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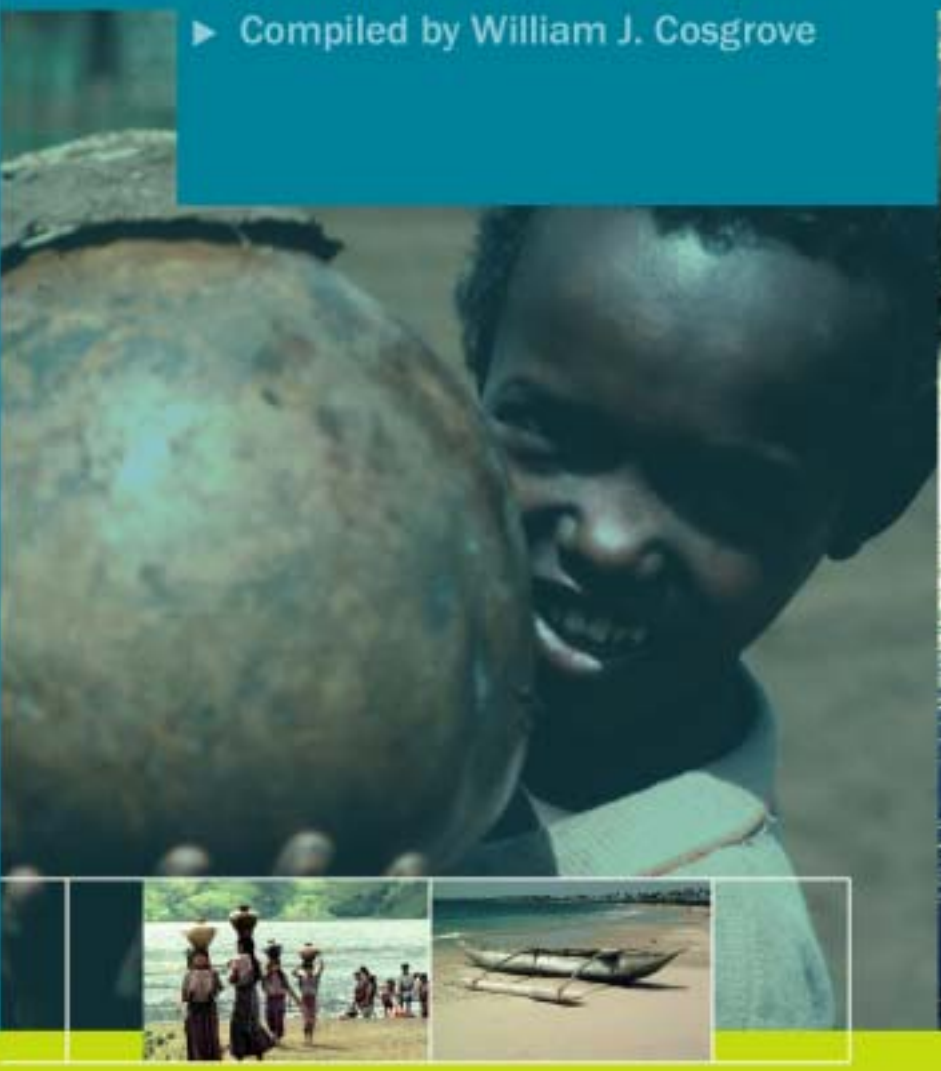
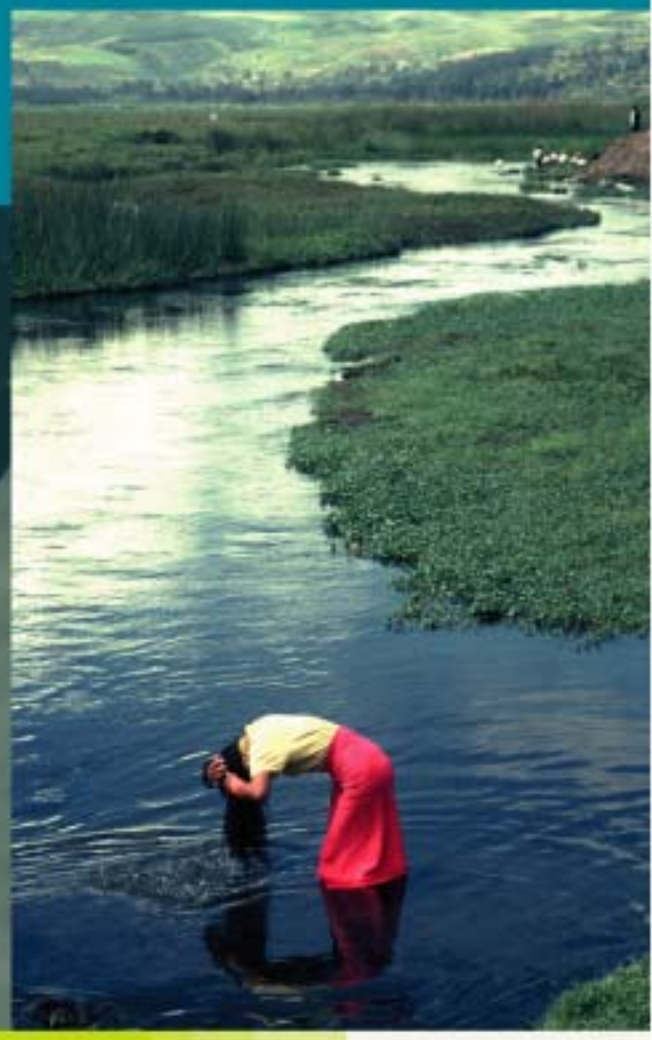
Water Security and Peace: A Synthesis of Studies Prepared under the PCCP-Water for Peace Process

▶ Compiled by William J. Cosgrove





UNESCO | IHP | WWAP
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1. Frederick M. Lorenz, *The protection of water facilities under international law*, UNESCO-IHP, 46 p.
2. Sergei Vinogradov, Patricia Wouters and Patricia Jones, *Transforming potential conflict into cooperation potential: The role of international water law*, UNESCO-IHP, 106 p.
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22. Jerome Delli Priscoli, *Participation, consensus building and conflict management training course*, UNESCO-IHP, 179 p.
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WATER SECURITY AND PEACE

A synthesis of studies prepared under the PCCP–Water for Peace process

(An UNESCO–Green Cross International Initiative)

Compiled by William J. Cosgrove[1]

1. William J. Cosgrove is President of Ecoconsult Inc., Montreal, Canada, Vice-President of the World Water Council and Consultant to UNESCO throughout the PCCP–Water for Peace process.

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ACKNOWLEDGMENT

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This report is based on a number of thematic and basin studies prepared under the PCCP – Water for Peace (PCCP–WfP) process. They are being published as UNESCO–IHP technical documents – PCCP series.

On the history and future of water resources:

Fekri Hassan, *Water for Peace: A Cultural Strategy* and *Water Management and Early Civilization*
Martin Reuss, *Historical Explanation of Water Issues*
Christoph Bernhardt*, PCCP Processes in History: The Model of the Upper Rhine Region*
Aaron Wolf, *Conflict and Cooperation: Survey of the Past and Reflection for the Future* and *Summary: The History and Future of International River Basins*
Julie Trottier, *Water Wars: The Rise of a Hegemonic Concept* and *The Need for Multiscalar Analyses in the Management of shared water resources*
Pieter van der Zaag and Jennifer Mohamed-Katerere, *Untying the "knot of silence": Making Water Policy and Law Responsive to Local Normative Systems*

On international water law:

Frederick Lorenz and The International Water Academy, Norway, *The Protection of Water Facilities during Armed Conflicts*
Patricia Jones, Sergei Vinogradov, and Patricia Wouters, *Transforming potential conflict into cooperation potential: The Role of International Water*

On systems analysis:

Institute for Catastrophic Loss Reduction (K. D. W. Nandalal and Slobodan Simonovic), *State-of-the-Art Report on Systems Analysis Methods for Resolution of Conflicts in Water Resources Management*
Sree Sreenath, Ali M. Vali, and Gundo Susiarjo, *An educational tool to examine the development constraints in the Limpopo River*

On techniques of negotiation, mediation and facilitation:

Yona Shamir, *Alternative Dispute Resolution Approached and its Application*
Branko Bosnjakovics, *Negotiation of International Conventions*
Philippe Barret and Alfonso Gonzalez, *Société civile et résolution des conflits hydriques*

Case studies:

UNESCAP, *Mekong Case Study*
Viktor Dukhovny and Vadim Sokolov, *Aral Sea Case Study*
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Uri Shamir, *Negotiation over the Jordan Basin*
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Stefano Burchi and Melvin Spreij, *Institutions for Water Related Management*

On education:

Oregon State University*, The Universities Partnership for Transboundary Waters*

Jerome Delli Priscolli, *Participation, Consensus Building, and Conflict Management training course*
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On indicators of water conflicts:

Aaron T. Wolf, Shira B. Yoffe, and Mark Giordano, *International Waters: Indicators for Identifying Basins at Risk*
Pal Tamas, *Water Resource Scarcity and Conflict: Review of Applicable Indicators and Systems of Reference*

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ACRONYMS

ADR	Alternative or Appropriate Dispute Resolution Mechanisms
CUSW	Cebu Uniting for Sustainable Water
DSS	Decision Support System
ECE	UN Economic Commission for Europe
ESCAP	Organisation for Security and Cooperation in Europe
GCI	Green Cross International
GEF	Global Environment Facility
GIS	Geographical Information System
GWP	Global Water Partnership
IBWC	International Boundary and Water Commission (United States–Mexico)
ICC	International Criminal Court
ICJ	International Court of Justice
IJC	International Joint Commission (United States–Canada)
ILA	International Law Association
ILC	UN International Law Commission
IUCN	International Union for the Conservation of Nature
IWA	International Water Association
IWC	UN Convention on the Non-Navigational Uses of International Watercourses (1997)
IWRA	International Water Resources Association
IWRM	Integrated Water Resources Management.
NEWAH	Nepal Water for Health
OKACOM	Permanent Okavango River Basin Water Commission
OMVS	Organisation pour la Mise en Valeur du Fleuve Sénégal
OSCE	Organization for Security and Cooperation in Europe
PCA	Permanent Court of Arbitration
PCCP	From Potential for Conflict to Cooperation Potential
RBO	River Basin Organisation
SADC	Southern African Development Community
SIWI	Stockholm International Water Institute
TVA	Tennessee Valley Authority
UNECE	United Nations Economic Commission for Europe
UNPO	Unrepresented Nations and Peoples Organizations
WEF	Water Environment Federation
WfP	Water for Peace
WSSD	World Summit on Sustainable Development
WTO	World Trade Organisation
WWAP	World Water Assessment Programme
WWC	World Water Council
WWDR	World Water Development Report
WWF	World Wildlife Fund (Worldwide Fund for Nature)
ACC-SCWR	Subcommittee on Water Resources of the United Nations Agency Coordinating Committee

PROLOGUE

The UNESCO–Green Cross Initiative

Our rivers and aquifers are the life-blood of the planet and must be shared among all that need them, and protected from the effects of conflict and over-exploitation.

In the past hundred years, the global population has tripled while demand for water has increased sevenfold. The signs of a looming water crisis are evident. Since water is essential to every aspect of life, this crisis affects everything – from health to human rights, the environment to the economy, poverty to politics, culture to conflict. Just as water defies political boundaries and classification, the crisis is also well beyond the scope of any individual country or sector, and cannot be dealt with in isolation.

Sustainable water resources development and management are major challenges of the immediate and long-term future. An increasing number of states are experiencing permanent water stress, yet in most cases, mechanisms and institutions to manage disputes over water resources are either absent or inadequate. Competition over this precious resource could increasingly become a source of tension – and even conflict – between states and sectors. But history has more often shown that the vital nature of freshwater provides a powerful natural incentive for co-operation.

> Fierce national competition over water resources has prompted fears that water issues contain the seeds of violent conflict. . . . If all the world's peoples work together, a secure and sustainable water future can be ours.
>
> (UN Secretary General Kofi Annan, World Water Day 2002)

However, many long-standing water-related disputes still remain unresolved, and the growing demand for finite freshwater resources heightens the risk of future conflicts developing. The need for integrated, cooperative solutions is particularly urgent in the 263 river basins that are shared by two or more states, and in which nearly half the territory and population of the world are located.

