Discussion paper

Incentives for watershed management in the Caribbean: diagnostic studies in Grenada, Jamaica, St. Lucia and Trinidad

Tighe Geoghegan, Vijay Krishnarayan, Dennis Pantin and Steve Bass

The Caribbean Natural Resources Institute (CANARI)

in collaboration with:

University of the West Indies' Sustainable Economic Development Unit

and

International Institute for Environment and Development, London

2003

Contacts:
The Caribbean Natural Resources Institute (CANARI), Fernandes Industrial Centre, Administration Building, Eastern Main Road, Laventille, Trinidad and Tobago
Tel: +1 868 626 6062, Fax. +1 868 626 1788, Email: canari@tstt.net.tt

Forestry and Land Use programme, International Institute for Environment and Development (IIED), 3 Endsleigh Street, London WC1H 0DD, UK
Tel: +44 207 388 2117, Fax: +44 207 388 2826, Email: james.mayers@iied.org

Citation:
Geoghegan, T., Krishnarayan, V., Pantin, D. and Bass, S. 2003. *Incentives for watershed management in the Caribbean: diagnostic studies in Grenada, Jamaica, St. Lucia and Trinidad*. The Caribbean Natural Resources Institute, Laventille, Trinidad and International Institute for Environment and Development, London (unpublished draft).

Developing markets for watershed protection services and improved livelihoods

This study is part of a cross-country initiative coordinated by the International Institute for Environment and Development (IIED) with the above title.

IIED carried out a global review of markets for forest environmental services and their impacts on the poor, as part of its Instruments for sustainable private sector forestry project. Amongst the forest environmental services considered was watershed protection services. The review showed that markets are emerging around the services provided by watershed land use, particularly water quantity and quality. However, there has been little regard for the actual impacts of such markets, particularly upon those who manage the land in watershed areas. Thus there is a need to explore mechanisms for ensuring that these markets can both improve watershed services as well as contribute to poor people's livelihoods.

With support from DFID, IIED and its partners in the Caribbean, India, Indonesia and South Africa have been investigating these issues through the preparation of diagnostic studies, which look at the issues, demands, players and potential ways forward. These countries are home to watershed contexts where markets are showing signs of emerging and key actors recognise that such markets will need to be shaped if they are to deliver good land use and poverty reduction. The research has also produced detailed case studies of the impacts of existing watershed market mechanisms in Costa Rica and Ecuador, and a core of partners in further countries eager to expand links and seize opportunities in Peru, Mexico, China, the Philippines and Vietnam. The work has also developed an effective network - an incipient "policy community" - amongst those in a wide range of institutions around the world engaging with these issues.

Reports in this series are available from IIED on request, and are downloadable from www.iied.org/forestry. They include initial diagnostic analyses of markets for watershed protection services and improved livelihoods in the Caribbean, India, Indonesia and South Africa; as well as detailed case studies on the social/ poverty impacts of markets for watershed services in Costa Rica and Ecuador.

For a wide range of published reports from IIED's previous 3-year initiative on ***Instruments for sustainable private sector forestry***, including the global review of markets for forest environmental services and their impacts on the poor ("***Silver bullet or fools' gold?***") see www.iied.org/forestry/pubs/psf.html

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Incentives for Watershed Management in Grenada: Results of a Brief Diagnostic

Vijay Krishnarayan, Caribbean Natural Resources Institute

1. Summary and overview

Despite limited hydrological information, there is a keen appreciation of the importance of watersheds in Grenada, which is shared among a broad range of governmental, non-governmental and private sector stakeholders. Seasonal variations in supply have over time heightened levels of awareness of watershed management issues. Over the past ten years the reliability of supply has improved and the number of Grenadians that enjoy access to safe, clean water has increased. Grenadians are proud of the general quality and "sweetness" of their water. Against this generally bright backdrop concerns remain over levels of pollutants and turbidity, and parts of the island still endure shortages during the dry season. There are also concerns at the state of the island's water storage and distribution infrastructure. The demand for water is set to increase with a growing population as well as plans for development, which favour irrigated agriculture and the expansion of the tourism sector.

Government responses to these challenges have focussed on strengthening the agencies with lead responsibility for watershed and water resources management: the Forests and National Parks Department - FNPD) and the water company (the National Water and Sewerage Authority – NAWASA). The introduction of metering for domestic users has had a profound impact on perceptions of water as well as patterns of consumption. The development of a national policy for Grenada's forests has given impetus to the creation of an Upland Watershed Management Unit within the Forestry Department. It has also provided opportunities for inter-agency co-operation and a focus for dialogue between stakeholders on watershed issues.

There is a consensus among the lead agencies regarding the practices that need to be encouraged and discouraged to ensure the supply of safe potable water. In an initial use of market tools, water metering was introduced several years ago. While there currently appears to be little interest in the further use of markets for achieving watershed management objectives, there are signs that the Government is willing to encourage the greater use of non-market or pre-market incentives to encourage good stewardship in watersheds. The experience of using these approaches could provide valuable lessons for others in the region working in this field.

This paper presents the findings of a brief study conducted under Phase I of a global initiative of the U.K. Department for International Development, *Developing markets for watershed protection services and improved livelihoods*, which is being implemented by the International Institute for Environment and Development (IIED) in collaboration with local partners. The project is summarised at Appendix 1. Grenada is a three-island state. The hydrological and institutional issues for watershed management for the larger island of Grenada and the small islands of Petit Martinique and Cariacou are distinct. This study focussed the resources available on the island of Grenada because of its value as a comparative case in a regional context.

The study consisted of a literature review and interviews with a selection of key actors during the period 10-12 July 2002 (see Appendix 2). The paper looks at watershed management in Grenada from an incentives-based perspective, and identifies opportunities to strengthen existing and

proposed watershed management initiatives through the use of market tools and pre-market incentives. It also suggests the ways in which Grenada could benefit from the establishment of a Caribbean learning group on incentives for watershed management, and through that in the larger global initiative of DFID and IIED.

2. Context

The water cycle

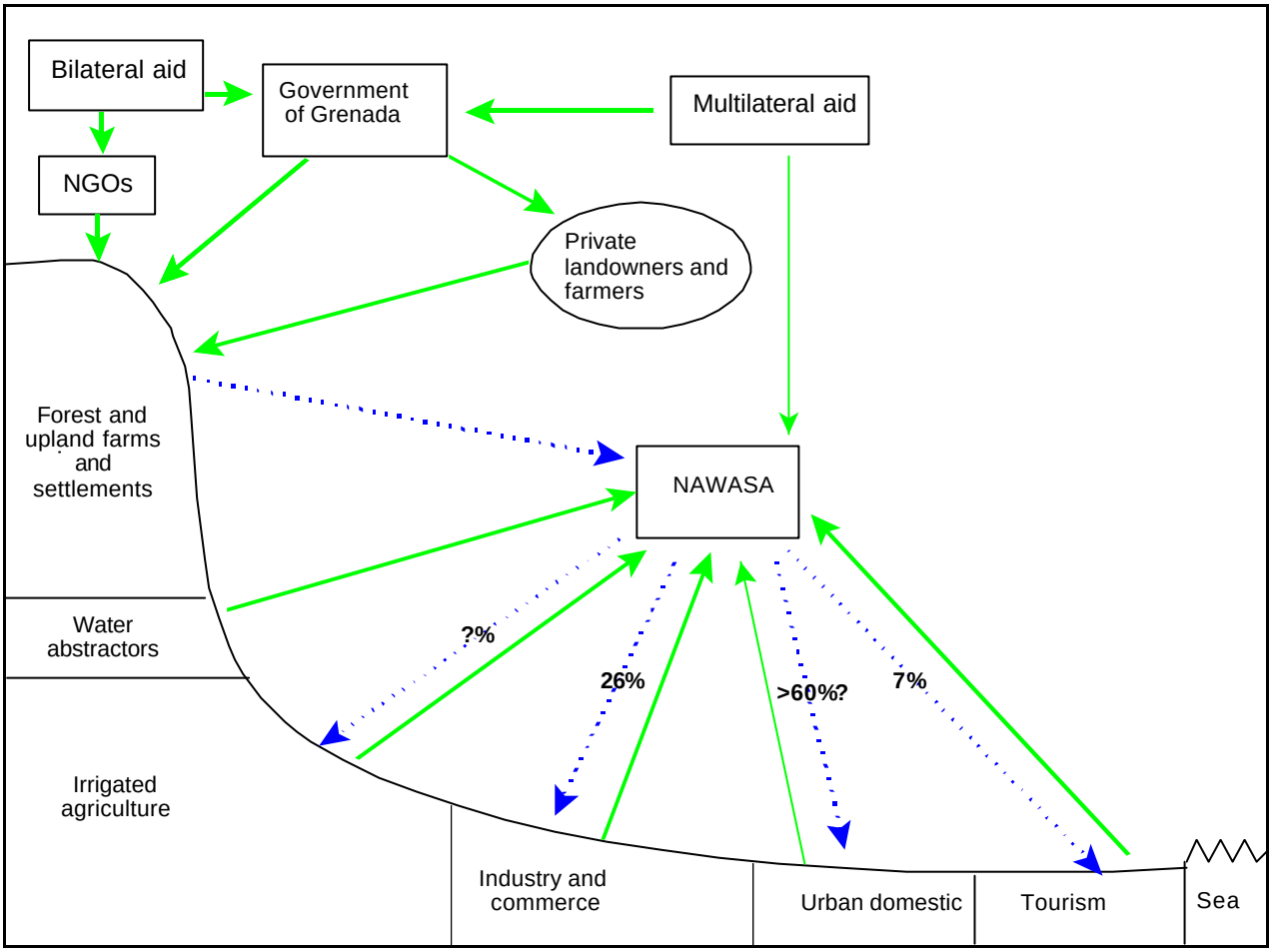
Water is seen as a public good, with the state being responsible for ensuring that Grenadians enjoy access to safe water. NAWASA has been granted exclusive authority over all water (on state and private land, above and below the surface) in Grenada. Surface water provides 90% of the island's potable water, with groundwater sources augmenting supplies during the dry season. Water collects in the hilly interior, which provides the main focus for watershed management activity, particularly at the Grand Etang Forest Reserve, and Mount St. Catherine. The Great River is by far the largest watershed and feeds the island's major natural water storage reservoir at Grand Etang. Water is abstracted exclusively by NAWASA from upland streams. It is treated at supply facilities and delivered to users.

Water users in Grenada are categorised as domestic and non-domestic. The former classification includes agricultural users and in 1991 accounted for c3 million cubic metres of water. In the same year non-domestic users accounted for c1.5 million cubic metres of water (44% commercial users, 22% industrial, 21% hotels, 10% schools and 3% public service) (Government of Grenada 2001). It is estimated by NAWASA that 35% of all treated water is currently unaccounted for (down from 55% in 1994).

The system of tariffs introduced with the NAWASA Act 1990 was designed to recover the water company's full costs. Following a particularly harsh dry season in 1994 a pilot project funded with French development assistance introduced metered domestic use in southern Grenada. By 1996 the principle of metering had gained acceptance (largely based on the experience of 1994, which convinced many that water resources had to be managed more efficiently). The majority of the island's domestic users are now metered. These tariffs fund NAWASA's running costs, but capital expenditure on infrastructure is mainly financed externally through loans.

The classification of farmers as domestic users means that they are supplied with potable water (that may not be needed for agricultural use) and they pay the same metered rate as household users. It has been argued that this system has forced some small scale farmers out of business, as they have not been able to afford the new tariffs. Rural users in upland areas have also complained that although their areas produce water for the urban and tourist area around the capital of St. Georges, they are the first to experience breakdowns in supply. Figure 1 shows that while upland stake holders are providing watershed services, downstream consumers are not paying the full price of production. The growth of demand for and expectations of a reliable water supply, as well as a functional system of metering means that there is scope to recover costs that are currently considered externalities.

Figure 1: Simplified diagram of the water cycle



Money flows ——————→

Water flows - - - - - - - - - - - - →

The main stakeholders

The main stakeholders in the water cycle as described in Figure 2, include:

- Forest and upper watershed managers: the agencies with statutory responsibilities including the FNPD (with responsibility for forest protection, the management of forest reserves and acknowledged as the focal point for watershed management) and the Physical Planning Unit (with responsibility for land use planning), and private landholders.
- Resource users and advocates for watershed management: these include upland farmers (producing bananas, cocoa and nutmegs) and the residents of isolated rural villages, as well as civil society organisations. Grenada has a tradition of activism and there are a number of vibrant rural development organisations (e.g. the Agency for Rural Transformation - ART and the Grenada Community Development Agency - GRENCODA).

- Abstractors: NAWASA is the primary abstractor and has sole authority to grant licenses for private abstraction (e.g. to the one bottled water company, which abstracts from a spring in St. Patrick north east of Mount St. Catherine).
- Water users: industry (e.g. the Carib brewery) commerce, tourism and household users. These are concentrated in the south east of Grenada. It is estimated that 85% of water for non-domestic use is consumed in the parish of St. Georges.

Management agencies have identified desirable watershed behaviour based on experience as well as land capability and hydrological information maintained by the Land Use Division; however, the hydrological information base is not extensive.

There are no formal mechanisms that bring these stakeholders together although the Forestry Department's newly established Upland Watershed Management Unit is committed to maintaining dialogue with stakeholders. There have also been some moves to coordinate mapping activities between NAWASA, the telephone company (Cable and Wireless), the electricity company (Grenlec), the Land Use Division in the Ministry of Agriculture and the Physical Planning Unit.

Figure 2: Main stakeholders in the water cycle

Stakeholders in watershed management: upstream to downstream	**Desirable watershed management activities**	**Constraints/ disincentives**	**Incentives: current (planned)**
Forest managers (government agencies and private foresters)	Encourage and ensure good stewardship of forest resources Maintain forest cover through planting, and encouraging others to do the same Enforce existing forest protection legislation. Control agro-chemical usage	Insufficient human and financial resources in public sector agencies Institutional arrangements for watershed management unclear	Seedlings made available to private landowners at a subsidised price with technical assistance for establishment
Upland farmers	Adopt practices and select crops that use water efficiently, minimise erosion, sedimentation and chemical run-off	Markets for bananas and cocoa no longer attractive leading some to abandon their farms Lack of markets for other produce	Seedlings for fruit trees made available to farmers at a subsidised price with technical assistance for establishment Concessions on the payment of duties on equipment imported for use for reforestation or improved agricultural practice (Concessions on water rates for farmers that adopt good land stewardship practices)

Stakeholders in watershed management: upstream to downstream	Desirable watershed management activities	Constraints/ disincentives	Incentives: current (planned)
Upland settlements	Plant trees on slopes in and around settlements Control building on slopes Practice proper sanitation	Variable service from water company does not encourage participation in watershed management Inadequate sewage treatment facilities "Bush" perceived as legitimate dumping site	Grants from development agencies to NGOs and CBOs to encourage tree planting and provide environmental education
Water abstractors	Monitor water quality (bacteria, agro-chemicals and heavy metals) Minimise wastage when abstracting and supplying water to consumers Pay (and recover) full environmental and social costs of water production	Social and political constraints to increasing water rates substantially Tools for calculating actual costs of water services not readily available Data for planning and management lacking	(Metering of domestic use could provide more scope for use of market-based approaches leading to a reduction in the costs of the water company)
"Domestic" farming (mostly downstream from abstraction points)	Adopt practices that use water efficiently, and minimise erosion and chemical run-off Maintain agricultural drains Pay full costs of water	Short-term market considerations determine type and scale of agricultural production Water rates to agriculture perceived as high, forcing some to leave the sector Water for irrigation (i.e. non-potable) not easily available	Metered use for agricultural users has encouraged efficiency
Industry and commerce	Use water efficiently Avoid contamination of water sources and drains Pay full costs of water	Lack of business support services that encourage and support water efficiency Cost saving imperative	Metered tariffs have encouraged efficient use of water (Making cheaper water available for non-potable uses)
Urban domestic	Use water efficiently Re-use "grey" water Lobby for improved water services Understand water cycle and full costs of water services	Partial understanding of water cycle	Metered tariffs have encouraged efficient use of water Education and awareness programmes by schools, NGOs and government agencies (Making equipment for water conservation available to households)

Threats to watersheds and management responses

The public sector agencies with responsibility for watersheds are indicated in Figure 3, along with a few of the major non-governmental actors.

