements in safety control.

3.5 Energy Efficiency

Key strategies for directly improving energy efficiency and reducing the costs associated with this input will include the following:

- i) improving plant, motor and pump efficiency;
- ii) ensuring that equipment is operated and maintained in accordance with specifications, and monitoring process variables to optimise operations;
- iii) optimising the operation of water pumping equipment including, where possible, taking

advantage of off-peak energy rates through installation of additional storage capacity;

- iv) maximising the use of gravity-driven systems by placing facilities at higher elevations, where feasible;
- v) improving the monitoring and control of water transmission and distribution operations;
- vi) utilising energy efficient lighting and air conditioning systems;
- vii) where feasible, utilising alternative energy sources such as wind, solar and hydroelectric power; and
- viii) ensuring that the most efficient electricity tariff is applied to each facility.

3.6 Business Operations and Customer Service

The NWC will redefine its concept of customer service to emphasise service delivery at the customers' premises. Elements of this will include:

- i) replacing the current billing system;
- ii) improving meter reading accuracy and frequency;
- iii) training of staff;
- iv) improving co-ordination among frontline customer service staff and maintenance crews for prompt response to customer complaints;

- v) improving the response to customer enquiries, to include the establishment of a call centre;
- vi) improving emergency response capabilities;
- vii) increasing the bill collection points; and
- viii) simplifying payment procedures.

3.7 Human Resource Development

Strategies to improve capacity strengthening in this area will include:

- i) the ongoing review of the organisational structure and processes to ensure continuous improvements in operational efficiency;
- ii) designing and implementing a comprehensive training programme to improve the effectiveness of employees at all levels;
- iii) designing and implementing a performance-based compensation system;
- iv) evaluating and analysing the existing culture to determine the barriers to satisfactory performance, and implementing strategies designed to foster a culture of excellence and high performance.

3.8 Information Systems Development

A fully computerised Management Information System (MIS) will be established to integrate the major related systems, including the billing, tariff collection and general ledger systems. The MIS will also include systems to improve the management of inventory, procurement, preventative maintenance and human resources. Under this programme a Geographic Information System

(GIS) will also be developed.

3.9 Social Water

The Water Sector Policy recognises that due to health, sanitation and environmental considerations, water has to be supplied to individuals who are unable to pay the full cost of the service. The strategy relating to social water is as follows:

- i) the provider will implement a programme to achieve an element of cost recovery from the beneficiary population, using a community development approach; and
- ii) the Government will establish mechanisms to underwrite the recovery of the remaining cost.

3.10 Watershed Management

The NWC owns watershed lands totaling to over 5,000 hectares scattered throughout the Watershed Management Units. It is the company's direct responsibility to ensure that these lands are adequately protected from excessive degradation.

For the NWC-owned lands, an aggressive programme will be pursued involving an environmental audit and reforestation of critical areas. These activities will form part of a comprehensive programme that will be harmonised with the efforts led by the NEPA, WRA and the Forestry Department. Once watersheds have been restored, plans will also be put in place to prevent future degradation.