In the absence of strong institutions and agreements, changes within a basin can lead to conflict. When major water projects proceed without regional collaboration, they can become a flashpoint, heightening tensions and regional instability, and requiring years or even decades to resolve. Regional peace, economic development and cultural preservation can all be strengthened by states cooperating over water.

UNESCO and Green Cross International have joined forces in response to this growing threat, by launching their joint *From Potential Conflict to Co-operation Potential: Water for Peace* programme in 2001 to promote peace in the use of transboundary watercourses by addressing conflicts and fostering cooperation among states and stakeholders.

> Water has the power to move millions of people – let it move us in the direction of peace.
>
> (Mikhail Gorbachev, President, Green Cross International)

The *PCCP: Water for Peace* programme is guided by the principal goals of UNESCO and Green Cross: to nurture the idea of peace in human minds, and to prevent and resolve conflicts arising from environmental degradation, mismanagement and injustice. This programme is Green Cross and UNESCO's contribution to the United Nations' *World Water Assessment Programme.*

PCCP: Water for Peace provides a valuable channel of communication, joint analysis and transparency between governments, the scientific sector, local people and non-governmental organizations, essential to the task of finding mutually beneficial solutions to water-related conflicts. *PCCP: Water for Peace* is essentially a human and institutional capacity-building and information program.

The program has sought answers to two questions. What is preventing the political will, active public participation, empowered institutions and investments needed to avoid conflicts and achieve cooperative basin management? How can these obstacles and conflicts be overcome?

On the ground activities and research carried out by the program teams were the backbone of this program. Invaluable guidance and insight into these questions also was provided at the international conference on *From Conflict to Cooperation in International Water Resources Management: Challenges and Opportunities* held by UNESCO and Green Cross in Delft in November 2002. Several hundred experts, government officials, international organizations, academics and NGOs gathered in Delft for three days of intensive debate aimed at identifying practical ways of shifting the balance from conflict to cooperation over the use and management of the world's hundreds of shared surface and underground watercourses.

All of these shifts involve an important value and perception change. Stakeholders move from seeing water as a commodity to be exploited, often at the expense of one's neighbors and the environment, to seeing a region's water as a shared and fragile resource to be used for the benefit of all peoples and as an avenue towards greater cooperation and trust.

Cooperation over water can be seen as an opportunity for some, and as the only possible salvation from severe water crises and even conflict for others. The key to both components of the *PCCP: Water for Peace* program is to encourage the realization that everyone stands to gain from cooperation over water. The first steps are what are often missing. These include the establishment of relations among water experts and policy makers from the different riparian states and regions; the awareness of the public and local decision makers; the existence of mutually accepted and equitable agreements and treaties; and the setting up of joint institutions and mechanisms. It is therefore on these areas that the program activities and recommendations have concentrated.

Some say that future wars will be fought over water, not oil. Others, more optimistically, say that history teaches us that people cooperate over water rather than fight over this life-giving resource. This report analyses many dimensions of the issue, and in conclusion sides cautiously with the optimists. It is hoped the joint initiative of UNESCO and Green Cross will facilitate, guide and inspire greater cooperation in the sharing of water resources around the world.

1. WATER SECURITY AND PEACE

1.1. Competition for Water

There have always been shortages of water in some places on earth at some times. Whenever this happened where there were people, there was competition for water and sometimes conflict. But humans always learned to adapt or cope, sometimes by moving. At first people followed the water, settling near rivers, lakes, and springs, and moving to others if these dried up because of climate variability. As our technology evolved, people moved the water to them by building reservoirs, aqueducts, and pumping stations. However in the past hundred years our population has mushroomed and large cities and megacities have developed. Water consumption has risen to feed us, quench our thirst, and supply the industries that feed our economic growth. Pollution loads have outstripped the capacity of our ecosystems to respond. Locally and regionally, competition for water is increasing. To this must be added the threats to regional and global ecosystems caused by anthropogenic and natural climate change.

Conflicts over water could be looked upon as consisting of three key spheres: hydrosphere, economic, and political. There is a strong potential conflict between the ecosystem's needs for water and human needs. Even within the context of human needs, conflicts over water are often affected by problems in the economic and political spheres as much as those generated within the water sphere itself. Similarly, problems in the water sphere may lead to conflicts or disputes in the other two spheres. Inequities are increasing between the rich who can afford to cope and the poor who cannot. Earth may have neared a point of discontinuity in human civilization.

This has led some to claim that water wars are inevitable. A counter-movement claims that learning to cooperate in sharing water will build peace. The World Water Vision exercise concluded that the planet does not suffer from a shortage of water, but from mismanagement of this precious resource. UNESCO and Green Cross International (GCI), two institutions devoted to peace, have undertaken this program of activities to determine how serious the problem is, whether conflict can be avoided, and – assuming that it can – how to build the capacity to assure this will happen.

1.2. From Potential for Conflict to Cooperation Potential (PCCP) and Water for Peace

1.2.1. Background

UNESCO developed its PCCP program (From Potential for Conflict to Cooperation Potential) to address the challenge of sharing water resources primarily from the point of view of governments, and to develop decision-making and conflict prevention tools for the future. The target audience of the PCCP program was governments, their officials, water professionals and the related academic community. Through its Water for Peace project, GCI aims to enhance the awareness and participation of local authorities and the public in the integrated management of water resources, and conflict resolution through more effective dialogue between all stakeholders. The joint "Water for Peace" program of UNESCO and GCI addresses the obstacles, identifies the incentives, and promotes the means to achieve integrated, equitable, and sustainable development across the world. By joining forces, they are reaching a wider constituency and forging more effective links between and among governments and local authorities, the private sector, academics, scientists, water professionals, and civil societies.

One of the critical aims of water management is to continually reconcile the competing interests of all water users, be they individuals, corporations, interest groups, administrative or sovereign entities. The management of water-related conflicts, confrontations, competitions, and cooperation is thus a part of water resources management in its broadest sense. This may range from overseeing peaceful cooperation between users of a resource to facilitating negotiation of disputes between sovereign states. All elements of the PCCP program were conceived with the idea that although shared water resources may be a source of conflict, their joint management should be strengthened and facilitated to promote cooperation between the users.

1.2.2. Some Comments on Terminology

As the population grows in a watershed or region, there is increasing *competition* for the finite resource that is water. There is competition between allocations for human use (e.g. drinking water and sanitation, energy production, irrigation, industrial use). There is competition between these uses and water needed for environmental sustainability, and sometimes to respect cultural values. This competition brings with it *tension,* which in turn may lead to *conflict* among users. If this conflict cannot be resolved peacefully, it leads to *disputes* that may be resolved legally to avoid *armed conflict* or even *war.* In this report these terms are used in this ascending order of degree of seriousness.

Freshwater flows (whether surface water or groundwater), and the lakes and wetlands which some of these flows may pass through, derive from, or terminate within, are described by some as *watercourses.* Others who believe that this term should cover the full extent of the hydrologic basin and all its water sources reject this and use the term *rivers.* This report uses the two terms interchangeably, intending that either be interpreted in the broadest sense.

There is debate about the term to be applied to freshwaters whose basins are situated within the borders of more than one state. Some use the word *international* for this purpose. Others believe this is incorrect as it implies that the waters (as in seas) do not belong to any state, whereas the basin states have rights over such rivers. Some use *transboundary rivers or watercourses*, while others hold that this is confusing because many river channels form international borders without crossing them (although in these cases the river basins themselves will almost certainly be transboundary). Transboundary rivers may be interpreted to include those that cross intra-national (e.g. state) borders, not only international borders. This is the case in countries that are federations of states or provinces (e.g. Canada, India, Germany, Russia, and the United States). Others use the term *shared rivers.* Yet it might be argued that shared rivers can exist even within a state, because many users share them, upstream and downstream, urban and rural. This report uses the term *transboundary,* hopefully distinguishing in the text whether it refers to international or intra-national boundaries.

Some may note that there are several sections of this report that deal with the management of water at a national and even community level where there are no administrative boundaries involved. While the focus of the report is on transboundary watercourses, even within states there may be conflicts between competing uses and users. They are included in this report partly because lessons learned from these situations may be applicable to transboundary watercourses. More importantly, good water management institutions and practices at this level can facilitate cooperative management of transboundary watercourses.

1.2.3. Outline of this Report

The program has been designed with the overall objective of helping the parties involved in potential water conflicts to negotiate the way towards cooperation. It analyzed historical experiences and reviewed legal, negotiation, and systems analysis tools and their ability to solve water-related conflicts. Case studies of successful cooperation and other educational material were developed. Another component of the project was aimed at developing skills and methods of facilitating open discussions and other similar mechanisms.

The program's overall objectives were translated into five operational objectives that have guided the three tracks of the project. These are:

- defining and surveying conflicts in water resources management
- monitoring indicators of potential conflicts (PC) and cooperation potential (CP)
- developing educational material targeting all respective levels
- providing decision support tools, by indicating how best to transform PC into CP
- disseminating results and good practices.

Activities were carried out along three major tracks in order to achieve its above mentioned objectives (see Figure 1).

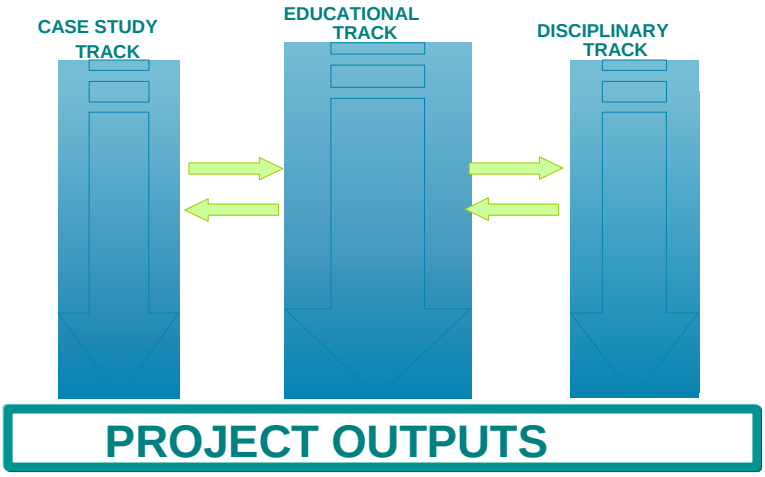


Figure 1. Structure of the PCCP program

- A disciplinary track investigated the professional approaches as well as the scientific background to conflict management, water-related negotiations, and cooperation building techniques and methods.
- A case-study track surveyed and analyzed a selection of real-world water conflicts, in order to draw lessons on both the root causes of such conflicts and the successful use of cooperation in shared water resources management.
- An educational track concentrated on how to develop skills for successful management of shared resources, at all levels from professionals to decision makers. This track also studied public information needs.

The Water for Peace activities centered on practical projects in six international river basins: the Danube, the Jordan, the Okavango, La Plata, the Volga, and the Volta. These locally managed projects have worked to raise awareness and identify solutions to disputes and conflicts by facilitating dialogue between citizens, governments, local authorities, the private sector, and water experts from the different basin states. One major objective of the Water for Peace project has been to ensure that civil society is

actively engaged in the process of developing agreements and solutions as to how to share water, and the benefits of water, in the basins in which they live. From these six very different river basins, lessons and tools have been identified which can be applied to shared river basins across the world.

Synergies were developed between the tracks, and information developed in the other two tracks was fed to the educational track. Through cooperation between the teams of UNESCO and Green Cross, learning from both programs was integrated.

Target groups for whom the learning of "Water for Peace" is intended include institutions and individuals that manage shared water resources. These include governments, donor and funding agencies, educators at all levels, and professionals of water management institutions, including current and future decision makers. The integrated process is referred to in this report as the PCCP – Water for Peace (PCCP–WfP) process.

The many reports from the disciplinary, education, and case study tracks are being published separately as a series. Some of them are referenced in footnotes to chapters in this report. All of them are listed in the References section of this report.

1.2.4. This Report

The PCCP program was conducted under the World Water Assessment Programme (WWAP) of the UN-Water. Some of the information it gathered will appear in the chapter "Sharing Water" of the World Water Development Report (WWDR). The first issue of the WWDR, prepared under WWAP by the UN agencies working in the field of water, will be released on World Water Day (March 22) at the third World Water Forum in Kyoto. Only the material appearing in the WWDR that is needed to provide context and continuity has been reproduced here.

The report is organized to provide its main messages in sequence as described below.

