

WATER RESOURCES MANAGEMENT AND POLICY

Enhancing Participation
and Governance in

WATER RESOURCES MANAGEMENT

Conventional Approaches and Information Technology



Edited by LIBOR JANSKY and JUHA I. UITTO

Enhancing participation and governance in water resources management: Conventional approaches and information technology

Edited by Libor Jansky and Juha I. Uitto



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Introduction

Enhancing public participation and governance in water resources management

Libor Jansky, Dann M. Sklarew and Juha I. Uitto

Background

Water is essential to our survival. Nonetheless, over 1 billion people today cannot obtain enough clean water to meet their basic human needs (UNESCO-WWAP 2003). Water scarcity plagues 27 nations, and an additional 16 nations are considered water stressed (WRI 2004). The United Nations has also identified rising demand for water as one of four major factors that will threaten human and ecological health over the next generation (UNESCO-WWAP 2003). As public health, development, economy and nature suffer, ensuring access to clean water is rising towards the top of government agendas.

Governments throughout the world face common problems in addressing the growing water crisis. They struggle to manage water in ways that are efficient, equitable and environmentally sound. Improvements in water efficiency often demand significant capital investment and legal and economic reforms – means generally beyond the capacity of members of the public directly impacted by lack of clean water. Equitable allocation and stewardship of water resources also require detailed understanding of interrelated hydrodynamic, socio-economic and ecological systems. Such knowledge is often sorely lacking among those responsible for water decisions at the local, provincial and national scales (Chapters 3 and 7 in this volume).

Critical knowledge about water management is distributed across governments, non-governmental organizations (NGOs) and the water users

themselves. Consider South Africans' constitutional right to clean water or Brazil's recent *Sede Zero* (Zero Thirst) programme (Barreto and da Silva e Luz, n.d.; South Africa 1996). Each initiative requires broad understanding: by regional water managers of basin-wide flows, by localities of gaps in rural and urban water availability, and by potentially affected users of resources from "hot spots" of degradation. To realize such water initiatives effectively, governments must solicit participation early on, then continue actively to involve numerous segments of their societies, including those most marginalized and most vulnerable to water limitation and impairment. A variety of tools are becoming available to support such efforts (see Chapters 3, 7 and 8 in this volume; Bruch et al. 2005). Regrettably, lack of awareness about these sorts of tools has severely limited their application. Hence, the world in 2005 remains far from systematic in its integration of public participation (P2) in water resources management decisions and their implementation.

The current volume aims to further global understanding of approaches and techniques for applying public participation to improve water resources management. As used herein, water resources management is the aggregate of policies and activities used to provide clean water to meet human needs across sectors and jurisdictions and to sustain the water-related ecological systems upon which we depend. In most circumstances, water management aims to address interests and integrate usage across hydrologically meaningful units, such as watersheds (all land that drains into a river, lake or aquifer, along with the body of water itself). Some management aspects, however, such as transboundary flows across multiple basins and inter-basin water transfers via channels or virtual water, may necessitate a broader geographical scope.

The International Association for Public Participation (IAP2) describes public participation as "any process that involves the public in problem solving or decision making and uses public input to make better decisions" (IAP2 n.d.). Note that this term differs slightly from "stakeholder involvement", which involves those affected by a decision as well as those able to influence its intended outcome (e.g. non-public stakeholders such as international donor agencies). By contrast, public participation aims actively to increase attention to and inclusion of the interests of those usually marginalized, e.g. politically disenfranchised minorities or poor people indirectly affected by water management (see Chapter 6 in this volume).

Principle 10 of the 1992 Rio Declaration on Environment and Development (UNCED 1992) emphasizes that environmental issues such as water management "are best handled with the participation of all concerned citizens". The Declaration urges nations to facilitate public participation through methods that increase (a) transparency, (b) participatory

decision-making and (c) accountability. These elements may be described respectively as: (a) informing people of water management issues or activities that may affect them, (b) involving the public in decision-making regarding such activities, and (c) providing those adversely affected by these decisions and activities with the means for seeking redress. This volume will address all three of these elements in the context of water resources management.