4 Action Plan

ACTION PLAN FOR THE WATER SUPPLY AND SEWERAGE SECTORS

Area of Focus	Strategy	Activities	Start Date	Duration (Months)	Cost (US\$M)	Funding Source	Implementing Agency	Status
Legal and Regulatory Framework	Review legal and regulatory framework to encourage and harmonise existing legislation and encourage private sector participation.	Perform Industry Legislation Study.	Apr-01	8	0.3	UNDP	MoWH	Amendment to NWC Act completed February 2004 to harmonise NWC legislation with OUR Act to give efficacy to fines to aid liberalisation of industry
Restore and Maintain Financial Viability of NWC	Implement an appropriate strategy	Perform comprehensive Cost of Service/Tariff Study	Dec-02	4	0.2	NWC	NWC	Tariff Study completed mid-2003
		Review of tariff by OUR	Jun-03	4	0.1	NWC	OUR	OUR review completed December 2003
		Implement new tariff based on OUR recommendations	Dec-04	2	0.1	NWC	NWC	New tariff implemented February 2004.
	Implement Short-term Billing and Collection Enhancement Measures	Review and update Customer Database	Apr-03	24	1	NWC	NWC	Implementation underway
Procure and implement new billing system		Dec-04	24	40	NWC	NWC	Board approval for project given, NCC approval next step	
Modernise NWC and Build Internal Capacity	Organisational Restructuring and Staff Rationalisation	Finalise new organisational structure and upgrade operating procedures and support systems	Apr-04	3	0.2	NWC	NWC	Implementation of new structure began October 2003 - review of work processes concurrent with organisational changes underway - a change management programme is being implemented. The project is expected to be completed mid-2005.
		Implement restructuring/re-engineering programme	Aug-03	36	5	NWC	NWC	Restructuring commenced August 2003. Action plans to support 3-yr strategic objectives being implemented.
	Build Internal Capacity	Formulate and implement skills development programme	Apr-03	3	0.1	NWC	NWC	Development and implementation underway - training in information systems and customer service procedures in progress
		Procure necessary tools and equipment	Aug-03	36	4	NWC	NWC	Necessary equipment, e.g. computers, being procured
	Implement Performance - Based Compensation System	Review performance monitoring system	Jan-04	12	0.1	NWC	NWC	Performance monitoring system being implemented - Completion projected December 2004
		Implement recommendations	Dec-03	3	0.1	NWC	NWC	Incentive-based compensation system for overall NWC in effect
Improve Potable Water, Sewerage Service Coverage and Operational Efficiency	Encourage conservation and efficient use of water by consumers.	Review and upgrade Demand Side Management (DSM) Programme	Apr-03	6	0.1	MoWH/OUR	MoWH/OUR	Customer conservation programme being implemented - financing being sought for full implementation of DSM programme
	Encourage private service providers in areas not serviced by NWC	Grant licences to private operators for areas not being serviced by NWC	Apr-03	Ongoing	-	MoWH/OUR	MoWH/OUR	Two (2) licences granted by NWC over past two (2) years - two (2) more being granted by Ministry of Water and Housing.

4 Action Plan cont'd

Area of Focus	Strategy	Activities	Start Date	Duration (Months)	Cost (US\$M)	Funding Source	Implementing Agency	Status
Improve Potable Water and Sewerage Service Coverage and Operational Efficiency	Increase potable coverage, and reduce UFW coverage and reduce UFW in NWC service areas	KMA Water Supply and Rehabilitation Project	Nov-03	48	80	JBIC/GoJ	MoWH/WRA/NWC	Engineering designs are progressing. Detailed drawings and tender documents are scheduled to be completed by Nov-04.
		Kingston Water and Sanitation Project - Water Supply Component	Aug-04	60	50	IDB/GoJ	NWC	Loan approval expected June 2004
		Port Antonio Water Supply, Sewerage and Drainage Project - Water Supply Component	Aug-04	48	30	EIB/GoJ	NWC	GoJ and EIB signed loan agreement in June 2002 - contract for engineering services awarded in January 2004
		Great River/Lucea Water Supply Project	April-03	18	40	Private Sector	NWC	Works are progressing satisfactorily and are scheduled for completion by December 2004.
		Santa Cruz Water Supply	Nov-03	24	0.1	TBD	NWC	The contracts for pipeline works have been signed and these should commence shortly.
		Martha Brae to Rio Bueno Water Supply	Sep-04	18	18	Private Sector	NWC	NWC is evaluating a proposal to enter into finance, design and build contract for the implementation of this project.
		Savanna-la-mar Water Supply, Sewerage and Drainage Project - Water Supply Component	Apr-04	36	15	TBD	NWC	Feasibility study to be done
		Rural Water Supply Project - Phase 2	Jan-04	40	12	EU/GoJ	NWC	Preliminary engineering design work for the water supply systems in the four areas is progressing.
		Annotto Bay/Highgate Water Supply	Apr-05	6	0.3	TBD	NWC	Feasibility study to be done
		North Spanish Town Water Supply	Apr-05	12	0.5	TBD	NWC	Feasibility study to be done
Rehabilitate/Implement new sewerage systems		Pear Tree Bottom Water Supply	Apr-05	18	1	TBD	NWC	Feasibility study to be done
		Implement mains replacement programme in major towns	Mar-05	48	15	TBD	NWC	Some pipes are being provided To be funded from NWC's rehabilitation programme.
		Port Antonio Water Supply, Sewerage and Drainage Project - Sewerage Component	Aug-04	48	10	EIB/GoJ	NWC	GoJ and EIB signed loan agreement in June 2002. Contract for engineering services awarded in January 2004
		Savanna-la-mar Water Supply, Sewerage and Drainage Project - Sewerage Component	Apr-04	48	15	TBD	NWC	Feasibility study to be done
		Rehabilitate/replace aged sewerage systems islandwide	Jun-03	48	10	TBD	NWC	Selected projects are being funded from NWC's revenue.