Chapter 2, "A History of Humanity and Water," illustrates the assertion made in the background section above that humans have indeed always had water problems. This has led to the hegemonic definition of water wars as inevitable. Sometimes there has been conflict in the short term, but humans have always adapted in the long term. Now the scale of challenges faced is at least an order of magnitude greater than any known in the past. Yet history shows cases of great looming disasters that were resolved by wise men and women.

The following chapter, "Ethics: The Ideal and Only Long-Term Solution," describes how ethics influence our behavior. It proposes that societies adopt and teach their children a system of moral principles for individual, community, and international behavior based on the shared fundamental human values of justice and equity.

"Legal Approaches: A Sound Framework" (Chapter 4) recognizes that legal principles are ultimately based on moral principles. But they are difficult to apply and do not always lead to sustainable solutions. Those related to water are still in their infancy. Yet they do provide a framework against which negotiations to find cooperative mechanisms and solutions may take place.

In Chapter 5, "Trends: Emerging Issues and Opportunities for Cooperation," we look at the many emerging trends in today's world. There is a tendency to look at them as negative, but they also bring opportunities. For example, unregulated free markets can hurt poor countries and poor people if they are driven by the sole interest of corporate profits; or they can ensure that those living in poor water-scarce countries have access to food they can afford by ensuring that they have access to markets where they can sell the goods they can produce to earn the needed foreign exchange to buy the food. Other trends that similarly have two sides to them are international relations in the post cold war era, changing technologies, societal

changes (social and economic order), transcultural and transnational civil society, climate change, and environmental and human crises (floods, droughts). The migration of production sites to lower-cost economies can also provide opportunities for developing countries, but must be properly managed to prevent negative side effects. The optimal benefits of all of these opportunities will only occur in a world of peace and trust.

One of the most important trends affecting the management of water is the theme of Chapter 6, "Emerging Trends: Public Participation and the Role of Civil Society." Citizen groups all over the world are demanding and sometimes gaining the right to participate in decision making that directly affects their lives and livelihoods. As a consequence, the principle of subsidiarity, under which decisions are made and actions are implemented at the lowest level capable of carrying them out, is becoming widely accepted. This is of great importance when it comes to water, which can only be managed locally.

The foregoing would seem to point to the approach we should take, but it will not be easy. Chapter 7, "Obstacles to Cooperation," notes that the challenges faced include potential for socioeconomic political disturbances; poverty and socioeconomic underdevelopment; lack of information; inequalities in water allocation, knowledge, and military force; geographic advantages; and the weakness of globally ratified laws and conventions, especially enforcement mechanisms. The water sector also suffers from weak institutions (including lack of democracy and good governance, lack of political will, relative lack of trained human capacity, and lack of financing and other support for the development of institutions).

Decision makers cannot act everywhere at once. It will therefore be useful to identify those places where action can head off potential conflict and build the capacity of enduring institutions. Much research has already been done to identify the factors that should be included in such indicators. These are discussed in Chapter 8, "Indicators of Potential for Cooperation."

"What We Have Learned from Recent Experience" is the subject of Chapter 9. Examination of experience in sharing water, especially transboundary waters, has taught us many lessons. Examples from several basins studied show that cooperation is an iterative process that begins with sharing information and getting to know each other in order to build trust and confidence. In the end, though, institutions with clear mandates must be created for efficiency, effectiveness, and sustainability.

Institutions are more than organizations. They consist of all the formal and informal practices that determine our behavior. They exist from the community to the national and international level. They reflect the ethics that are shared at each level. These are discussed in Chapter 10, "The Critical Role of Institutions." Changing institutions means changing value systems and therefore takes time, perhaps generations. Some of the problems faced cry out for faster solutions.

The PCCP–WfP exercise has identified several tools and mechanisms that can be used to develop trust and build institutions that can secure cooperation. These are described in Chapter 11, "Means and Tools for Managing Shared Water Resources." Some of these are related to developing shared values that support justice and equity. Some are related to improving processes of conflict avoidance and resolution. They include mixtures of building human skills and using the latest technology.

History and a review of experience in the past century both demonstrate that it is possible to manage the scarce resource that is water so that all benefit in a just and equitable manner. There are still many challenges ahead that emerge from changing global physical systems and evolving socioeconomic and political systems. However, as seen above, the PCCP–WfP process has identified a number of tools and mechanisms that will build the capacity and resilience needed to cope with these challenges. The exercise has also identified future actions to add to our toolbox.

Chapter 12, “Epilogue,” demonstrates that there is every reason to hope that the next generation will live in a world with water peace.

The report concludes with a chapter listing selected reference material that served for preparation of the volumes in the PCCP Series.

2. A HISTORY OF HUMANITY AND WATER

2.1. Water Wars and Water Peace: Hegemonic Concepts in Water Discourse[1]

The complex relationship between humanity and water is shaped ultimately by the interplay of ideas expressed through various media of communication to engender and perpetuate certain actions (or inaction). In the current discourse on water, the idea that the coming wars will be about water, and the counter idea that water could lead to cooperation and peace instead of leading to conflict, have emerged as "hegemonic" concepts.

2.1.1. Translating Ideas into "Common Sense"

In a state society, the kind of society most of us live in today, individuals belong to various social groups with varying degrees of influence and power over each other. Such groups include the governing ruling elite, the government functionaries, representatives of the public in government, civic organizations, professionals, religious leaders and their communities, media corporations, journalists and reporters, the military, and the financial, industrial, and commercial enterprises. A social group can become dominant and gather state power into its hands only if it succeeds in developing its hegemony within society. It does this by persuading the other groups to accept the values and ideas it propagates and by building a network of alliances based on these values and ideas. The hegemony of the dominant group is therefore very much ideological in nature. The dominant group generates what others will uncritically take for granted as self-evident "common sense."

2.1.2. Hegemonic Concepts of Water

It is fair to say that the idea of water as a basic human right is well entrenched as a hegemonic concept around the world. The hegemonic concept of water and food as basic human rights has given rise to another concept: "water development." As humans have a basic right to food and water, "water development" would bring clean water to them for their domestic use and allow the development of irrigation to provide food.

Sometimes the water available is not sufficient to satisfy the needs under these two hegemonic concepts. One commonly held idea is that this is liable to lead to conflict or even war over water. A newly emerging view sees it as leading to cooperation and peace. Protagonists of both ideas are trying to influence civil society and the decision makers to make their concept hegemonic. What matters here is the recognition that fundamental concepts about water that are current today are not "absolute" truths, but ideas shaped by social and historical forces. There is at present a competition between several hegemonic concepts that will eventually lead to one course of action or another, depending on the success by which parties to certain concepts will prevail in promoting their vision (see Section 3.3 for incentives for change).

2.1.3. Water War vs. Water Peace: A War of Position

Clearly the idea of a causal link between water scarcity and war has grown over the past twenty years to the point that it could become ideologically hegemonic. In March 2001, even Kofi Annan declared: "and if we are not careful, future wars are going to be about water and not about oil."[2]

One school of thought questions the causal link between water scarcity and international war. J. A. Allan developed the concept of "virtual water" to describe the water necessary to produce food which is imported. Importing one ton of cereal was virtually equivalent to importing the corresponding quantity of water necessary to

produce this cereal. Allan demonstrated that more "virtual water" already flowed into the Middle East than real water flowed in the Nile. Indeed, by 1999 Jordan was already importing 91 percent and Israel 87 percent of their cereals. Food security does not necessarily entail food self-sufficiency, he argued. Calculating water stress indicators on the basis of agricultural production capacity does not allow prediction of the likelihood of war among states. Yet food security is an essential concern of all governments for their people. Importing of food products containing virtual water is only an alternative if it is affordable. Because food is virtual water and because other industrial commodities are also virtual water, all wars over resources are ultimately water wars. All countries have far more to gain from cooperation in keeping the price of cereals low in the international market than in wars against each other to appropriate the others' water. Water because of its symbolic and emotive value could be mobilized either for war or peace, even when the source of conflict is something else.

The water war literature tends to perceive a rather anthropomorphic state, one that deals in a unified, coherent, and rational manner with its water needs. In the current discourse, it appears as if governments are viewed as single, unified entities that make rational decisions about water needs and development issues within the state's foreign policy. This trend is much less dominant in the water peace literature. Tony Allan, for example, shows that states have spontaneously adjusted to importing their cereals without formulating a specific policy in this respect.

The press also plays a crucial role in the propagation of the water wars concept. References to water wars provide a catchy title, while a quarter-page article rarely allows a journalist to explain the complexity of the competition for water. Whereas much popular literature has been devoted to the topic of water wars, the water peace literature has always targeted an academic readership.

This does not necessarily mean that the water peace concept is doomed never to replace the water war concept in its hegemony. For example, the joint Israel–Palestinian call to protect water supplies on February 1 2001 provided the water peace camp with a precious argument. This document concluded in an Israeli–Palestinian–American meeting of the Joint Water Committee at Erez Crossing, aimed at keeping the water infrastructure out of the cycle of violence. "The two sides wish to bring to public attention that the Palestinian and Israeli water and wastewater infrastructure is mostly intertwined and serves both populations. . . . We call on the general public not to damage in any way the water infrastructure, including pipelines, pumping stations, drilling equipment, electricity systems and any other related infrastructure," said the document. This was repeated again between the two sides in 2002, again calling on one and all to keep water out of the cycle of violence. The fact that both governments agreed to issue this joint statement shows that they are bowing to another pre-existing hegemonic concept: that of water as a basic human right.

Nevertheless, damage to water infrastructure that served Palestinian towns was carried out by the Israeli military in Salfeet in the fall of 2000 and in Nablus and Ramallah in 2002, and to wells in Gaza in 2003, to name but a few examples.

In fact there was a real effort to minimize damage, and to supply water without disruption. On December 13 2002 Nabil Al-Sherif, Chairman of the Palestinian Water Authority, spoke at the Annual Conference of the Israeli Desalination Society at the Technion–Israel Institute of Technology. From the podium, in front of an audience of some 250, including delegates from the United States and Europe, he thanked the Israeli Water Commissioner, Shimon Tal, for the Israeli efforts to cooperate in maintaining water supplies to the Palestinian population. This demonstrates that the possibility exists for the water peace concept to eventually replace the water war concept in its hegemony.

2.2. An Anthropology of Water Management and Civilization[3]

Water shortages are nothing new, and throughout the history of our common human civilization various solutions have been implemented to overcome water scarcities and enhance water security. Such solutions were always short-lived – a temporary relief on an historical time scale – because the social and cultural consequences of each solution led to a gradual, cumulative increase in the demand for water. Civilization is faced with the opposing hegemonic concepts of water wars and water peace. History suggests that while technology may provide a partial solution, only a return to fundamental human values of justice and equity will provide a sustainable solution to the world's accelerating water crisis.

Human societies have throughout history found new means to secure the availability of water where they settled. They have devised ingenious methods to harvest, transport, and store rainwater, spring water, groundwater, and even air moisture. Human societies will thus continue to search for new sources of water, but the cost of procuring water is a function of the combined cost of extraction/harvesting, transportation, treatment, storage, and delivery. There is thus inevitably an economic aspect of water availability. As water scarcity increases, the cost of water also increases. Accordingly, the fundamental issues throughout history have been: Can society afford to meet the increasing cost of water works? Who pays? And who benefits? These questions imply that there are various social and political aspects to water economics. In turn, social issues are never divorced from beliefs concerning the world, the social order, and ethics.

Water shortages have been an engine of human innovation: propelling, motivating, and prodding societies to devise, accept, and perpetuate means to avoid or remedy water scarcity. Water is thus the mainspring of civilization and all its works. However, relief mechanisms have so far always entailed in the long run greater demands for water than what is available at prevailing withdrawal, transport, and treatment cost. The reasons for this paradox lie in the fact that the historical solutions to water scarcity involved:

- increasing population size
- greater water consumption per person
- progressive depletion of utilized water resources
- progressive deterioration in the quality of water.

This leads to the conclusion that further water scarcities cannot be overcome simply by new technologies. All technological innovations aimed at relieving water scarcity are embedded in a social and ideological matrix. All such innovations also have an impact on society and its ideology. To gain a deeper understanding of the complex relationship between water, people, and culture, the following sections of this chapter endeavor to develop an analytical perspective on the relationship between historical cultural developments and water management from the dawn of prehistory to the present.