Perspectives on applying public participation to water management

This book contains the papers presented at an international symposium organized in October 2003 by the United Nations University (UNU) and Tokyo University of Agriculture and Technology (TUAT). The objective of the symposium was to identify successful mechanisms, approaches and practices for promoting public involvement in water resources management. The symposium also examined the conditions that facilitate or hinder public involvement, as well as contextual factors that may limit the transfer of experiences from one watershed to another. The works herein should be regarded as a survey of expert insights, though by no means a definitive treatise regarding this emerging field.

The text is organized into several parts. This chapter introduces a set of issues pertinent to public participation in water resources management, including a preview of the approaches addressed in subsequent chapters. Case studies in these later chapters focus on conventional approaches, information technology and IT-based approaches, and approaches involving international institutions. The book concludes with a perspective on how these various approaches might be systematically transferred and applied across a wide diversity of hydrological, socio-political and cultural contexts. As such, the final chapter serves also as the preliminary sketch for a future definitive framework for public participation applied to water resources (a substantial effort beyond the scope of the current volume).

This basic review and assessment of watershed management activities is intended to provide reliable information on lessons learned and existing gaps. Such information is much needed to justify investment in watershed management activities and to orient such activities to areas where they are most needed. The assessment and approaches were selected to respond to identified needs. The collection also takes into account the characteristics of different audiences involved in water resources management – within contexts of both national and transboundary watersheds.

Water resources management without public participation

People are often denied the right to participate in water management decisions and policies that concern them, with sometimes tragic results. For instance, large dams for water supply and irrigation have forcibly displaced tens of thousands, even millions of intended beneficiaries, across India, Mauritania, Brazil and many other places around the world. Numerous news reports also highlight how inadequate governance continues to allow industries to poison their neighbours through tainted water supplies and fish in China, Indonesia and elsewhere. Meanwhile, some governments have even intentionally used water policy to harm the disenfranchised, such as Iraq's years of draining the wetlands upon which its Marsh Arabs depended for millennia (Cohen 1997).

The brief examples above illustrate how inadequate public participation in governments' water management can result in tremendous social upheaval and the violation of the basic human rights of their citizens. How can public participation in water management have the opposite effect – providing for our basic human need for water and ensuring no thirst? Below we summarize three approaches explored by participants in the UNU symposium.

Conventional approaches

By conventional approaches to public participation, we simply mean approaches that utilize processes to inform, consult, involve, collaborate with and empower the public. These approaches may entail various levels of public participation from merely keeping the public informed to a stage where only actions that have been decided upon in a participatory manner will be carried out (see IAP2 2003). Opening Part I of this book, Syafruddin Karimi illustrates that, even with the best of intentions, governments face daunting challenges to include participatory management of water resources under conditions of limited institutional capacity and substantial spatio-temporal variability in water quantity. As communities (such as West Sumatra in Indonesia) make the transition from small traditional social structures to large, market-based societies, the collaborative management of water is further complicated by the emergence of competing water usage interests across sectors and regions.

Anthony Turton and Anton Earle's case study from southern Africa demonstrates how public participation in an international context can be equally daunting. Historical contention between international interest groups and riparian nations in the Okavango River basin was overcome, in part, by the recognition of a set of principles guiding transboundary water resources management. These include: national sovereignty in for-

eign policy, government decision makers' need for greater knowledge, and the role of scientific experts in informing water management decisions. This process also shows how scientists may perform a valuable service in developing viable options for watershed management.

Jessica Troell et al. present transboundary environmental impact assessment (TEIA) as an important methodology for encouraging public participation in water resources planning. TEIA involves testing the implications of various decision scenarios for the natural and human environment across political boundaries. As such, the timing and manner in which participatory mechanisms are incorporated into the EIA process can have a tremendous impact on the ultimate utility of the resulting water management regime. Still, participation in TEIA remains in its early stages, with much to glean from other domains of subnational and international environmental planning.

