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**INTEGRATED WATER MANAGEMENT IN BARBADOS: THE WAY FORWARD**

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## **Introduction**

About 70% of the earth's surface is covered with water, yet only 3% of this is freshwater. Considering that about three quarters of the human body is composed of water, it is accurate to say that it is the foundation of life but unfortunately there is no substitute. With water being a finite but renewable resource and the demand for it on the rise, the growing shortage of water supplies in the Caribbean region is of concern to all stakeholders. Barbados' situation has been made more apparent as a result of it being listed by the United Nations as one of the world's most water scarce countries<sup>1</sup>. Stakeholders have recognised that the water resources shortage has a domino effect on all aspects of development including national and regional plans for sustainable growth and are now beginning to treat this issue with the level of importance that it warrants.

## **Integrated Water Management**

As a result of Barbados' geology its main water sources are aquifers - underground reservoirs. This makes the issue of availability more complex as recharge issues, saline intrusion and pollution, among others, must be factored in.

The concept of integrated water management as shown in figure 1 goes beyond the management of the water catchment and containment area, which in Barbados' situation is mainly comprised of unconfined aquifers, to include other issues such as pollution mitigation, water abstraction, treatment, distribution and conservation.

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<sup>1</sup> Permanent Mission of Barbados to the United Nations. 2004. The 12<sup>th</sup> Session of the Commission on Sustainable Development. Available from: [http://www.un.org/esa/susdev/csd/csd12/statements/barbados\\_2904.pdf](http://www.un.org/esa/susdev/csd/csd12/statements/barbados_2904.pdf) Accessed: October 07, 2005.

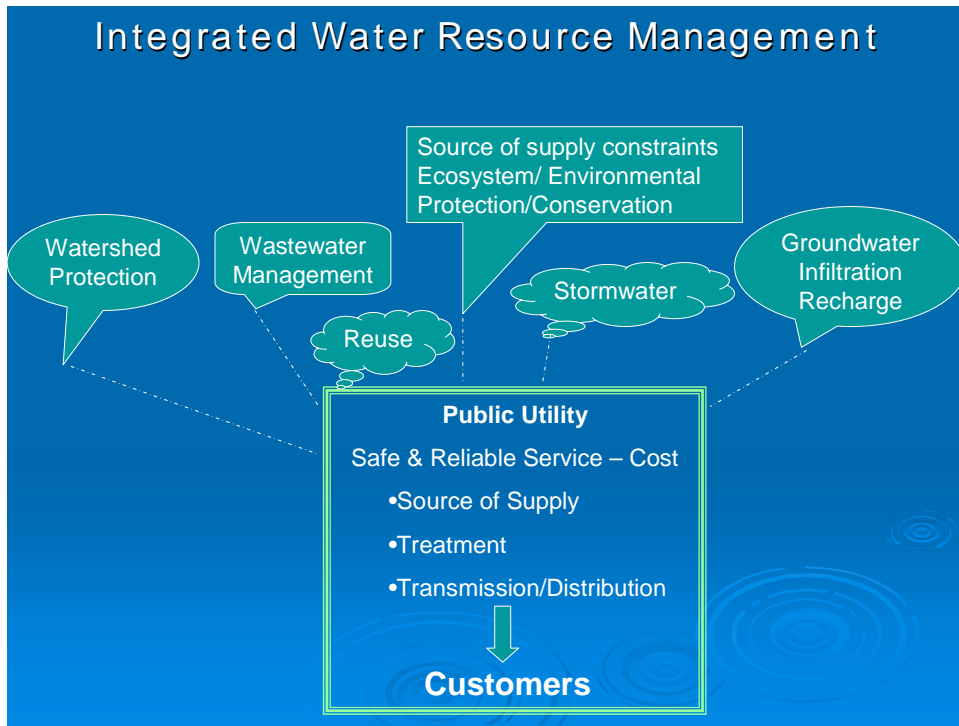
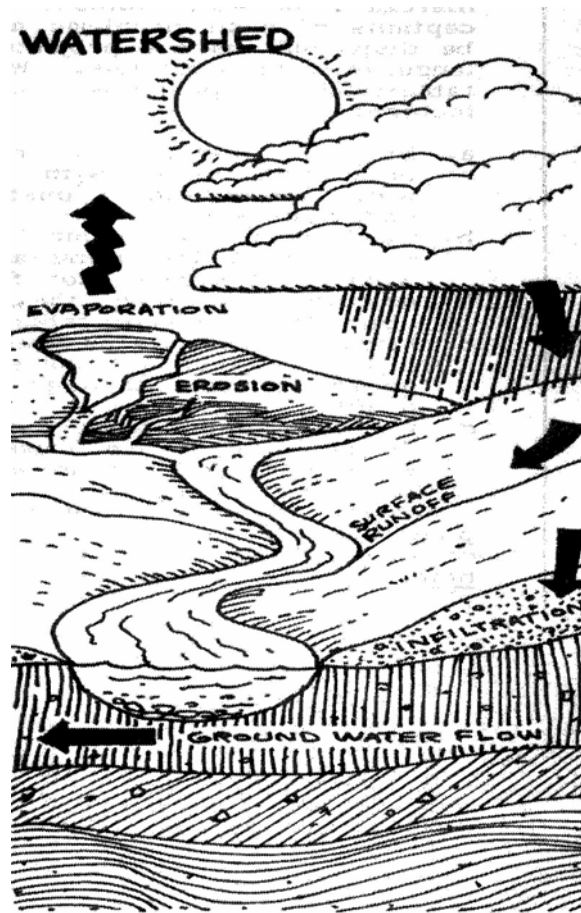


