



# TOTAL WATER MANAGEMENT: FROM VISION TO EXECUTION

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The media reports frequent stories of global climate change, pollution, flooding, and the suffering they cause. Meanwhile, a quiet revolution is being led by men and women who care about sustainable use of water resources, public service, and a healthy balance between business and government. Many of these water leaders work in water supply and wastewater utilities or water management agencies.

Balancing water management and the environment is not only essential to a sustainable future, it's also good business. As Sandra Postel (2007) explained: "As one of the most publicly visible stewards of the earth's water sources, drinking water utilities are uniquely positioned to exert a leadership role in the emerging field of ecologically sustainable water management. In important ways, this field is integrating the traditional goals of water management with those of ecosystem conservation in order to sustain a broader spectrum of the valuable goods and services on which human communities depend."

The revolution is directed toward new ways to manage water resources and the public's business. That part of it addressed by this book is Total Water Management, or TWM. TWM offers to water utility managers and others involved in the water industry powerful and urgently needed tools to balance needs of water management and the environment.

Total Water Management means stewardship and management of water on a sustainable use basis. Its concepts are explained in detail in

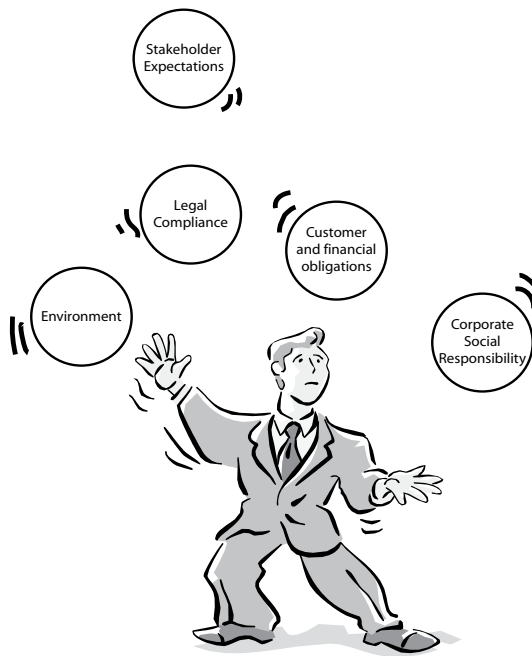


Figure 1-1. TWM as a balancing act

chapter 3. TWM challenges water managers to juggle objectives that may conflict with each other (Figure 1-1).

## What is TWM, really?

TWM is not a new and secret weapon. It is a new way of using tried-and-true methods to create a framework for principles and practices of sustainable water resources management. In explaining it, a working group of water utility officials defined TWM as the “exercise of stewardship of water resources for the greatest good of society and the environment” (AwwaRF, 1996).

A framework is a basic arrangement of a set of elements. It is a structure on which to hang the elements that make up the whole of your construct, which in this case is a method to manage water called TWM. For example, the European Union uses frameworks to construct bodies of law and policy to govern sectors of society and the economy. In the case of water, it is called the Water Framework Directive, and how it works will be described in more detail in chapters 3 and 9.

The TWM framework, outlined in Table 1-1, has a number of elements and good practices for stakeholders and participants in the water management game.

Table 1-1. The TWM framework

Participants	TWM provides
Utilities and water service providers	Guidelines to balance water supplies and impacts on the environment. TWM does not focus on business processes but it supports them.
River basin and watershed planners	Ways to cooperate and work together. It advocates management on a natural systems basis for watershed planning.
Regulators	Ways to blend regulatory strategies with volunteer actions to achieve higher levels of compliance than with command and control alone.
Government and policy community	Consistent ways to structure policy and government actions to support effective and shared governance.
Water users and people impacting water	Ways to integrate control of nonpoint sources and hydromodification with water storage, diversion, and point source discharges.

## Why is TWM needed?

TWM is needed because the capacity of the environment to bear its load may be nearing its limit, and we cannot afford to waste or misuse water. Whether the topic is global warming, rising water demand, or exotic pollution, people sense that we must lighten the load and use sustainable management.