The chapters in Part I suggest that public participation processes for water governance are often practised in isolation from one another. To date, there has been little transfer of public participation practices or lessons between water management initiatives. As a result, there remain many potentially useful, though underutilized, tools (e.g. TEIA, consensus-building, joint fact-finding, visioning). Furthermore, it is often unclear how to measure and determine the success of conventional public participation initiatives.

Information technology approaches

How information technology (IT) can be utilized to promote public participation in the management of water resources is the main question tackled in Part II of the book. IT contains a range of tools and technologies that can be used to enhance the process of public participation. They may include the Internet and its various applications, as well as non-networked decision support and geographical information systems. Hans van Ginkel and Brendan Barrett focus on the vast potential for IT to enhance public participation in decision-making. They note both IT's promise, in terms of greater inclusiveness and faster response to environmental stresses, as well as its potential challenges – such as the pursuit of IT as an end instead of a means to improve participation and effective water management. Other pertinent externalities and misconceptions are also presented.

As summarized by Dann Sklarew, public involvement initiatives should be based on a set of culturally and politically relevant principles. With respect to public participation in international waters management, in particular, the International Waters Learning Exchange and Resource Network (IW:LEARN) has established a collaborative platform for the

international waters community, which is accessible on-line. IW:LEARN and its partners invite IW managers, interested members of the public and private sectors, and civil society at large to participate in the workshop series design, development and evaluation.

Srikantha Herath et al. specifically target the limited human and IT capacity of countries such as Viet Nam to collect adequate environmental data to make effective decisions. The authors have developed an Internet-based data collection and management system, built upon email and free open source software. The result is a semi-automated tool for transferring various sorts of data collected in the field – where email often is the most advanced IT available – to centralized Web servers for data management and processing. The tool has been designed to be flexible, thus easily adaptable to other environmental assessment activities in Viet Nam or elsewhere.

Kazimierz A. Salewicz outlines the recent developments in decision support systems (DSS) for use in water resources management. As DSS expands from desktop to the Internet, along with concurrent increases in IT processing and storage, there is great potential for applying DSS in real time to both long-term structural decisions (e.g. where to build a dam or channel) and short-term operational decisions (e.g. how much water to direct down various conduits). One of several challenges considered is how to meld intuitive user interfaces effectively with powerful databases and valid computational models.

These IT narratives collectively indicate an emerging “toolbox” for increasing public awareness and participation in water resources management. A common challenge will be to adapt and apply appropriate IT or ICT (information and communication technologies) tools to the specific needs of water resource managers in real time.

International approaches

As demonstrated in Part III of the book, international and regional organizations also play a vital role in enhancing public participation around transboundary water resources management. The goal is to extend public participation across political boundaries and to empower the broader public to participate in decision-making and monitoring relating to projects and actions that concern two or more countries. International financing of water management projects may catalyse the inclusion of participatory processes, as is the case with the policies of the Global Environment Facility (GEF). Alfred M. Duda and Juha I. Uitto focus on the participatory process tools that the GEF and its projects use to improve the management of transboundary waters. According to the GEF’s policy, public

involvement consists of three related, and often overlapping, processes: information dissemination, consultation and stakeholder participation. Projects across East Asian seas, the Black Sea/Danube basin and Lake Tanganyika have used information dissemination to transcend national and cultural boundaries in order to improve transboundary water management. Meanwhile, consultation with stakeholders in the Rio San Juan basin between Nicaragua and Costa Rica has involved over 100 stakeholder groups and partnerships at various scales.

Beyond specific water management projects, permanent international basin organizations also play a long-term role in promoting public participation to improve watershed management. Prachoom Chomchai echoes lessons from West Sumatra and Okavango in his examination of the challenges faced in transboundary water management within the Mekong River basin, one of the most densely populated and rapidly developing areas in the world. The Mekong provides a lifeline for over 57 million people across six countries (WRI 2003). Conflicting interests between civil society and modern development and between local and national priorities and contexts have escalated through both participatory and extra-participatory processes (e.g. protests). Thus, participatory processes alone are not sufficient, he argues. In addition, there is a need for institutional overhaul as well as rethinking of the process of international development in general. This conclusion also reaffirms findings from other basins (e.g. UPTW 2003).