2.2.1. Foragers in Nature

History begins with the first hunter-gatherers, who roamed the earth for millions of years before agriculture began 10,000 years ago. As foragers and hunters, they were tuned to seasonal variations in edible resources. In general, the available yield from wild resources for human consumption was only sufficient to sustain a small number of people within the perimeter of a territory determined by a day return journey to a home base. The size of a local group at any one time of the year thus rarely exceeded fifty persons, and was often between fifteen and twenty-five persons. Even such small groups could not survive in the same locality all year round because of seasonal

variations in food availability. As such, seasonal scarcities or abundance in certain desirable resources prompted people to relocate frequently in tune with the seasonality of rainfall and temperature variations that were critical for the growth and maturation of plants and the movements of animals.

Hunting and gathering was common everywhere in the world, with a broad range of regional adaptations. The range included various degrees of emphasis on hunting big game animals with spears and other hunting devices, small animals with bows and arrows, nets, and game traps, fishing, fowling, and even whaling. With a few exceptions, foraging for plants provided most of the dietary items.

2.2.2. Agriculture: Overcoming Climatic Variability

From the end of the last ice age (14,000 years ago) and until approximately 10,000 years ago, the world experienced frequent climatic oscillations as global climatic conditions were undergoing major changes in the heat budget and the differences between ocean and earth temperature. In certain localities wild cereal grains proved to be a viable staple food, allowing communities to settle near fields to harvest and process foods, utilizing a new technology based on stone tools such as sickles. The use of grinding stones to process cereals also became widespread. The wild cereals proved to be an alluring resource.

In Southwest Asia, a return to ice age conditions from 13,000 to 11,500 years ago transformed the landscape and influenced the distribution of wild cereal stands and animal game. These changing climatic conditions encouraged some groups to become fully committed to growing wheat and barley as staple foods. In China, populations in the area of the Yellow River began to cultivate millet, whereas some communities along the Yangtze River began to domesticate rice as a significant source of food. Another key development was the cultivation of root crops in New Guinea. This was also the case in West Africa, where root crops were introduced during the fourth millennium before the present. Still later, rice was also cultivated there. In South America and Mesoamerica, cultivated plants included maize, beans, squash, and various seed crops. Cultivated cereals spread from Southwest Asia to Europe and eastward to India. The latter received rice from China.

In Southwest Asia, goats and sheep were added to the subsistence base *c*. 10,000 years ago. In the Egyptian Sahara, foragers were taking advantage of the greening of the desert due to an increase in rainfall associated with post-glacial warming. One of the remarkable recent discoveries is the growing evidence for cattle keeping in Africa almost at the same time as sheep and goat were domesticated in Southwest Asia.

The beginning of a strategy focusing on keeping goats, sheep, and cattle, with or without horticulture, appears to have been initiated in the natural habitats of these crops and animals. Agriculture initiated an increase in the number of inhabitants, who remained for most or all of the year in villages and hamlets, significantly altering the relationship between people and water. A commitment to keeping animals entailed providing them with water or taking the herd to a water hole or a stream. For some groups, the idea of relocating settlements close to permanent springs and streams was a solution to the problem. Natural irrigation provided water needed for growing crops. Dependence on water from streams also militated against the capricious pattern of rainfall in arid and semi-arid lands. Not only is rain seasonal, with marked variability from one year to the next, but it is also not certain that rain will always fall in the same area.

2.2.3. Early State Societies: The Benefits of Cooperation

Having overcome the major problems associated with dry farming, the earliest generations of farmers in river valleys found themselves after a few generations

eventually faced with periodic water shortages when rivers dried up, silted, or changed their course. In response, they dug canals and drains, and constructed dikes and earthen dams in order to either get rid of excess water or bring water to parched fields. In a sense, the first attempts to manage drainage and irrigation water, no matter how feeble or elementary, marked a revolutionary shift in the way people interacted with water.

There were also other changes that proved in the long run to have been equally revolutionary. People from neighboring villages made deals and mutual support pacts, since they suffered equally from flood disasters, and went hungry when droughts ruined their crops. Such deals included cooperating to repair breached embankments or dig canals. Sharing grain and other foodstuffs in regional networks (using boats or donkeys whenever available) was a successful mechanism to buffer local communities against food shortages.

In good years, herds are plentiful and herders prosper and become numerous. However, when pastures wither and water holes dry up, especially when farmers are better off, the peaceable pact between pastoralists and farmers may break down.

The importance of water holes and pastures led to a sense of territoriality and the organization (coordination) within and between groups of movements over long and short distances. This encouraged the emergence of a managerial strategy based on tribal affiliations and political organization.

In the American Southwest, in the uplands of the Gila and San Juan rivers, long irrigation canals were dug to water the crops. The Hohokam in this region built mound platforms and ball courts associated with the canals. Ceremonial ball games and other activities were apparently carried out, perhaps with irrigation rites involving various segments of the population.

2.2.4. Early States: Managing Inequality

The early state was not responsible for or involved in massive irrigation programs, and nowhere is there any evidence in early civilizations for a centralized despotic organization based on elaborate water works. However, the rise of the state created a destabilizing force. This force consisted of a greater demand for food to meet the progressive increase in the number of non-food-producers, from the king and his court to the scribes and the carpenters.

This force gained more intensity as the demand of each of the non-food-producers soared to fit their elevated social status. With an increasing demand for food, the farmers were forced to work harder, to work longer hours, and to beget more children to increase the size of the labor force. Social and ideological mechanisms were put in place to ensure that farmers remained in the fields, living in misery and destitution in hovels. At the same time, the state elite – and the supporting cast of priests, scribes, soldiers, and artisans – retreated to palaces and town houses on royal estates in capital cities and provincial towns. Social inequality and poverty thus began, and were to plague humanity throughout history.

Greater productivity, to feed both the peasants and the rising number of non-food-producers, could only mean that more water was needed, especially when the stretched system of production suffered from lack of rain or poor floods. The answer was for the kings to dig longer canals, construct bigger dikes, and on occasions to reform the organizational bureaucracy. In some state societies, urban centers for the state elite, craft specialists, priests, and scribes led to the emergence of the earliest large cities with as many as 20,000–40,000 persons. The permanent location of these cities required protection from floods, transport of water, supply of goods through water canals, storage of water in tanks or ponds, and water distribution and sewage systems.

2.2.5. The Clash of Empires: The Thirst for Water

The age of empires, beginning about 2300 BC and culminating around 1500 BC in Southwest Asia and the Mediterranean region until the founding of the Roman Empire, followed in the wake of the establishment of city-states in Mesopotamia and the nation-state in Egypt, beginning about 3200 BC. This was mainly a result of the voracious appetite for revenues and trade goods by the state elite. A thousand years of agrarian developments under state rule pushed the early agrarian societies to their uppermost level of production. Large-scale military operations by armed forces dedicated to warfare were a novel strategy to secure more land, more laborers (often slaves), and to guarantee the flow of coveted exotic goods for the consumption of the elite. The only recorded incident of an outright war over water took place during this time (4,500 years ago) between two Mesopotamian city-states, Lagash and Umma, in the region now called southern Iraq.

Chan Chan, a city in the Peruvian Desert that was the center of the South American kingdom of Chimor, depended on large-scale irrigation and amassing large amounts of food, apparently obtained by conquest, to overcome periodic droughts. The city was guarded by high walls, which did not stop the Inca from destroying it. Almost everywhere, the development of state societies was followed by warfare, often associated with expansion and annexation of territories. In addition to the above mentioned civilizations, there are the notable cases of the Chinese empire, the Inca, and the Aztecs.

It may be said that conflict over water rarely leads to war (see the section on hegemonic concepts). But it is foolish not to consider that water is an indirect cause for many conflicts. Wars for agricultural products, for example, are wars for the water resources essential for farming. Wars for cotton, sugar, or rubber are wars for water, because water is required to produce them. Today it is recognized that these goods contain "virtual water." The spread and expansion of waterworks under the Romans and the world preoccupation ever since with hydraulic engineering and water technology are excellent indicators of the thirst for water as the indispensable ingredient for economic activities from agriculture to mining. Water scarcity under the Romans was a result of greed for water, a greed precipitated by the desire for greater production to meet the demands of the imperial elite.

2.2.6. Greeks and Romans: Globalizing Water Technology

The pace of technological advance was slow as a result of a closed system of absolute monarchy and monopoly, a religious ideology structured around the glorification of the king, and the low rate of economic agrarian growth. There were few literate scholars. They were not organized in national or international organizations, and their learning devices were not geared for practical knowledge. The achievements of the Alexandrian scholars, including Euclid and Archimedes (287–212 BC), definitely represent a breakthrough in water history, because they laid the foundations of theoretical hydrology in connection with practical applications. The world owes to them the water wheel and the Archimedean water screw.

The Persians made an ingenious contribution to hydraulic engineering by developing a water delivery system known as *qanats*: a subterranean system of tunnels connecting wells and dug using vertical shifts designed to collect and transport water, sometimes over distances of more than 50 kilometers. From Persia this method for utilizing groundwater spread to drylands in Iraq, Syria, Jordan, Palestine, Egypt, Algeria, and Cyprus. Qanats also diffused to Arabia, the Gulf States, and Oman, as well as to Pakistan, Afghanistan, and China. They were introduced by the Muslims to Spain, to be exported subsequently to Mexico (Tehuacan), Peru (Nazca), and Chile (Pica and Matilla). This is one of the major early historical examples of the diffusion of water technology from one civilization to another.

The Romans, who in essence capitalized on the knowledge accumulated and generated by the Ptolemies (notably at the Alexandria school) and the Persians, were instrumental in the spread of hydraulic engineering to various parts of their empire. The Nabateans, who in AD 62 came under Roman occupation, had by then constructed more than 1,000 small reservoirs using small gravity dams in what is now the region of Jordan. The Romans transported the idea to Italy in the reign of Emperor Nero (AD 54–68) on the River Arniene, about 50 km east of Rome. The Romans also introduced gravity dams to Turkey, Syria, North Africa, and Spain.

Greece and Rome thus left a lasting legacy – the legacy of a cosmopolitan world from Rome to India that permitted the flow of information, ideas, and mechanical devices on an almost global scale. Asia also contributed to a highway of information along the trade route that linked China, India, Central Asia, and Southwest Asia, which in turn was connected to Japan, Europe, Southeast Asia, Arabia, and East Africa. The road followed drainage channels from the mountains to the desert, where it clung to the footslopes of the mountains where wells were dug to benefit from underground water fed by rainfall on the mountains. The first information highway was thus a waterway.

It is remarkable that the Roman period, which entailed an unprecedented phase of economic boom, land reclamation, intensification of agrarian production, and trade on a global scale, was also a period of worsening conditions for peasants and for those who had the misfortune to become slaves.

2.2.7. The City–Water Arteries for Urban Life

The Roman Empire left another legacy, glorious or inglorious depending on how you look at the metropolis. Greater Rome had as many as 500,000 inhabitants, more than ten times that of earlier cities. Ptolemaic Alexandria in its heyday also approached 400,000. The water demands of both Alexandria and Rome were met by ingenious solutions. In Alexandria, the city more or less floated on top of hundreds of cisterns fed from a canal connected to a branch of the Nile. In Rome, aqueducts and tunnels were constructed to deliver water to a city that needed water not only for drinking and domestic use, but also for public baths.

One of the remarkable urban centers was Moheno-Daro of the Harappan Indus civilization. The mature Harappan civilization covered a vast region of about a million square kilometers. The city was remarkable for its water management system, which followed the city grid system, a notable feature of many mature Harappan sites.

In La Venta and San Lorenzo, urban centers of the Olmec civilization, ceremonial platforms emerged following thousands of years of farming, fishing, and fowling. Ruled by an elite who practiced human sacrifice, by the second millennium BC, the Olmec city of San Lorenzo had substantial reservoirs and drainage systems.

In Guatemala, Tikal was probably the greatest of all Mayan cities, with monumental buildings dating to about 400 BC and a royal cult of warlords dating to the third century AD. To feed the large population of the city, narrow canals were dug between raised earth platforms used for cultivation. The canals were stocked with fish and snails. The city was situated in a vast, flat expanse of rainforest in the Petén region.

Another great city of the ancient world was Angkor, which commanded a huge agrarian area from the Gulf of Siam to Vientiane and from Saigon to the Menam valley. The agrarian wealth of the region was due to the monsoon-fed Mekong River, which allowed three rice crops per year.