Unfortunately, the real world places barriers to doing this. In a perfect world, we could apply new technologies and create a society that places smaller burdens on natural systems. That's the goal of sustainable development, which is the concept of using resources wisely to preserve them for the future. But can the visionary concept of sustainable development be translated into action? The jury is out on the question, but whatever the outcome, the water industry will have a big part in it.

Leaders in the water industry have big, big roles to play in sustainable development. The playing field is changing rapidly. Students who are preparing right now to lead the industry will face a different set of challenges than the baby boomers did. The grandparents of baby boomers saw the close of the nineteenth century, before most piped water supply was available and when life expectancies were lower due to waterborne diseases such as cholera and typhoid. Baby boomers entered a stable workforce. Not so with today's new ball game.

Yes, the water industry faced many challenges in the twentieth century, and it witnessed dramatic improvements in water management and public health. Water safety improved, new methods to divert water and create supplies were developed, and many new laws and regulations were passed. But every advance was met with another challenge. Chemical

contaminants increased, new forms of pollution have been identified, and impact on the environment from water use has increased, and neither government nor the free market seems able by itself to steer the water industry toward sustainable development.

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### **Sustainable development uses resources wisely to preserve them for the future**

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Thinking people sense that wiser approaches to resource management are required, and they buy into the concept of sustainable development. While this may sound like an academic concept to some people, it is really a practical imperative. It may, however, increase political challenges

to water managers, because customers expect *both* reliable water supplies and environmental protection. In fact, water industry research already shows that it is good policy to emphasize environmental stewardship as a business strategy.

To practice TWM, tomorrow's water industry will require utility and government leaders as well as regulators who can span the needs of the economy and the environment. Policy makers will need keen insight into the water industry and its incentives, and citizens will have to practice greater stewardship. The knowledge industry, including consultants and researchers, will have to provide new ideas, and vendors must create new products. Above all, leaders who can be "master integrators" will be required to become effective public managers in the twenty-first century.<sup>1</sup>

This book serves as an instruction manual for these master integrators. It is about the balance between our responsibilities to provide safe and reliable water services and to protect the environment. The chapters address the management of water resources rather than specific issues of water treatment or distribution.

When the American Water Works Association (AWWA) developed the TWM concept, the focus was on water supply services. However, TWM's definition shows that it applies to all water services—supply, wastewater and water quality, agricultural water, hydropower, instream flow management, and security against flood losses. In other words, TWM goes beyond narrow definitions of water management to total water stewardship. It is a term, similar to Integrated Water Resources Management (IWRM), that describes taking an overall approach to solving water problems.

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<sup>1</sup> Donald Stone (1974) saw the need for integrative problem solving through the field of public works management and Joseph Bordogna (1998) saw it through education and research.

## TWM is about leadership

At the end of the day, TWM is about leadership. Given this, the question of “Whose point of view?” becomes critical. Are we focused on a utility serving its customers or on the needs of the broader society? The answer is, we focus on both. This is clear from the definition of TWM: “stewardship of water resources for the greatest good of society and the environment.”

Can TWM serve both the environment and society? Is what’s good for General Motors also good for America?<sup>2</sup> It will have to be. TWM requires participation of utilities, business, and government. As Figure 1-2 shows, business and utilities are pulled in different directions but in different ways. One way is to make a profit or be a successful enterprise. The other is to reach out to handle social responsibilities.

TWM is clearly in society’s best interests, but what are the incentives for utilities to embrace it? This fundamental issue creates a clash of culture that is captured by the phrase “it’s not my problem.” TWM requires that incentives be created. Otherwise, TWM will be just a visionary concept with little practical value. The key is to move past vision and on to action.

Water managers know that, above all, they must provide reliable, safe, and secure water services to their customers. This imperative trumps all others because it is their direct responsibility. If confronted by a value set that threatens this responsibility, the direct mission will come first. It is hard to share power and to say to someone with a different value set, “Let’s cooperate to solve our problems together.” The result is a system that is more adversarial than cooperative. This leads to the “it’s not my problem” syndrome, which says “Don’t bother me with that,” or, at worst, “We’ll see you in court.” One of the institutional problems that confront TWM is that some people benefit by keeping the adversarial process going. These types of problems are discussed in chapter 10.