Figure 3. Governmental agencies and selected non-governmental organisations with remits that impact on watershed management

Relevant Agencies	***Main activities concerning watershed management***
National Water and Sewage Authority (NAWASA)	Managing water resources (with powers to make regulations prescribing water and sewage rates and charges)
Physical Planning Unit (within the Ministry of Finance)	Land use planning and regulation
Land Use Division (within the Ministry of Agriculture, Lands, Forestry and Fisheries - MALFF)	Regulating the development, management and use of state-owned land including the management of forest resources below abstraction points, as well as: ▪ agricultural land use planning and zoning ▪ conducting hydrological studies ▪ mapping (e.g. soil surveys and agricultural capability)
Pest Management Unit (within MALFF)	Advising farmers on approaches and methods for pest management (with an emphasis on integrated pest management)
Agricultural Extension Division (within MALFF)	Providing extension services related to plant propagation, agronomy and conservation Making recommendations for approvals of duty-free concessions on equipment for farmers
Forests and National Parks Department (within MALFF) Upland Watershed Management Unit	Managing forest reserves , national parks and government-owned lands, with limited responsibilities related to private forested land. Managing forest resources above abstraction points Managing plantations (planting, weeding, logging and extracting) Facilitating and coordinating the management of watersheds through the involvement and participation of stakeholders
Environmental Health Department (within the Ministry of Health and the Environment)	Regulating the management and disposal of solid and liquid waste Monitoring the quality of water
Grenada Handicraft Association	Encouraging the use of non-timber materials as an alternative to traditional timber usage
Minor Spices Cooperative Marketing Society	Encouraging and supporting the production of crops with good soil and water conservation properties
Agency for Rural Transformation (ART)	Assisting rural communities through practical development projects and advocacy with a sustainable development focus

Relevant Agencies	*Main activities concerning watershed management*
Grenada Community Development Agency (GRENCODA)	Mobilising small farmers, women and young people around rural development initiatives with a sustainable development focus

Two of the most important actors, the FNDP and the Land Use Division in the Ministry of Agriculture, have a shared understanding of the management challenges that they face and have worked together to develop common approaches to meet them. Traditionally the responses have focused on the establishment of forest reserves for example at Grand Etang. There is a high incidence of private landownership and this has posed particular challenges in the establishment of protected areas (e.g. at Levera). This is one of the factors that has encouraged a trend towards stakeholder involvement in planning, awareness raising and improving the delivery of services where possible. These approaches have been adopted by the FNPD for example in developing management plans for critical watersheds such as Annandale. The specific issues of concern include the following:

- Poor agricultural practices especially among short crop farmers result in agro-chemical pollutants and sediment draining into surface water dams and contaminating ground water sources as well as increasing the susceptibility of land to erosion. The Ministry of Agriculture (through the FNPD, the Land Use Division and the Extension Division) has been actively working with small-scale farmers in critical watersheds as well as those in close proximity to dams and abstraction points to discuss ways in which stewardship can be improved.
- There has been a general downturn in agriculture. There are instances of banana farms in particular having been abandoned. Reaction to this trend has been positive and negative. There is some feeling that a reduction in banana farming could lead to a reduction in the levels of agro-chemicals found in watercourses. On the negative side, the slump in agriculture has been blamed for the neglect of drains and other features that support soil and water conservation.
- Unplanned and indiscriminate land use has given rise to concern about the integrity of watersheds. The main cause for concern is the loss of tree cover for housing at lower elevations (including the cutting of vegetation to improve aesthetics and vistas). The need to strengthen Grenada's land use planning system has been recognised and this has led to a review of development control legislation, the drafting of a national physical development plan (which makes provision for the establishment of national parks and conservation areas to protect water resources), and the establishment of a Physical Planning Unit within the Ministry of Finance.
- Poor sanitation and waste disposal practices persist. These include the dumping of industrial and household refuse despite an improved collection service and a high profile public awareness campaign run by the Ministry of Health and the Environment, which has included radio and television features as well as a schools programme

Factors that constrain improved management

In the face of these threats, the responses of management agencies have been constrained by policy, institutional and organisational factors.

The process of developing a policy for Grenada's forests mobilised a wide rage of stakeholders, particularly around watershed management issues, but barriers to implementation include the lack of guidance on the specific technical challenges associated with improving watershed management, and the lack of mechanisms for ongoing stakeholder participation.

There is a freeze on recruitment to the public service and this means that there are vacancies that are not being filled. As one worker in the Ministry of Agriculture said *"is a long time since we see a new face here."* The Forestry Department's new Upland Watershed Management Unit requires additional staff to become fully operational, which is a concern as it has a pivotal role to play in facilitating and coordinating planning and management activities.

Inter-agency cooperation and coordination remain informal and ad hoc. While this works well for sharing operational information on a day-to-day basis, it prevents the systematic sharing of data and the development of joint approaches to planning and management. Linkages within the Ministry of Agriculture (especially between the Land Use Division and the FNPD) are strong, but the lack of an interface with other agencies is a fundamental barrier to improved watershed management.

Each of the key governmental agencies interviewed saw themselves as having a part to play in improving land management; however there is no clear lead institution with a remit to push for these improvements. This is a critical constraint, although it was not explicitly cited as such by respondents.

Factors that constrain the behaviour of other stakeholders

Against the backdrop of a general downturn in agriculture it has been suggested by extension workers that farmers are only amenable to adopting soil and water conservation practices when the sector is buoyant. In addition, the pace of rural-urban migration has increased, depriving agriculture of the younger farmers that are more likely to adopt new techniques.

In an attempt to revive the flagging fortunes of the banana industry, new investments in irrigation have been proposed. In addition to having a major impact on the demand for water, the encouragement of irrigation could have an adverse impact on efforts to improve water conservation practices.

The partnership approach to forest resource management was a recurring theme during the forest policy process but this has not fed through to its implementation. The capacity of the FNPD to implement the policy has been enhanced through a UK Department for International Development funded project but similar inputs are required for civil society organisations if they are to play their part in forest resource management.

The level of awareness of even the most direct relationships between the upland producers of watershed services and downstream consumers remains poor among the general public and policy makers. Larger scale investments are planned (e.g. for irrigation and in tourism) without adequate regard for the impacts on supply in upland areas. Conversely, in the dry season there have been reports of farmers damming watercourses to feed their crops without regard to the impacts on communities downstream.

Constraints to implementing cost recovery measures

The metering of domestic supply has radically altered the way that the general public perceives and uses water. Water is now valued as a commodity rather than consumed as a right. Most households are metered, but there are parts of the island that are still governed by a flat rate tariff. When coverage is complete NAWASA will be in a position to recoup most of its recurrent costs. Water is still being lost through leakages before it reaches Grenadians' taps and this remains the main constraint to full cost recovery for the water company.

Metering provides a mechanism for full cost recovery, but the inclusion of production costs (including watershed management) in water tariffs is a distant prospect. The lack of dialogue between the water company and the agencies responsible for watershed management has prevented the principle of full cost recovery from being established. In the face of the adverse impacts of current land management practice on water quality, there are signs that NAWASA and other agencies are amenable to improved coordination; however historical divisions between land management agencies and the water industry persist. In addition the specific tools such as economic evaluation techniques that would enable production costs to be accounted for by watershed managers are not available.

3. Progress and opportunities

In the face of these constraints and building on Grenada's experience of stakeholder involvement, the need to employ a range of policy tools to improve watershed management has been recognised. Incentives have not been built into the framework for management, but small steps have been taken and there are signs that their use could feature more prominently in the future of watershed management. Experience to date includes:

- the sale of seedlings through the Ministry of Agriculture's propagation station at a subsidised price to farmers and private landowners, combined with technical assistance from the FNPD and Extension Division to help with establishment;
- the encouragement of banana farmers to diversify by making soft loans (up to c$US 2,000) available through the Extension Division for the establishment of fruit tree orchards (citrus, mangoes, cherry, golden apple and avocado) from one acre upwards;
- the provision of funds through development agencies and the cocoa and nutmeg marketing boards to farmers to clean and maintain drains;
- the provision of technical assistance through the Pest Management Unit to encourage the adoption of integrated pest management practices by farmers.

However, it is worth noting that while these incentive schemes seek to alter land management behaviour, they do not link land managers' incentives directly to water users needs.

The process of developing a national policy for Grenada's forest resources has had a profound impact on the prospects for stakeholder participation in management. A review of policy was initiated to optimise the contribution of forest resources to environmentally sound social and economic development. The process of policy review and development:

- raised levels of awareness among a wide range of stakeholders of the importance of forest resources to development. During the process a survey of over 400 people revealed that most people felt that soil and water conservation should be the main priority for management in uplands;

- provided a catalyst for collaboration between stakeholders. The process consolidated linkages within the Ministry of Agriculture, but also provided an entrée for private sector interests (specifically from the tourism sector) to become more engaged in forest management.

The policy recognised the relationship between stakeholder participation and effective management. It acknowledged that the Forestry Department could not and should not have sole responsibility for implementation. Implicit was the premise that established state based command and control approaches to management had not succeeded. The policy process identified a number of potential opportunities for ensuring improved watershed management for the benefit of both water users and land managers. These included a call for the adoption of a structured approach to integrated watershed management as well as an explicit reference to the need for incentives to encourage appropriate watershed management practices.

Following the adoption of the policy by Cabinet the FNPD embarked on a strategic planning process, designed to enable it to respond to these new challenges. This resulted in the establishment of a number of specialised focal points within the Department including the Upland Watershed Management Unit. Taking its cue from the policy, the Unit was established to enable the participation of stakeholders in watershed management. The Unit has already drafted management plans (which refer to the use of incentives) for priority watersheds with stakeholder input, but awaits the resources to play an effective role in coordinating their implementation.

During the period 1993-1998 Grenada was infested with the pink mealybug (*Maconellicoccus hirsutus)*, which posed a major threat to the island's agriculture sector and resulted in a loss of tree cover. According to the Ministry of Agriculture's Pest Management Unit this was linked to increased levels of siltation and associated water treatment costs. The problem was eventually managed using biological controls and this success won many farmers over to the use of integrated pest management techniques. Building on this experience, Grenada has taken the first steps towards establishing a market for organically produced goods. By the end of 2001 150 acres of land at the River Antoine estate in the parish of St. Patrick were under cultivation for organic bananas for sale to J. Sainsbury (one of the largest supermarket chains in the UK). With support from the Windward Islands Banana Development and Exporting Company (WIBDECO) farmers are now exploring this potentially lucrative market, which provides a return on the value added to fruit by sustainable farming practices. An expansion in this sector could see more farmers adopting soil and water conservation practices as well as minimising the use of agro-chemical inputs. This could have a considerable impact on land management in upland areas.

The adoption of meters for household users also presents an opportunity for the improved management of water resources. NAWASA has reported improvements in the efficiency of domestic use and the interviews revealed that metering has improved general levels of awareness of the need for water conservation. Metering has changed the perception of water in Grenada from an entitlement to a commodity. There is now an acceptance of the need to pay for the resource. An opportunity now exists to use this mechanism to pass the costs of watershed management on to consumers.

4. Needs and directions

This review of experiences, opportunities and constraints has revealed the following needs:

i. *Improve the technical capacity of management agencies:* specific tools are needed by managers to help them achieve their goal of integrated watershed management. In the first instance there is a need for methods and approaches that can help to identify the various stakeholders in watershed management and understand their interests and interrelationships. With regard to the development of market-based approaches, there is a need for tools that would enable managers to value watershed services, as well as for the hydrological information to base such values. The principle of valuing critical ecosystems is supported in Grenada's Biodiversity Strategy and Action Plan.

ii. *Establish a forum for stakeholders:* a mechanism that can facilitate shared watershed management is urgently needed so that agencies and water users can be brought together. Such a forum should address the need to coordinate management approaches (in the first instance between the Ministry of Agriculture, including the Forestry Department and its Upland Watershed Management Unit, and NAWASA), share data (e.g., to help map watersheds, and exchange information on water quality monitoring), and hear the concerns and issues raised by consumers (e.g., the disappearance of standpipes associated with domestic metering).

iii. *Maintain the momentum of the forest policy process:* the policy process was highly participatory and provided the basis for a sharing of forest management roles and responsibilities among a broad range of stakeholders. The gains made during that process must be extended to all areas of land management and consolidated by agencies with statutory responsibility by creating opportunities for participation and collaborative management. If this is not done, management will be seen once more as the sole domain of public sector agencies and regulatory approaches.

iv. *Develop a land use policy to provide a framework for improved land management.* Land use policy and planning is currently fragmented. Responsibility for agricultural land use resides within the Ministry of Agriculture, whereas development control and national strategy falls within the Ministry of Finance. There is no clear national land use policy that identifies critical watersheds and regulates development to protect them.

The directions that could result in improved land management include:

Grenada Forest Management Project: The DFID-supported project that provided the impetus of the Forest Policy process made provision for a second phase to build the capacity of the FNPD to work with stakeholders in order to implement the policy (including its watershed management component). This phase also addresses the need to build the capacity of stakeholder groups to participate in policy implementation. The Upland Watershed Management Unit is using this facility to identify interests and aims to establish a forum that brings together the major stakeholders in watershed management.

Land use planning: A draft land use plan for Grenada with a 20-year timeframe has been developed, addressing development control on state and private land with a system of zoning. It provides for the establishment of conservation areas and national parks. A Physical Planning and Development Control bill that would operationalise the plan has been drafted for parliamentary approval. If it is enacted, a new planning authority will be established with the powers to draft development plans and require environmental impact assessments as a condition of development. A Board will make development decisions, and the bill recommends that NAWASA should be a board member.

5. Incentive possibilities to explore

In recognition of the need for incentive-based approaches to watershed management, the FNPD has joined with the UK-based Centre for Ecology and Hydrology to find out how the actions of various stakeholders in watersheds impact on each other. Having established these interrelationships, the research will inform the development and testing of pilot compensation mechanisms aimed at changing practices that impact adversely on watersheds. In October 2002 the Department will be making a request to Cabinet for the approval of two incentive-based measures:

- the establishment of a voluntary tourism donation programme that would finance a trust fund to be used to meet critical needs of rural communities in support of better watershed management. It is envisaged that the project would fund infrastructure (for example storage tanks that could help communities cope with dry season shortages) or help identify key concerns (such as the provision of improved sanitation facilities). The tourism sector has been targeted because of its perceived ability to generate funding as well as its reliance on Grenada's natural resources;
- the introduction of a mechanism that would enable farmers that have adopted good stewardship measures (e.g., introducing and maintaining check dams) to have their water bills reduced as an inducement to adopt new practices and to compensate them for any additional costs they may incur.

If these measures are granted approval, the FNPD has indicated an interest in having their monitored, evaluated and documented.

6. Conclusion

The IIED/DFID project *Developing markets for watershed protection services and improved livelihoods* coincides with the proposed introduction of specific incentive based approaches aimed at improving watershed management and is therefore timely. Grenada is well placed to share the experience it gains from adopting incentives-based approaches and could learn from others as it seeks to integrate these into its forest resource management policies and programmes.

Incentives for Watershed Management in Jamaica: Results of a Brief Diagnostic

Steve Bass, International Institute for Environment and Development
Tighe Geoghegan, Caribbean Natural Resources Institute

1. Summary and overview

The need for improved watershed management is well recognized in Jamaica, with an aim to *conveniently* provide *reliable* and *adequate* supplies of *clean* water for agriculture, industry, tourism, and urban and rural populations. Currently, water supplies are unreliable and insufficient during the dry season; water quality at the source is often poor, requiring costly treatment; and despite continuing improvements in delivery, many rural households still lack convenient access to treated water, with a significant percentage of the poor continuing to rely on untreated water from rivers and streams. These problems are likely to increase with a growing population, an aging infrastructure for water collection, treatment and delivery, political constraints to increasing the price paid for water, and a range of human activities impacting negatively on watersheds.

Government's responses in recent years have reflected the priority placed on the issue. Actions have included the development of a national watersheds policy green paper, the establishment of the high-level interagency National Integrated Watershed Management Council (NIWMC), the initiation of a USAID-Government of Jamaica (GOJ) five-year "Ridge-to-Reef" watershed management improvement project, and the strengthening of the National Environment and Planning Agency's (NEPA) Watersheds Branch.