2.2.8. The Moslems: Waterworks and Water Courts

Under the Moslems, originally from a barren desert region, irrigation waterworks, aqueducts, subterranean *qanats*, water mills, baths, and fountains spread to many

parts of the world from the eighth to the twelfth century AD. Moslems also introduced a system of water management and water courts. The court in Valencia in Spain still functions today. Attention to hydraulics by the Arabs was one of the main sources of modern mechanics and industry: the forces that were to shape the world to come.

2.2.9. The Rise of the West: Industry and Water

By 1650, the advent of mechanized industry and the introduction of food crops from the New World were associated with a phase of urbanization based on manufacture or commerce; both were under the patronage of the king or the church. Manufactured goods were largely the prerogative of the state functionaries, to be awarded by the head of the state. The expansion of manufacture and trade in later times was related to not only advances in technology, but also the breakdown in the monopoly of "divinely appointed" kings over manufacture and trade. This allowed many individuals to engage in such activities, and raised the number of consumers by allowing commoners to have access to luxury goods.

In Europe, the development of medieval towns linked to trade and crafts in a climate of competition and warfare not only made it necessary to secure water for city dwellers, but also entailed the use of water for defense, mills, tanning, and paper-making. Sewage, sanitation, and water pollution became issues of concern, and had a major role in transforming water management methods.

At the same time advances in the natural sciences were instrumental in alerting communities to the danger of deforestation and the drying of wetlands. Science also provided other means for manufacture that eliminated putrefaction and reduced the ravages of epidemics. With increasing affluence, the cities enjoyed the benefits of parks, tree-lined boulevards, and fountains, the Renaissance legacy of a landscape of meadows, fountains, and nymphs.

Canals and water mills in the late eighteenth century paved the way to a world where water is controlled and manipulated. Canals also paved the way for the rise of nation-states by strengthening inter-regional links within water basins. The rise of the modern nation-state was closely connected with the management of water on an inter-regional scale for transport, commerce, and industry. Water was now needed not only for agriculture and domestic uses, but also as a raw material for industry and as a source of energy. Over the last 200 years industrialization, in association with urbanization, has thus created great demands for water, competing with the growing demands for water to produce food for the ever-increasing masses of humanity. Industrial water pollution from suspended solids, organic materials, heavy metals, synthetic chemicals, and acidic waste is now compounded with pollution by modern farming, such as contamination by nutrients, pesticides, and animal waste.

Industrial farming, involving the use of farm machinery, fossil fuels, fertilizers, and water works on an industrial scale, as well as scientific methods of breeding and management, provided the possibility of supporting very large numbers of people, who in turn became the source of a huge labor force. They became also the consumers of agrarian and industrial goods, with great profits to landowners, bankers, and industrialists. A part of the profit was re-invested in science and technology to increase the margin of profit.

The share of profit was greater for the industrialized West at the expense of colonial possessions and less developed nations. The frightful result of this disparity was that the numbers living in poverty were worsened by a population explosion. In the West industrialization, education, and higher incomes and pensions made small families desirable, leading to a reduction in birth rates. Families in poor countries wanted more children so as to gain more income and security in old age, but improved health conditions meant that more of them survived.

Poor countries are now facing the dilemma of having to undergo rapid industrialization. to face growing population numbers, migration to the cities, and greater demands for the amenities of urban living and middle-class lifestyles. In the process they are stressing existing water resources, hastily and rather inefficiently developing new water resources, overlooking degradation and the breakdown of the urban water and sewage infrastructure, and failing to minimize or prevent water pollution from modern farming and industrial installations. Thus they are trying to repeat the patterns of growth of the industrialized countries, which appear to be unsustainable at the global level.

2.3. Water Resources Management in the Postmodern World

2.3.1. What Has Not Changed?

The technology of water resources development has not changed significantly for a long time. Improved mathematical approaches and computational capacity and new materials technologies at the end of the nineteenth and beginning of the twentieth centuries led to the last major innovations in engineering design (i.e., arched dams and the trial-load method). Also, beginning in the mid-twentieth century, computers allowed us to design water systems to meet more precisely divergent social objectives. In construction too, use is now made of reinforced concrete and steel, as well as rock, stone, and earth, to build levees, floodwalls, jetties, and dams. Nevertheless, recent innovations have been mostly in the details. Indeed, the most interesting thing about water resources technology is its essential atemporal nature: lessons learned two thousand years ago in ancient China or two hundred years ago in Napoleonic France may well be equally valid for current water management and engineering. This has been constant.

2.3.2. What Has Changed?

As has been seen in this chapter, our problems are not new, except that:

- Our water demands are rising sharply.
- Our ability to pollute is global.
- Our pollutants are more deadly.
- Our interference with ecosystems is both far-reaching and nefarious.
- All societies are closely interlinked so that any regional catastrophe can have global repercussions.
- There are increasing global social and environmental concerns.
- The increased speed of transformation gives people less time to adapt to new situations.

Human societies have always needed to cope with unforeseen natural forces. They are most vulnerable when they are stretched to a meta-stable condition: a point of living dangerously when minor perturbations can plunge society into a state of chaos.

Today, climatic change, mostly as an external force that is now destabilized by human-induced variables, could suddenly and significantly influence the hydrological cycle, air mass movements, ocean currents, and regional distribution of water resources, with serious socioeconomic effects. This may require new approaches to create the necessary resilience to adapt and cope.

2.3.3. A Lesson from History

There has been a change in the scale of our relationship with nature and other societies. Yet humanity is still constrained by the sentiments, ideologies, and worldviews shaped in our remote and recent past. Societies are hindered in their

ability to respond to change by nation-states, religious divides, racial discrimination, elitism, and consumerism. Other hindrances include so-called "rational" economic thinking, faith that technological fixes or "progress" will provide solutions, and the view that humanity is set above Nature and that the world was created for our pleasure.

Society cannot forgo advanced technology, and indeed we must have recourse to new technological measures to alleviate our current water shortage situation. The current scarcity is a function of the uneven distribution of financial and technical resources, as well as an explosive demand for worldly goods. Society might learn how to deal with this crisis from history.

Consider the collapse of the Old Kingdom, 4,200 years ago, when a series of severe, unforeseen floods on the lower Nile led to a devastating famine. Communications were disrupted, the peasants rioted and began to plunder palaces and tombs. The government collapsed and the social order was overturned.

The country, shattered and dying of hunger, was put back together by rulers who realized that a civilization could not be sustained without two things: first, attention to water management, and second, an ethical code of justice and compassion. The kings who succeeded in putting the country back together undertook major hydrological projects. In addition, they were no longer rulers by divine right. They proclaimed instead that they were sent by the Gods to protect the poor, feed the hungry, and help their neighbors. For the first time, the names of the kings were conjoined with the name of the Goddess of Justice, *Ma'at*.

Yet one should not neglect the possibility that the rate of change has accelerated to the point where it is disjunctive, and new generations will have to learn new ways.

Notes

1. Concepts drawn from the PCCP Series Volume *Water Wars: the Rise of a Hegemonic Concept.* Julie Trottier, Oxford Center for Water Research, University of Oxford.
2. Kofi Annan, question and answer session after statement (SG/SM/7742) at the Federation of Indian Chambers of Commerce and Industry, New Delhi, March 15 2001.
3. This section is drawn from the PCCP Series Volume *Water Management and Early Civilizations: From Cooperation to Conflict*. Fekri A. Hassan, Institute of Archaeology, University College London.

3. ETHICS: THE IDEAL AND ONLY LONG-TERM SOLUTION

3.1. What are Ethics?

Conflict and cooperation are social processes embedded in a deeper cultural matrix. Any attempt to transform situations of conflict or potential conflict must entail an understanding of social change. In developing ethical and cultural incentives of water for cooperation one must explore the means by which societies undergo transformational changes, and understand the processes by which attitudes and institutions change.

Our outlooks on life, perceptions, cognitive styles, and sensibilities are the result of the dynamics of being in the world as individuals and coping within the parameters of our cultural inheritance with ever-changing life situations. Individuals are neither passive puppets enacting traditional cultural programs nor totally free agents who can create their world *ex nihilo*. Traditions are important. They maintain a sense of order and stability. At the same time, a blind or dogmatic adherence to tradition can prevent societies from coping with new situations. Hence societies cannot live long without admitting change and innovations. Human society is the product of a long evolutionary journey in which constant change or adaptation has been characterized by two driving forces, social organization and intelligence.

The virtues of love and compassion in human beings are intertwined in human minds with the capacity to transcend their bodily interactions in the world and their circumstantial situations. This exceptional mental power, which can be traced in our cousins among the primates, is magnified to such an extent that it sets us apart from other animals. Transcending the tangible world – developing, storing, processing, and retrieving ideas in a world of "virtual reality" – was tantamount to an evolutionary threshold. It was a revolutionary achievement that has enabled us to survive under very different environments, from the arctic to the tropics, from parched deserts to rainforests, from valley floors to mountaintops. This exceptional intelligence allowed us to solve problems, not the least of which is living with others who are different from us. In fact, sociality was the womb of intelligence.

In turn, intelligence is the guardian of sociality. There are often more problems to solve in a social environment than those encountered in dealing with natural environments. As emotional animals with the proactive minds of thinking primates, humans are prey to swings of moods and flights of fancy – some can bring us close together, while some can repel, threaten or endanger others. The mind thus becomes a powerful game-playing tool. Its individual reality (subjectivity) must be harmonized with that of others if the individual is to survive. As such, there is no such thing as individual subjectivity: subjective views are embedded in a socially constructed inter-subjectivity, the only kind of objectivity humans know. To know others or the world without human eyes and cultural lenses and filters constituted by our being in society, which is in turn a channel in the braided stream of human culture, is impossibility. For us, absolute objectivity is a meaningless notion.

Our actions are determined by a system of moral principles for individual, community, and international behavior, or ethics. Ethical notions are enshrined in rituals and imbued with a sense of inviolability and sanctity. Ethical beliefs are bonded in our minds with deep emotions and sentiments that verge at times on passion, zeal, and devotion. Ethics are not the dry subject of textbooks. They are the incendiary fuel of disputation and the pacifying ointment of social cohesion.

3.2. Ethics and Social Performance

Changes from conflict to cooperation are much more than resolution of conflict. The aim is to transform the situation in a manner that ensures cessation of hostile

confrontation and disputes, and the creation of an environment that could sustain cooperation. Such a change is a process that involves individuals, social groups, governments, and institutions.

Individuals are dynamic entities, forming groups of people related in different degrees and by bonds that vary in their strength. Each individual is socialized as soon as he or she is born, by parents, family, and wider society (represented by schools, mass media, governmental agencies, and religious institutions). As the individual matures, his or her thoughts and practices begin to shape a personality that will eventually influence his/her ideas and behavior. Individuals may separately converge upon similar ideas. They may then coalesce to further their ideas. A society changes in response to the degree in which new ideas are incorporated in older structures that are conserved and guarded in the name of tradition, authenticity, and identity. Swift and dramatic changes can be short-lived and/or catastrophic. Conflict between old and new is normal because change threatens the security engendered by what is familiar. The emotional comfort of the ways of the ancestors may and often does create a barrier against innovations, which entail troublesome readjustments of cherished notions and practices.

Incentives aimed at encouraging cooperation rather than conflict in international as well as regional and community management of water resources cannot be separated from existing modes of ethical and cultural beliefs and attitudes. Nor can they be considered without the cognitive and emotive processes by which individuals accept or reject new ideas transmitted as messages by messengers through specific channels of communication.

Emerging social values force us to re-examine traditional planning objectives. Rather than maximizing economic efficiency or optimizing the opportunity to meet public objectives, planners – especially in industrialized countries – now often set limits to growth. Often a certain inherent moral value is granted to non-humans, establishing a system of competing claims that ultimately limit human population, patterns of consumption, and technological development. Any equitable solution to these problems of competing claims with non-humans requires the application of a system of ethics and a notion of justice that substantially modifies the value systems of many cultures.

3.3. International Trends

Since the 1970s a series of international meetings and conventions have provided milestones on the way to sustainable water resource management, leading to the widely accepted Dublin principles for managing water:

- Freshwater is a finite and vulnerable resource, essential to sustain life, development, and the environment.
- Water development and management should be participatory, involving users, planners, and policy makers at all levels.
- Women are central to providing, managing, and safeguarding water.
- Water has an economic value in all its competing uses and should be recognized as an economic and social good.[1]

These principles recognize the close interrelationships between economic, social, and environmental security.