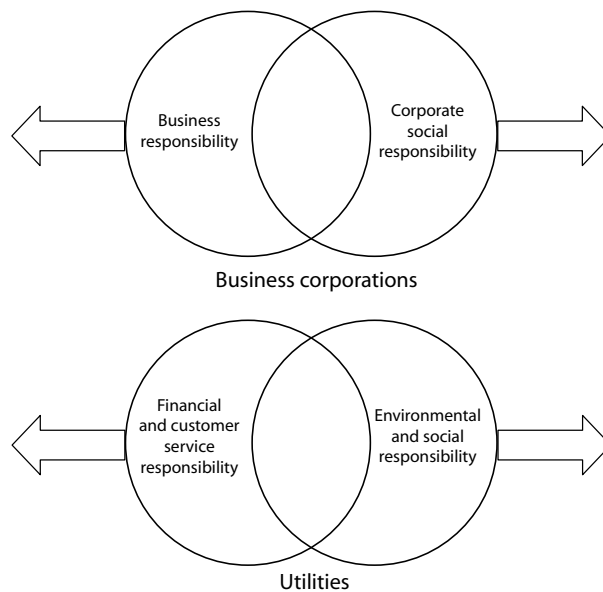
The real challenge is to meet direct needs of your organization *and* to work with others to meet their needs, too. The military analogy explains why this is difficult: it’s much better to be on one side of the valley or the other, because the people trying to balance things from the valley floor get shot at from both sides!

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**TWM must be more than visionary; its challenge is to move from vision to action**

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<sup>2</sup> This quote, attributed to General Motors president Charles Wilson in 1955, suggested that society’s best interests were the same GM’s. For TWM, the comparable question is, Is what is good for utilities good for society?



**Figure 1-2. Financial and outreach responsibilities of business and utilities**

To some water managers, sustainable development sounds like an environmental ploy to get more concessions from an industry that already has difficult problems in delivering reliable and safe water services to its customers. Most challenges are in the political rather than technical arena. While politics vary, sustainable development and the need to manage water wisely are shared values around the world, transcending geography, culture, and religion. People share values such as good public health, environmental protection, and a fair deal for everyone. Every person, animal, and plant on the globe depends on water for life. So the central dilemma is how, with growing populations and demands for a limited resource, do we manage water so all needs are met without spoiling the environment for tomorrow?

There are plenty of slogans for meeting today's needs without spoiling the environment, but the challenge is to make them work. Without its defining principles, TWM could be just another one of those slogans. Its definitions and principles (see chapter 3) tell us what it is, but how to practice total water management requires the explanations given in the remaining chapters.

As an idea, TWM captures our imagination about addressing issues and stakeholder needs. John Young (2006), chief operating officer of American Water, wrote that it is to "assure that water resources are managed for the greatest good of the people and environment and that all segments of society have a voice in the process."

Taken together, TWM and related concepts such as Integrated Water Resources Management form a dominant paradigm that is legitimized by professional organizations, the media, government agencies, educators, or other mechanisms (Wikipedia, 2006).

Positive practices meet the needs of the present without sacrificing resources for future generations. Figure 1-3 shows the balance point for sustainable development. However, these positive practices are difficult to implement. Unsustainable practices are negative and harmful to nature.

### Is there an environmental crisis?

Is there really an environmental crisis that requires TWM, or is this invented by radical groups and the media? To answer that, think of three groups of people. One thinks that pollution, drought, and waste of water are bringing global disaster. A second group is busy solving the practical problems of supplying and managing water. To the third group, access to clean, safe, and low-cost water on demand is more important than the debate about the environment. For convenience, let's call the three groups the "environmentalists," the "water managers," and the "citizens."<sup>3</sup>

