SUSTAINABLE WATER MANAGEMENT

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Abstract. The water resources of a region are renewable, but finite. Thus, regional water resources are limited as to the uses they can support. That is, with respect to these uses, they have a "carrying capacity." If this carrying capacity is exceeded, the system ceases to be "sustainable."

The carrying capacity for a region is dependent upon the mix of uses that are present or that could be present. Determination of this mix of uses for a sustainable future must consider the interrelationships that exist between the physical, ecological, societal, economic, and institutional sectors. This mix also is contingent upon that vision of the future on which the region's stakeholders can agree. So long as this future's regional water resources demands are less than the carrying capacity of these same resources, it is, potentially, a sustainable future.

Demands so defined, then, can be used as the basis for a sustainable water resources management effort. This in turn requires initiating the process of deciding what actions are needed to assure that this mix of uses is realized and that future generations are bequeathed a system in balance.

The success of this process is made more likely by the implementation of a Decision Support System. This system, which represents a long-term commitment by those who lay claim to their share of the region's future, is useful in tracking progress, identifying emerging issues or concerns, providing a forum for problem solving, and continuing the critical process of data collection.

All these actions are of great importance in developing a sustainable water resources management plan for a region. In the end, however, the assurance that the plan's goals and objectives are achieved is dependent upon the critical linkage between the plan and its implementation, a linkage that can be forged and maintained only by determined, politically engaged stakeholders.

APPROACH

Definition. Today in the United States there is a wide ranging debate revolving around the terms "sustainable", "sustainability," and/or "sustainable development." For the purpose of this presentation, I have chosen to use the definition set forth by the President's Council on Sustainable Development: "Sustainable development is economic growth that will benefit present and future generations without detrimentally affecting the resources or biological systems of the planet." Economics has been incorporated because it is a central theme in society; when economics is excluded, a management strategy has little chance of acceptance.

A Regional Approach. While everyone will agree that a region is a geographical area, the question becomes: how large is the geographical area? Is it a group of states (the southeastern United States); a physiographic province (the Atlantic coastal plain); a single political jurisdiction (a state, county, or city); or is it a watershed (for a large river, a small river, a stream)? While defining the size or extent of a region is a necessity, it is not critical when one is identifying issues that must be addressed in developing a regional water resources management plan. The region's size (and its nature) only adds to the complexity of the various tasks.

A regional approach to water resources management must deal with the interrelationships that exist between the physical, ecological, societal, economic, and institutional sectors. Gone are the times when single purpose strategies could suffice to define the issues that must be addressed. Today we must think in terms of holistic systems that seek to optimize multiple uses. This systems approach is demanding. It requires masses of information; considerable commitment of time; analytical tools to help interpret the information; active involvement of stakeholders; lots of patience; excellent communication skills; and liberal doses of public education.

Information Requirements. In an information society, it is no surprise that data and information form the foundation of the systems approach. However, it is not just any data and information that are sought. Rather it is the kinds of data, of information, that stakeholders hold to be important and relevant to the planning process. There must also be agreement that the data and information are both accurate and complete.

Examples of the classes and kinds of data and information needed for sustainable water management include:

1. Societal: Demographic information, such as population and population growth rates, areal distribution and densities of population, and ethnic composition, as well as numerous related elements;
2. Physical: Land forms, land uses, rate of land use

change, categories, locations and qualities of existing water resources, areal and regional hydrology, and other such items;

3. Ecological: Available quantities and qualities of surface and ground water resources, location, extent and productivity of wetlands, current water uses and their locations, and threats to the water resources;
4. Economic: Water recreation, sports fishing, tourism, industry, commercial businesses, marinas, commercial fishing, agriculture, and other segments of the regional economy; and,
5. Institutional: Law and regulations (federal, state, local); water use permits; zoning ordinances; private property rights; governmental boundaries; and other such arrangements.

All the concerned stakeholders must have complete and easily implemented access to these data and related information. This helps greatly in establishing and building trust between the various interests and interest groups. The ready availability of analytical equipment, techniques, and expertise to assist in the interpretation of the data and information also promote dialog and a trusting relationship between the stakeholders, and between stakeholders and the public/private agencies involved in managing the resource.

Future Vision and Carrying Capacity. Ultimately, the stakeholders of the region must focus their discussion on the question of: "What do you want to be when you grow up?" The water resources of a region are a finite resource, a renewable resource, but no less finite. Consequently, the regional water resource has a limit to what uses it can support. In other words, the region has a carrying capacity. Once this carrying capacity is exceeded, the system is no longer sustainable.

Obviously, the carrying capacity for a region is dependent upon the mix of uses that are present or could be present. The mix of uses, in turn, depends on the agreement reached by the stakeholders of the region as to what they want to be when they grow up. As long as the mix of uses does not exceed the carrying capacity of the region, the bases for a sustainable water resources management plan has been laid. This in turn starts the process towards deciding the actions that are required to assure that this mix of uses is realized and that future generations will be bequeathed a system in balance for the specific mix of uses the stakeholders have chosen.

Decision Support System. As important as the preceding actions are for developing a region's sustainable water resources management plan, they are only an intellectual exercise if their results remain un-implemented. Assurance that this happens, that the plan's goals and objectives are achieved, is greatly facilitated by the creation and effectuation of a Decision Support System (DSS). The DSS helps to track progress, identify emerging issues or concerns, provide a forum for problem solving, and continue the critical process of collecting information and data (such as those needed to develop, calibrate and run predictive models, or other decision tools, to verify projections and accomplishments, and to make informed mid-course corrections). The Decision Support System represents a long-term commitment to the region and its sustainable development, by and for the region's stakeholders. It provides the critical linkage between the planning and the implementation of the sustainable water management plan.