Ending global thirst depends upon providing the public with a voice in water resource decisions that directly affect them. Where the public are not included in decisions that affect their welfare, the Mekong example shows that they may resist change, protest or otherwise obstruct implementation of such decisions. Donors such as the GEF may at times be crucial to the integration of public participation in water resources management across national boundaries. Nonetheless, identifying appropriate moments and mechanisms to involve the public in water resources management remains an ongoing challenge.

Those living along international watercourses, near international borders and far removed from central governments are particularly difficult to include in such decision-making. Yet, for the stakeholders, transboundary participation is also critical. Inadequate public participation in transboundary water management has been a historical factor contributing to strife between nations along the Danube River, the Senegal River, the Mekong River and Lake Chad, for instance. However, improving public participation across international boundaries also requires addressing difficult transboundary challenges (e.g. sovereign water rights; migratory populations; linguistic and cultural differences; and distinct

political, economic and legal frameworks among riparian nations). Nonetheless, public involvement, associated with ongoing reform in governance, holds the promise of improving the management of watercourses and reducing the potential for national and international conflict over water issues (see Chapters 3, 9 and 10 in this volume).

To realize this potential will require a more comprehensive understanding and systematic application of public participation processes across both national and international basins. This should begin, first and foremost, with a review of existing approaches and the tools available. Such an effort began with several workshops in early 2003 (Bruch et al. 2005; UPTW 2003). The current volume builds upon these important precursors by focusing on several specific approaches. Moving forward, mechanisms are now needed to systemize the experiences captured in these volumes and elsewhere, then transfer such guidance to those fostering public participation in water resources management around the world (see Chapter 6 in this volume).

Outstanding issues

It is clear that much progress has been achieved in water resources management, as new approaches and methodologies have been developed to promote participation across national and transboundary watersheds. Participatory processes are recognized as important in watershed management from project identification through design and implementation to monitoring and evaluation. Similarly, attention must be given to the services and benefits that participatory watershed management can provide. Watershed management is increasingly seen as an appropriate vehicle not only for environmental conservation but also for the improvement of rural and urban communities' living conditions. In this regard, there is a demand for the development of appropriate technologies, including ICT, that can ensure the sustainable development and management of natural resources involving the public.

Capacity development for participatory watershed management is one of the most needed parts of watershed development projects. In this respect, it is being recognized that there is a need for improved understanding and identification of the institutional and organizational arrangements required for effective watershed management. An appropriate legislative framework to support watershed management policies needs particular attention.

Nevertheless, several issues of concern emerge from the papers included in this volume, as well as the associated discussions in the UNU symposium. We deal with some of these below.

There is a need to define more clearly and adapt key terms to promote public participation in water governance

The role of public participation

The Rio Declaration, the GEF and IAP2 each describe key elements of participatory processes. Turton and Earle have also provided a set of participation principles related in transboundary water management in Chapter 3. Is this set of characterizations sufficient to guide practitioners?

During the symposium, Norio Okada suggested that defining factors could also include: (1) the level of public participation; (2) the process of public participation, including who initiated the process and who participated at each stage; (3) the communication platform for public participation; (4) the role of facilitation and consultation; and (5) the role of science and technology. In addition, he proposed that resources management involving local communities takes place at five different levels: (1) life in the community; (2) land use/built environment; (3) infrastructure; (4) social schemes/culture and convention; and (5) the natural environment. Each of these five spheres has its own speed of functioning, and these different levels are connected vertically and not horizontally. This way of thinking is needed in dealing with resources management so that adaptive management can be used for implementing ideas in the real world.

These various characterizations should be scrutinized in adapting a definition of public participation that is pertinent to water resources management, in particular. The result should clearly describe how public participation fits into adaptive water management regimes at local, national and international watershed scales.