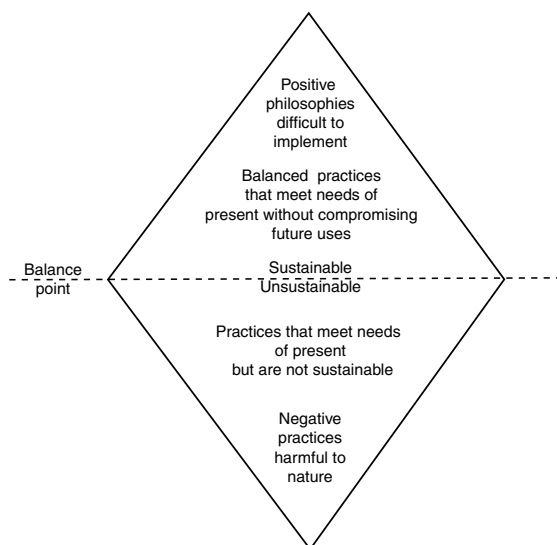


Figure 1-3. Balance point for sustainable development

<sup>3</sup> These terms do not minimize the views of any group mentioned here. Use of the terms will facilitate discussion about environmental goals, practical water management issues, and citizen rights and responsibilities.

The environmentalists keep major issues in front of us, such as global warming, loss of forest and wetlands, and extinction of species. Lest we say that they are too global, they also skirmish in local places about small losses such as paving over wetlands. They perform a service to society in keeping our attention on environmental issues.

Water managers are concerned about environmental issues, but they focus on the immediate problems of managing infrastructure, raising revenue for operations, recruiting skilled workers, and complying with regulations.

As citizens, we are all environmentalists to some extent. However, we have different views of issues and what to do about them. Probably most agree that unless water is managed better, both the environment and society will suffer. We part ways in deciding how to manage water better and in assessing how the suffering will occur. Most of us would admit that many people are not tuned in to the water conversation. People focus on things that interest or concern them and do not get involved in every issue.

The positions of the three groups can be summarized by saying that the environmentalists push a sustainability agenda, water managers want sustainability but are focused on their direct missions, and most citizens do not tune in to the conversation very much. This triangle of groups creates a TWM balancing act, as shown in Figure 1-4.

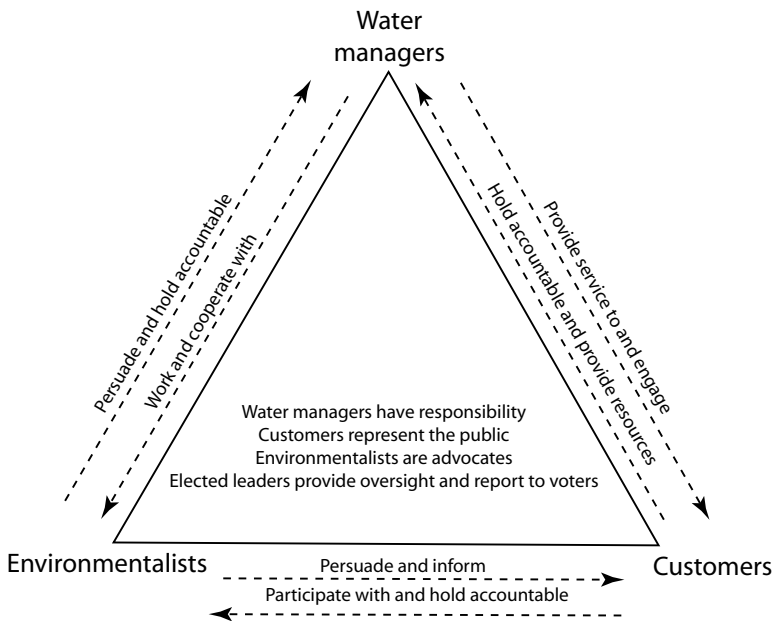


Figure 1-4. The balance in water management



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## Barriers to sustainability

Although TWM provides a powerful platform to place water management on a sustainable use basis, it faces formidable challenges. The challenges arise from myriad small impacts that cause problems, not a single large foe to conquer. The water crisis is also a creeping crisis, easy to ignore in the short term. It is not a massive, sudden crisis that galvanizes a lot of political support.

Water managers must be leaders in TWM, but they do not work with only a few partners. They must work broadly with stakeholders and citizens in many situations they do not control. Utilities and regulators work in an ordered business world, but many small and seemingly unorganized players also affect water systems.

The shared problem of water managers is to provide sustainable water management services for human and economic needs while maintaining the environmental quality that underlies economic prosperity. Sustainability requires balanced water supplies for humans and the environment, protection of water sources, and resolution of water conflicts at scales from local to global. Solutions must include resource sharing, governance systems, and reduction of hazards. Water scarcity requires new technologies for water efficiency, conflict is mitigated by knowledge of shared benefits and improvements to the Triple Bottom Line (TBL),<sup>4</sup> and vulnerability requires improved security against natural and human-caused threats.