There is a widely shared understanding among the lead management agencies of the practices taking place in watersheds that threaten water supplies and of the "best practice" behaviour that needs to be encouraged. While there has been progress on some fronts (most notably in increased awareness), the many actors involved in watershed management face considerable obstacles to being effective custodians. There is general agreement that – for cultural, political, and economic reasons – fully-fledged market-based approaches being employed in other countries do not offer promise for Jamaica at this stage. In the search for solutions, however, non-market, and pre-market, incentives for improved watershed management have been highlighted, but there has been little progress to date in identifying effective incentives and putting them in place. Nonetheless, there are a number of positive developments that can create a context for testing incentive-based approaches.

This paper presents the findings of a brief study conducted under Phase I of a global initiative of the U.K. Department for International Development (DFID), *Developing markets for watershed protection services and improved livelihoods*, which is being implemented by the International Institute for Environment and Development (IIED) in collaboration with local partners. The project is summarised in more detail in Appendix 1. The study consisted of a literature review and interviews with a selection of key stakeholders during the week of 4 March 2002 (see Appendices 2 and 3). The paper looks at watershed management in Jamaica from an incentives-based perspective, and identifies several opportunities to strengthen existing and proposed watershed management initiatives through the use of incentives. It also suggests opportunities for

Jamaica to contribute as a partner in a Caribbean learning group on incentives for watershed management, and through that in the larger global initiative of DFID and IIED.

2. Context

The water cycle

Implicit in GOJ policies on water is that Jamaica's water belongs to its people, and that the government has an obligation to make it available to the population. Water supplies collect in the aquifers and rivers of the country's mountainous interior, and these upper forested and agricultural areas are the focus for most watershed management activity. Water is abstracted from these areas by the National Water Commission (NWC), the National Irrigation Commission (NIC), and a handful of other water suppliers, treated, and delivered to users. The main uses of water are for agriculture (75%), urban households (15%), industry (7%), rural households (2%), and tourism (1%) (NRCA 2001). Payments from users to suppliers are barely sufficient to cover the costs of treatment and delivery. Capital improvement and watershed management costs are borne directly by the government. Government revenues are vastly insufficient to cover these costs properly, resulting in severe management constraints and a continuing reliance on external grants and loans. In effect, the water cycle and the associated financial cycles are not congruent with each other. Figure 1 indicates how the main downstream users are not paying directly for upstream watershed management costs. Yet – with increasing demands for quantity, quality, reliability and convenience – there is scope to do so.

The main stakeholders

The main stakeholders in the water cycle, as described in Figure 2, include:

- *Forest and upper watershed managers*: agencies including the Forestry Department, NEPA, and the Rural Agricultural Development Authority (RADA) that are responsible for assuring the protection of forest reserves and protected areas, and the appropriate use of other land.
- *Watershed "guardians"*: NGOs, community groups, funding agencies such as EFJ, and individuals that advocate for good watershed management; the Water Resources Authority, which regulates the abstraction and allocation of water; and the upland farmers and residents (both legal and illegal) who could act either positively or negatively for watershed management.
- *Water abstractors and distributors*: Most water is collected and distributed by the NWC and the NIC, but Parish Councils also play a role, and a few private water companies have started up in response to a recent change in government policy.
- *Water users:* Industry and commerce, irrigated farming, urban residential users, and the tourism industry.

Some of these stakeholders, or representatives of them, have been brought together under the umbrella of the National Integrated Watershed Management Council (NIWMC) and its associated working groups and links to local committees. However, the NIWMC, whose emphasis is on inter-agency coordination, does not mirror the landscape of the water cycle, as can be seen by comparing Figure 2 with Figure 3, a diagram that reflects the tremendous complexity of the formal policy and institutional framework for watershed management in Jamaica. For example, while the Ministries of Agriculture and Tourism are represented on the Council, actual farmers and hoteliers are not, except through the single seat of the private sector

representative. (In addition, interests of farmers are indirectly represented by the Forestry Department through its Local Forest Management Committees and by NEPA through its Local Watershed Management Committees.)

Figure 1: Simplified diagram of the water cycle

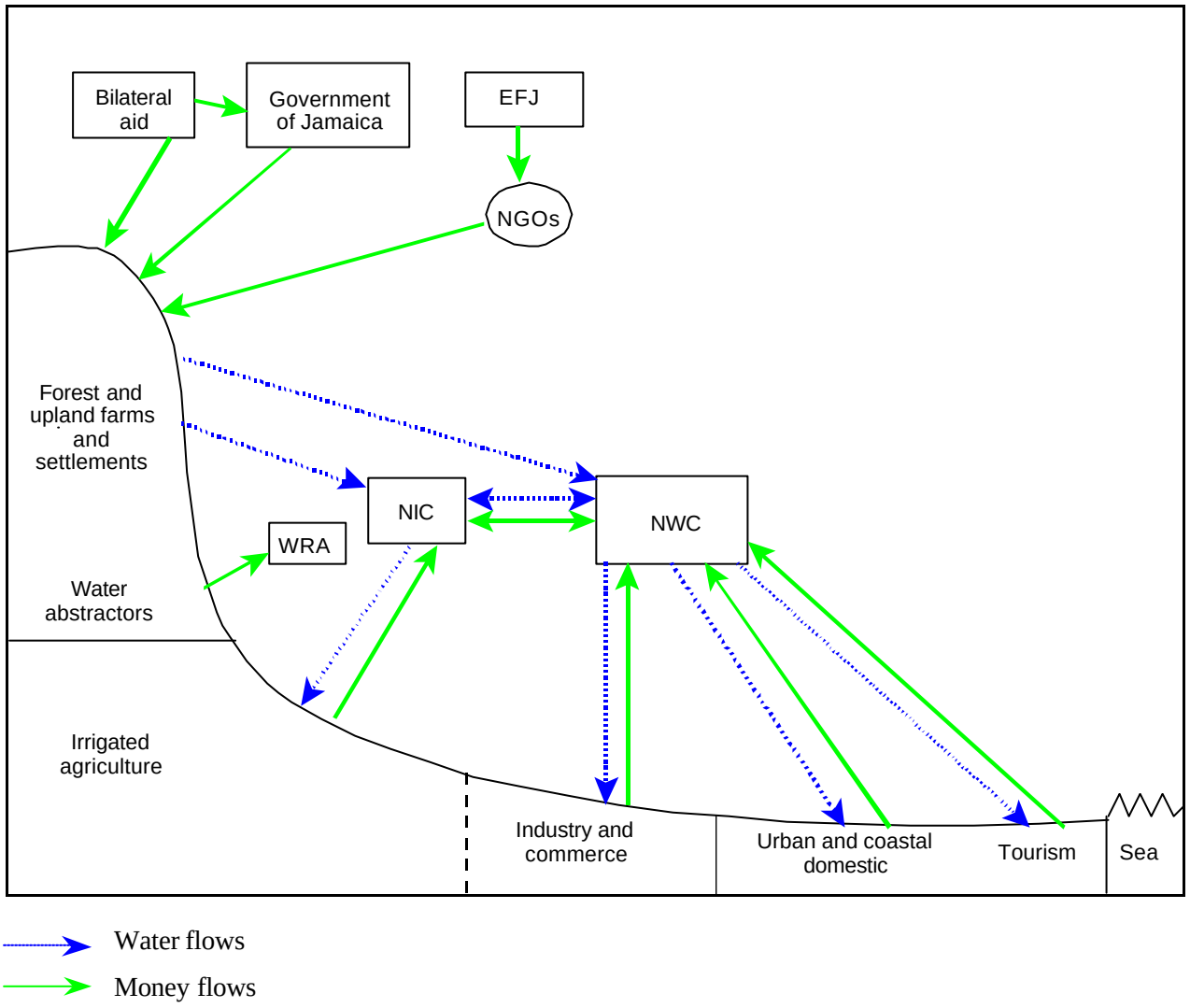


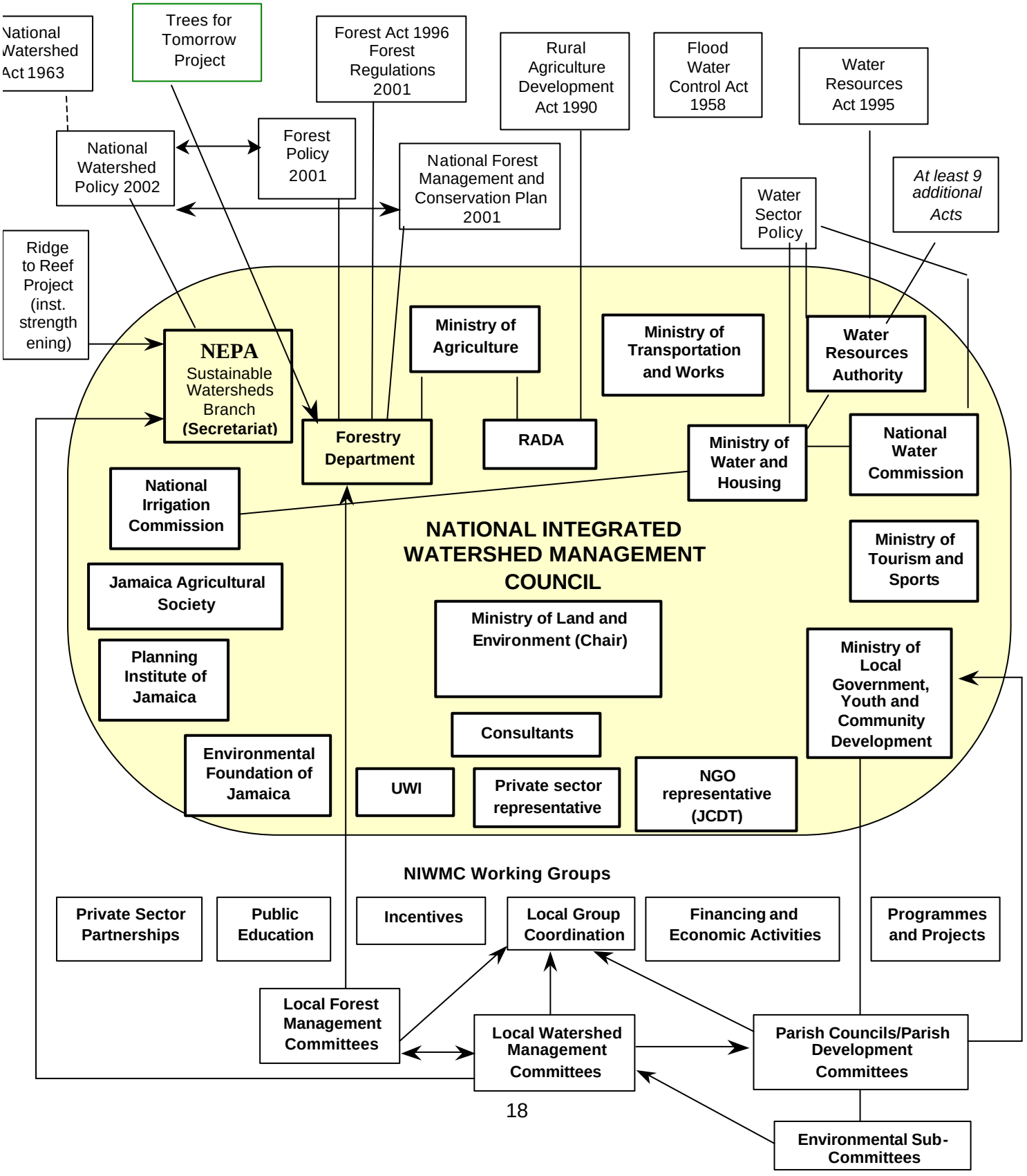
Figure 2: Main stakeholders in the water cycle

Stakeholders in watershed management: upstream to downstream	**Desirable watershed management activities**	**Constraints/ disincentives**	**Incentives: current [planned]**
Forest managers (government agencies, NGOs, and private foresters)	Develop and maintain proper forest cover through protection and planting Encourage others to do the same	Insufficient budgets/high cost of management	Free seedlings for private planting from Forestry Department [Forest Fund and Tropical Forest Conservation Fund]
Upland farmers (legal and illegal)	Develop and maintain proper tree cover Employ farm practices that minimize erosion and chemical run-off Discourage bad practices by others through social control Contribute to fire control	Many farmers compelled by need to plant short-term crops, not trees Lack of knowledge of good practice and watershed services Lack of secure tenure NGO support resources/ scope limited	Free seedlings from Forestry Department and RADA FD extension on agro-forestry in Buff Bay/Pencar on pilot basis, and being extended to other watersheds NGO demonstration and outreach projects [Regularization of tenure]
Upland settlements	Plant trees near houses, on slopes Control building on slopes Practice proper sanitation disposal Store water for dry periods	Poverty limits building, sanitation options Poor access to information on proper construction and waste disposal Cost of water storage tanks	NGO sanitation demo projects and education
Water abstractors (public and private)	Monitor water quality and quantity Minimize wastage in delivery/bottling Pay (and charge users) full environmental and social costs	Social and political constraints to increasing water rates Increased cost and effort as a result of deteriorating quality and diminishing quantity	May be licensing conditions for private abstractors tied to good practice Potential consumer preference for suppliers providing better quality, more reliable water
Irrigated farming	Use water efficiently Recycle waste water Avoid contamination of water supplies and drainage Pay full costs of water	Collapsing industries discourage long-term investment/changed practice Most markets don't pay for externalities Imperative for low-cost production	Water rates schedule rewards efficiency Waste water available from NWC at reduced rates
Industry and commerce	Use water efficiently Recycle waste water Avoid contamination of water supplies and drainage Pay full costs of water	Inadequate enforcement Cost-saving imperative	Water rates schedule rewards efficiency Cheap waste water available from NWC

Urban domestic	Use water efficiently Reuse water within house and yard Lobby for improved watershed management Understand full environmental and social costs Pay full costs Use storage tanks	Lack of awareness of watershed management issues and needs No disincentives to contamination Low willingness to pay full costs	Metering and rate schedule reward efficiency Education programmes by media, schools, government, NGOs
Tourism industry	Use water efficiently Reuse water (safely) within facilities Educate visitors about watershed management Pay full costs Use storage tanks	Price competition may causes resistance to paying costs, raising environmental standards Political leverage results in preferential treatment by Government	Metering and rate schedule reward efficiency External sustainable tourism certification schemes Customer pressure for environmental consciousness

Figure 3 Institutional landscape for watershed management in Jamaica

Note that this figure covers formal institutions only.



3. Threats to watersheds and management responses

Government management agencies have a clear picture of the behaviour and practices that threaten watersheds and water supplies, and their management actions are largely aimed at eradicating, controlling, or modifying these practices. Some of the issues of greatest concern include:

- illegal tree cutting from critical watershed areas and riparian zones for yam sticks, fuelwood, and timber
- hillside farming methods, including use of fire, that result in heavy soil erosion
- poor domestic sanitation practices and facilities in rural and urban areas, increasing the faecal coliform and nutrient levels in upper watersheds
- pesticide and fertilizer run-off, particularly in relation to poor farming practices and dunder contamination
- construction of buildings and roads on steep slopes
- river-bed sand mining

Management agencies have relied on education, extension and enforcement to address these issues. There is a widespread perception that awareness campaigns and participatory approaches have reduced some bad practices. The Canadian International Development Agency (CIDA) funded Trees for Tomorrow project has equipped the Forestry Department better to do its work of forest management, outreach, and enforcement, and the enhanced capacity of the Department is widely acknowledged. Local NGO initiatives to introduce improved pit latrines and soil conservation practices have supplemented government extension efforts. NGOs have also become involved in water quality testing, working together with government agencies. More rigorous planning regulations have also had a positive impact, for example, planned housing developments have septic systems or sewerage.

Factors that constrain improved management

Despite these scattered successes, improving watershed management is constrained by a variety of policy, institutional, and social factors. Some of these are:

Constraints to government agencies doing their jobs well

- The Forestry Department and the NWC (which manages some upper watershed areas) have inadequate budgets for protection and patrol staff and other management costs.
- The budgets allocated to these agencies do not reward effort and accomplishment, and there is always an expectation to 'do more with less'.
- This leads these agencies to 'projectize' priorities in order to attract external funding, leading to fragmented, unsustainable efforts.
- Given their limited resources, management agencies are working through and with intergovernmental programmes, NGOs and community groups, but local organizations are sometimes weak and unstable and do not represent all relevant stakeholders, and important stakeholders such as farmers are difficult to reach because they are not well organized.

- The legal framework for watershed management is incomplete and includes few binding regulations.