Geographical scale and focus

Whereas water resources management has historically used the river or lake basin as its unit of management, the growth in population and urbanization has placed increasing pressure on water resources across multiple basins in a region (e.g. southern Africa, India, Tigris–Euphrates area, Tokyo Bay). Increasing scale from basins with millions of people to multi-basin regions of hundreds of millions may strain the capacity of any known public participation process. However, there is historical precedent for coordinated or “nested” management of basins at various scales (e.g. the North American International Joint Commission, Turkish–Syrian water management agreements). These may point to a future, multi-tiered approach to involving the public in managing their water resources.

Although groundwater accounts for about half of current potable water supplies, 40 per cent of the demand of self-supplied industry and 20

per cent of water use in irrigated agriculture (UNESCO-WWAP 2003), this fact is largely neglected in water resources management discussions. It is also important to bear in mind that the dimensions of groundwater aquifers are often uncertain and frequently cross jurisdictional and international boundaries. This lack of knowledge further complicates raising awareness and promoting public involvement. Still, such participation is crucial to ensure that these often slowly recharging systems are neither permanently depleted nor polluted beyond further use by those who depend on groundwater.

Scope of involvement: The public or stakeholders?

On a case-by-case basis, it is equally important to clarify whether participation is aimed at the public-at-large or at more specific interest groups, including non-public stakeholders. Stakeholders are often seen as only the people living in specific project areas. However, successful water resources management should ideally from the outset consider all people and institutions directly or indirectly affected by the project (though, practically speaking, not all stakeholders can be consulted directly). These would thus include, for example, sectoral ministries and government agencies not directly involved in the project but affected by its results. Whether and how to involve stakeholders physically outside the area of affected water resources are fundamental questions whose answers vary from case to case. Without such clarity, however, it would be difficult to determine success.

It is equally important to learn from local people, to respect different attitudes and experiences, and to seek out win-win situations based on such learning. Even in the twenty-first century, there continues to be a strong need for respected experts and decision makers to solicit and accept the different viewpoints of the affected public. These public stakeholders are, in fact, experts in their own right on the quantity, quality, usage and habitat associated with their personal and community water resources. With finesse and some luck, integrating local interests – sometimes viewed as parochial or self-serving – with other broader interests can result in the discovery and pursuit of a better, shared vision and strategy for collective benefit.

Measures of successful public participation

Monitoring and evaluation indicators are frequently used to measure the progress and impact of water resources management activities. Such indicators of success are also needed to track the success of public participation as it contributes both to water management as well as to broader societal goals, such as good governance. Specific public participation indicators should measure both progress (e.g. the development of and timely

adherence to a stakeholder involvement plan, broad acceptance of a collective “watershed vision”, the creation of basin-wide citizen advisory committees, etc.) and its impact (e.g. the public are generally satisfied with the result, or indicate being better off thereafter). Duda and Uitto have shown in Chapter 9 how transparent monitoring of indicators can also enhance public participation, increase the accountability of authorities and lead to a better performance and compliance with agreed norms.

As The Access Initiative (TAI) notes, “transparent, participatory, and accountable governance [is] an essential foundation for sustainable development” (TAI n.d.). TAI’s standardized qualitative approach to tracking governments’ progress towards realizing Rio Principle 10 could be adapted and applied to the water resources management domain. When linked to a clear vision or description of success, ongoing measures of such indicators will be key to determining the overall success of the public participation process.

There is a need for greater focus on institutional issues to ensure effective water resources management

Different countries are at different stages of development. Some countries are still struggling with basic infrastructure, whereas others have progressed to a need for greater institutional reform and capacity development. Within the span of countries at different stages of development, there may be valuable opportunities to work together and to exchange experiences and lessons in order to solve problems related to their water resources. Institutional development is especially important in terms of land tenure, economic, legal and policy reforms. All are crucial for effective community-level participation in water resources management.

During the symposium, Dann Sklarew stressed the need for trans-boundary legal frameworks and institutions to determine when and how to integrate public participation into design and implementation. How can momentum be maintained despite changes over time in the role of public participation as well as the make-up of those involved in water resources management for a given basin or area?