To implement these solutions requires substantial societal efforts in the face of formidable challenges. Moreover, they will defeat us unless we sustain actions on multiple fronts against many small challenges, while being vigilant and not allowing a creeping crisis to overwhelm us.

Who is in charge of this shared problem? No one really manages the myriad of smaller actions that fly under the radar screen of the water industry, and no one is in charge of finding solutions to the shared problems. That is why, from time to time, someone will say, “We need a czar to take control of this water issue.” The European Union’s Water Framework Directive calls for a leader on water issues in the form of a “competent authority” (Green and Fernández-Bilbao, 2006). This is, to some extent, another call for a czar, but there won’t be one in the United States because the public doesn’t generally support more government oversight and instead seeks decentralized and private-sector solutions. Water utilities on the one hand and business and private citizens have to work together

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<sup>4</sup> The metaphor of the Triple Bottom Line originated in the sustainability movement and refers to accounting for economic, social, and environmental costs and benefits. It will be explained in chapter 5.

to solve the problems. We have to create through our shared work an “invisible hand” to solve the problems, albeit with some badly needed coordination.<sup>5</sup>

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## **The Tragedy of the Commons: people care for their own property but not the property of others**

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The water industry manages big systems, such as dams, large diversions, and discharges from wastewater treatment plants, but innumerable smaller actions caused by land management activities are not under the direct control of water utilities. They mainly involve nonpoint sources and hydrologic modifications, two activities originating in the broader society. Also, many small storage, diversion, and discharge actions are also caused by small players who do not fall within the spheres of influence of the large utilities and agencies. So we think of TWM as mainly an activity of water managers, but one that also requires broad engagement of society to deal with the myriad of small impacts that affect water systems (Figure 1-5).

## **The nature of TWM**

TWM is a systemic concept, much as is shown in Figure 1-5. This illustrates how industry and citizens have roles in directing water uses toward positive contributions to the economy, the environment, and society. The Triple Bottom Line is the way to keep score (see chapter 5).

## **Principles and practices**

Given the broad scope of TWM, it is a challenge to create a clear set of principles and practices to define it.<sup>6</sup> However, without a defined set of principles and practices, the concept of TWM remains ambiguous. It is based on notions that may seem soft, such as stewardship, shared governance, coordination, and conflict resolution; nevertheless, TWM can be implemented through specific actions and processes.

So, it is natural to ask again, is TWM for real or is it only fantasies and dreams? Is it simply another visionary concept that is doomed to an early death as soon as another trendy phrase comes along, or does it have practical value? In many ways, the jury is out on these questions because of

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5 The invisible hand metaphor was made famous by eighteenth-century economist Adam Smith, who wrote *The Wealth of Nations*. In water management we need an invisible hand that occurs from the shared work and coordination of water industry players who make the system work in spite of the lack of centralized government control or marketplace solutions.

6 Chapter 3 presents a definition and set of principles and practices for TWM.

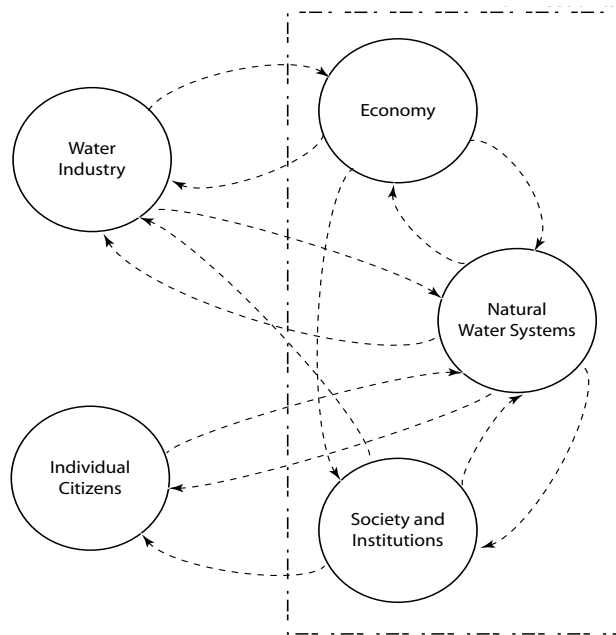


Figure 1-5. Total water management: a systemic concept

the institutional barriers to it (see chapter 10). But like in any challenging area, moving forward is progress.