Constraints to changing the behaviour of stakeholders

- Half the population lacks title to land or secure tenure, discouraging investment in improved soil conservation, sanitation, or solid waste management practices.
- A large percentage of the rural population lives in poverty, and behaviour and decisions are entirely predicated on day-to-day survival.
- Agricultural incentives, for example those that resulted in the expansion of the coffee crop, can encourage poor watershed management practices.
- Much of the population is still unaware of the upstream-downstream links within the water cycle, or even of their own position in and impact on their local watershed.
- While regulations abound, inspections and sanctions have become uncommon, and people no longer expect censure for actions they know are wrong. There is a lack of support from the judiciary and the police to ensure at least some compliance by public to laws and regulations.

Constraints to implementing cost recovery measures, as recommended in relevant policies and studies

- The public sees water as a 'right' or a free commodity and expects government to be fully responsible for delivering it at minimal cost.
- The agencies managing water abstraction and distribution are affected by deteriorating infrastructure and other factors contributing to inefficiency.
- Government's poor track record in managing earmarked taxes and levies has created a credibility problem that makes it politically difficult for the NWC to apply to the Office of Utilities Regulation for new water usage or related fees.
- Important economic groups such as the tourism sector have routinely and successfully used their political power to resist paying the full cost of managing their impacts on the environment.

4. Progress and opportunities

Despite these constraints, the country has made progress that can be capitalized upon, and that can offer lessons for other Caribbean countries, on a number of fronts.

While incentives have not been integrated into the overall management framework, a few incentives to stamp out bad practices and encourage good ones already exist. These include:

- the Forestry Department's popular free seedling programme, which is available to all farmers and landowners regardless of income level, and which is used as a primary tool for building relationships with stakeholders
- small grants to NGOs from the Environmental Foundation of Jamaica (EFJ) and the USAID-GOJ Coastal Water Improvement Project and Ridge to Reef Watershed Project, for community-based projects aimed at improved practices in watersheds

- water conservation incentives built into NWC's rate structure (metered water, higher rates for higher consumption, reduced rates for purchase of waste water for appropriate uses, e.g. cooling).

The watershed policy and management framework is well advanced (and well ahead of most other countries in the region), and includes the delineation and prioritization of watershed management areas, the development of a new watershed policy through a consultative approach, the establishment of the NIWMC and its working groups on key issues, and the Ridge to Reef project's analysis of laws and policies related to watersheds as a first step to achieving policy coherence. Jamaica is also taking advantage of regional and international initiatives (for example, the CEHI-GEF regional Integrating Watershed and Coastal Area Management project) to further its agenda. With so many initiatives underway, there is scope for duplication and confusion, however.

Stakeholder participation is openly encouraged and supported, through:

- consultative policy processes
- the establishment of a range of local advisory groups (e.g., Local Forest Management Committees, the Great River Watershed Management Committee, the Ocho Rios Environmental Advisory Group, IDB-sponsored water user groups), which offer an avenue for local stakeholder input
- partnerships with NGOs to sensitize stakeholders and demonstrate alternatives to destructive practices, with a focus on pilot projects

The Forestry Department is placing priority on watershed issues, which are given prominence in the 2001 Forest Plan and policy. The proposed Forest Fund and Tropical Forest Conservation Fund, once capitalized, can be vehicles to channel money towards improved management of forests in the upper watersheds.

As watershed landowners and managers themselves in a few watershed areas, the NWC and the Urban Development Corporation are agencies that have a stake in all stages of the water cycle. Unfortunately, however, they lack the financial resources to effectively manage their upper watershed lands or enforce land use standards on land leased to farmers. The NWC does however get limited management assistance from the Forestry Department (which has its own serious financial constraints).

The recent policy change that allowed private companies rights to Crown land for water abstraction opens up possibilities for incentives through competition. At the moment, however, standards of quality and operations are not well enforced.

Local and international pressure on some industries, particularly tourism, is causing them to embrace environmental standards through certification schemes (e.g., Green Globe, Blue Flag) and through support to local environmental initiatives. The Ministry of Tourism is looking into capitalizing on this trend by creating licence renewal conditions tied to "voluntary" investments in the community or environment.

5. Needs and directions

The major needs and directions identified by main stakeholders and drawn from this review, include the following:

- *Clarify watershed-friendly behaviour which should be encouraged:* There needs to be a common understanding about what sort of behaviour to encourage, and what to discourage, to improve watershed services. A first step is for stakeholders to agree on, and then to make widely known, both the acceptable and unacceptable land use, water use, sanitation, and waste disposal practices that affect watershed management. NWC apparently has good information over many decades, which can correlate land use types with water quantity and quality.
- *Improve awareness of stakeholder roles*: Education is needed to help people understand their own roles and responsibilities within the water cycle (upper watershed actors as producers of watershed services, middle watershed actors as stewards of water, and lower watershed actors as responsible consumers). Without that understanding, there is limited scope for encouraging people to adopt good practices or to accept paying the full cost of watershed services. NEPA's Watersheds Branch and the Ridge to Reef project are placing priority on this need.
- *Enhance government's credibility*: Consumer willingness to pay is now constrained by a widely held lack of trust in government's commitment and ability. Effective demonstrations of government's commitment to improved watershed services are needed. Opening up the water abstraction and distribution business to private companies may begin to increase willingness to pay, as long as government does its part to set and apply standards and regulations.
- *Bring watershed stakeholders together:* There have been some positive experiences at the local level with bringing the main actors in the water cycle (producers, stewards, users) together to discuss issues, define needs, and make deals: for example, the 'watershed forums' sponsored by South Trelawny Environment Association for south Trelawny. A similar forum at the national level could create a broader dialogue on vision, policy, and need than NIWMC – as an interagency coordination mechanism – is able to.
- *Consolidate scattered pilot work*: The many valuable pilots now underway, through Forestry's Trees for Tomorrow project, the Ridge to Reef project, EFJ's Dunn's River project, and a number of local NGOs, are spatially scattered and are hitting different places and needs along the water cycle. A mechanism for bringing these efforts together for learning, for stakeholder sharing, and to inform policy processes, would enhance their usefulness substantially.
- *Develop standards or codes of practice*: Codes of practice (to define minimum acceptable levels) or standards (to set an upper threshold) of watershed stewardship will be needed to set the basis for certification and labelling schemes (such as the "Great River" branding concept for produce from that watershed, which is being considered in the Ridge to Reef project) and other incentives. These could be developed through a multi-stakeholder approach and applied to the activities of different producers and consumer groups.
- *Establish sustainable funding flows consistent with a broad valuation of multiple watershed services*: The value of watershed services needs to be assessed and agreed to

by stakeholders as a basis for starting to establish rates and fees that are sufficient to fund quality watershed management. There are now methods available to estimate this, without going into a major research project – although more detailed assessments can help the design of specific schemes. Without such an assessment, the public will continue to look on water as a free environmental service. With a watershed valuation, and a more detailed assessment of associated demands and financial flows than could be done in the current brief review, potential incentives can be identified.

6. Incentive possibilities to explore

This analysis has confirmed the perception of many lead stakeholders that incentives can and must be an important component of watershed management approaches. On the one hand, incentives need to be based on local needs and motivations, and on what works locally (hence the value of pilot projects). On the other hand, bigger national schemes are needed to avoid the fragmentation of current and past efforts and to demonstrate to stakeholders that they are contributing to something significant. Incentives should be designed to both encourage good watershed practices and to build a sense of the value of watershed services and the obligation of users to contribute to their costs.

Pilot incentive-based activities to improve watershed management

Some possible ideas that could be tried on a pilot basis include:

- *A "reef-to-ridge" donation programme*, in which hotels and other downstream users are encouraged to support upper watershed management activities, perhaps in the case of hotels by contributing some funds saved through their "conserve water" initiatives with guests. This could be carried out in conjunction with the Ministry of Tourism's efforts to increase the industry's support to the community, and with EFJ's proposed "Champions of the Forest" programme, which could provide recognition to contributors. International tourism certification schemes increasingly recognize such efforts in a positive light in their assessments. The potential for tax write-offs could also be explored. An existing arrangement between Sandals' and local farmers offers a precedent.
- *Branding and marketing of agricultural, horticultural, and industrial products and bottled water*, based on agreed and applied standards of practice (the "Great River" brands idea). There are several possible incentives, apart from the obvious market-led incentives from sales to discriminating markets. They include streamlining government procedures for allocating rights, and for planning and development control.
- *Grants and tax write-offs for the establishment of community mini-dams and household water storage tanks,* to reduce problems of reliability and reduce NWC's water delivery costs. These ought to be associated with standards for their construction and use, and could be combined with appropriate public education campaigns.
- *Awards aimed at building the notion of stewardship of the water cycle*, through competitions to find the best examples of good practices and behaviours. The competitions might also identify behaviours to stamp out.

A national campaign – 'rebuilding the Spinal Forest'

These pilot ideas could be incorporated into a national campaign to increase visibility, attractiveness to stakeholders, coherence, and thus impact. The current EFJ-FD initiative to rebuild the Spinal Forest could provide the focus for a suite of mutually reinforcing incentive-based actions, which could include – in addition to those noted above – such elements as:

- *Seeking donations* for the purpose of buying up lands critical to upland watershed services, to be managed by the Forestry Department and perhaps NWC. This could include a percentage, even if initially a very small one, out of water abstraction license fees, as suggested in the Forest Plan, as well as user fees on construction projects in watersheds, which have been considered by Government. The Forestry Department might also consider leasing land, through the Commissioner of Lands, that is less critical to its overall forestry aims in order to reduce its expense burden and rationalize its estate.
- *Providing financial incentives*, through the proposed Private Forest Initiative of EFJ's Spinal Forest project, for upper watershed landowners to move out of uneconomic cattle raising or agriculture and into afforestation and fruit trees based on good land use standards, or to give up the use of their lands for a period of time for forest restoration. These should have a strong component of community involvement.
- *Giving priority to addressing the tenure issues of upland farmers*, including squatter communities, and tying the securing of tenure to meeting watershed-friendly land use standards (with the possibility of loans or Social Investment Fund grants to help poor farmers meet those standards.)
- *Tax incentives to improve land use* by larger upper watershed landowners, to be developed through consultations with landowners and relevant government agencies.
- *Seeking Kyoto Protocol Clean Development Mechanism funds* for afforestation/ reforestation projects that meet sustainable development and land use control criteria. One of the two objectives of the CDM is sustainable development. The CDM regulations require the host government to determine the frameworks within which CDM projects should contribute to sustainable development. The Spinal Forest idea would be ideal.
- *Concentrating action in the highest priority watersheds*, drawing on the NEPA environmental and social classification system, in order to assure the greatest impact.

7. Conclusion

Jamaica could potentially benefit, and benefit others, from participation in the IIED/DFID project *Developing markets for watershed protection services and improved livelihoods*. It can also benefit from the experiences of other countries as it seeks to incorporate incentives-based approaches into its watershed management policies and programmes. The further exploration and testing of the approaches suggested above could be assisted by further involvement in the project in Phase 2.

Incentives for Watershed Management in St. Lucia: Results of a Brief Diagnostic

Tighe Geoghegan, Caribbean Natural Resources Institute

1. Summary and overview

St. Lucia is currently reforming its approach to water resource management in response to deficiencies that have plagued the sector for years and that limit the potential for development in other key sectors, including agriculture and tourism. This reform process has three related components:

- preparation of a national water policy based on the management of water as an economic product, and of a strategic plan for its implementation;
- development of a new legal framework and institutional arrangements for integrated management of the water sector;
- privatisation of the water industry, to attract new capital and reduce inefficiencies.

All these initiatives, which are receiving support from international agencies including the European Union and the World Bank, are in a fairly early stage.

While it is believed that the country's water supply, if properly managed, is adequate to meet current and projected demand, the information base on water resources is considered grossly insufficient for proper planning. The major issue faced by consumers has been *reliability*, since the supply comes almost entirely from surface water, mostly from rivers originating in the upper watershed. In the dryer parts of island and dry periods during the year, shortages chronically result in rationing. Decisions on allocation are made by the water distributor and generally favour critical sectors such as health and tourism, but even in these sectors, the lack of reliability and insufficient data on available quantity limit growth and development.

Water quality also is a serious problem, and one that resource managers largely link to upstream human activities, including siltation caused by conversion of steep forest land to agriculture, particularly banana production and grazing; associated agrochemical use; unregulated development along river banks; and the use of sub-standard septic systems, pit latrines, and rivers for bathing and washing.

The reform process now underway has revealed a consensus on the need for integrated management of the water cycle, with a range of tools, including land acquisition, regulation, education, community management, incentives, and markets, for addressing issues at each level. These tools, many of which are not currently in use and would therefore need to be developed and tested, would be specified in the strategic plan for the implementation of the policy.

This paper presents the findings of a brief study conducted under Phase 1 of a global initiative of the U.K. Department for International Development (DFID), *Developing markets for watershed protection services and improved livelihoods*, which is being implemented by the International Institute for Environment and Development (IIED) in collaboration with local partners. In the Caribbean, IIED's local partner is the Caribbean Natural Resources Institute (CANARI). The project is summarized in more detail in Appendix 1. The diagnostic consisted of a literature review and interviews with a selection of key stakeholders between 13 and 16 August 2002 (see Appendices 2 and 3). This paper looks at watershed management in St. Lucia and identifies

opportunities to develop market and incentive-based tools in order to improve management and increase local involvement. It also suggests opportunities for St. Lucia to contribute to and benefit from participation in a Caribbean learning group on incentives for watershed management, and through it in the larger global initiative of DFID and IIED.

2. Context

The water cycle

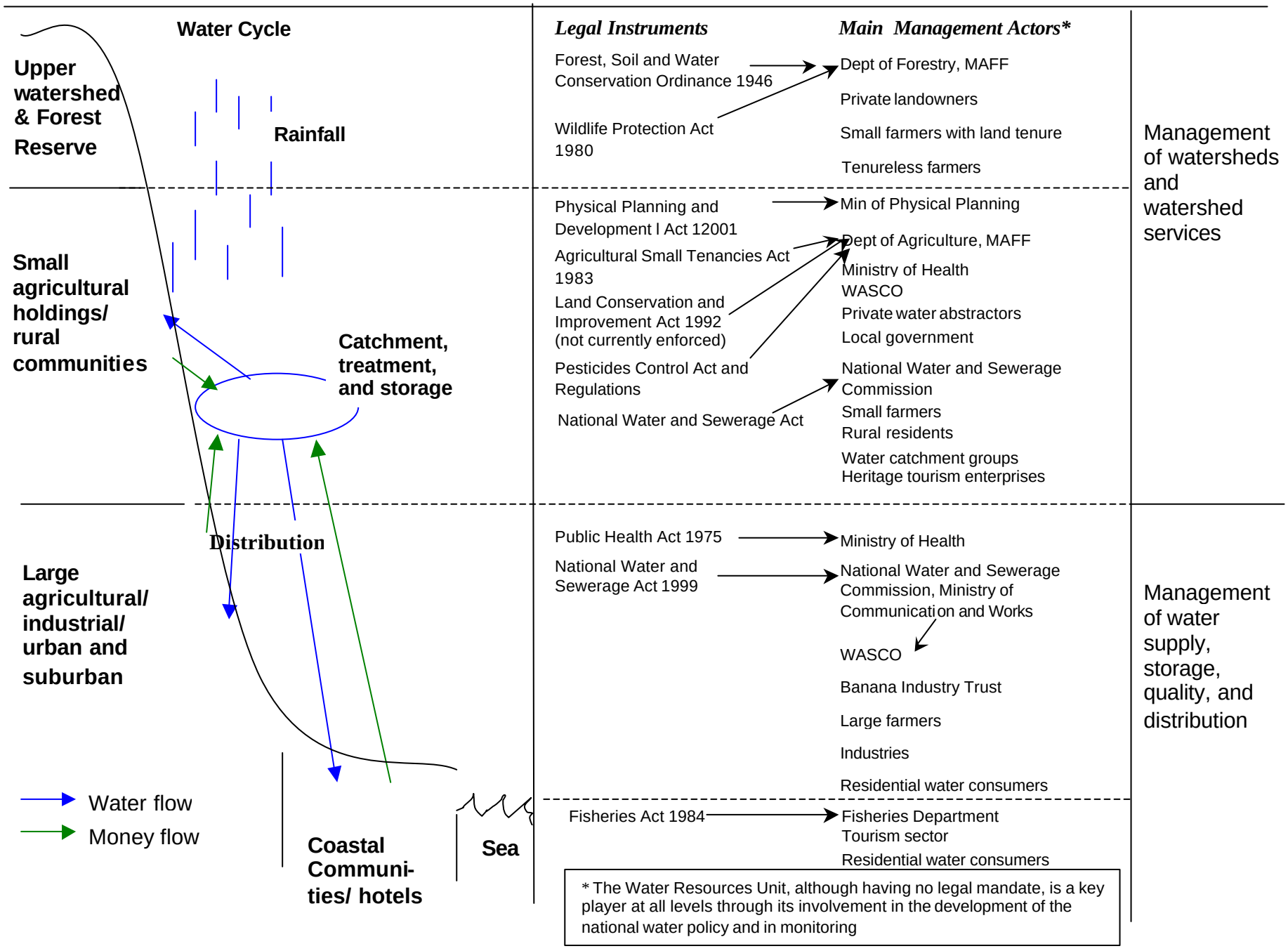
St. Lucia's water supply is entirely dependent on rainfall in the upper watershed, which is caught in the island's many rivers and the one reservoir recently built to serve the north of the island. Rainfall is highly variable across the island and throughout the year, with the June to November rainy season seeing as much as 75% of the annual total, and with the mountainous centre receiving more than twice as much rainfall as the dry southern coast. Much of the upper watershed is protected as Forest Reserve, but to assure adequate volume most abstraction occurs below the Reserves on private land, portions of which have been converted from forest to agriculture and other uses since the water intakes were installed decades ago.