Since each river basin is unique, it may be difficult to transfer experiences from one place to another. In the case of sub-Saharan Africa, in particular, such transference is compounded by the fact that many countries are still proceeding from conflict situations to an absence of hostility and to ongoing peace. For instance, although the GEF Lake Tanganyika project was developed concurrent with the Rwandan genocide, it was only after violence had subsided a bit that riparian states were able to sign the resulting Convention. In this and other regions, an evolution in

national governance and international relations is a crucial prerequisite for effective water resources management.

Public participation may provide the means for making the transition from dependence to empowerment

Based on her experiences on the Rio San Juan in Costa Rica, Hiromi Yamaguchi drew attention during the symposium discussion to how the term “public participation” is often viewed sceptically in developing countries. This phenomenon is also cited by Anthony Turton here. In some instances, local people and government officials may cynically consider “public participation” to be a key to getting more funds from donor agencies.

Experience also shows that foreign aid from donors can lead to a culture of dependence on the part of recipient countries. Fortunately, developing formal processes for public awareness and participation can be an effective means to increase local ownership, thereby laying the basis for locally sustained stewardship of water resources. Moreover, active oversight by donors and civil society may also ensure that water resources management projects and basin organizations are not spoiled or co-opted by corruption.

Determining appropriate roles for new technologies

Naruemon Pinniam Chanapaithoon emphasized during the symposium discussion that most or all new knowledge and technologies search for the same solution: how to allocate limited resources to all inhabitants in a fair and sustainable manner. This is the case for any resource, be it fresh water, food, clean air or fuel. The trick, as van Ginkel and Barrett emphasize in Chapter 5, is that new technologies are applied to meet such needs with conscientious attention to the externalities of such application.

Environmental impact assessment

Environmental impact assessment (EIA) has become an important and widely used tool. It is essential that EIA be used appropriately, not just as a rubber stamp for development projects. There have been many cases where EIA has been the only review mechanism applied and at only one point in time during project preparation. Once the EIA was completed, the project proponents have felt that they have fulfilled the review requirements and proceeded with the project. Those affected by the process are henceforth ignored. As a result, many people in developing countries see EIA as a negative governmental tool. Public perception and ongoing

participation are very important to long-term success. EIA must become a continuous process that involves the local stakeholders who will be affected by the project in the overall, iterative process of water resources management.

Furthermore, in basins that span national or international jurisdictions or that cover multiple basins owing to long-distance water transfers, as mentioned above, tools such as the transboundary environmental impact assessment must be further developed and applied consistently across jurisdictions.

Information technology

We live in an era of information technology, and those who can access more information and know how to utilize it and make benefit of it wield increasing power. Therefore, what is crucial today is not only a fair distribution of resources but also equal chances for people to acquire information to use those resources appropriately. Although the Internet provides a powerful medium for collecting and disseminating information, over-reliance on computers for public awareness may limit participation to those on the “virtual” side of the so-called “digital divide”. It is thus important that the Internet be leveraged to communicate with stakeholders beyond the computer *literati*, including people without any direct access to IT.

The public have a right to know the assumptions, costs and benefits of water resource decisions that affect them, through government transparency and accountability. In order to become useful information, data should be unbiased and undistorted before reaching their audience. In developing countries in particular, quality – as well as quantity – of data issues becomes critical. Such quality does not always come cheaply. Getting good enough data sufficient for decision-making in developing countries is often difficult, so one must be very careful about the kinds of conclusion that can be drawn and the decisions to be made. On the other hand, the choice is often between using inadequate data or no data at all. In such cases, the public must be informed (in understandable language) of the limitations of the data available and the resulting assumptions used by decision makers.

Geographical information systems

Geographical information systems (GIS) are recognized as very powerful tools for decision-making. GIS can be used to examine different problems, proposals, ideas, etc., in the quest for effective water management decisions. The quality of data is very important because that affects the answers that we get to the questions posed. It is important to bear in mind that GIS and other information technologies are only tools, and

there is a risk of their oversimplifying the problem-solving process, i.e. assuming that just applying GIS technologies will solve the problems.