At the Stockholm Water Symposium in 2002 there was a rare degree of unanimity among organizations representing water managers and other stakeholders on four basic principles (Box 3.1).

Box 3.1. **Principles Adopted at the Stockholm Water Symposium 2002**[2]

Water users must be involved in the governance of water resources.
The behavior of local water users is the ultimate test of policy success. Users must be informed of and closely involved in the governance decisions affecting their freshwater use. While it is essential that government exercise a strong hand in protecting natural resources and the common good, it must accomplish this through a close, effective and continuing dialogue with water users.
We must break now the link between economic growth and water degradation.
Activities generating wealth often contaminate water, resulting in pollution of rivers and groundwater throughout the world. If this continues unabated, available water becomes too polluted to use, and the world has less water available. Positive, proactive national and local action toward water pollution abatement and restoration is essential today to avoid even more severe problems in coming decades.

Urban water services are crucial for urban stability and security.
An adequate flow of water through a city is a necessary condition for the health of its inhabitants and also for the functioning of industries, hospitals and other city components. A secure water supply is essential for a sustainable city, and realistic, budgeted planning must extend to the poor and peri-urban areas of our cities.

Policy, planning, and implementation must move towards integrated solutions.
In its downstream flow, water is linked to land use and ecosystems in a river basin. Water management, land use, and ecosystem policies must therefore complement rather than counteract each other. Sector approaches to drinking water supply, water for food production, and water for nature must urgently be complemented by an integrated approach that considers all of these. Institutional arrangements must be put in place to ensure integration.

Between Rio and the World Summit on Sustainable Development in Johannesburg in 2002, the world's nations met in several major conferences under the guidance of the United Nations, including the Monterrey Conference on Finance for Development and the Doha Ministerial Conference. These conferences defined for the world a comprehensive vision for the future of humanity. Recognizing the importance of building human solidarity, heads of state in the closing political statement urged the promotion of dialogue and cooperation among the world's civilizations and peoples, irrespective of race, disabilities, religion, language, culture, or tradition. It is to be hoped that this solidarity will also embrace hydrosolidarity: the solidarity between downstream and upstream citizens of a watercourse in managing their water in the interest of all.

None of these statements or declarations, however, focuses exclusively on international freshwater sources. Despite the efforts over the past decade to expand global institutional capacity over freshwater resources, no supranational agency exists to manage transboundary resources globally. While many of the principles of national water management apply to international rivers and lakes, the political, social, and economic dynamics associated with transboundary waters can require special consideration.

Yet in recent years, there has been movement on the ground as well: the World Bank and UNDP have collaborated to facilitate the Nile Basin Initiative, which looks close to establishing a treaty framework and development plan for the basin. The

Bank also is taking the lead on bringing the riparians of the Gurani Aquifer in Latin America to dialog. The US State Department, a number of UN agencies, and other parties have established a Global Alliance on Water Security aimed at identifying priority regions for assistance, which may help countries to avoid escalating conflict. The Global Environment Facility (GEF) is now active in fifty-five international basins. The UNECE has programs on ten European and Central Asian basins, and supports the International Water Assessment Center. SADC and ESCAP have been taking the lead in establishing transboundary dialogs within their respective regions. The Organisation for Security and Cooperation in Europe has also launched a project on international waters.

Getting beyond the imperative of "integrated international basin management," a concept whose practice is in fact the exception rather than the rule, has been an important step in some basins. Even friendly states often have difficulty relinquishing sovereignty to a supra-legal authority, and the obstacles only increase along with the level of suspicion and rancor. At best, in many regions, one might strive for coordination over integration. Once the appropriate benefits are negotiated, it then becomes an issue of "simply" agreeing on a set quantity, quality, and timing of water resources that will cross each border. Coordination, when done correctly, can offer at least the same benefits as integration, and be far superior to unilateral development, but does not threaten the one issue all states hold dear: their very sovereignty.

3.4. Creating Incentives for Change

With a few exceptions, individuals do not change their minds overnight. The process of change is gradual and cumulative. It starts with novel ideas followed by structural adjustments and so on, until the structural re-arrangement of ideas becomes a selective force in its own right as individuals at the threshold of radical transformation seek to strengthen their newly emerging outlook by seeking and practicing what their ideas prescribe. At a certain point, social and historical contingencies create and facilitate the dissemination of key ideas. The adoption of the ideas by certain individuals provides nuclei for social change. Ideas may emerge within the downtrodden, but such individuals rarely have the clout or the know-how to effect change. However their views, which are often emotionally camouflaged or alloyed with despair and anger, may elicit suppression and repression. The suffering and humiliation of the downtrodden, however, may be recognized by the media, national authorities, or international agencies. Whatever the motivation, the call for change in order to remedy the problems suffered by the downtrodden has over history acquired a "biblical" dimension, the aura of a sacred imperative, no doubt brought about by the evolutionary validation of the ethics of equity as a social strategy.

Purposeful change begins with the recognition of a problem, finding its causes, providing the means to generate solutions, and finally implementing the solutions. This apparently simple model is deceptive. It masks the social process in the "rational" process of thinking – a process that is not wrong for being a matter of reasoning, but is faulty and defective because it is "abstract" – divorcing thought from the process by which thought is expressed, generated, and translated to action. In this context, a ministerial declaration must be viewed as an element in the social process of creating an increasing awareness of the water problem and a preparation for the next steps.

Efficient incentives are those that either amplify existing beliefs or promise a better payoff: personal, social, or economic. The process from conflict to cooperation is never purely a matter of economic calculus, ideological confrontations, or legal disputation. Cooperation is bound with notions of mutual recognition of rights and obligations, mutual respect and acceptance, which are grounded in the ethics of justice and equity. Yet every party to a conflict in a governmental delegation or a

professional team is imbued with emotive ethical notions and personal strategic, social, and economic outlooks. Mistrust, grievances, and enmities are obstacles to resolving water conflicts, which are often embedded in a historical context of emotional dimension. Incentives for cooperation must involve reconciliatory mechanisms to sustain a positive milieu for dialogue.

Incentives for the resolution of water conflicts and the promotion of cooperation will fail if they are solely focused on water rights, legal obligations, or history. Nor should they be restricted to the overall advantages of cooperation. Instead they should extend to consideration of tactical actions that, if taken, in the long term will institutionalize cooperation.

3.5. Partnerships for Peace

Peacemaking is not a process limited to the work of governments. Important as that work is, it depends in fundamental ways on changes in human relationships, an arena well beyond the reach of governments alone. Ministers responsible for water affairs are not necessarily representatives of their governments as a whole or of public opinion. However they are well placed to transmit their views to the ministerial cabinets of their countries and to engage ministers of information, education, and culture, university professors, research institutions, NGOs, and grass-root associations and alliances to work with them to mobilize public support, disseminate information, and implement change.

Any change imposed from the top will be short-lived, unless it entails a mechanism to win the support of the public regardless of the political configuration of the state. Incentives for cooperation must thus realistically work both with governments and the public as individuals in organized movements or groups whose ideas and arguments are largely inseparable from an emotional ingredient. The incentives must be also elements of an integrated long-term vision based on the fruits of cooperation. More is said on this subject in Section 6.

Professionals have a leading role to play along with diplomats, policy makers, and legislators. A partnership between professionals and the public is essential for promoting cooperation. The professionals form the bridge between government and the public. Professionals in turn need academic and social incentives to encourage them to cooperate with other professionals to meet the demands of integrated management of international and national water resources.

UNESCO and other international organizations also have to define their role. Perhaps they could develop an integrated package that countries can use to generate a national discourse on water for peace and prosperity. This integrated package would involve strategies, procedures, and educational material to engage the media, ministers, universities and research institutions, schools, children, and communities to debate, discuss, and develop national programs.

Although women are the main users and managers of water, they are often left out of the decision-making and planning processes. Many of our problems and wrong decisions occur because humanity has advanced technologically faster than biological changes required in humans to cope with the new environment the species has created. Men took most of the decisions that have created our problems. One solution (other than biological engineering of humans to create a species that is adapted to our environment) would be to put women in the positions of responsibility. Certainly women appear to be much more socially adept than men. And they to a large extent determine the values that are taught to the next generation. Perhaps in the end it is by teaching our children a system of moral principles for individual, community, and international behavior based on the shared fundamental human values of justice and equity that will build this world of Water Peace.

Notes

This chapter draws heavily on *Water for Peace: A Cultural Strategy* by Fekri A. Hassan in the UNESCO–IHP technical documents PCCP Series, and on the keynote address *Ethical and Cultural Incentives of Water for Cooperation* given by Professor Hassan at the International conference From Conflict to Cooperation in International Water Resources Management at IHE Delft, November 21 2002.

1. The Earth Summit in Rio added recognition of the social nature of water to the Dublin principles in 1992.
2. Organizations that endorsed the statement included the Global Water Partnership (GWP); International Water Association (IWA); International Water Resources Association (IWRA); Stakeholder Forum; Stockholm International Water Institute (SIWI); Water Environment Federation (WEF); World Business Council for Sustainable Development; and the World Water Council (WWC).

4. LEGAL APPROACHES: A SOUND FRAMEWORK

4.1. International Law in Conflict Prevention and Resolution[1]

A national framework of laws, legal conventions, treaties, and regulations is ultimately built to codify accepted standards of behavior in that society. International law offers a series of means to resolve international disputes, both diplomatic (negotiations, consultation, good offices, mediation, fact-finding, inquiry, conciliation, and the use of joint bodies and institutions) and legal (arbitration and adjudication). Generally, water conflicts are settled through negotiations. with an agreement as the final outcome. While conflicts may arise over scarce water resources between users within a country and sometimes between states or provinces within a country, this chapter deals with cases of possible conflict across national borders.

In fact, most transboundary water resources are subject to a treaty regime of some form. Some 3,500 international agreements govern the use of most of the world's shared waters. The agreement may be watercourse-specific (e.g. The Columbia River Treaty), a boundary agreement (e.g. the 1909 Canada–United States Boundary Waters Treaty) an umbrella agreement regulating all regional waters (e.g. 1992 Helsinki Convention on Transboundary Waters), or an instrument for dispute resolution to maintain the "friendly" relations between neighboring states. The key issues of these agreements for international lawyers are:

- The material terms of the agreement.
- The duration of the agreement.
- Whether or not the agreement is being adhered to by all parties (implementation).
- How (or if) the agreement may be modified in the event of changed or unforeseen circumstances. In some cases the legal rules for each of these elements may be ascertained from rules that are external to the treaty in question.

Of particular relevance to the PCCP–WfP process is the way disputes are resolved within the existing legal regimes governing the international waters under consideration. Review of a number of cases where international law has been a part of resolving conflict has shown that successful achievement of cooperative solutions is facilitated by:

- the legal framework in place (series of treaties)
- the relatively good neighborly relations between the parties
- the creation of joint commissions to address the problems
- agreement to submit the matter to arbitration
- absence of significant adverse impact on the quantity or quality of waters flowing into the neighboring country.

Unfortunately, these enabling factors are seldom present in water conflicts between watercourse states. Quite often relations between the parties to water disputes are tense or openly hostile, and the legal basis for regulating transboundary waters may be either lacking or insufficient. Sometimes a planned or existing use of a shared water resource may cause serious adverse impacts in another state, depriving it of its "equitable and reasonable use." In such a case international law, including various mechanisms for conflict resolution, is traditionally used by states to facilitate seeking and securing a mutually acceptable solution. International law, while admittedly not a panacea for all water conflicts, provides a transparent range of rules, instruments and mechanisms capable of transforming conflicts into cooperation. Unfortunately

enforcement of decisions and agreements under international law may remain problematic.

4.2. International Law: What it is and How it Works

4.2.1. International Law: Definition

International law is sometimes defined as a system of principles and rules of general application dealing with the conduct of states and of international organizations and with their relations *inter se,* as well as with some other persons, natural or juridical. What distinguishes international law from domestic law is that the former is both created and enforced by states (at the international level) primarily in order to regulate interstate relations in various areas of human activities, while the latter involves matters within a state's borders. It is also important to note that international law – "the law of nations" – is not comparative national law, for example the system of different national legal systems. International law operates as a separate system of law, with its own distinct rules and mechanisms.