Until recently, the Government of St. Lucia (GOSL) controlled and directly managed the water sector, and low rates and inadequate infrastructure resulted in considerable losses. The country is now in the process of converting to a private sector, market-based approach to the provision of water, under the regulation of the National Water and Sewerage Commission. Water is mainly abstracted by the autonomous - but currently wholly government-owned - Water and Sewerage Company, Inc. (WASCO), which has the sole licence for the provision of piped water. Several watershed landowners abstract water from their property for bottling, but these operations are all on a fairly small scale and are not yet regulated by the Commission. The Commission recently issued a second licence for the abstraction of water for agricultural irrigation.

Information on the use of water by sector is incomplete, but it appears that at least half of the demand is for domestic and small-scale commercial use. The remainder is divided among the tourism sector, government, industry, and agriculture. Current use by the agricultural sector is low, but is expected to increase substantially with the expansion of irrigation to improve the efficiency of banana production.

While WASCO's government-operated predecessor, the Water and Sewerage Authority (WASA), chronically operated at a loss, WASCO has instituted rate increases and now appears able to cover its full cost of operations, including infrastructural improvements, along with a small surplus that goes towards the reduction of debt inherited from WASA. Income does not however cover the costs of water production and protection. The GOSL directly bears the costs of managing the Forest Reserves as well as enforcement and extension in the watershed and pre- and post-treatment water quality monitoring. In the case of one important watershed, a community group, the Talvan (or Talvern) Water Catchment Group (TWCG), conducts management activities in the area surrounding the local intake. These costs have been covered by the group members and through small grants from various agencies. The water cycle, its water and financial flows, legislative framework and main stakeholders are illustrated in Figure 1.

Figure 1: St. Lucia's Water Cycle, Associated Legal Instruments and Main Actors



The future of the water sector will be determined by the results of the policy and sectoral reform processes now underway, and the current structure of the industry could change significantly as a result of these processes. The draft water policy now being developed proposes that the rates charged for water should cover all costs of production, storage, treatment, and delivery, including those related to "protecting forests, watersheds and other ecosystems required to regulate and maintain water quality". In order to implement this policy recommendation, the economic value of these watershed management services would need to be established. The policy also suggests that the National Water and Sewerage Commission should have control over the allocation and use of all freshwater resources, even in areas within or surrounded by private land. This directive would have significant implications for the further development of the sector, including the water bottling business, which is now largely carried out by private landowners on their own lands without regulation. On the other hand, the draft policy does not address the issue of water abstraction or private production, through technologies such as desalinisation, for industrial uses, although their expansion could have significant implications for the development and privatisation of the sector.

The main stakeholders

The main stakeholders in the water cycle (see Figure 1) and their roles include:

Forest and upper watershed:

- *Department of Forestry*, Ministry of Agriculture, Forestry and Fisheries (MAFF): responsible for managing the Forest Reserves (covering about 60% of the upper watershed forest), protection of any other Crown Lands within water catchments, and education and extension on privately owned lands within water catchments.
- *Private landowners*: while most private land in the upper watershed remains in forest, some portions have been converted for agriculture and other uses that may impact negatively on water supply and quality. Since large-scale timber harvesting is not economically viable in St. Lucia, upper watershed landowners have an incentive to either sell their land or convert it to other uses.
- *Small farmers*: a small number of farmers use upper watershed private plots, or squat on public lands, for short term planting or grazing, but soils and slopes are unfavourable.

Water catchments surrounding intakes and other middle watershed areas:

- *Ministry of Physical Planning*: responsible for development oversight, but lacks resources for monitoring and enforcement, particularly in rural areas. Many aspects of rural planning are actually addressed by the MAFF.
- *Department of Agriculture*, MAFF: responsible for agricultural extension and enforcement of legislation governing agricultural practices. The most powerful piece of legislation, however, the Land Conservation and Improvement Act of 1992, is not enforceable since the Board described in the Act has never been constituted.
- *WASCO*: abstracts from and maintains water intakes and reservoir and treats and delivers water. Does not conduct management activities in areas surrounding intakes; however its local officers do some limited extension work.
- *National Water and Sewerage Commission*, Ministry of Communication, Works, Transport and Public Utilities: established in 1999 to regulate the water industry and to

coordinate the input of the various actors in the sector. It regulates water abstraction, treatment, and storage in catchment areas.

- *Water bottlers*: private landowners who abstract and bottle water from rivers on their land. Water quality is expected to meet set standards, but the industry is not currently regulated.
- *Ministry of Health:* responsible for conducting sanitary surveys of catchment areas surrounding intakes and bacterial analysis of pre-treated water, but constrained by limited resources.
- *Local government:* responsible for the management of community standpipes in rural areas. Some consider these standpipes to be a major source of leakage, as no individual or agency takes responsibility for their wise use.
- *Small farmers*: farming remains the most extensive land use in St. Lucia (55% of the total land area), even though it is no longer the most important economic sector. Small farming in the middle watershed proliferated during the banana boom years. Many farmers are now converting to other crops or abandoning their plots, with some reversion to forest. Main impacts on the watershed are from agrochemicals and poor soil conservation techniques.
- *Rural residents*: lack of awareness and development control results in impacts on the watershed from rural communities, including solid waste disposal in rivers, leakage into rivers from pit latrines and defective or poorly sited septic systems, use of rivers for washing and bathing (especially during periods of water rationing), and grazing and tethering of domestic animals along riverbanks. Education has improved practices in a few communities.
- *Community water management groups*: community groups to help manage critical catchment areas were started by the Department of Forestry several years ago in five areas. Two groups remain active (Talvan and Thomazo) and have had an important impact on local awareness of the link between watershed management and water quality and supply. In the Choiseul area, farmers maintain an old canal in order to supplement the local water supply.
- *Heritage tourism enterprises*: several small enterprises supported by the St. Lucia Heritage Tourism Programme manage sites and attractions in the watershed and depend on good water quality and a pristine natural environment.

Lower watershed, urban, industrial and coastal areas:

- *National Water and Sewerage Commission*: responsible for licensing water companies, and is overseeing the development of the national water policy.
- *WASCO*: the first company licensed under the National Water and Sewerage Act 1999 "for the provision of an adequate water service... for the people of St. Lucia". The vast majority of households have access to piped water, although many rural households still rely on community standpipes or extract water directly from rivers.
- *Ministry of Health*: responsible for conducting post treatment bacterial analysis and certifying piped water as safe for drinking.

- *Banana Industry Trust*: an entity established in 1999 to support the development of the banana industry through the management and disbursement of grants from the EU, it has a licence to abstract water for irrigation, but has been impeded by inadequate supplies.
- *Large farmers*: lowland plantation farmers abstract water directly from rivers and use irrigation on a limited but increasing scale.
- *Industries, tourism sector, households*: the major consumers of water (the tourism sector alone consumes 20% of the water provided by WASCO), are encouraged to conserve and for many, particularly industrial users, recent increases in water rates have provided a strong incentive to do so.

There are currently no mechanisms that bring all or even a portion of these many stakeholders together. However, the *Water Resources Management Unit (WRMU)*, MAFF, which was established through the European Union-funded Water Resources Management Project, provides a national focal point for water issues and works regularly with all the main institutional actors.

The financial and technical assistance agencies that are heavily involved in various aspects of water sector reform also have major stakes in the process. These include the *World Bank*, which is supporting the process of water sector reform, and *European Union*, which is supporting the development and improved management of water resources for the agricultural sector through its STABEX programme. And two national programmes, the *Basic Needs Trust Fund* and the *Poverty Reduction Fund* are financing a major initiative to supply water connections to poor communities, resulting in a substantial increase over the past ten years in the number of rural homes with piped water.

3. Threats to watersheds and management responses

The activities that threaten watershed services are well understood by the country's resource managers, if not the general population. The following table identifies the major management issues, past and current responses and constraints, and solutions that have been proposed in the past or were suggested by informants during the interviews for this report.

Threats	Existing responses and constraints	Proposed solutions
Portions of forested upper watershed are privately owned and vulnerable to change of use. Some of this land, as well as small amounts of squatted private land, is being used for marginal farming, with apparently negative impacts on water retention and quality	Government has purchased some pieces of watershed that are most critical for water production or storage. *But* land purchase is costly, slow, and can require relocation of residents; and MAFF's resources for extension work with local farmers are limited.	• Place surcharge on water rates to finance purchase of critical upper watershed areas and incorporate into Forest Reserve. • Conduct land swaps between GOSL and private landowners to rationalize area in Forest Reserve for increased contribution to water supply. (A few swaps related to other issues over the past 20 years provide a precedent.) • Provide incentives to private landowners through government or bilateral assistance sources to grow tree crops that will support improved water retention and quality. • Provide upper watershed landowners with licences to abstract and sell water in exchange for good land use practices. • Make water production the primary objective of forest reserve management, through the planting of species that optimise water retention.

Threats	Existing responses and constraints	Proposed solutions
Much of area around water intakes is privately owned and subject to contaminating activities, e.g., pesticide use, inappropriate waste disposal, poorly sited or constructed septic systems and pit latrines; use of rivers for washing and bathing. Water abstracted therefore requires heavy treatment. And development of heritage tourism sites and attractions is hampered by poor water quality (e.g., at waterfall attractions) and vulnerability to land slides, which result from tropical storms and appear to be exacerbated by poor upstream land use practices.	• The Dept of Forestry has worked with community groups in critical water catchment areas to encourage local stewardship and two groups remain active. One group has done river stabilization activities upstream from intake and seeks to increase local awareness of the impacts of human activities on water quality and quantity. The other group is advocating the relocation of the intake to a less heavily impacted area and is also interested in conducting watershed rehabilitation activities. *But* these groups have no steady financial support for their work and rely on small grants and ongoing assistance from Forestry. • Consumers generally distrust quality of piped water. The middle class is increasingly purchasing bottled water; others boil their water before drinking. • WASCO and the Ministry of Health undertake water quality monitoring, and the WRMU is initiating a water quality monitoring programme for selected areas	• Purchase areas draining into water intakes and incorporate into Forest Reserve • Relocate intakes from areas of intense human activity to more pristine areas (but would result in a decrease in available water for abstraction) • Establish arrangements between GOSL or water company and communities surrounding intakes to manage areas for improved water quality and quantity, with provision for local monitoring • Decentralise water services to permit the establishment of local operators and the introduction of competition to stimulate improved quality and service • Provide incentives through government or bilateral assistance sources for marginal banana and livestock farmers to convert to tree crops and other land uses that are compatible with clean water production • Strengthen regulations related to water quality and the capacity for water quality monitoring, including chemical monitoring.

Threats	Existing responses and constraints	Proposed solutions
• Much of middle watershed is used for banana or short crop production that contributes to soil erosion and contamination from agrochemicals. However, this threat may be diminishing with the rapid decline in the external market for bananas. • Activities and practices of households in watershed result in pollution, erosion and other forms of watershed degradation.	• Some agencies and community groups carry out sensitisation and extension activities in rural communities. *But* their human capacity is limited and they are unable to regulate or enforce, and there is still little awareness of the impacts of activities in the watershed on water quality and supply. • A national land policy is being developed that if implemented should address the need for integrated watershed management.	• Conduct education campaigns, targeted particularly at schools and rural communities, on the importance of watershed protection • Provide government incentives to farmers and landowners based on meeting land use standards • Operationalise and enforce the Land Conservation and Improvement Act 1992 • Establish the hydrological boundaries of the country's watersheds and implement watershed-based management systems that allow for extension and regulation based on individual watershed characteristics and requirements, for participatory planning at watershed level, and for transactions between stakeholders to mitigate downstream impacts • Encourage downstream hotels and tourism attractions to support watershed communities to improve land use

Threats	Existing responses and constraints	Proposed solutions
Levels of water consumption and loss in the catchment and distribution system exceed available supply in many areas, especially in the dry season, resulting in frequent rationing, particularly in rural communities and the dry south of the island.	• WASCO rate structure rewards conservation by domestic users. *But* Government continues to assume most of the costs of water production (watershed protection and management). • Those who can afford install back-up tanks and occasionally water-saving devices and cisterns. *But* others use rivers for bathing, washing and drawing water when piped water is not available, resulting in further contamination. • WASCO has conducted some public awareness activities on the subject of conservation. *But* there is still insufficient awareness of the value of water and the need to conserve it. • Farmers in the Choiseul area work together to maintain sugar-era canal to bring additional water to the area for farming and other uses.	• Incorporate the costs of watershed management, now borne by government agencies (e.g., Dept of Forestry) and others (e.g.,TWCG) into water rates • Conduct education campaigns on the cost and value of water to increase consumer acceptance of higher rates and improve water conservation responsibility at the household level • Develop a water pricing structure that better rewards conservation and eliminates cross-subsidies (except for the poor) • Reduce loss in the system through infrastructural improvements and systems for monitoring wastage levels. • Provide government incentives for residential and business consumers to retrofit fixtures and install water cisterns, tanks, and roof harvesting systems to reduce piped water consumption • Provide tax incentives to hotels to assist communities to install water saving devices and storage facilities • Establish local water user associations to assist in managing and conserving water resources and in community education

Threats	Existing responses and constraints	Proposed solutions
Existing available water resources may be inadequate to meet national development goals (e.g., economic development of south of island, expansion of irrigated banana farming).	A national policy for integrated water resource management is being prepared, to be followed by the development of institutional arrangements to address the existing lack of interagency coordination and a work plan for policy implementation.	Conduct a comprehensive national water resources inventory and use as basis for a national water resources development and use plan

The policy and institutional environment

Awareness of the need for improved watershed and water resource management began relatively early in St. Lucia, and has existed within key government agencies since at least the 1980s, resulting in the Forestry Department's focus on management of water catchments and plans for the development of the Roseau Dam. Prior to the reform process now underway, however, virtually the only functional links between watershed management and the provision of water came from the establishment of Forest Reserves in the upper watersheds during the colonial era, the promulgation of the Forest, Soil and Water Conservation Ordinance of 1946, amended in 1983, and the work of the Department of Forestry. In recent years, the Department has sought, with some success, to increase the involvement of rural communities in the management of local water catchment areas.

The Water Resources Management Unit was established in the MAFF in 2000 through the EU-funded Water Resources Management Project, initially out of a need to assess water availability for irrigation to improve banana production efficiency. The Unit, whose small staff is housed at the Department of Forestry's offices, is coordinating the development of the national policy and the strategic plan and institutional arrangements (including mechanisms for coordination of the main actors) that will result from it. Other programme areas include prioritising watersheds for rehabilitation, increasing public awareness through education and the establishment of water user groups, and improvement in the monitoring of water resources.

As seen in Figure 1, the legislation related to watershed and water resource management appears somewhat piecemeal, but actually provides a comprehensive framework that, once marshalled in a coordinated manner through an integrated water policy, should provide adequate regulation and protection. The one weak link in the framework may be the Water and Sewerage Act of 1999, which has been revealed to have a number of deficiencies, and is likely to require a comprehensive review and revision in the near future. The national water policy is being developed with sectoral input, largely through the use of focus groups representing a range of interests. The draft policy, which has not yet been finalised for submission to Cabinet, addresses water issues largely from the user end of the water cycle and is perceived by some as giving insufficient attention to the production end, including watershed protection and management. The section of the policy on "water for environmental sustainability" does encompass issues related to watershed management, but from the perspective of the environment as a user of water rather than a producer.