Irrigation

▶ 1 Introduction

The total potential irrigable area of Jamaica is approximately 188,000 hectares. Approximately 25,000 hectares, or 10% of cultivated lands in Jamaica, are currently irrigated. Of these 50% are served by public irrigation systems managed by the NIC; the other half are on commercial banana, papaya, and sugar cane estates, as well as private farms. The main irrigated crop is sugar cane, which accounts for about 70%-80% of the irrigated land. Other irrigated crops include bananas, citrus, and fruits such as mangoes, papayas and vegetables. The majority of the systems are located in areas characterised by dry climatic conditions, with effective rainfall normally below 1000mm/yr, which is inadequate for economic agricultural production.

Of the areas irrigated by the NIC, 80% are served by surface systems, compared with the 70% served by private schemes. This reflects the relatively high proportion of sugar cane lands being irrigated by public schemes. Conversely, private schemes appear to favour both high valued crops and systems with higher efficiencies, notably drip and sprinkler. The high valued crops include banana, orchard and papaya.

Several constraints are presently being experienced in the irrigation sector.

- **Low Crop Returns**
The returns on some crops (e.g. sugar cane) are so low that farmers experience difficulty in paying the necessary tariffs to maintain reliable irrigation supplies. Where feasible and appropriate, crop diversification into higher value crops should be encouraged.
- **High Energy Costs**
In systems with deep well pumps, the cost of electricity is a major concern and is the single most costly item in the operation and maintenance of the system.
- **High Canal Maintenance Costs**
The presence of several kilometres of unlined canals necessitates frequent cleaning of weeds to avoid a reduction in their carrying capacity and increased seepage losses.
- **Inefficient Water Use**
In addition to the required improvement in conveyance efficiency (canal lining), there is need for significant improvement in on-farm water management, to either maintain existing crop production levels with less water, or preferably, increase production with the same amount or more water.

- **Lack of Capital Funds**

Irrigation projects are by nature capital intensive, and the Government does not always have the capital to inject into the sector at the required rate.

- **Insufficient Storage**

Most seasonal flood run-off goes to the sea. Storage of this and other short-term surplus will assist in reducing deficits during drought periods and reduce the reliance on energy-intensive ground water.

- **Capacity Limitations**

The capacity of existing systems is insufficient to meet current irrigation demand.

The constraints outlined above can only be addressed comprehensively in conjunction with the National Agricultural Policy, which is being developed. This policy will outline the strategic direction for the agricultural sector, addressing such critical issues as crop diversification, marketing and agricultural extension, all of which impact on the sustainability of the irrigation sub-sector. In this regard, a Memorandum of Understanding (MOU) among the Ministries and agencies responsible for irrigation and agriculture is proposed. This MOU will establish a protocol for collaboration in the effective implementation of activities.

2 Objective

The objective is to provide an irrigation service in support of the agricultural sector in an efficient, cost-effective and sustainable manner, while encouraging broad-based participation.

The strategies listed below will be employed in the achievement of this objective.

3 Irrigation Strategies

The National Irrigation Development Plan (NIDP), developed in 1998:

- assessed the state of the irrigated agricultural sector;
- identified and prioritised projects for implementation;
- proposed the establishment of Water Users' Associations (WUA's) to increase farmer participation; and
- proposed strategies for making NIC self-sustainable.

The GoJ has adopted the NIDP as the basis for future developments in the irrigation sub-sector. The GoJ is also spearheading efforts to mobilise funding for implementation of the Plan, while simultaneously encouraging private sector participation.