The ultimate purpose of international law is to ensure peaceful relations between states and to prevent and resolve interstate conflicts and controversies. The pacific settlement of disputes has been enshrined in the United Nations Charter as one of the main goals of the United Nations. The principal UN organs – the General Assembly, the Security Council, and the International Court of Justice (ICJ) in particular – are each entrusted with various dispute avoidance/settlement duties and functions. Nevertheless, a judgment received as a consequence of adjudication may have more effect than an agreement reached through mediation, unless the latter is also confirmed by a court.

The "Sources" of International Law

Statute of the International Court of Justice Article 38 (1): "The Court, whose function is to decide in accordance with international law such disputes as are submitted to it, shall apply:

a) international conventions, whether general or particular, establishing rules expressly recognized by contesting States;
b) international custom, as evidence of a general practice accepted as law;
c) the general principles of law recognised by civilised nations;
d) . . . judicial decisions and the teachings of the most highly qualified publicists of the various nations, as subsidiary means for the determination of rules of law."

4.2.2. Sources of International Law

International law incorporates the rules that have emerged and developed as a result of many centuries of interstate relations and practice. Those rules that legally bind states may be found in international treaties, international customary law, and, general principles of law: the so-called "sources" of international law. International treaties and international custom are the primary sources of law. The decisions of international courts and arbitral tribunals, and legal doctrine (the teachings of the "most highly qualified publicists" of various nations) are also used to determine the applicable rules of law, as "subsidiary" sources.

Until relatively recently the rules of customary – or unwritten – law, played the most dominant role among the sources of international law. International custom is a legal rule that has evolved from the practice of states, usually in the absence of formal agreements (although agreements may contain rules of customary law). To become binding, customary law must be the subject of a general widespread practice that demonstrates the rule is considered by states to be a "law" that governs their activities. The evidence of customary law (state practice) can be found in the form of agreements, statutes and decrees, diplomatic correspondence, statements of states' representatives in international organizations and conferences, and so forth.

Over the last fifty years many customary rules have been "codified" (written down) in the form of special international treaties – "codification" conventions. Today international treaties have replaced customary law as the most important and prevalent source of international legal rights and obligations. Given their particular significance, especially in the area of water law, treaties will be discussed in some detail in this part of the study.

In the rare instances where rules of customary law or treaty law are lacking or inadequate, "general principles" of law may provide a source of international law, largely through providing a method to use existing sources. These rules are generally gleaned from the domestic practice of all legal systems, and traditionally represent laws that are common to all legal systems. The general principles of law are identified through inference, analogy, and inductive reasoning from existing international or domestic (national) law. Examples include the principles of "good faith," estoppel (consistency with previously held positions or actions), and proportionality.

Additionally, some non-legally binding acts of a normative character (such as declarations, resolutions, and recommendations adopted by the UN General Assembly and various international organizations and conferences) can be considered as "subsidiary" sources of international law. While resolutions and recommendations lack a legally binding quality, they play an increasingly important role in the development of international law, especially in the field of environmental protection and natural resource utilization.

4.2.3. International Treaties

International treaties have now replaced customary law as the primary source of international law. Compared with rules of customary law, international treaties are considered to have many advantages. They provide a clearer manifestation of the legal undertakings made by states; their norms are often more precise and more easily accessible. They are also able to deal with questions of a highly technical nature (such as freshwater quality and quantity standards, norms of water abstraction, permissible levels of discharges and emissions, and so on).

Multilateral treaties, which are often called international conventions, are normally adopted by specially convened international conferences, usually under the auspices of the United Nations General Assembly or of UN specialized agencies. Among the most important are conventions that "codify" customary international law in particular fields of interstate relations or activities such as the law of the sea, diplomatic and consular relations, and the law of the non-navigational uses of international watercourses, to name a few examples.

The Vienna Convention on the Law of Treaties codified and "progressively developed" international treaty law: the customary and other rules governing conclusion, implementation, interpretation, and termination of international agreements. Treaties are concluded, or become legally binding, only after a series of specific actions by the state parties to them. The actions are designed to signify clearly the consent or agreement of states to be bound by their legal undertakings. States can demonstrate by signing, and in the case of important treaties, through their subsequent ratification, the act of giving consent. In modern practice ratification is usually necessary, as the constitutional law in many countries requires an elected representative body to approve of the agreement before it becomes legally binding.

4.2.4. 1997 UN International Watercourses Convention

There is only one universal treaty dealing with the use of freshwater resources: the 1997 UN Convention on the Non-Navigational Uses of International Watercourses (1997 IWC Convention). The initial attempt to draft a treaty with universal application to shared international waters dates back to 1970, when the UN General Assembly

asked its International Law Commission (ILC) to prepare a set of rules governing the non-navigational uses of IWC. The Commission, which consists of thirty-four international lawyers serving in their individual capacities and representing the major legal systems of the world, is a special UN organ entrusted with the codification and progressive development of international law. In 1994, the ILC adopted Draft Articles on the law of the non-navigational uses of international watercourses, following close to thirty years of work on the topic. This project went forward to the UN General Assembly and its Sixth (Legal) Committee, which provided the forum for negotiating and eventually adopting the 1997 IWC Convention.

That the effort to codify international law of water resources was a challenging task is evidenced by the time it has taken to come to agreement and by the differences in legal positions that had to be reconciled. Until the very last deliberations of the UN Working Group of the Whole in April 1997, it was uncertain whether or not states could find agreement and adopt a universal convention. Seemingly irreconcilable views on the nature and extent of a state's right to use transboundary water resources that had divided upstream and downstream countries in the past resurfaced during the debate. Three central issues dominated the UN debate. They included: first, the status of existing treaties and the effect of the convention on future agreements; second, the relationship between the "no harm" rule and the principle of "equitable and reasonable utilization," including environmental considerations; and third, the provisions on dispute settlement.

Notwithstanding the serious disagreements that for some time threatened the negotiations, the text was finally agreed on by the majority of state representatives in the Sixth Committee and adopted by the UN General Assembly on May 21 1997. There were 104 in favor, three against, and twenty-six abstentions. So far twelve countries have become parties to the 1997 IWC Convention, and eight additional states have signed but not yet ratified it. To enter into force it needs to be ratified or approved by thirty-five states. Regardless of when and whether the Convention enters into force, it is clear that it will play a very important role in all relations involving watercourse states.

As of September 2002, the 1997 IWC Convention has been ratified by: Finland, Hungary, Iraq, Jordan, Lebanon, Namibia, Netherlands, Norway, Qatar, South Africa, Sweden, and the Syrian Arab Republic. Signatories are Côte d'Ivoire, Germany, Luxembourg, Paraguay, Portugal, Tunisia, Venezuela, and Yemen.

The 1997 IWC Convention applies to uses of IWC for purposes other than navigation and to measures of protection, preservation, and management related to those uses. "Preservation" includes conservation, but does not extend to living resources unless these are affected by other uses. Navigation is covered only to the extent that it affects other uses or is affected by them. The term "international watercourse" is defined as a system of surface and connected groundwater located in more than one state. The IWC does not govern the use of "confined" transboundary groundwater (also called "confined aquifers") or fossil aquifers.

Substantive rules normally defines those customary or treaty rules, which deal with the creation, definition, and regulation of rights and duties. The issue of "entitlement" is the fundamental issue. Entitlement is a legal right to use the waters of a shared watercourse located in the territory of a watercourse state.

Legal entitlement: "*Who* has a right to use *what* water?"

The primary substantive rules of the 1997 IWC Convention include the governing rule of "equitable and reasonable utilization" and the obligation to take all measures necessary not to cause significant harm. A non-exhaustive list of factors to be considered in the determination of an "equitable and reasonable use" covers two broad categories. These are, first, scientific (hydrographic, hydrological, climatic, ecological, factors of a natural character; effects of use on other watercourse states,

existing and potential uses, conservation measures, and availability of alternatives), and second, economic (social and economic needs, population dependent on watercourse). The convention directs that "the weight to be given each factor is to be determined by its importance in comparison with that of other relevant factors. In determining what is an equitable and reasonable use, all relevant factors are to be considered together and a conclusion reached on the basis of the whole."

The ILC suggests that a watercourse state should first attempt to determine its legal entitlement to the beneficial uses of an IWC in its territory. States should take into account, in an ongoing manner, all factors that are relevant to ensuring that the equal and correlative rights of other watercourse states are respected." The primary rule of "equitable and reasonable use" includes consideration of "all relevant factors" as they may arise in the context of new or increased uses. Thus, factors such as vital human needs, in-stream flow requirements, pollution harm, sustainable development requirements, and so forth are all part of the calculus. Implementation of the rule is flexible and tied to specific uses at specific points of time.

4.2.5. Convention on the Protection and Use of Transboundary Watercourses and International Lakes (Helsinki I Convention)[2]

The Convention on the Protection and Use of Transboundary Watercourses and International Lakes (Helsinki I Convention) forms the backbone of the UN Economic Commission for Europe (UNECE) water-related legislation. However two other UNECE conventions (the Espoo Convention on Environmental Impact Assessment in a Transboundary Context and the Helsinki II Convention on the Transboundary Effects of Industrial Accidents) are of key importance for transboundary water management.

The UN/ECE Convention on the Protection and Use of Transboundary Watercourses and International Lakes was signed in 1992 at Helsinki by twenty-five countries, and by January 2002 ratified by thirty-two countries including the EU. The aims of the Convention may be summarized as follows:

- protection of transboundary waters (including surface and ground waters) by preventing, controlling and reducing pollution
- ecologically sound and rational management of transboundary waters
- reasonable and equitable use of transboundary waters
- conservation/restoration of ecosystems.

To that end, parties have the obligation to take measures for prevention, control and reduction of pollution, where possible at source. This applies both to point and diffuse sources.

The Convention explicitly recognizes the need to apply a number of basic principles. The *precautionary principle* implies that action to avoid the potential transboundary impact of the release of hazardous substances shall not be postponed on the ground that scientific research has not fully proved a causal link between those substances and the potential transboundary impact. Costs of pollution prevention, control and reduction measures shall be borne by the polluter (the "polluter pays" principle). Water resources shall be managed so that the needs of the present generation are met *without compromising the ability of future generations* to meet their own needs.

The essential obligation of all Parties is to develop, adopt, implement and render compatible relevant legal, administrative, economic, financial and technical measures with respect to a number of issues including:

- application of low- and non-waste technologies
- introducing emission limits for and licensing of wastewater discharges
- applying at least biological treatment to municipal wastewater

- applying best available technology (BAT) and best available practices to reduce nutrient inputs from industrial and diffuse sources
- application of environmental impact assessment
- promoting sustainable water resources management including the application of the ecosystems approach
- contingency planning and minimization of the risk of accidental pollution
- monitoring the conditions of transboundary waters
- research and development on effective techniques for the prevention, control and reduction of transboundary impact.

The main and core obligation to the riparian parties, i.e. the parties bordering the same transboundary waters, is to enter on the basis of equality and reciprocity into bilateral or multilateral agreements or other arrangements. These are to define their mutual relations and conduct regarding the prevention, control and reduction of transboundary environmental impacts. Such agreements shall provide for the establishment of joint bodies, covering well-defined catchment areas, with their tasks including to:

- collect, compile and evaluate data on and inventories of pollution sources
- elaborate joint monitoring programs
- elaborate emission limits for wastewater and evaluate effectiveness of control programs
- elaborate joint water quality objectives
- develop concerted action programs for the reduction of pollution loads
- establish warning and alarm procedures
- exchange information on existing and planned uses of water and on BAT.

The work of the joint bodies specifically also includes cooperation with coastal states, as well as with the joint bodies established by coastal states for the protection of the marine environment directly affected by transboundary impact.

Whether or not in the framework of joint bodies, the riparian states have very detailed obligations on consultations, joint monitoring and assessment, common research and development, exchange of information, warning and alarm systems, mutual assistance and public information

Under the Helsinki I Convention, several additional instruments – either binding or non-binding – have been negotiated, and others are still under negotiation. These include the following:

- The Protocol on Water and Health (negotiated jointly under the auspices of UNECE and the WHO/EURO Regional Committee), adopted in London on 18 June1999.
- Guidelines on Monitoring and Assessment of Transboundary Rivers (2000a); Guidelines on Monitoring and Assessment of Transboundary Groundwaters (2000b); Guidelines on Monitoring and Assessment of International Lakes (2002).
- Guidelines on Sustainable Flood Prevention (2000c).
- An Intergovernmental Group on Civil Liability started in November 2001 negotiation on a binding instrument on civil liability for transboundary damage caused by hazardous activities, within the scope of the Helsinki I and Helsinki II Conventions.