The Water and Sewerage Act established the National Water and Sewerage Commission to regulate the industry and manage the country's water resources. To date, the Commission, whose terms of reference are still evolving, has concentrated on its licensing and regulatory functions. It

is possible that its dual roles will eventually be split between two bodies, one responsible for regulation and the other for coordination and management. The World Bank project on water sector reform, which is focused only on the commercial and operational aspects of the water cycle, is putting in place the legal and institutional framework for privatisation of the water sector. The GOSL is privatising the industry in order to attract capital for major infrastructural improvements needed to improve service and permit further development, particularly in the south of the island, and the expansion of irrigated agriculture.

4. Progress and opportunities

St. Lucia faces serious challenges in the management of its water resources, but is moving forward to address them in innovative ways and has recognized the potential of market-based approaches to improve management effectiveness and efficiency. It has made good use of assistance from international agencies including the World Bank, the OAS, and the EU, and regional organizations, particularly the Caribbean Environmental Health Institute (CEHI) and the OECS Natural Resources Management Unit. It is participating in the GEF-funded project *Integrating watershed and coastal area management in small island developing states of the Caribbean*, which is coordinated by CEHI and the United Nations Environment Programme. While there is much work still to be done to sensitise people to the link between activities in the watershed and the quality and reliability of water, the projects supported by these agencies have had a positive impact on public awareness.

The water sector reform process has resulted in more rational water rates, and this progress towards a more realistic valuing of water is backed up by the emphasis in the draft water policy on full cost recovery. The goal of privatisation of the water sector may also offer opportunities to improve the functional link between the water industry and watershed management.

The national water policy is being developed in tandem with a national land policy, with the involvement of many of the same actors, providing opportunities for the development of more integrated and holistic approaches to managing the water cycle.

Incentives have not been a major tool in watershed management in the past. Poor water quality and reliability have actually served as incentives for both water conservation and community action, but as quality and reliability improve, other incentives will be required to sustain desired behaviours. In addition, there are precedents for the use of fiscal incentives; for example an incentive programme already exists for the purchase of solar water heaters, which could potentially be expanded to include water conservation devices and roof catchment systems with associated cisterns. These incentives would largely be of interest to higher income groups, however

The work of the TWCG is well known and widely praised, and other communities have indicated interest in similar approaches. The Group has succeeded in obtaining support through small grants from national and regional sources and in doing so has developed a good understanding of the costs of its management interventions. There are unfortunately no data to substantiate empirical evidence that water quality and quantity have improved as a result of the Group's interventions, but the Group is anxious to put a water quality monitoring programme in place

The MAFF has developed a GIS-based land use planning system, which pulls together the results of past land use and capability studies and incorporates spatial decision support tools for determining optimal land management regimes. The system is meant for use at the watershed level, and the Ministry plans to use it as the basis for the development of management plans for

critical watersheds. The availability of this information base on GIS and associated decision tools opens up possibilities for new and interesting approaches to participatory land use planning.

Through the St. Lucia Heritage Tourism Programme, the GOSL is seeking to diversify its tourism product and spread the benefits through support to largely rural-based heritage tourism sites and attractions. Among the issues being addressed is that of "wise water management" by the small enterprises managing heritage tourism sites, but the need to protect these sites, which include waterfalls where visitors bathe, from upstream impacts on water quality is now also being given attention.

5. Needs and directions

Most of the requirements for improving the management of the water cycle have been identified through the current policy process. Those that are particularly relevant for the development of incentive and market-based approaches to watershed management include the following:

- *Development of a comprehensive database on water resources* to determine water supply, availability, rates of production and loss, geographic and temporal variations, the uses that can be sustained, and the impacts of land use changes on water services.
- *Quantification of the value of the watershed management services* currently and potentially performed by government agencies, land owners, and community groups, so that these can be used in economic planning and built into future tariff structures
- *Systems for monitoring water quality and supply*, in order to evaluate the impact of management interventions in the upper watershed and around water intakes
- *Mechanisms to bring watershed stakeholders together* to find solutions to problems and to permit direct transactions between upstream and downstream stakeholders, thus spreading the cost of watershed services among all beneficiaries, not only piped water consumers
- *Improvement of management responsibility at all levels of the water cycle* from upper watershed farmers to downstream consumers, through targeted programmes of education and extension.

6. Possibilities to explore

St. Lucia can learn from the positive and negative experiences of other countries in moving to a market-based approach to water production and delivery. Two clear lessons from these experiences relate to the need to incorporate provisions for upper and middle watershed protection into the cost structure of the industry, and the need to ensure that the poor are not hurt by, but are able to benefit from, the changes in the sector. Incentive and other fiscal-based approaches are relevant in addressing these needs. Based on the discussions held for this diagnostic, the following areas may be worth further exploration.

Actions to sustain and expand the work of local water catchment groups

The decentralized nature of St. Lucia's system of water abstraction, treatment and distribution creates the possibility of local water management and thus provides the incentive for the establishment of water catchment groups around intakes. But the work of protecting intakes is costly and time-consuming, and sustainable sources of support are required. A pilot market-based approach to the provision of intake protection services could be developed and tested in Talvan and if effective, extended to other areas. Activities would need to include:

- an economic valuation of the benefits, in terms of improved water quality and quantity, of the activities being carried out by the TWCG
- an assessment of their costs, in terms of labour, materials, transportation, and technical assistance
- an assessment of the technologies and approaches being used and how they might be improved
- negotiations, between the TWCG and WASCO, the GOSL, or another interested party, on the price to be paid for the services provided
- implementation of a system to monitor the effectiveness of management.

A watershed stakeholders' forum to stimulate transactions between upstream and downstream users

The MAFF is interested in using its new GIS rural land use planning tools to develop watershed-based management systems, including management plans for critical watersheds. The Ministry also has a long-standing history of support to community-based management approaches. Using the watershed management planning process as an opportunity to bring stakeholders together in a watershed forum could provide the potential for negotiations between stakeholders on upstream uses that have downstream impacts and even for direct transactions between upstream and downstream users. Past, albeit passing, interest by a major coastal hotel in supporting upstream watershed management activities in order to reduce sedimentation of its coastal waters demonstrates that there could be interest in such transactions. The ideal watershed for testing such an approach would be one that supports a range of uses resulting in costly upstream-downstream impacts. The Choc watershed has been already been proposed for a pilot integrated watershed management project through the GEF-funded integrated watershed and coastal area management project. The Marquis watershed, which includes the Talvan water intake and at least one heritage tourism site, would also be a suitable candidate.

Incentives for watershed landowners to convert to watershed-friendly cropping systems and other uses

The decline of bananas opens up the potential for introducing more "watershed friendly" crops and other uses, including nature-based tourism, which could be promoted as part of a strategy of integrated watershed management. Small farmers in the watershed are currently accepting decreasing returns from bananas or abandoning their land and moving out of agriculture because they lack the information and financial resources to convert to other uses. Many are reluctant to switch to tree crops because of the long time lag between planting and harvesting the first crop. If cost-benefit analyses suggested it could be viable for government and attractive to farmers, a pilot incentives programme could be developed to encourage small landowners to convert to cropping systems that support watershed services and are financially attractive over the long term. The programme could include education and technical assistance components as well as support for diversification to appropriate non-agricultural uses

Development of a coordinated private sector response to water management needs

Some St. Lucian industries, notably the hotel and beverage industries, have high rates of water consumption and thus a major interest in maintaining supplies and keeping costs down. Engaging them in a process to identify ways in which they could improve efficiency of water use and support improved upstream management of water resources to protect supplies and reduce costs

could result in new and innovative approaches while contributing to a greater sense of stewardship on the part of an important community of stakeholders.

7. Conclusion

Other countries of the region would have much to learn from St. Lucia's development and implementation of an integrated water management policy coupled with the move to privatise the water industry. In turn, the process underway in St. Lucia could benefit from information on progress in other countries of the region, for example Jamaica's system of watershed classification and mechanisms for inter-agency collaboration on watershed management. St. Lucia would therefore be a valuable participant in a regional learning group as part of Phase 2 of the IIED/DFID programme *Developing markets for watershed protection services and improved livelihoods*. In addition, there appear to be opportunities for St. Lucia to explore the use of incentives and markets to improve watershed services through pilot projects potentially supported through this programme.

Incentives for Watershed Management in Trinidad: Results of a Brief Diagnostic

Dennis Pantin, University of the West Indies' Sustainable Economic Development Unit
Vijay Krishnarayan, Caribbean Natural Resources Institute

1. Summary and overview

The supply of water throughout the year is a perennial concern for the majority of Trinidadians, but there is little evidence to suggest that this has been linked to issues associated with watershed management. The issue of water supply has been framed by widespread concern at the condition of the distribution infrastructure. Nearly all Trinidadians have access to water connections, through internal plumbing, yard taps or standpipes, but although service coverage is high, reliability of service is variable and water supplies are inadequate. It is estimated that about half of water supplied is unaccounted for.

Water quality has not been an issue in recent times, however concern has been expressed at the potential for groundwater contamination as a result of limited sewage treatment as well as non-point industrial and agricultural pollutants. Threats to surface water quality include uncontrolled discharges and erosion in upland watershed areas.

There is a difference in perception of supply between the residents of suburban Port of Spain, and people throughout the rest of the island. This geographic disparity has also been an important factor in shaping water policy. There is also a direct correlation in the minds of policy makers and the public at large between the seasons and the status of supply. The principal government efforts at improving supply have focussed on capital programmes. In the past these have included proposals for large-scale investment in desalination plants, and more recently a commitment to upgrading the existing infrastructure.

The demand for water is set to increase as a result of a growing population and an expanding manufacturing base. Concern is being expressed at the status of the upland areas that collect water. It has been reported that total forest cover in Trinidad and Tobago has decreased from 170,000 ha in 1990 to 161,000 ha in 1995. Unregulated development for housing (both low cost and upscale) on the slopes of the Northern Range has also prompted campaigns by environmental advocacy groups.

The institutional landscape for watershed management is highly fragmented, with no overarching policy or governing mechanism. The need for better institutional co-ordination has been recognised and tentative steps have been taken that could lead to an improvement in the framework for management.

This paper presents the findings of a brief study conducted under Phase I of a global initiative of the U.K. Department for International Development, *Developing markets for watershed protection services and improved livelihoods*, which is being implemented by the International Institute for Environment and Development (IIED) in collaboration with local partners. The project is summarised in Appendix 1. The hydrological and institutional issues for watershed management for the islands of Trinidad and Tobago are distinct. This study focussed the resources available on Trinidad because of its value as a comparative case in a regional context.

The study consisted of a literature review and interviews with a selection of key actors during the week of 29 April and 6 May 2002 (see Appendix 2). The paper looks at watershed management in Trinidad from an incentives-based perspective, and identifies some limited opportunities to strengthen existing and proposed watershed management initiatives through the use of incentives. It also suggests the ways in which Trinidad could benefit from the establishment of a Caribbean learning group on incentives for watershed management, and through that in the larger global initiative of DFID and IIED.

2. Context

The water cycle

Water is seen as a public good, with the state and its agencies playing key roles at each stage of the water cycle. There are 55 catchment areas in Trinidad, with water collecting in the island's aquifers, rivers and reservoirs (or dams). There are three reservoirs: Caroni, Hollis, and Navet. There has been no formal prioritisation of watersheds, but those on the central and eastern Northern range, which feed the Caroni and Hollis dams are seen as the most important by natural resource managers. These dams supply the island with most of its potable water.

The water company (the Water and Sewerage Authority – WASA) is the primary abstractor in watersheds, although corporations and farmers also abstract for industrial purposes and irrigation. Of the water that is accounted for, the main consumers in 2000 were: domestic (63%), major industry – associated with the industrial estate at Point Lisas (27%), other industry (5%), and agriculture (5%) (Water Resources Agency 2001). Unlike many other Caribbean countries, Trinidad's tourism industry is not a significant economic sector, or water user.

Charges are levied for providing a supply, but these tariffs do not reflect the real costs of abstracting, treating and distributing water. The revenues that are collected are insufficient to cover the costs of capital programmes, which are underwritten by central government. Watershed management costs are not factored in to charges and are also borne directly by central government (mainly through subventions to the Forestry Division and other agencies with management responsibilities). There is no direct economic linkage between the upstream producers of water services and downstream consumers and this is depicted at Figure 1.

The main stakeholders

The main stakeholders in the water cycle as described in Figure 2, include:

- Public sector forest and upper watershed managers: including the Forestry Division, the Ministry of Agriculture (especially the Lands and Surveys Department and the Land Administration Division) and the Environmental Management Authority. Between them these agencies have statutory authority for upper watershed management. The Ministry of Public Utilities and the Environment has overall responsibility for water policy, but does not have a role to play in the regulation of the sector at present.
- Non-governmental watershed stewards: private landowners, farmers (legal and illegal), squatter communities (e.g. at Fondes Amandes), NGOs (e.g. the Caribbean Forest Conservation Association). These stakeholders either have a direct impact on watershed management or have the ability to lobby for improved watershed services. The Northern Range, where priority watersheds are located is largely state land; however it is estimated that 20% of the western half of the area is under private ownership. In this area private landowners are the predominant interest group.

- Water abstracters, distributors, and regulators: the main abstracter is the Water and Sewerage Authority (WASA), but there are 2,300 private operators (domestic, agricultural and industrial) licensed and regulated by the Water Resources Agency (WRA). The WRA is housed within WASA (which does not pay an abstraction charge). This arrangement undermines the credibility of the WRA as an effective abstraction regulator.
- Water users: domestic, industrial and agricultural.

There is no overarching mechanism that brings these stakeholders together, nor is there a forum for inter-agency co-ordination. The Water Resources Management Unit (WRMU) within the Ministry of Public Utilities and the Environment (the focal point for water resources management within the government) is responsible for the development of water strategies and polices. It has spearheaded the development of a draft water policy that advocates bringing together the functions of the WRA and the WRMU in an independent Water Resources Management Agency. Although this agency has not been established, the Director of the WRMU also serves through a split assignment on the staff of the WRA. The government agencies with remits that impact on watershed management are listed at Figure 3.

