

Executive Summary

Overview

Water resources, undoubtedly, play a critical role in sustaining the economic and social well being of people as well as in maintaining the ecological stability of the environment. Natural phenomena and human interaction can negatively impact water resources and consequently the environment/ecosystems and people dependent on them. A case in point is the severe drought of 1999 which affected several states of the North-East including Delaware. This event generated a great deal of concern at both the public and official levels regarding the present condition of water resources in the state as well as the long-term sustainability of these resources. It is within this context that the present report must be placed. This study examines best practices in sustainable water resource management in nine states. It utilizes data collected from these states in making its recommendations.

“In order to meet the needs of existing and future populations and ensure that habitats and ecosystems are protected, the nation’s water must be sustainable and renewable. Sound water resource management, which emphasizes careful, efficient use of water, is essential in order to achieve these objectives. Efficient water use can have major environmental, public health, and economic benefits by helping to improve water quality, maintain aquatic ecosystems, and protect drinking water resources. As we face increasing risks to ecosystems and their biological integrity, the inextricable link between water quality and water quantity become more important. Water efficiency is one way of addressing water quality and quantity goals. The efficient use of water can also prevent pollution by reducing wastewater flows, recycling industrial process water, reclaiming wastewater, and using less energy.”
(EPA Office of Water, Dec. 1992). ”

Integrated Water Resource Management (IWRM)

Sustainable water resource management is required to adopt a balanced, integrated and long-term view of this precious resource. This concept, commonly referred to as integrated water resources management (IWRM), combines supply and demand management strategies to include all economic, environmental, social, political and institutional factors operating within a watershed. This comprehensive approach seeks to achieve a more efficient use of water resources and maintain adequate long-term water supply. Thus it conforms with the idea of sustainable development as envisioned by CEEP (Center for Energy and Environmental Policy, October 1996c).

The comprehensive approach of IWRM requires that a number of factors be considered when formulating a water management strategy. This report employs a number of criteria to compare water resource programs in different states. These criteria include (i) level of stakeholder involvement, (ii) extent of interagency coordination, (iii) importance of water conservation and other demand side efforts, (iv) response to droughts, (v) consideration of land-use and growth planning efforts, and (vi) assessment of environmental aspects of WRM.

Definitions of Important Terms

Sustainable Development: *Development that meets the needs of the present without compromising the ability of future generations to meet their own needs.*

Integrated Water Resource Management/Planning (IWRM): *A balanced approach to water resource management (WRM) that integrates capacity expansion and demand management activities to account for all the economic, social, environmental, and health factors involved in WRM.*

Water Conservation: *Activities designed reduce the demand for water, improve efficiency in use and reduce losses and waste of water, or improve land management practices to conserve water.*

Drought: *A period of abnormally dry weather, which persists long enough to produce serious hydrologic imbalance leading to water shortage, crop damage, etc.*

Land-Use Planning: *Systematic preparation through rational decision-making of land use in accord with legal guidelines, local public objectives, and areawide conditions.*

Environmental Indicators: *Direct or indirect measures of environmental quality, used to assess and communicate status of and trends in environmental conditions.*

World Commission on Environment and Development, *Our Common Future* (1987); National Weather Service, *All About Droughts* (1999); Green Mountain Institute *Environmental Indicators* (Jan. 1999); Inter-American Development Bank, *Strategy for IWRM* (1998); National Regulatory Research Institute, *Compendium on Water Supply, Drought, and Conservation* (1989); John W. Smith and John S. Klemanski, *The Urban Politics Dictionary* (1990).

Stakeholder involvement is an essential component of any integrated water resources management approach. It is necessary for different viewpoints to be heard so that a comprehensive strategy can be devised. Given the nature of the resource, the demands of individual stakeholders on water vary greatly, often resulting in conflicts. Mechanisms to resolve these conflicts are inherently an integral part of IWRM.

Another essential component of the holistic and balanced approach to IWRM is the need for established procedures for interagency coordination. This is often manifested in water resource management (WRM) guidelines that bring together representatives of various departments on a committee to decide on a possible use of water resources. Political boundaries like state boundaries often prevent the comprehensive management of large water resources. Interagency coordination can therefore also be evidenced in the role played by supra-state, regional commissions like the inter-state river basin commissions.