GIS and other information technology tools can be powerful in providing an improved basis for decision-making, but they cannot offer a panacea. It is essential to understand that the choice of actions to be followed must be based on a careful analysis of the social, cultural, political and economic factors, and that the choice is ultimately political in nature.

Developing countries often do not have sufficient financial resources to make use of sophisticated technologies. In fact, funds are often too limited to use the modern technologies and expertise common in more prosperous countries. It is thus important that the tools alone are not allowed to determine the agenda. Information technology should be used appropriately for different cultural contexts and available media, rather than trying to use sophisticated tools where they cannot be operational.

After examining various approaches, water resource managers must then select and integrate

Traditional and information technology approaches are both useful and complementary in promoting improved public participation in water resources development. Traditionally, access to information that enables decision-making has been limited to very narrow lines of professionals and administrators. Today, thanks to technological development, information has been made more accessible to a wider range of people (although more is obviously still needed). Now the question is how to use that information properly.

Government bureaucrats and policy makers for a given body of water may change over time. When talking about global water resources, however, stakeholders are not only the people in a certain region; all of us around the world are affected. Even with the help of various decision support systems to cope with a huge amount of complicated data, water policies and plans cannot be implemented successfully without the cooperation of the public as a whole. The tools cannot give the whole correct answer if the input is wrong from the beginning, if the analysts cannot distinguish the cause and the impact of what they are doing, or if the analysis does not lead to any reliable alternatives useful for the society. Therefore, learning how to use a tool is only one step in a process that must include how to apply it effectively and make use of it properly.

Similarly, we must continue to learn and transfer successful approaches to involving the public in water management decisions that affect them at local, national, regional and global scales. As populations grow and migrate over time, such broad inclusiveness is critical to early warning and rapid response to emerging water concerns. Only then will we collectively

be able to manage Earth's water efficiently, equitably and ecologically and at the same time ensure clean water for all humanity.

It is recognized that significant progress on participatory watershed management approaches and methodologies has been achieved in different places in the world. An important challenge will be the dissemination and exchange of information about achieved success and lessons learned between institutions within the same country and across basins involving one or more countries.

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Tel: +81-3-3499-2811 Fax: +81-3-3406-7345
E-mail: sales@hq.unu.edu general enquiries: press@hq.unu.edu
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Edited by Libor Jansky and Juha I. Uitto

Contributors:

Libor Jansky,
Juha I. Uitto,
Syafuddin Karimi,
Anthony R. Turton,
Anton Earle,
Jessica Troell
Carl Bruch, Angela
Cassar, Scott Schang,
Hans van Ginkel,
Brendan Barrett,
Dann M. Sklarew,
Srikantha Herath,
Nguyen Hoa Binh,
Venkatesh Raghavan,
Nguyen Dinh Hoa
Nguyen Truong Xuan,
Hoang Minh Hien,
Kazimierz A.
Salewicz,
Alfred M. Duda,
Prachoom Chomchai

This book aims to further global understanding of approaches and techniques for applying public participation to improve water resources management.

Water resources management is the aggregate of policies and activities used to provide clean water to meet human needs across sectors and jurisdictions and to sustain the water-related ecological systems upon which we depend. Knowledge that is crucial for water management is distributed across governments, non-governmental organizations and the water users themselves. In most circumstances, water management aims to address the interests of and integrate usage across hydrologically meaningful units, such as watersheds. Some management aspects, however, such as transboundary flows across multiple basins and inter-basin water transfers via channels or virtual water, may necessitate a broader geographical scope. In this book, the authors identify successful mechanisms, approaches and practices for promoting public involvement in water resources management, including both conventional approaches and those based on information technology.

Libor Jansky is Senior Academic Programme Officer in the Environment and Sustainable Development Programme at the United Nations University, Tokyo, Japan. **Juha I. Uitto** is Senior Monitoring and Evaluation Coordinator at the United Nations Development Programme's Global Environment Facility Unit, New York, USA.

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