SUMMARY

Water Resource Planning: turning theory into practice

Water is basic to all life on earth, and is vital for the functioning of society. Although water is vital to sustaining society, it is made increasingly impure as it is used. As populations expand, both in number and geographic area, the demand for fresh water supplies increases, the volume of pollutants available to contaminate water increases, and the competition between nature and society for use of that finite resource of fresh water intensifies. Whether to protect a relatively affluent way of life or to simply meet the basic needs of exploding populations, the need for water resource planning has never been greater. Unfortunately, water resource planning is often overlooked, and when done, plans are often incomplete or poorly constructed. There is a clear need for a more organized approach to water resource planning.

Organizing principles must come from planning theory, but water resource planning lacks a long tradition of planning theory specific to its own particular demands. Water resource planning theory comes primarily from the tradition of spatial planning (land use planning, town and country plans, regional plans etc.). When applied to water resource planning, however, it has not resulted in a coherent theory that practitioners can easily use. Water resource planners have to deal with many, practical, technical problems. One of the most important is the need to deal with a variety of objectives, multiple levels of government, numerous regulatory programs and permits, and different controlling government agencies. Water resource planning also engages a wide range of interests and stakeholders who are often passionate about the subject. Yet it also requires a firm grasp of hydrology, hydrogeology, hydraulics, statistics, water chemistry, biology, ecology, and other related sciences that are often difficult or impossible for stakeholders to fully grasp. Thus, an effective water resource planning framework must carefully balance the more interactive, stakeholder oriented aspects of modern planning theory.
with the more technical, “top-down” aspects of the older, rational comprehensive planning approach.

Although a framework is presented in this dissertation, the most important point to be made before “an approach” is advocated is that there is no single approach that will work in all situations. Water resource planning covers such a diversity of planning objectives, physical and environmental conditions, and political context, that a one-size-fits-all process cannot be defined. For example, water resource planning objectives can have ties with objectives related to economic development, human health, environmental protection, and even urban revitalization. Nevertheless, there is undeniable benefit to using a classic planning framework in water resource planning.

In the practice of water resource planning, planners usually attempt to limit the planning to one or more aspects of the water system that are most critical to the goals of their organization or for the community at large. Because of the economic and human health implications of water as a source of drinking water, it is often the protection of drinking water sources that is the primary driver for a management plan. For example, in coastal areas reliant on groundwater, water resource planning invariably focuses on the aquifer system and its vulnerability to salt water intrusion. In areas that rely on surface water, it will usually focus on sources of pollution (point or non-point) to the river, reservoir, or lake, combined with issues of yield reliability. Occasionally the primary driver is repeated flooding, in which case storm water runoff and the ability of rivers to handle peak flows become the primary focus. It is less common for purely environmental degradation issues to be the sole driver of a large scale water management program; however, this sometimes occurs in areas of special ecological value.

The primary objective of this dissertation is to address the importance of a thoughtful planning process. The diversity of environments, political systems, and scale make it important to develop a flexible framework within which to work, otherwise the planning complexity quickly can become overwhelming. Water resource planning must be approached each time with a fresh eye and a willingness to design a planning process that fits the unique physical, political, and social context of the resource being managed. But that does not mean that we start with a blank slate. The planning framework presented in the dissertation provides a framework, a
The most advocated is that rationalizations. Water resource uses, physical and environmental. Water resource planning is a one-size-fits-all approach. The dissertation focuses on sources of water for drinking water. The dissertation attempts to illustrate both successful and less successful approaches. The research and experience behind this dissertation come primarily from the United States, based on the author's more than 20 years experience in a variety of planning settings.

The dissertation is divided into three sections. Section 1 lays out a general planning framework, drawing on references to planning theory from the urban and spatial planning literature. It relates familiar planning steps to the category of planning called water resource management, and shows how this neat framework is bent, twisted, adjusted, and even compromised on the "battlefield" of real world planning. The framework is illustrated using examples from various types of water resource planning. These include plans aimed at groundwater resource management, coastal aquifer management, source water protection for river intakes, integrated water resource planning for multiple watersheds, and urban watershed management plans. The section concludes with a discussion of the stakeholder process in water resource planning.

Section 2 reproduces eight articles published by the author over two decades of water resource planning experience in the United States in refereed journals. The chapters discuss in greater detail various aspects of water resource planning such as database design, groundwater modeling, coastal aquifer planning, and water conservation. Although some of the older articles are clearly outdated with regard to technology, as a whole they illustrate key concepts of the planning framework that have been successful, and also provide a rough time line of evolving water resource planning practice in the US.

Section 3 examines the context within which the planning framework can or cannot be applied, with particular emphasis on the US situation. It also describes commonly encountered pitfalls that are to be avoided if the framework is to result in a successful plan. In this concluding section, a slightly broader view is taken on why the planning framework will or will not be applied, or may be applied in an unsuccessful fashion. Although the
context is presented from the US water resource planning perspective, much of the information is equally applicable to the European context. The intent of the section is to help legislators and their planning staff create conditions under which this planning framework can be successfully applied.

Applying theory to practice in the planning profession can be a frustrating experience, and many practitioners eventually abandon any reliance on theory in carrying out their work. Water resource planners are no exception to this. The planning framework set out in this dissertation is one that is based on a mix of planning theories, molded by experiences in water supply, groundwater, coastal, watershed, and integrated water resource planning projects in the US and the Middle East. It has stood the test of application under a variety of planning settings and planning objectives. It has proven successful for plans at the utility, municipal, county, and even national level. But it also represents a series of projects in which the initial conditions were ideal for applying the framework. Successful application will depend on factors that are often beyond the control of planners. If external factors are favorable, however, it is up the planner to avoid the pitfalls described in section 3, take from the framework the elements that are relevant and useful to the situation at hand, and produce a plan that has clearly stated objectives, follows an organized path toward recommendations for achieving the objectives, and lays out the actions needed in a fashion that makes implementation possible.

Does planning theory help? The answer from this practitioner’s point of view is a resounding yes. But no single theory fits all, and the practitioner will be asked to design the planning process on the fly, taking whatever bits of wisdom and guidance theory has to offer to smooth the road toward plan completion, acceptance, and above all, implementation.