Water conservation is considered to be a necessary component of IWRM. The United States Water Resources Council has defined water conservation as “activities designed to reduce the demand for water, improve efficiency in use and reduce losses and waste of water, or improve land management practices to conserve water” (Beecher and Laubach, 1989). IWRM seeks to reduce the demand for water, improve the supply of water and at the same time forego costly efforts to enhance water supply capacity.

Droughts are a natural phenomena that can have a severe negative impact on water supplies, surrounding ecosystems and on the well-being of humans and other life forms. IWRM should

necessarily include a strategy that alleviates the effort of droughts. Both drought preparedness and drought mitigation action plans are necessary components of a drought management plan.

A credible IWRM program must include established linkages with land-use planning efforts. Land-use planning efforts, designed to promote economic growth, seldom address its effect on water resources. Water resources are affected by the different demands various land-use activities place on them. Water resources are also affected negatively due to the imperviousness of developed land. Smart growth plans within the IWRM strategy are essential to address the problem.

Finally, the goal of attaining a sustainable water resource is possible only if the ecological integrity of the resource is maintained. Failure to balance human water needs with ecosystem sustainability can result in adverse environmental effects. Given the strong linkages that exist between the environment and between the economic, social and health spheres, negative environmental impacts can result in loss of human well-being and so their inclusion within any IWRM plan is essential.

Delaware's Water Resources

Delaware's approach so far to water resource management can be characterized as a collection of incremental policy formulations that have lacked a coherent and cogent vision for addressing water resource issues in the state.

Policies to address water conservation in Delaware have been formulated by Delaware River Basin Commission (DRBC), Department of Natural Resources and Environment Control (DNREC) and PSC. Water conservation policies in the state have been primarily limited to conducting public awareness and education campaigns and requiring the installation of low-flow plumbing fixtures as mandated by the modified plumbing code. Although declining block rates have been declared illegal in the state, water conservation oriented rates have not been universalized.

Drought conditions have negatively impacted economic, environmental and social aspects of life in Delaware in the past few decades. Responses to droughts have been primarily reactive, with mandatory restrictions of water use being imposed. Short-term response of the government was limited to voluntary and ultimately mandatory water restrictions in the state, in the hope that it would curtail non-essential use of water. As part of the long-term strategy of drought management, a Water Supply Task Force was constituted and charged with suggesting policies that would eliminate the gap between water supply and demand through a combination of supply and demand supply options. However, all of the options considered by the Task Force have been supply options.

Increased economic activity and high population growth rates have led to the suburbanization of Delaware. The 1968, Preliminary State Comprehensive Development Plan has listed goals for the government to pursue in order to ensure that development does not adversely affect water and other natural resources. Despite numerous efforts, Delaware has yet to link its WRM and growth development issues through a formal policy.

The environmental aspects associated with WRM have also been pursued on a piecemeal basis. Monitoring of environmental quality of water resources is done through Delaware's Ambient Water Quality Monitoring Program. This program collects chemical, physical and biological

data from Delaware surface waters. DNREC's Environmental Indicators Catalogue has been utilized in the state to assess the health of a water resource. In addition to the more common stream water quality standards, a water quantity standard denoted as the 7Q10 standard is also employed in Delaware. To date, however, the 7Q10 standard has not been fully analyzed with respect to ecosystem health.

Key Findings from state WRM programs

CEEP researched water resource programs in nine states around the nation. The choice of states were made on the basis of locational proximity to Delaware, innovativeness of water resource programs and similarity of geographic features. The key findings from the research can be summarized below under the following categories:

- **Programmatic Goals:** Most of the states surveyed have specific goals with respect to water resource management. Explicit water resource objectives have been enunciated in some states through a dedicated piece of legislation or through a dedicated executive agency.
- **Inclusiveness of Stakeholder Participation:** Surveyed state programs have fostered active participation of concerned stakeholders by incorporating democratic mechanisms like public comment periods and roundtables and also by encouraging decentralized planning through watershed groups.
- **Extent of Interagency Coordination:** Most water resource programs examined require involvement of a number of state agencies in formulating and implementing policies in different aspects of water resources. Further in some states supra-state regional entities also play an important role in policy making.
- **Emphasis Given to Conservation:** Enhancing public awareness, effective management of water through conservation oriented pricing policies and providing incentives for efficient management of water through low-flow fixtures and water reuse were the common strategies employed by the states surveyed to further water conservation.
- **Response to Drought:** State responses to drought have ranged from being wholly reactive in their approach to a combination of pro-active and reactive policies to combat droughts.
- **Integration of Land-Use/Growth Management:** Most states surveyed have developed programs that attempt to balance the need to preserve water resources with nurturing economic objectives of the community.
- **Accounting for Environmental Aspects:** A majority of states surveyed have implemented programs to perform a periodical biological assessment and habitat analysis of water resources within different eco-regions within the state.