Figure 1: Integrated Water Resource Management

The watershed, which is depicted in figure 2, is however a critical component as it is the source from which freshwater is obtained. Groundwater is recharged through precipitation and surface water percolation. Depending on climatic conditions, land use, soil type, geology, among other factors, usually only between 5 to 50% of annual precipitation results in groundwater recharge.

Figure 2: The Watershed



It is only a holistic approach to the sustainable use of environmental resources, incorporating social, cultural and economic issues at the local level that will reap success in watershed management. Local governance and accountability is critical to the concept of water resources management as it is the primary building block of the watershed. This is so as we all live in a watershed. Watersheds are the places we all call home, where we work and where we play. Our actions on the land impact the quality and quantity of water available to us.

Threats to water resources may either be in the form of quality or quantity or both. The threats to quantity include “drawdown”, “overdraft” and “subsidence” which are all a result of the increasing levels of water withdrawal to meet growing demand. “Drawdown” is a transient effect and refers to the temporary lowering of the water table mainly as a result of pumping. In contrast to “drawdown”, “overdraft” is a permanent corollary of the imbalance between

abstraction and recharge. Possible consequences of “overdraft” include saline intrusion, diminished storage capacity and contamination. “Subsidence” is the most visible effect of over-pumping, but due to the nature of the aquifer material, unconfined coral rock, only becomes an issue when caves are involved. It is indicated by sink holes which in themselves are associated with a permanent loss of storage capacity.

Pathogens, organic and inorganic compounds all impact the quality of a water resource. Pollution may be of a point or non-point source, with the former being easily identifiable and therefore easier to correct. Non-point sources refer to widespread, seemingly insignificant amounts of pollutants which are however cumulative and less conducive to detection. Floods have a greater impact on watershed management than droughts as they tend to mobilize non-point source forms of pollution and clog recharge and drainage wells.

### **Barbados’ Current Water Resource Issues**

The Draft Policy Framework for Water Resources Development in Barbados, as approved by the Cabinet in 1997, is the major working policy framework for the development and management of water resources in Barbados. The Barbados Water Authority (BWA) through the Underground Water Control Act, CAP. 283 and the Barbados Water Authority Act, CAP. 274A is the primary agency responsible for water resources management. However, in a modern regulatory environment it is desirable to have separation of operational and regulatory powers. Three other agencies have mandates that impact groundwater use, monitoring and control. The Town and Country Planning Office in conjunction with the Environmental Protection Department are legally obligated to enforce the groundwater protection zoning policy. The Environmental Protection Department is also responsible for the monitoring and control of conditions that are likely to affect water quality. The Land and Water Use Unit of the Ministry of Agriculture and Rural Development is charged with the responsibility for developing and delivering water for irrigation.

Barbados has no noteworthy surface water bodies and the yield from springs is insignificant. The 1996 Water Resources Study estimated a yield of 49.6 mgd under normal rainfall conditions; however yield is expected to be reduced by 15.2 mgd under drought conditions.

Current abstraction rates are estimated to be between 47.9 and 50.3 mgd and continuing on its present trend are expected to reach a minimum of 51.6 mgd by 2016<sup>2</sup>.

Approaches used to mitigate the likely future demand deficit include: the introduction of metering to reduce demand – more than 90% of Barbados Water Authority's customers are now metered; construction and operation of a reverse osmosis desalination plant to augment available supplies; and the institution of a leakage control programme. Although this latter initiative has not yet had a significant impact it has the potential to do so as it is estimated that 40 to 45% of the water transmitted is unaccounted for<sup>2</sup>.

Five rising block tariff categories are considered in the tariff structure, Basic Needs (0 – 8M<sup>3</sup>), Normal Needs (9 – 20 M<sup>3</sup>), Discriminatory Use (21 – 40M<sup>3</sup>), Excessive Use (Over 40M<sup>3</sup>), and Commercial and Ships Bands (\$2.91 and \$ 5.05/M<sup>3</sup>, respectively)<sup>3</sup>. The utilization of a minimum charge does not promote conservation in the lower use categories. Water rates should be such as to convey the scarcity of the resource and to encourage water use conservation. They should be adequate to cover maintenance and operational costs as well as a portion of the fixed costs. Efforts should be made to reach this ideal over a period of time, while ensuring the security and reliability of supply.