3.1 Establishment of Water Users' Associations

A Water Users' Association (WUA) organises private farmers into a cohesive self-governing unit, which manages an irrigation system (or a part of a system). Farmers are members and shareholders, and they have the responsibility to govern the organisations through democratic processes.

WUAs are seen as a way to reduce public expenditure and to ensure better operation and maintenance (O&M), by making users responsible for the facilities that they enjoy. They provide a mechanism to:

- increase farmers' awareness of the role of irrigation in enhancing farm income and the quality of life in general;
- motivate farmers to utilise this scarce resource more efficiently; and
- protect, operate and maintain the irrigation hardware, so that agricultural production can be increased and sustained.

The following strategies will be employed in the process of establishing the WUAs:

- assessment of the present level of organisation and co-operation among farmers' groups;
- sensitisation of stakeholders as to the benefits of WUAs to encourage participation;
- facilitating the formation of groups around discrete systems;
- training groups, using the "bottom up" approach;
- development of a new work ethic geared towards understanding the roles of the WUAs, the NIC and its staff;
- co-operation between consumers in the distribution of water supplies and in the scheduling of irrigation;
- provision of technical training such as reading and recording water measurements; and
- organising and conducting meetings in office procedures and organisational protocol.

It is recognised that there will be a transitional period during which NIC will need to play a lead role in facilitating the development of the WUAs. Once operational, the WUAs will be responsible for acquiring all the skills necessary to successfully manage the systems.

3.2 The Role of the National Irrigation Commission Limited

With the establishment of WUAs, the role of the NIC will shift progressively to focus on planning, monitoring and regulating the irrigation sector. Regulation in this context will primarily embrace policy and technical, as well as organisational issues, while tariff issues will remain within the purview of the Office of the Utilities Regulation (OUR).

In addition, this context will reinforce the NIC's role as a developmental agency rather than a utility. In that regard, the NIC should be seen as a facilitator for agricultural development.

3.2.1 Personnel / Staffing

In order to accommodate its new role, the Commission envisions that:

- the current field staff will be reorganised in those areas where WUAs have taken over the responsibility for operation and maintenance of the irrigation systems. WUAs will be encouraged to hire technical staff rather than trying to develop the expertise themselves. Where it is not possible for WUAs to take over certain systems, the Commission will retain an appropriate cadre of field staff.
- a similar staff adjustment will be made at the Head Office in order to maintain an appropriate ratio between administrative and technical staff within the Commission.

The role and functions of the NIC in those systems operated and managed by WUAs will substantially be:

- promotion, co-ordination and implementation of the National Irrigation Development Plan (NIDP);
- macro Strategic Planning;
- training;
- monitoring and evaluation;
- regulation of WUAs; and
- arbitration of conflicts/disputes about water and other relevant issues.

3.3 Cost Recovery Strategies

The National Water Policy envisions full recovery of operation and maintenance costs on the commissioning of new systems. In the case of existing systems, the full recovery of operation and maintenance costs will be achieved by the year 2010, or as soon as possible thereafter, subject to the provision of funding to rehabilitate their infrastructure.

Another element of the cost recovery strategy will involve initiatives to integrate the irrigation pricing policy with the Government's agricultural policy. This will, *inter alia*, consider the pace of crop diversification and improvements in cultural practices on the farms. It is also intended that any level of subsidy contemplated will be treated as an invoice payable by the Government to the NIC on behalf of the farmers.

In addition to full recovery on O&M costs, Section 6.3.2 (policy section of this document) also states:

"In the case of new systems to be constructed under the National Irrigation Development Plan, users will be required to pay a reasonable proportion of the capital costs also. The proportion will depend on the ability of the users to pay, and will be decided on a case by case basis."

By way of interpretation, the word 'reasonable' is to be construed as meaning 'affordable'. It is anticipated that a Net Margin will be applied in determining affordability.

However, it should be borne in mind that the Net Margin could be a moving target, depending on market forces and competition within the global environment. As a result, periodic adjustments may have to be made to accommodate this fact. It will be the responsibility of the Economic Planning Division of the Ministry of Agriculture to provide appropriate periodic analyses to support the administration of the capital cost recovery.

The principle of the NIC's invoicing Government for the amounts that the latter decides to grant to farmers as a subsidy, will also apply to these new systems.