Table A: Comparison of State Water Resource Management (WRM) Programs

State	Programmatic Goals/Focus	Inclusiveness of Stakeholder Involvement	Extent of Interagency Coordination	Emphasis Given to Conservation	Response to Drought	Integration of Land-Use/Growth Management Issues	Accounting for Environmental Aspects	Lessons for Delaware
California	<ul style="list-style-type: none"> - manages state water resource development system - facilitates local water needs 	Moderate	Moderate	<ul style="list-style-type: none"> Strong conservation focus Effective program to fund conservation Innovative performance measurement system 	<ul style="list-style-type: none"> Strong reactive response to droughts Establishes drought water bank 	<ul style="list-style-type: none"> Limited efforts to link water resources with land-use planning Efforts at local level for growth management. 	<ul style="list-style-type: none"> Links water quality with instream flow levels. Use of GIS in mapping environmental aspects. 	<ul style="list-style-type: none"> - comprehensive water conservation program - program that is sensitive to the environmental aspects of water resources
Florida	<ul style="list-style-type: none"> -Focuses on water quality and quantity. - Preserve habitats from destruction. 	Strong	Moderate	<ul style="list-style-type: none"> Moderate emphasis on conservation Encourages water alternatives like reuse and recycling 	<ul style="list-style-type: none"> Reactive response to drought Established clear chain of communication Graded activation of emergency operations. 	<ul style="list-style-type: none"> Decentralized planning for growth at regional level Identifies water resources of regional importance. State level plans are consistent with regional plans 	<ul style="list-style-type: none"> State level program, established to monitor stream and habitat quality State program exists to counter negative impacts of surface water. 	<ul style="list-style-type: none"> - comprehensive ecosystem management and regional planning framework. - Proactive stakeholder participation
Maryland	<ul style="list-style-type: none"> -Focus on water quality and quantity issues. - Comprehensive regulatory scope 	Strong	Moderate	<ul style="list-style-type: none"> Basic emphasis on conservation Water conservation tied with permit application Public awareness campaign initiated 	<ul style="list-style-type: none"> Reactive response to drought Public informed about drought Water restrictions integral to plan. 	<ul style="list-style-type: none"> Strong linkages between state planning for growth and protection of water resources. Program to community smart growth initiative launched 	<ul style="list-style-type: none"> State stream/habitat assessment program in place Permit system utilized to provide corrective actions. 	<ul style="list-style-type: none"> - the need for integrating land-use planning with resource preservation. - Comprehensive approach to involving stakeholders.
Massachusetts	<ul style="list-style-type: none"> - Focus of program on water quantity. - Permit system used to manage both surface and ground water 	Strong	Moderate	<ul style="list-style-type: none"> Strong emphasis on conservation. Dedicated conservation program to be established State coordinator to be established. 	<ul style="list-style-type: none"> Comprehensive reactive plan Water conservation an integral measure of plan Standardized method of drought assessment. 	<ul style="list-style-type: none"> Smart growth initiative strong linkages between regional watershed initiative and growth. Community funds available. 	<ul style="list-style-type: none"> State level bioassessment program Efforts to develop linkages between water quantity and quality. 	<ul style="list-style-type: none"> - Innovative conservation program. -Unique approach to link quantity with quality
New Jersey	<ul style="list-style-type: none"> - identify and protect surface and ground water sources to meet supply needs 	Strong	Moderate	<ul style="list-style-type: none"> Moderate conservation program Stresses structural aspects to behavioral Involves reuse program 	<ul style="list-style-type: none"> Reactive approach to drought Modifies permit allocations Flow requirements in streams altered 	<ul style="list-style-type: none"> Attempts to integrate growth with water resource. Program requires impact assessment of projects prior to approval 	<ul style="list-style-type: none"> EPA's RBP's method used for bioassessment. Attempts to identify water quantity levels necessary for ecosystem health 	<ul style="list-style-type: none"> - a watershed-based approach part of WRM - effective integration of WRM and growth management.