The institutional barriers are driven by the “it’s not my problem” syndrome, in which players take decisions and actions in their own interests and create a version of the Tragedy of the Commons, the phenomenon of people caring for their own property but not the common property of the public (see chapter 10).

Obviously, water management would work better if everyone thought about others’ needs as well as their own, that is, there existed a Golden Rule of water management. However, this fantasy quickly founders on the shoals of reality, and incentives and penalties are needed to encourage or force people to do the right thing in water actions. Everyone may agree that TWM is a good idea, but when it comes to spending money or giving up political power for it, they will balk and say, “That is not my problem.”

## Laws and regulations

Sustainable water management will occur only if all stakeholders take decisions and actions that align with sound principles, requirements, and incentives. However, utopian concepts and changed attitudes alone will not make people do the right thing. For ethical and sustainable water management, regulatory controls and law enforcement are required.

Laws and regulations compel stakeholders to meet minimum environ-

mental and health rules, but if the players do only the minimums, water systems tend to degrade. The consequence of this drive toward minimal standards is that developing regions will experience unsustainable development that causes water scarcity, conflict, and vulnerability. So regulations are necessary but also not sufficient for TWM to occur. This is particularly the case with all the activities and policies that affect water resources.

### **Stewardship goes beyond regulations**

The “it’s not my problem” syndrome is a natural consequence of the fact that water utilities and organizations have challenging corporate responsibilities that require their full attention, even before they worry about societal issues and stewardship of the environment. They give their primary attention to meeting the budget, building facilities, delivering services, and avoiding regulatory sanctions.

In addition to this situation of benign neglect, society also faces challenges caused by greed, incompetence, malfeasance, and ignorance. If you take this attitude to the limit, you end up with a situation in which everyone withdraws inside his or her own corporate castle and a lot of the territory is left unguarded, subject to raids or just general neglect.

Good policy is needed to get organizations and individuals to care for the public space as well as their own spaces. While they agree about the need for the broader societal responsibilities implied by TWM, the challenge remains how to get it done.

### **TWM—more political than technical**

While the definition of TWM emphasizes principles and practices of water management, at its center are ideas about economics and politics. The core economic issue is a search for the greatest good of society and the environment, which is a general goal of public-sector economics anyway. The TWM definition includes the subsidiary economic goals of efficient allocation of limited water resources to address social values, cost-effectiveness, and environmental benefits and costs.

The political ideas of TWM are that stewardship is a public responsibility and that TWM requires participation from all units of government and stakeholder groups to balance competing uses of water in spite of local and regional variations and issues. If successful, this coalition will foster community goodwill and public health and safety. The political statements outline how the process should work and what it should achieve.

You need look no further than the general welfare provisions of the US Constitution for authority for these economic and political ideas. The Preamble states: “We the People of the United States, in Order to form

a more perfect Union, establish Justice, insure domestic Tranquility, provide for the common defense, promote the general Welfare, and secure the Blessings of Liberty to ourselves and our Posterity, do ordain and establish this Constitution for the United States of America.” Article I, Section 8 states: “The Congress shall have Power to lay and collect Taxes, Duties, Imposts and Excises, to pay the Debts and provide for the common Defense and general Welfare of the United States” (US Government 2006).

TWM’s focus on the greatest good of society and the environment is aimed directly at improving the general welfare, and stewardship and balancing competing uses are necessary conditions to achieve the greatest good.

Two powerful philosophical ideas also support TWM: environmental ethics and corporate social responsibility (see chapter 11). Environmental ethics is the study of our right behavior toward the environment. The argument is that, as a public good, water has been bestowed on people and nature (the environment), and it is our responsibility to care for it.

Stewardship is closely related to the goal of corporate social responsibility (CSR), meaning the responsibilities businesses have to make contributions beyond the profit motive (Hay, Stavens, and Victor, 2005). How do firms balance their fiduciary responsibility to shareholders with CSR? It can be argued that any firm, agency, or organization that affects natural water systems has a public responsibility to care for water because of water’s shared uses, including environmental uses.