3.4 Strategies to Improve Irrigation Efficiencies

Conveyance efficiencies are currently estimated to be 60%. The objective is to improve this efficiency to 90% by 2010. Factors, which contribute to low conveyance efficiency, include the poor physical condition of canals in which weed growth, silting, constriction by tree roots and seepage are major components. Along the distribution canals, the illegal uses of water: dumping of refuse, seepage and weed growth are important contributors to low efficiency. Improvements in conveyance systems will require investments in canal lining, installation of pipe systems and measuring devices.

Some measures to improve the efficiency of conveyance systems, such as canal lining, installation of pipe systems, and water measurement, have already been implemented. The following additional measures will be implemented:

- replacement of the earthen channels with lined canals or pipes;
- construction of new reservoirs;
- rehabilitation of existing micro-dams and construction of new ones;
- installation of appropriate measuring devices;
- installation of downstream flow control whenever feasible;
- development of a waste water reuse pilot project, in collaboration with the relevant agencies, to fine-tune this initiative as a viable alternative for agricultural

development and replication where appropriate.

- improvement of preventive maintenance practices;
- decentralising the operation, maintenance and management of conveyance systems to the lowest practical level.

In respect of on-farm irrigation systems, the NIC will collaborate with the Rural Agricultural Development Authority (RADA) to promote efficient use of water.

3.5 Legal and Institutional Framework

Consistent with the development of the WUAs and the changing role of the NIC, a comprehensive review of the legal framework will be undertaken and appropriate modifications made.

4 Action Plan

ACTION PLAN FOR THE IRRIGATION SECTOR

Areas of Focus	Description of Action/Project	Planned Start-up Date	Expected Duration (Years)	Cost (US \$M)	Funding Source	Implementing Agency	Remarks
Establishment of Water Users' Associations	Engagement of services of Social Organiser	Sep-00	15	1.5	CDB/IDB/GoJ	NIC	For duration of NIDP
	Engagement of Legal Consultant	Dec-00	2	0.1	CDB/IDB/GoJ	NIC	Approx. 10 man-months
Major Projects	Spring Plains	To be determined	1	2.2	To be determined	NIC	
	Pedro Plains & Hounslow	Aug-04	3	5.8	CDB/GoJ	NIC	
	Yallahs	Sep-05	4	1.7	IDB/GoJ	NIC	
	Essex Valley	Apr-06	3	4.8	IDB/GoJ	NIC	
	Cabarita Irrigation	To be determined	8	3.8	To be determined	NIC	
	New Forrest/Duff House	Sep-05	2	2.6	IDB/GoJ	NIC	
	Colbeck	Sep-05	2	0.8	IDB/GoJ	NIC	
Rehabilitation of existing NIC Schemes	Mid-Clarendon Rehabilitation	To be determined	2	1.3	GoJ	NIC	Subject to availability of funds
	Braco	To be determined	2	0.6	GoJ	NIC	"
	St. Dorothy Rehabilitation	Apr-06	5	1.9	GoJ/IDB	NIC	
	Rio Cobre, Blocks A-E	To be determined	4	2.4	GoJ	NIC	Subject to availability of funds
	Rio Cobre Lining	To be determined	8	8.2	GoJ	NIC	"

4 Action Plan cont'd

ACTION PLAN FOR THE IRRIGATION SECTOR (cont'd)

Small Scale Projects	Implementation of small scale projects commencing with Seven Rivers	Sep-04	13	19	CDB/IDB/GoJ	NIC	Projects in 12 parishes
Storage	Reservoir in St. Catherine Plains Micro-dams, etc.	To be determined	9	30.1	To be determined	NIC	Actual construction time - 5 years
Private Projects	Banana Projects (2 Nos.)	To be determined	5	6.8	Victoria Banana/Eastern Banana	N/A	
	Sugar Projects (3 Nos.)	To be determined	5	2.5	Monymusk/ Bernard Lodge/ Long Pond	N/A	
Energy Conservation	Installing variable speed pumps, retrofitting equipment	To be determined	2	4.7	GoJ	NIC	Subject to the availability of funds
Equipment	Purchase necessary equipment	Apr-04	2	0.4	GoJ	NIC	Subject to the availability of funds