Table A (Contd.): Comparison of State Water Resource Management (WRM) Programs

Pilot Program	Programmatic Goals/Focus	Inclusiveness of Stakeholder Involvement	Extent of Interagency Coordination	Emphasis Given to Conservation	Response to Drought	Integration of Land-Use/Growth Management Issues	Accounting for Environmental Aspects	Lessons for Delaware
New York	- addresses water quantity, quality, supply system and public involvement	Moderate	Moderate	Moderate emphasis Coordinated approach to conservation. Tied with the permit system	Strong pro-active program Stockpiling, creating contingency plans inherent part of prevention	Developing community involvement in growth management. Funds available for community efforts.	Biocriteria used for monitoring streams & habitat. BMPs employed to address negative effects.	- effective preventive strategy for drought mitigation - clearly defined state agency roles.
Pennsylvania	- broad approach involving planning, regulating and monitoring.	Moderate	Moderate	Moderate emphasis Tied with permitting system Strong public education campaign	Strong drought containment strategy Links effectively with emergency management agency	Good effort in integrating land use with water resources. Infrastructure funding tied with land-use	State has instituted a bioassessment program Macroinvertebrates and fish serve as indicators.	- Strong containment strategy to deal with drought. - Comprehensive growth management with funding mechanism to protect water resources.
Virginia	- Focuses on water quality and quantity aspects.	Moderate	Moderate	Moderate conservation emphasis Encourages user efficiency through reuse and recycling	Reactive response to drought. Drought task force established to monitor conditions Voluntary/mandatory water restrictions.	Moderate effort to address land-use/growth management Environmental impact reviews for assessing growth impacts.	Both quality and quantity part of assessment State-wide monitoring program in place.	- Comprehensive drought management. - Water quality and quantity interlinkages.
Washington	- Fostering water resource projects. - ensure preservation of ecological resources - balance present & future needs	Strong	Strong	Moderate emphasis on conservation. Laws encourage conservation measures.	Moderate response to drought. Permits system tied with drought response.	Developed linkages between growth management and env. protection. Watershed planning and growth planning linked	Monitoring program for bioassessment in place. Biological, physical and chemical indicators are employed.	- Effective involvement of stakeholders at state and watershed level - Growth management strategy attempts to balance watershed planning.

Recommendations

Delaware should consider the formulation of a sustainable WRM strategy that incorporates the following criteria: clear programmatic goals, nurture stakeholder involvement, provide forums for interagency coordination, emphasize water conservation, develop a pro-active drought plan, include an effective growth management plan and account for environmental aspects.

Programmatic Goals

- Codification of Delaware's objectives vis-à-vis water resource management.
- Creation of an integrated strategy to manage water resources in a sustainable manner.
- Establishment of a single state entity responsible for formulation of strategy, implementation and monitoring of water resource policies.

Inclusiveness of Stakeholder Involvement

- A legislative mandate that requires participation of concerned constituents in regulatory process.
- Involvement of interest groups fostered through watershed-based participatory bioregional planning strategies.

Extent of Interagency Coordination

- Creation of a Water Resources Partnership Agreement conceived to provide a forum for coordination between relevant state, sub-state and local agencies.
- Provision of a dedicated office to coordinate between interstate and state agencies.

Emphasis Given to Conservation

- Create and adopt a state-wide standard for conservation measures.
- Institute a position of a State Water Conservation Coordinator.
- Establish a dedicated State Water Conservation and Resource Protection Program.
- Adopt policy options that employ instruments to mitigate the financial disincentives associated with water conservation.
- Encourage efficiency measures like water reuse and recycling.
- Provide technical assistance for implementing conservation measures.
- Ensure a proactive role of the nodal state agency in water conservation.

Response to Drought

- Institute an interagency Drought Response Task Force.
- Develop a comprehensive Drought Preparedness Plan at the state level.
- Strengthen the existing Drought Management Plan.

Integration of Land-Use/Growth Management Issues

- Consider creating growth management goals vis-à-vis water resource preservation and utilization.
- Establishment of a dedicated agency at the state and county levels responsible for evaluating water resource implications of a development proposal.
- Involve watershed groups in development of local planning missions.
- Promote state initiatives that allocate grants and loans targeted at the development and implementation of sustainable land-use plans.
- Enhance research for creating more sustainable land-use patterns.
- Increase public awareness regarding the value of effective growth management.

Accounting for Environmental Aspects

- Promote the integration of environmental aspects in water resource management considerations.
- Allow for a reexamination of minimum flow standards for stream flow in the light of new research.
- Institute specific conservation measures tied to low levels.