Figure 1: Simplified diagram of the water cycle

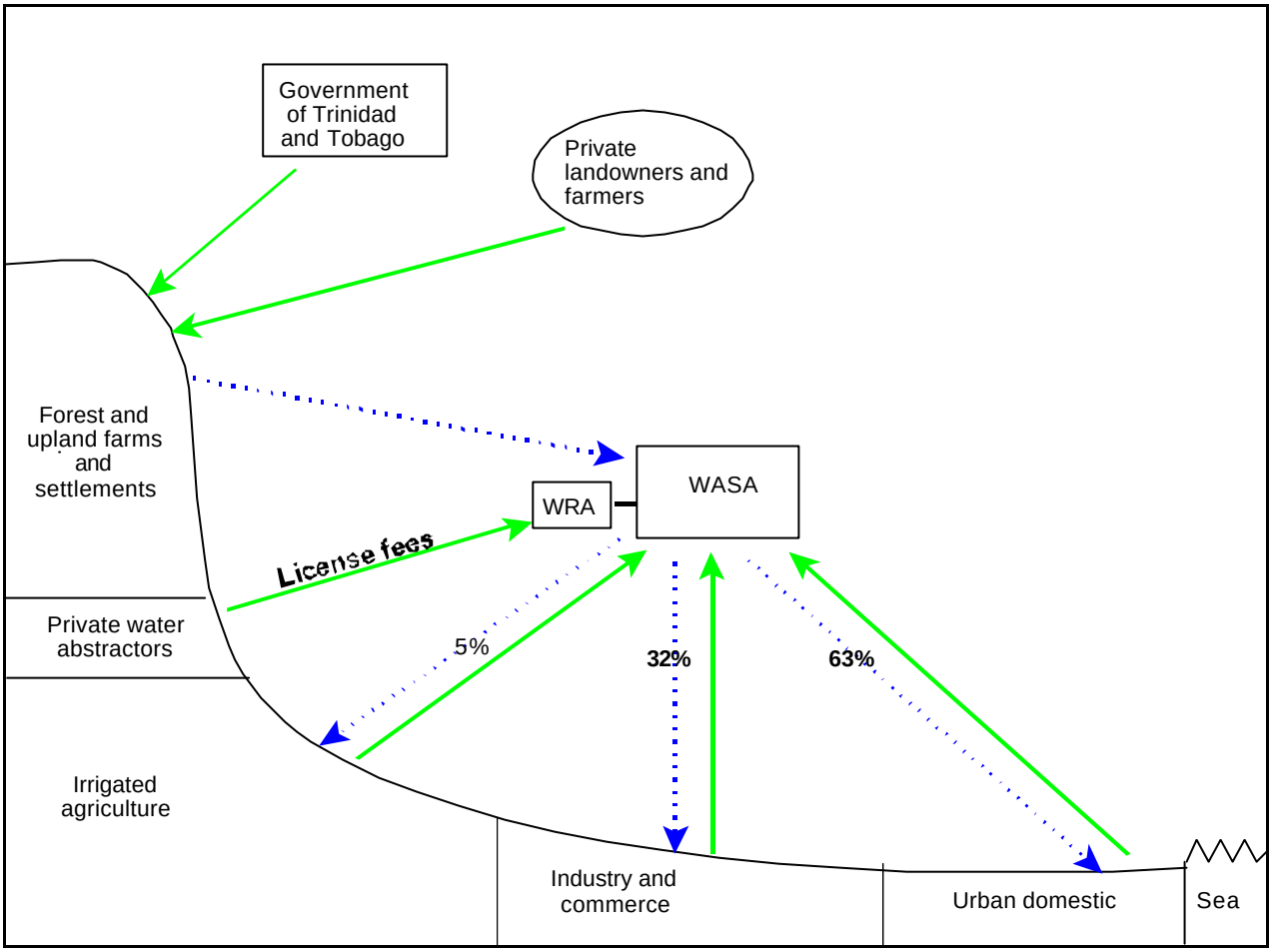


Figure 2: Main stakeholders in the water cycle

Stakeholders in watershed management: upstream to downstream	**Desirable watershed management activities**	**Constraints/ disincentives**	**Incentives: current (planned)**
Forest managers (government agencies and private foresters)	Maintain and increase forest cover through planting, and encourage others to do the same. Enforce existing forest protection legislation. Regularise the land tenure of squatters as a means of ensuring good stewardship of forest resources	Insufficient human resources in public sector agencies Institutional arrangements for watershed management unclear	Seedlings made available to private landowners at a subsidised price with technical assistance for establishment
Upland farmers (legal and illegal)	Maintain and increase tree cover (fruit crops) Adopt practices that use water efficiently and minimise erosion, chemical run-off and the risk of forest fires	Farmers without security of tenure plant short crops Government agencies will not engage with squatters who are deemed illegal Land prices in Northern Range push agricultural land into use for "upscale" residential development	Seedlings made available to *bona fide* private landowners (i.e. those with leases or titles) at a subsidised price with technical assistance for establishment Small financial incentives available to private landowners for cutting fire lines and establishing nature trails "Letters of comfort" can be issued to farmers without title to provide protection against eviction pending "regularisation"
Upland settlements (legal and illegal)	Plant trees on slopes in and around settlements Control building on slopes Practice proper sanitation	Land values in Northern Range encourage residential development rather than tree planting Sewage treatment facilities are inadequate "Bush" perceived as legitimate dumping site	Grants from development agencies (and potentially the Green Fund, see Fig. 3) to encourage tree planting by NGOs and CBOs as well as environmental education

Stakeholders in watershed management: upstream to downstream	Desirable watershed management activities	Constraints/ disincentives	Incentives: current (planned)
Water abstractors (public and private)	Monitor water quality (bacteria, agro-chemicals and heavy metals) Minimise wastage when abstracting and supplying water to consumers Pay (and recover) full environmental and social costs of water production)	Social and political constraints to increasing water rates substantially Tools for calculating actual costs of water services not readily available	Major government funded investment in distribution infrastructure (Proposed arrangements under a new Water Resources Management Agency could provide more scope for market based incentives by rationalising water resources management and in particular by consolidating policy development and implementation functions)
Irrigated farming	Adopt practices that use water efficiently, and minimise erosion and chemical run-off Maintain agricultural drains Pay full costs of water	Short-term market considerations determine type and scale of agricultural production Water rates to agriculture reduced to encourage growth in the sector Water for irrigation (i.e. non-potable) not easily available	Metered use for agricultural users encourages efficiency
Industry and commerce	Use water efficiently Avoid contamination of water sources and drains Pay full costs of water	Lack of business support services that encourage and support water efficiency Cost saving imperative	Most industrial users are metered and tariffs for large scale industrial users (at Point Lisas Industrial Estate) are higher than for other business users, encouraging more efficient use of water
Urban domestic	Use water efficiently Re-use "grey" water Lobby for improved water services Understand water cycle and full costs of water services	Most households not metered, discouraging efficient use of water Poor understanding of water cycle Urban elite insulated from water issues	Education and awareness programmes by schools, NGOs and government agencies

Figure 3. Government agencies with remits that impact on watershed management

Relevant Agencies	Main activities concerning watershed management
Forestry Division (within the Ministry of Public Utilities and the Environment)	Forest and wildlife management on state-owned lands
Water and Sewerage Authority (WASA)	Water abstraction, treatment and distribution and wastewater utility
Water Resources Agency (within WASA)	Water resources management – surveying and monitoring, research, water demand analysis, planning and allocation, abstraction licensing
Water Resources Management Unit (WRMU) (within the Ministry of Public Utilities and the Environment)	Water resources management – overseeing the development of the National Water Resources Management Strategy, and focal point for implementation
Lands and Surveys Division (within the Ministry of Agriculture, Land and Marine Resources - MALMR)	State land management – verifying and approving surveys, valuations, executing leases, ensuring lease conditions are fulfilled
Land Administration Division (within MALMR)	State agricultural land management – facilitating leasing process and monitoring fulfilment of lease conditions
Environmental Management Authority (EMA)	Monitors environmental standards and enforces regulations
Green Fund Agency	Established to administer funds collected via the environmental levy (Green Fund), providing funding for NGO and community reforestation and remediation projects – not yet functional
Drainage Division (within the Ministry of Works)	Planning and management of drainage, flood control, erosion control, irrigation measures

Threats to watersheds and management responses

There is concern at the state of Trinidad's watersheds among conservationists and water managers. Studies undertaken as part of the development of a national water resources management strategy in 1999 found evidence of the loss of topsoil in catchment areas and the need for conservation measures. There is a growing consensus among the responsible agencies that land use and tenure issues pose the principal threats to watershed management, but it is not clear what evidence this is based on, as the impacts of development and squatting are not monitored on a systematic basis. The following specific threats can be identified:

- The development of the western Northern Range (where lands are largely under private ownership) has resulted in a loss of forest cover for high-income residential accommodation and squatter settlements. The associated infrastructure of roads and drains has also impacted on watersheds by increasing run-off and erosion.
- Fires, whether set for short-term agriculture or not, are regular occurrences during dry seasons in upland areas resulting in a loss of tree cover.
- Mining for aggregates also poses a threat to watersheds. Limestone is particularly sought after and is only found in certain locations.
- Sanitation facilities in upland areas are inadequate given the current and projected levels of development. Poor disposal practices also contribute to increasing levels of faecal coliform in watersheds.

- Hillside squatting preoccupies many of the agencies that are a part of the watershed management institutional landscape. Squatters who were previously encouraged to establish small holdings in the Northern Range through patronage or as part of a concerted development thrust, now find themselves cast as villains and practitioners of slash and burn agriculture.
- Hillside agriculture can have an adverse impact, particularly when soil and water conservation measures are not employed. An emphasis on short crops that meet immediate market demands also has an impact on soil cover. Chayote (*Sechium edule*) is increasingly seen on steep slopes at the expense of tree cover and is grown with nitrogen rich fertilisers.

Management responses have emphasised the need for enforcement, but this has had little impact in halting what is seen as a general decline in the state of Trinidad's watersheds. Latterly the Forestry Division (the agency nearest to having lead responsibility for watershed management) has expressed a willingness to adopt participatory approaches to engage with community-based organisations to provide watershed protection services. The Division has also adopted the use of incentives on a small scale to encourage tree planting and establishment.

Legislation is now in place (Environmental Management Act 2000, Certificate of Environmental Clearance – CEC Rules 2001) that requires developers to obtain a CEC from the Environmental Management Authority (EMA) prior to commencing any one of 44 different kinds of activity. In some instances the EMA may require an Environmental Impact Assessment (EIA) to be undertaken before granting a CEC. This is seen as a positive step in systematising the approach to incorporating environmental considerations into the land use planning system.

Factors that constrain improved government management

These incremental responses have been constrained by a range of institutional and organisational factors:

Policy overlap and institutional ambiguity: Watershed management is affected by separate pieces of legislation dealing with water, environmental management, environmental health, land use planning, forests, agriculture and state lands. Each of these pieces of legislation identifies different lead agencies and militates against an integrated approach by prescribing institutional arrangements without adequate reference to existing or similar arrangements.

The institutional problems constraining watershed management are exemplified by the locus of the Forestry Division, which is often cited as the agency with lead responsibility. Legislation only provides the Division with authority over the trees on state land. The land is managed by the Ministry of Agriculture's Lands and Surveys Department (LSD). This means that the Division is powerless to act over illegal settlements that it encounters in forest reserves, while the LSD is in practice more concerned with administering land (i.e. allocating and verifying titles and deeds) than managing it. No agency has clear authority for watershed management on private lands, which is a critical issue in the western Northern Range.

Limited capacity: All of the state agencies involved in watershed management suffer from limited capacity and in interviews most cited the lack of personnel as the main constraint. Morale in the public sector is low and it has struggled to compete with other sectors for human resources. The prioritisation of critical watersheds could help to marshal resources. Management agencies are also incapacitated by a lack of basic information on the status of watersheds, which

are not mapped or monitored systematically by any agency. This has also resulted in a lack of hydrological information.

Political vacuum: The general election of 2001 resulted in a dead heat between the two main parties, resulting in a temporary government that was unable to convene parliament and a political stalemate. The enduring political crisis affecting the country has also prevented policies, including the water resource management policy spearheaded by the WRMU, from progressing beyond the stage of drafting. New land use legislation was placed before the House of Representatives, just before the current political stalemate ensued.

Without direction or a parliament, officials within the relevant state agencies operate according to guidelines, which they consider defensible in an uncertain political climate. For example key agencies have an ambivalent attitude towards squatters, who are acknowledged as stakeholders in watershed management, but staff members from the Forestry Division and the Lands and Surveys Department are reluctant to engage with them, as they believe that this would amount to state endorsement of illegal activity.

In the scramble for votes, successive political parties have chosen to pour money into capital works rather than invest in rationalising the institutional arrangements for the management of water. There is no formal water policy in place, but statements from successive governments have emphasised the need to improve the geographic distribution of supply. For example a recent manifesto commitment from one of the main political parties was presented under the heading "water for all." In April 2002 the Minister for Public Utilities announced a TT$ 500 million, three-year package of investment consisting of pipe laying, the rehabilitation of pump stations and wells.

Factors that constrain the behaviour of other stakeholders

The overarching development thrust in Trinidad and Tobago is one that favours rapid economic expansion rather than sustainable development. A "Singaporean" model of development has often been touted. Policies and incentives for industry and agriculture tend to favour expansion rather than wise use.

Many of the people that have settled in areas in and around watersheds are among Trinidad's poorest, living a "catch and kill" existence. They do not enjoy security of tenure and have no immediate interest in or the means to make investments in soil conservation or waste management.

In upland suburban areas that have been settled by affluent middle class residents there are also signs that soil conservation and waste management are not a priority, with evidence of dumping and the removal of tree cover perceived as "bush."

The level of understanding among the general public of the water cycle remains poor. There is little awareness of even the most direct linkages between the upstream producers of water services and downstream consumers. This means that water issues are dominated by concerns about access to water and distribution. People who do not enjoy access to a regular supply attribute their problems to the inadequacies of the water company, and the lack of rain. Few make the link with watershed issues.

Constraints to implementing cost recovery measures

Water is perceived as an entitlement rather than a commodity that has to be paid for. This perception is reinforced by a universal tariff for domestic users, which does not reflect the full costs of distribution and does not encourage the efficient use of water.

The water company has historically been unable to recover costs from customers, although this has recently improved following limited private sector inputs to a project (Severn Trent Water 1996-1999) that focussed on improved service delivery and cost recovery.

3. Progress and opportunities

There is an awareness of the need for a multi-sectoral and participatory approach to the management of water resources on the part of decision makers, yet there is little evidence that they are willing to invest in institutions. In April 2002 a ministerial statement called for "the adoption of an integrated approach to the management of [our] water resources, and the willingness and commitment of all stakeholders to work together in the national interest" (Government of the Republic of Trinidad and Tobago. 2002). The same statement announced a major capital investment programme, but there was no indication of support for institutional reform.

There has been limited use of incentives to encourage good land stewardship among farmers with security of tenure and the private owners of forested land. A summary of the use of incentives is set out in Figure 4.

Figure 4: Policies and programmes that have advocated the use of, and implemented, incentives for watershed management

Year	Policy/Projects	Key agency	Relevance to incentives for watershed management
1990s	Tropical Forest Action Plan	Forestry Division (FAO/UNDP-funded)	Proposed that state lands be rented to farmers. Incentives given to plant timber species and to practice agro-forestry. Funds were solicited from donor organisations and lodged in an agro-forestry/reforestation fund with disbursements to individual farmers.
1992	Agricultural Investment Programme	Land Tenure Center, University of Wisconsin	Proposed investment programme to regularise tenure of farmers under revised leasehold system
1992	Administration and Distribution Policy for Land	Ministry of Planning and Development	Reaffirmed the allocation of state land using short-term leases
1995	Agricultural Sector Reform Programme (ASRP)	Land Administration Division, Ministry of Agriculture, Land and Marine Resources (MALMR)	Provided for state agricultural land to be leased under 30-year leases with automatic right to renewal for a further 30 years
1998	Farmers' Registration Programme	Incentive Unit at the Forestry Division	Subsidised seedlings given to authorised occupiers of land

Incentives have taken the following form:

- Under the Agricultural Incentive Programme 1999 incentives were made available to encourage soil conservation practices. These include subsidies for the construction of: storm and contour drains; contour banking, ridging and bench terracing; contour barriers; terrace outlets; and check dams. In 2001 the sum of cUS$ 4,000 [sic] was set aside to pay for these incentives (there is provision for this annual sum to be raised according to demand).
- The Forestry Division has the power to grant: rebates on 25% of establishment costs to a maximum of cUS$ 400/ ha; rebates on establishing perimeter fire lines to a maximum of cUS$ 40/ km; a subsidy of 15% for the establishment of nature trails to a maximum of cUS$80/ km; a 50% subsidy on all equipment used for re-forestation; and subsidised seedlings, sold at cUS$.25 each. In addition the Division provides technical assistance and advice (Pantin and Tyler 2002).
- Stewardship concerns are factored into the process of regularising squatters (i.e. granting leases to occupy state land). Applicants to the Land Administration Division (LAD) within the Ministry of Agriculture (the agency with responsibility for regularising agricultural squatters) are obliged to provide five-year agricultural plans for the initial period of their 30 year lease. This provides the LAD with the basis for negotiating improved farming practices (e.g. terracing and inter-cropping).

The use of incentives is therefore limited and piecemeal, lacking adequate resources and an overarching watershed management framework. The take up of the incentives available through the Forestry Division is low and the LAD lacks clear guidelines as to the nature of the conservation measures they should be negotiating with farmers.

Against this generally bleak backdrop there are some encouraging signs:

Civil society action: Non-governmental and community based organisations in Trinidad and Tobago have traditionally played an important part in advocating for conservation and the collaborative management of natural resources. They have also demonstrated what can be achieved with vision and meagre resources.

In the late 1970s at Fondes Amandes, at the northern end of the St Ann's valley in the western Northern Range, a community of squatters established themselves on 15 acres of state land, planting short-crops. They lived with the constant threat of forest fires (the area is classified as fire climax) and took action by planting hardwoods and fruit crops. The Fondes Amandes reforestation project was established in 1982. The squatters still faced periodic harassment from WASA as the area was also classed as an important filter bed. With NGOs acting as intermediaries, the water company and nearby residents have come to accept and value the work of the squatters, who have attracted financial backing from local private foundations. The squatters have been regularised and the project aims to become self-sustaining based on the sales of fruit and other non-timber forest products.