Although private well groundwater abstraction licenses set limits on the volume of water to be abstracted daily, most wells are currently not metered and there are no other incentives in place to promote efficient water use by this group of users. The BWA is now charged with the development and implementation of a license fee, metering and a volume based abstraction charge.

From a pollution prevention standpoint, a groundwater protection zoning policy was instituted from as early as 1964. The goal of zoning is to minimize contamination of public supply wells by restricting land use to varying degrees particularly within vulnerable water catchment areas. This policy has historically served the island well, however in recent time due largely to urban

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<sup>2</sup> Atkins, W. S. 2000. Barbados Water Sector Study – Final Report. Public Utilities Board.

<sup>3</sup> Barbados Water Authority. 2005. Water and Sewerage Tariffs.

population expansion and encroachment on sensitive water recharge zones such as the environs of the Belle Catchment Area elevated nitrogen concentrations have been reported. Reduced rainfall which translates to a reduction in the dilution effect in combination with the increased use of agricultural chemicals compound the vulnerability of groundwater to chemical contamination.

The quality, type and amount of information available impede the clear understanding of the present water resource situation. There appears to be a lack of appropriate data collection networks, equipment, funds, quality control and human resources. The areas of resource assessment, research, training and public education have generally not been accorded the level of attention that it necessitates and there has been very little public participation in the decision making process. However, being cognisant of the need for policy change, the Government of Barbados in its effort to further the implementation of an integrated water resources management policy has collaborated with the Commonwealth Science Council and World Bank on a pilot project on stakeholder participation.

### **The Way Forward**

Acknowledgement that efficient watershed management is best achieved at the local level is the basis of any successful integrated approach. Water management must be directly linked to and be based, among others, on the following approaches: sustainable development; land management; ecosystem approach; poverty reduction and consideration of the local, regional and global needs. Issues pertaining to the inadequacy of technical equipment, training of technicians, data on groundwater systems, watershed planning and management systems need to be urgently addressed. Given the limited access and availability, at the national level, of the range of specialised expertise that needs to be drawn upon for adequate understanding of water resources issues, it is necessary that pooling of expertise and the sharing of knowledge be undertaken at the regional level. Linkages, both horizontal and vertical between organizations are important to the effective coordination of policies, legislation and action plans. Currently there is some cooperation between agencies however this could be further enhanced by mandating such collaboration amongst the relevant agencies.

Notwithstanding this, awareness of such a need is only one aspect of the quest for an institutionalization of processes that can support ongoing research, analysis of data, policy formulation and change. Public awareness, involvement and incentives for behaviour change must complement this institutional building dimension. In devising an approach that would be truly inter-disciplinary and multi-sectoral, so as to be genuinely characterised as “integrated” management, the economic and financial issues in conjunction with legislation are not to be neglected.

Local participation is generally viewed as information dissemination, acquisition, consultation or even public awareness and education. These forms of participation do not transcend all aspects of the decision making process and thus limit the role of stakeholders. There is a need for a paradigm shift away from the traditional top down approach towards the management of natural resources to a more flexible and adaptive approach which allows local stakeholders, especially those who live in and use the watershed resources to be involved not only in action but in the decision making process at every level. With this there needs to be continuous capacity building at the community level.

Barbados already has two provisions in place which may be used to chart an integrated approach to watershed management, namely the Barbados Sustainability Development Policy and the Environmental Management and Land Use Planning Document. The former document addresses all the sustainable issues in a holistic manner and has been approved by government for use in guiding the relevant policies and actions of stakeholders. The latter document was groundbreaking in that it proposed the amendment of the Town and Country Planning Order to require all major development projects to conduct Environmental Impact Assessments as part of the application process. This recommendation has since been adopted. The diverse skill sets of an Environmental Impact Assessment Review Committee facilitate an integrated management approach.



The priority of watershed stakeholders of the region at this time should be the synchronization and strengthening of legislative and policy provisions. This strategy will invariably precipitate more robust enforcement, monitoring and compliance.

### **Conclusion**

In view of the antagonistic correlation between water scarcity and its importance to human and animal life, to maintaining ecological balance and for economic and developmental activities of all kinds, the planning and management of this resource and its optimal, economical and equitable use has become a matter of the utmost urgency. The success of any national water policy will depend entirely on the development and maintenance of a national consensus and commitment to its underlying principles and objectives. Given the regional nature of this issue and the insufficiency of resources to address the problem at a national level, a regional approach to enhancing the institutional framework, capacity building, legislation and policy is proposed.

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