So TWM is a paradigm for water management to work effectively in a democratic political system, with the rule of law and a mixed public and private economic framework that underlies the political framework. As the “art of government, politics is important for governance to occur and for negotiating conflicts and balancing outcomes to meet goals and objectives within the economic framework.

Water has a high political intensity because people have different agendas that are worked out in the political process. Politics and governance provide a set of rules and processes to resolve differences and make positive things happen.

The difference between what people are required to do and what they ought to do is the difference between law and stewardship, or social responsibility. What we ought to do is governed by rules that fit within social norms and are part of the institutional fabric of the water industry.

## **Use of case studies to explain TWM**

Sometimes a case study helps us see the interplay of issues in water management situations. A case study is like a story with a setting, characters,

action, and a conclusion. Case studies add experience-based learning to expository information. They raise interest levels, show how decision systems can make the difference between success and failure, and give a sense of participation in real-world political situations. This book uses brief case studies and examples of interactions and water decisions to illustrate the principles and practices of TWM.

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## **Water management is a shared challenge**

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The case-study method involves analysis of complex situations requiring remedial treatments of some kind, as in medicine, law, or business situations. The first case at the Harvard Business School was in 1912, and by 1924 the case method had been adopted as the primary method of instruction (Ewing, 1990). Also at Harvard, the John F. Kennedy School of Government (1992) uses the case method to explain decision-making in public administration.

Action-forcing cases place the reader in the shoes of government officials faced with a problem requiring action and ask, “What would you do?” Retrospective cases tell the whole story, including the decision and the consequences (Kennedy and Scott, 1985). A good case is short but general, has pedagogic utility, and is conflict-provoking and decision-forcing (Robyn, 1986).

Just as in complex law or business cases, water problems are amenable to explanation with case studies. Chapter 2 offers a detailed case study in the form of a story to illustrate how players in water management interact with each other. Other examples throughout the book offer fragments of case studies.

## **What does the book contribute?**

This book explains TWM’s goals and principles and outlines the institutional challenges to making it work. It offers policy prescriptions for overcoming the main challenges. It explains how the water industry works and how decisions to control water resources systems are made. The book also explains how myriad small actions fly under the radar screen of the water industry but are important to sustainable water management, and defines TWM and its elements and how they work within the water industry.

The next chapters examine the important concept of shared governance and how water actions are evaluated under the Triple Bottom Line concept of sustainability. Chapters 9 and 10 explain the political and legal forces that shape how the water industry works. In this highly regulated industry, water service providers operate under the close scrutiny of regulators and with participation by a public and private support sector. The

book also discusses how the myriad of small actions work in a different legal and political environment.

Given that “beneficial human and environmental purposes” involve economic, environmental, and social impacts, chapters 6, 7, and 8 are devoted respectively to explaining how these are evaluated.

The final chapters provide an analysis of how to make TWM work better in the highly regulated and political water industry and how environmental education can improve TWM. The concept of institutional arrangements is used as an organizing concept to describe how incentives, roles and relationships, and controls on the industry can be used to make it work better.

In summary, the book explains the following:

- How TWM is a formidable challenge, and while utilities cannot take all the responsibility, they can lead in promoting shared governance and corporate social responsibility toward sustainable water management;
- The problems that create a creeping water crisis, including mega-issues such as dams, diversions, and discharges and the many hydrologic modification and nonpoint source issues;
- The principles and practices of Total Water Management and how creating a workable institutional framework for them is essential to achieve balanced environmental management;
- Roles and the circle of responsibilities and how to deal with the “it’s not my problem” syndrome;
- Requirements of sustainable water management, including big systems as well as impacts of small water systems and hydrologic modifications;
- How water is a creeping crisis, not a sudden one, and that public awareness and support for the full value of water to society are needed, as well as the critical roles of environmental education and sustainability training;
- Tools for Triple Bottom Line reporting, along with economic, environmental, and social impact assessment;
- Principles of shared governance, regional cooperation, and river basin planning as they apply to TWM; and
- How to promote social harmony and community spirit by linking environmental ethics, citizen responsibility, and stewardship to water management.