Green Fund: In 2000 the government's budget speech announced the introduction of a levy on businesses to finance the creation of a "Green Fund." This tax has been collected from all registered companies at 0.1% of gross receipts since 1 January 2000 (the rate was reduced in the 2002 budget). The Fund was set up to enable grants to be made to civil society organisations to encourage communities to undertake environmental remediation, reforestation and beautification

projects especially in ecologically important areas such as watersheds. It is estimated that the Fund currently stands at US$ 14.5 million, but it has not started making disbursements, possibly on account of the uncertain political climate, and business interests are now calling for the levy to be abolished.

4. Needs and directions

Based on this review the following needs for improved watershed management can be identified:

i) The policy for water resources management must provide a framework for watershed management, which would enable the development of range of policy instruments (regulations, incentives and awareness raising). The draft policy developed by the WRMU is being made available for public comment; however a "champion" is needed to press for this kind of framework. At present there is no coherence to the approaches adopted (e.g. some advocate the bulldozing of squatter settlements, while others try to reconcile squatter aspirations and environmental concerns).

ii) The respective roles and responsibilities of the actors in watershed management must be rationalised and understood. There are several state agencies with partial and or overlapping responsibilities for watershed management functions. Presently there is no clear lead agency and consequently watershed management in Trinidad lacks a "product champion" capable of catalysing, facilitating and mobilising the participation of stakeholders from the range of sectors involved.

iii) The information base that informs watershed management must be improved. There is need for basic data on watersheds to enable policy development as well as improved planning and management. Where information does exist there is little evidence to suggest that it has been shared between agencies. In the context of the use of incentives specific technical information (including hydrological linkages such as that between land management and water delivery) is also required to develop a pricing policy that reflects the costs of production and distribution of water.

5. Incentive possibilities to explore

Consistent with the fragmented approach to watershed management the use of incentives in this field has been limited, but their relevance has been recognised and small steps have been taken. The main lessons from experience to date are that incentives need to reflect market conditions (especially the marginal utility of forested land) and they need to be located within a broader coherent institutional framework.

Policy instruments are urgently required to encourage and ensure the provision of watershed services on the 20% of forested areas that are privately owned (primarily in the western Northern Range) and state land that is occupied illegally. Current incentives available through the Forestry Division are not attractive enough and only private landowners are eligible. Effective mechanisms are required that encourage the range of private actors (whether they be owners or managers) to provide watershed services.

Against this backdrop the research team, drawing on the outcomes of the interviews, identified the following ideas for incentive based approaches:

- Use site value based taxation as the basis for concessions or rebates to the managers of forests on private lands in priority watersheds;
- Establish collaborative management arrangements with community-based organisations and forest resource users to manage forests on state lands (particularly those that have been illegally occupied). This could be financed through the Green Fund;
- Involve the private sector in purchasing privately owned lands in priority watersheds with a view to restoring tree cover through tax incentives. The oil and natural gas industry could be specifically targeted as they are significant actors in the local economy and make constant reference to their commitment to the environment; and
- Ensure that the continuing process of regularising squatters explicitly addresses the provision of watershed services.
- Build on existing but limited awareness campaigns, which focus on encouraging water efficiency among domestic users during the dry season, to improve levels of awareness of the hydrological cycle.

6. Conclusion

In a scan of Trinidadian natural resource management concerns, watershed management can at best be described as a neglected issue. No single agency lays claim to it and it lies too far "upstream" from issues of distribution to be of popular or political concern. The proposed establishment of a Water Resources Management Agency (WRMA) referred to in the draft water policy offers the prospect of institutional coherence and the draft water resources management policy should provide a framework for an integrated approach. In developing its approach to leading the implementation of the policy the WRMA would benefit from a range of regional experiences. The IIED/DFID project *Developing markets for watershed protection services and improved livelihoods* is therefore timely. Trinidad could learn from others as it seeks to incorporate incentives-based approaches into its watershed management policies and programmes.

Appendix 1

Markets for watershed protection services and improved livelihoods
Summary of an IIED project supported by DFID

Phase I: Exploration of the potentials

A central plank in strategies to reduce poverty is to improve access to reliable supplies of clean water. Another is to reduce vulnerability to environmental risks such as flooding, landslides and water pollution. Both of these require better management of watersheds. Today, services provided by watersheds are often under threat, and existing regulatory approaches to addressing the problems are often insufficient. Yet participatory and market-based approaches are also emerging throughout the world.

IIED, with its partners in developing countries, have identified the need to integrate and promote all approaches which can improve watershed land use and livelihoods – fitting new market-based approaches together with existing policies, incentives and institutional mechanisms that work. DFID shares these concerns and has commissioned IIED to explore how to do this. CANARI and SEDU-UWI have been identified as regional partners to help in this exploration in the Caribbean.

A four-year programme of research and action in a range of countries is therefore proposed to increase understanding on how market-based approaches can support better watershed land use and improved water services for the benefit of poor people – and where they cannot. The programme will include international network building, experience sharing, and an action-learning component involving people in regions that can gain from working together. Four action-learning regions are proposed – South Africa, India, Indonesia and the Caribbean – to be co-ordinated by regional partners, with back up from IIED. Substantive Phase 2 work in the action-learning regions will depend on the support of the relevant DFID country/regional programmes, or other development assistance agencies.

The aims of Phase 1 are:

- To explore the relevance of the project in the Caribbean, building on preliminary IIED exploration in January 2001, which identified interest in Grenada, Jamaica, St Lucia and Trinidad;
- To conduct brief national diagnostics in four Caribbean countries to assess the links between suppliers and users of watershed services, to map out related initiatives, and to identify learning needs and opportunities
- To explore what a regional project might do, to develop and share learning on the potentials and limits of market-based approaches
- To identify key partners and resource people for moving forward

Appendix 2: People met and documents consulted

1. Grenada

People met with, 10-12 July 2002:

- Arlene Outram, Permanent Secretary (Ag.), Ministry of Agriculture, Lands, Forests and Fisheries
- Patrick Moore, Operations Manager, Grenada Solid Waste Management Authority
- Alice M. Thomas-Roberts, Executive Director and Lawrence Lambert, President, Grenada Hotel and Tourism Association
- André M. Worme and Allan Edwards, Senior Environmental Health Officers, Ministry of Health and the Environment
- Paul Graham, Pest Management Officer, Pest Management Unit, Ministry of Agriculture, Lands, Forestry and Fisheries
- Gordon Paterson, Watershed Resources, Forests and National Parks Department, Ministry of Agriculture, Lands, Forestry and Fisheries
- Randolph Shears, Extension Division, Ministry of Agriculture, Lands, Forestry and Fisheries
- Andrew Alleyne, Director (Ag), Lands and Surve ys Department, Ministry of Agriculture, Lands, Forestry and Fisheries
- Judy Williams, General Secretary, and Terrence P. Smith, Chairperson, Grenada Community Development Agency
- Sandra Ferguson, Secretary General, Agency for Rural Transformation
- Cecil Frede rick, Senior Planning Officer, and Fabian Purcell, Planning Technologist, Physical Planning Unit, Ministry of Finance
- Christopher Husbands, Manager of Planning and Design, National Water and Sewage Authority
- Raymond Baptiste, Chief Land Use Officer, Land Use Division, Ministry of Agriculture, Lands, Forestry and Fisheries

Documents consulted:

Bass, Stephen. 2000. Participation in the Caribbean: a review of Grenada's forest policy process. Policy that Works for Forests and People series no. 10. International Institute for Environment and Development. London.

Caribbean Conservation Association and Island Resources Foundation. 1990. Draft Grenada Environmental Profile.

Dunn, Robert. 1998. Timber harvesting and processing options in Grenada: a study for the forest policy review process.

Government of Grenada. 2001. National Report: integrating management of watersheds and coastal areas, Grenada. Ministry of Finance.

Joseph, A.G. 1998. A participatory approach to review and formulation of Grenada's forest policy. Unpublished MSc thesis. University of Reading Agricultural Extension and Rural Development Department.

Paterson, Gordon. 1998. An overview of watershed management in Grenada and issues affecting their conservation and management, as related to water supplies and quality. Document prepared for forest policy review process. Forestry Department.

2. Jamaica

Persons met with, March 4-8, 2002:

- Selena Tapper and Ian Gage, Environmental Foundation of Jamaica
- Marilyn Headley, Albert McKenzie, and Michael Barrett, Forestry Department
- Jacqueline daCosta, Leonie Barnaby, and Donna Blake, Ministry of the Environment
- Althea Johnson, Ministry of Tourism
- Learie Miller, Thera Edwards, Winsome Townsend, and other staff, NEPA
- Desmond Malcolm and Marcia Richards, National Water Commission
- Hugh Dixon and staff, Southern Trelawny Environmental Agency (STEA)
- Dave White, farmer, Thompson Town
- Dr Douglas, private forest owner, Buff Bay
- Mark Nolan, Ridge to Reef Watershed Project
- Stewart Forbes, ENACT Programme
- Scott McCormick, Coastal Water Improvement Project

Major documents consulted:

Computer Assisted Development, Inc. 1999. Development of a national watershed classification and monitoring program, Jamaica. 25 pp.

daCosta, J. 2002. Forests and watersheds: integrating watershed management in the context of the national forest management and conservation plan. Presentation to the Roundtable of Partners in Development - Jamaica National Forest Management and Conservation Plan, 26-28 February 2002.

Forestry Department. 2001. National forest management and conservation plan. Forestry Department, Kingston. 100 pp.

Ministry of Water and Housing. 2000. Jamaica water sector policy paper: strategies and action plans. 49 pp.

National Environmental Planning Agency. 2001. Watershed policy green paper. Draft. 24 pp.

NRCA. 2001. The national report on integrating the management of watersheds and coastal areas in Jamaica. Prepared for the Caribbean Environmental Health Institute and the United Nations Environment Programme. Natural Resources Conservation Authority. Kingston, Jamaica. 53 pp.

Ridge to Reef Watershed Project. 2001. Governance and watershed management. Draft consultant report. Prepared for the Government of Jamaica's National Environmental Planning Agency and the United States Agency for International Development. Associates in Rural Development Inc., Burlington, Vermont. 40 pp.

Ridge to Reef Watershed Project. 2001. Policy and legislative framework for watershed management: a review of existing laws and regulations. Draft. Prepared for the Government of Jamaica's National Environmental Planning Agency and the United States Agency for International Development. Associates in Rural Development Inc., Burlington, Vermont. 67 pp.

3. St. Lucia

Persons met with, August 13-16, 2002:

- Lucien Augustin, Babonneau area field officer, WASCO
- Deborah Bushell, Project Manager, Water Resources Management Unit, MAFF
- Sylvester Clauzel, Programme Coordinator, St. Lucia Heritage Tourism Programme
- Christopher Cox, Chief Agricultural Planning Officer, MAFF
- Crispin d'Auvergne, Sustainable Development and Environment Unit, Ministry of Planning
- Hon. Felix Finisterre, Minister of Communications, Works, Transport and Public Utilities
- Herold Gopaul, Director, Information Services, and Shanta King, Sanitary Engineer, Caribbean Environmental Health Institute
- Cornelius Isaac, Assistant Chief Forest Officer, Department of Forestry, MAFF
- Joseph Medard, Chief Environmental Health Officer, Ministry of Health
- Martin Satney, General Manager, WASCO
- Talvan Water Catchment Group: Claudina Roberts, Secretary, and other members

Major documents consulted:

Bushell, D. 2002. Water resources management: a national concern. Insight 1:18-19.

Cox, C. n.d. Perspective on rural land management and soil and water conservation in St. Lucia. http://www.slumaffe.org/rural_land_management.pdf.

Government of St. Lucia. 2000. National report on integrating the management of watersheds and coastal areas in St. Lucia. Prepared for the Caribbean Environmental Health Institute and the United Nations Environment Programme. 105 pp.

National Water and Sewerage Commission. 2001. Licence granted by the National Water and Sewerage Commission under the Water and Sewerage Act No. 13 of 1999 to Water and Sewerage Company Incorporated. Draft of 9 July 2001.

Organization of Eastern Caribbean States Natural Resources Management Unit. 2002. Proceedings of the Regional Policy Dialogue on Watershed Management in Small Island States. Eastern Caribbean Central Bank, Bird Rock, St. Kitts & Nevis, 25-27 February 2002. 35 pp.

Talvan Watercatchment Group. 2002. Talvan rapid riverbank rehabilitation and soil conservation project. Proposal to the Water and Sewerage Company (WASCO). 5 pp.

Water Resources Management Unit. 2002. National water policy of St. Lucia. Draft. 41 pp.

4. Trinidad

People met with, 29 April to 6 May 2002:

- Jacqui Ganteaume-Farrel, Director, Land Administration Division, Ministry of Agriculture
- Dr. Robin Rajack, Director, Wayne Huggins, Senior Research Analyst, and Shrikant Bharate, Senior Research Analyst, Research and Communications Unit of the Land Settlement Agency, Ministry of Housing and Settlements
- Tyrone Leong, Director, Land and Surveys Department, Ministry of Agriculture
- Keith Meade, Hydrologist, Water Resources Authority and Water Resources Manager, Water Resources Management Unit, Ministry of Public Utilities and the Environment
- Wayne Rajkumar, Technical Co-ordinator, Environmental Management Authority
- Matthew Lee, Acting Assistant Director, Planning Division, Ministry of Agriculture
- Kenny Singh, Deputy Conservator, Forestry Division, Ministry of Public Utilities and the Environment

Documents consulted:

Government of the Republic of Trinidad and Tobago. 1998. Draft forest policy of Trinidad and Tobago. Ministry of Agriculture, Land and Marine Resources, Forestry Division.

Government of the Republic of Trinidad and Tobago. 2002. Draft national water resources management policy, April 2002. Ministry of Public Utilities and the Environment, Water Resources Management Unit.

Government of the Republic of Trinidad and Tobago. 2001. National report on integrating the management of watersheds and coastal areas in Trinidad and Tobago. Ministry of the Environment, Water Resources Agency.

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Pantin. D. and S. Tyler. 2002 United Nations Convention to Combat Desertification: first national report of Trinidad and Tobago. Ministry of Public Utilities and the Environment.

Appendix 3: Questions guiding the brief diagnostics

1. What are the big watershed issues?

- Reliability of water supply?
- Water quality?
- Landslip, erosion, etc?
- What services are scarce?
- What are the 'priority' watersheds and how determined?

2. Where has watershed management (WM) improved?

- What improvement (re scarcity)?
- How, by whom, through what kind of activity?
- [Any particular project, programme, incentive responsible?]

3. Is there good information correlating land use to watershed services?

- Generally, and in specific places?
- Who generates it and how?
- What form does it take?
- Any watershed valuation work?
- [Any particular project, programme, incentive responsible?]

4. What groups have been targeted to improve WM?

- Who are the producers of watershed services (small farmers in uplands, forestry)?
- What are their motivations in relation to WM?
- Who are the users of watershed services (irrigated plantation agriculture, tourism, industry, government services, domestic)?
- What are their motivations in relation to WM?
- What key behaviour changes are required for each (encouraging good practice, stopping bad practice…)? And who has decided this?
- Who has been actively targeted – as a group, or within a geographical area?
- [Any particular project, programme, incentive doing such targeting?]

5. What incentives have been proposed or used to improve WM?

- Who has been pushing incentives approaches and why?
- Type of incentive used in practice? (intangible, physical, information, training, rights, financial, market-based)
- Who targeted (supply-side, demand-side)?
- Period/regularity?
- Awareness of incentive by target group and take-up levels?
- Constraints to take-up e.g. rights, resources?
- Compatibility with other sustainable development objectives and participatory approaches?

6. What impacts have incentives had?

- On changed WM practices?
- On the quantity and quality of watershed services?
- On other environmental variables e.g. biodiversity?
- On economic objectives (sector/livelihood)?
- On social objectives e.g. equity?
- Distribution of costs, benefits and risks?
- How is information on impacts being generated?

7. What are the relations between producers and users of watershed services?

- Where there is competition or conflict between users, how is water allocation determined?
- Is there competition between suppliers – in what form?
- What means of communication/intermediaries link stakeholders?
- Local institutions to bring stakeholders together – role and effect? Links to other local institutions?
- National institutions to bring stakeholders together – role and effect? Links to other national institutions?

8. How can learning/capacity for incentives for WM be improved?

- What kind of learning does the country already offer?
- What kinds of capacity are in place to handle incentives?
- What further learning needs are there – from the Caribbean, globally?