Figure 1-6 shows the elements of TWM and how they are addressed in the book.

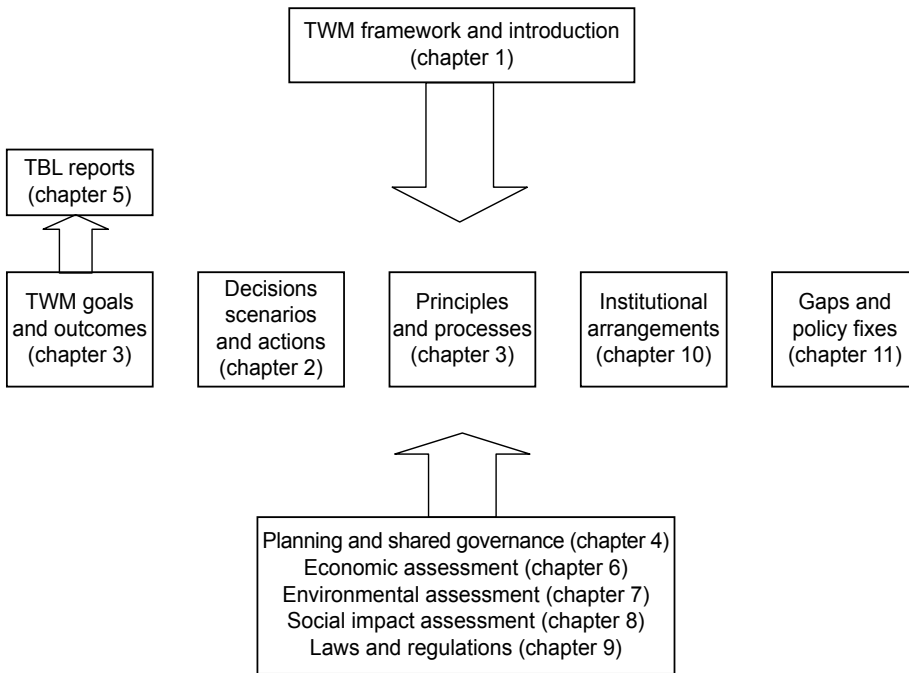


Figure 1-6. How TWM works

## How do utilities take the lead?

Given the difficulty of managing an enterprise in the first place, how could a utility do other than take care of its own customers? How could it focus on the broader public good and still perform its mission? It is not a perfect world, and no one can shoulder society’s whole load.

Actually, this question is at the heart of the long debate over the role of government in the economy. In a communist system, benefits and costs are to be spread over society, and in a dictatorship, a wise authority is to decide how to do that. In reality, neither works and we revert to democratic capitalism, which has competition and an imperfect political system. So we have to make it work as best we can.

That’s why utilities need to take a lead role in TWM. Utilities are the logical leaders for much of the work involved with TWM. They have more resources than other institutions, and they have experts who know about and care about water. However, utilities are not alone in this fight because there are plenty of leadership roles to go around.



## Summary points

- TWM is a framework for principles and practices of sustainable water resources management. It is a way to work on water problems within a democratic political system with the rule of law and a mixed public and private economic system.
- Evidence shows that TWM is needed because the capacity of the environment to bear the load may be nearing its limit. Sustainable development and management are TWM concepts for using resources wisely to preserve them for the future.
- Large water issues are controlled by permits and other government actions, but smaller actions and shared problems are more difficult to manage.
- Water utilities and organizations have challenging responsibilities that require their full attention, and it is sometimes difficult for them to focus on shared societal issues such as sustainability. Moreover, environmental issues are perceived differently by environmentalists, water managers, and citizens. Utilities should take a lead role in TWM because they have more resources than other institutions and they have experts who know about and care about water.

## Review questions

1. Define sustainable water resources management and explain how TWM fits within it.
2. Why have visionary concepts such as TWM not been embraced more widely by the water management community?
3. Which stakeholder group(s) should have the major responsibility for TWM? Why?
4. If TWM adds cost to a water utility's operations, who should bear that cost and how should it be financed?
5. Give examples of small actions that degrade water resources but are not controlled readily by government regulators.

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