4.2.6. Convention on Environmental Impact Assessment in a Transboundary Context (Espoo Convention)

Environmental impact assessment (EIA) has already proven to be a very important instrument for implementing and strengthening sustainable development. It combines the precautionary principle with the principle of preventing environmental damage, and arranges for public participation. EIA has become the major tool for an integrated approach in the UNECE region for the protection of the environment, since it requires a comprehensive assessment of the impacts of an activity on the environment, contrary to the traditional sector approach. Moreover, it looks into alternatives to the proposed activity, and brings facts and information on environmental impacts to the attention of the decision makers and the public. The EIA Convention was adopted at Espoo (Finland) on February 25 1991. It was signed by twenty-nine countries, and by July 2000 ratified by thirty countries including the EU.

This convention is the first multilateral treaty to specify the procedural rights and duties of Parties with regard to transboundary impacts of proposed activities and to provide procedures, in a transboundary context, for the consideration of environmental impacts in decision-making procedures. The EIA Convention stipulates the obligations of parties to assess the environmental impacts at an early stage of planning. The EIA Convention prescribes measures and procedures to prevent, control or reduce any significant adverse effect on the environment, particularly any transboundary effect, likely to be caused by a proposed activity or any major change to an existing activity.

4.3. International Water Law

4.3.1. What is It?

International water law (also known as international watercourse law, or international law of water resources) is a term used to identify those legal rules that regulate the use of water resources shared by two or more countries. The primary role of international water law is to determine a state's entitlement to the benefits of the watercourse (substantive rules) and to establish certain requirements for states' behavior while developing the resource (procedural rules).

The development of international water law is inseparable from the development of international law in general. Such fundamental principles and basic concepts as the sovereign equality of states, non-interference into matters of exclusive national jurisdiction, responsibility for the breach of a state's international obligations, and peaceful settlement of international disputes apply equally in the area governed by international water law.

At the same time, this relatively independent "branch" of international law has developed its own principles and norms specifically tailored to regulate states' conduct in a rather distinct field: the utilization of transboundary water resources. The basic rules are: the right to use waters of the transboundary watercourse located in the territory of the state ("equitable and reasonable utilization") and a correlative duty to ensure similar rights are enjoyed by co-basin states.

International water law and international water-related cooperation are undergoing changes in a very dynamic way with the introduction and/or adaptation of various water-related agreements: global, regional, basin-related, and bilateral. These are not just the result of legal and professional expertise in the field, but are determined by the outcomes of negotiations, which form the tool and the forum for reconciling the interests of various sectors, disciplines, and countries. The mere fact of negotiations taking place means that the risk of an escalating conflict is limited.

4.3.2. Principal Sources

The law governing international watercourses has evolved through both custom (practice of states) and international treaties, and has been influenced by other "sources" of law: general principles of law, judicial decisions, and resolutions and recommendations of international organizations.

International customary law is the primary source of two fundamental obligations of states regarding transboundary water resources: to use them in an "equitable and reasonable" manner and to avoid causing significant harm to other riparian states. There have been several attempts to put these and other customary rules "on paper."

In 1966, the International Law Association (ILA) adopted the Helsinki Rules on the Uses of the Waters of International Rivers, a comprehensive set of rules that codified and progressively developed the law that governs utilization of the waters of international drainage basins. The ILA Helsinki Rules could be considered as a "statement of the existing rules of international law" at the time they were adopted. The most important among these was the cornerstone principle according to which each river basin state was entitled to an equitable and reasonable share in the uses of the waters of an international drainage basin.

Since 1966, the ILA has adopted a number of resolutions that provide supplementary rules dealing with specific issues of transboundary water resources: flood control, international groundwater, and regulation of flow, pollution, administration, and so forth, most of which are contained in their Campione Consolidation (1999). Although the ILA resolutions are not legally binding they are widely acknowledged by many states and numerous international water resource experts to be an authoritative statement of the international law governing transboundary water resources.

International judicial decisions played a particularly important role in the evolution and clarification of the customary rules of international water law. On a number of occasions international tribunals were asked to settle disputes over transboundary waters between riparian countries. The most recent and probably the most important dispute over water brought before the International Court of Justice (ICJ) is the Gabčikovo–Nagymaros case (also known as the Danube River Case), involving Hungary and Czechoslovakia (at a later stage Slovakia, as a successor state). This case is described in Box 4.1.

***Box 4.1*. Danube River Case before the IJC**

The dispute arose over the implementation of the bilateral treaty concluded in 1977 with the aim of constructing a series of dams and barrages on a stretch of the river crossing the territories of the two states, Hungary and Czechoslovakia. The project was conceived as a joint venture, with equal participation in terms of investment and sharing of future benefits, for the purposes of hydropower generation, improving navigation, and flood and ice control on the Danube River.

Ten years after the works began, serious opposition to the project on environmental grounds in Hungary forced the country's government to suspend and eventually abandon its part of the project. Czechoslovakia, which by this time had completed substantial works assigned to it under the treaty, had little choice but to proceed with the so-called "Variant C": one of the possible "provisional solutions" that allowed it to complete the project without Hungary's participation. It had to divert most of the flow (80 to 90 percent) into the bypass canal, which

rejoins the main stem of the river further downstream. In response, Hungary unilaterally terminated the 1977 Treaty. The two parties tried unsuccessfully to resolve their dispute through negotiations and third-party mediation offered by the Commission of the European Communities.

Finally, the dispute was submitted to the ICJ, which was asked to address the following questions:

- whether Hungary was entitled to suspend and abandon works
- what should be the legal effects of Hungary's unilateral termination of the 1977 Treaty
- whether the Czech and Slovak Federal Republics were entitled to proceed and implement Variant C.

The range of legal issues that the court had to address was without precedent. It ranged from the validity of international treaties, succession of states and international responsibility to environmental protection and the law of international watercourses. In essence, the Court decided that both parties acted unlawfully. Hungary had done so by abandoning work on the project, Slovakia by putting into operation Variant C and thus diverting for its use and benefit between 80 and 90 percent of the waters from the part of the river that constituted the boundary between the two countries. The Court also upheld the legal validity of the 1977 Treaty, which allowed the parties to adjust the project in order to address environmental concerns, and ruled that that its purported termination by Hungary was ineffective. The joint operational regime of the entire project would have to be reinstalled, and the parties, unless they agreed otherwise, would have to compensate each other for the harm caused by their unlawful acts.

National judicial decisions, although not a *source* of international law as such, can serve as models for resolution of international disputes or be used to identify applicable general principles of law. This is especially true when considering decisions of the supreme courts that were called on to settle water controversies between different constituent units (states, länder) in federal states. The US Supreme Court, in particular, has greatly influenced the articulation of some of the fundamental rules of water law. The Court unequivocally endorsed the approach to water allocation based on the equality of rights of upper and lower riparian states: the former have no entitlement to undiminished stream flows, while the latter are not entitled to claim exclusive rights to use water only because it originates within their territory. In resolving interstate conflicts over water sharing the Supreme Court developed and applied the doctrine of "equitable apportionment" which eventually evolved into the international legal principle of "equitable and reasonable utilization."

International treaties are the primary instruments of cooperation in the field of water resource utilization as well as the most important source of international water law. More than 3,600 international agreements, bilateral and multilateral, that deal with water-related issues are known. The first general treaty dealing with international watercourses – the 1923 Geneva Convention relating to the Development of Hydraulic Power affecting more than one state – failed to achieve its objectives. Only ten countries, none of them having common borders, ratified it.

There are a significant number of *multilateral–regional and basin-wide agreements*, the most significant being the 1997 UN Convention on the Law of the Non-Navigational Uses of International Watercourses (1997 UN IWC Convention). The other most important water treaties are:

- The 1992 UN Economic Commission for Europe Convention on the Protection and Use of Transboundary Watercourses and International Lakes, concluded in Helsinki (1992 UN ECE Helsinki Convention).
- The 1992 Agreement on Cooperation in the Area of Joint Management, Utilization and Protection of Interstate Water Resources [in Central Asia] (1992 Central Asian Water Agreement).
- The 1994 Convention on Cooperation for the Protection and Sustainable Use of the Danube River (1994 Danube Convention).
- The 1995 Agreement on the Cooperation for the Sustainable Development of the Mekong River Basin (1995 Mekong Agreement).
- The 1998 Convention on the Protection of the Rhine (1998 Rhine Convention).
- The 1995 Protocol on Shared Watercourse Systems in the Southern African Development Community (1995 SADC Protocol) (later superseded by the 2000 Revised Protocol on the Shared Watercourses in the Southern African Development Community (2000 SADC Revised Protocol).

Examples of *bilateral water-related treaties* are numerous. Among the earliest was the 1909 Boundary Waters Treaty concluded between the United States and Canada (Great Britain), which established an International Joint Commission: one of the most successful models of bilateral cooperation. Many bilateral treaties that established international boundaries also deal with the waters that are crossed or constitute an international boundary (one example is the 1973 agreement between Czechoslovakia and the USSR on the regime of state frontiers and cooperation in frontier questions). Some bilateral agreements may also have a "framework" character that establishes certain general legal rights and obligations, and creates institutional mechanisms of cooperation for all "transboundary" waters. Examples are the 1956 treaty between Hungary and Austria concerning the regulation of water economy questions in the frontier region, or the most recent agreement of May 24 2002 between Russia and Belarus on cooperation in the field of protection and rational use of transboundary water bodies. Finally, bilateral agreements are often concluded to regulate different activities on specific watercourses (such as the series of agreements between France and Switzerland concerning Lake Leman). They may also be related to the implementation of joint projects (such as the 1977 treaty between Hungary and Czechoslovakia concerning construction of a system of barrages and ship locks on the Danube).

Thus, water treaties may be bilateral or multilateral; they may have a "framework" character governing all transboundary waters or deal with a specific international watercourse (IWC) or part of it; they may regulate a particular use, be project specific or be concerned with the watercourse protection and pollution control.

4.3.3. The Obligation to Cooperate and its Procedural Applications[3]

The duty to cooperate is the bridge between the substantive and procedural rules under customary international water law. The obligation of notification is one key element of such cooperation. States must notify other riparian states of planned measures in watercourses that could potentially affect them. This does not imply that they must obtain prior consent to plan the works. Procedural rules to be followed by states when they seek to undertake new works are one of the strengths of the 1997 UN Watercourses Convention. Following such rules would be a sine qua non for the involvement of the World Bank in the project.

The obligation to give notice of environmental (or social) impact studies, though well established in domestic law, is not yet a rule of customary international law. It is not provided for in the 1997 UN Watercourses Convention. It is, however, included in a number of international legal instruments, including the 1992 Helsinki Convention.

The obligation to give notice in emergency situations is a rule of customary international law. However questions remain as to who must be notified, and when.

The obligation to notify automatically entails the obligation to enter into consultations or negotiations. This is, however, an obligation of conduct not of results!

Procedural obligations have been repeatedly affirmed in treaties and other international legal instruments. Except for the obligation to notify in emergency situations there is still some debate whether these obligations are rules of general customary international law. It is desirable that institutional mechanisms be established to facilitate such consultations, but this has not always been the case nor is it obligatory. New treaties being established tend to promote higher levels of cooperation, together with the establishment of the supporting institutional mechanisms. Under the UN Watercourses Convention, binding settlement procedures – including compulsory fact-finding, arbitration, and adjudication – are to be resorted to after all other measures of dispute resolution through negotiation, good offices, mediation, conciliation, and joint watercourse institutions have failed. Some flexibility is provided in how the initial stages of the dispute is handled, but where the matter is not resolved impartial fact-finding is compulsory if the parties have not agreed to another means of compulsory dispute settlement.

4.4. Alternative Dispute Resolution Approaches and their Application[4]

4.4.1. Prior Recourse

Not all conflicts escalate to the level of dispute. It is more usual that efforts focus on defusing the potential for conflict that is inherent in interstate water relations. This is the primary function of the commissions and committees described in Chapter 9. Prior recourse to other measures of dispute resolution may be a requirement under customary international law. On only one occasion have two countries at odds with each other over water issues resorted to the International Court of Justice.

As shown in Figure 4.1, recourse to formal legal processes should therefore be the last step in the process to obtain a cooperative agreement.

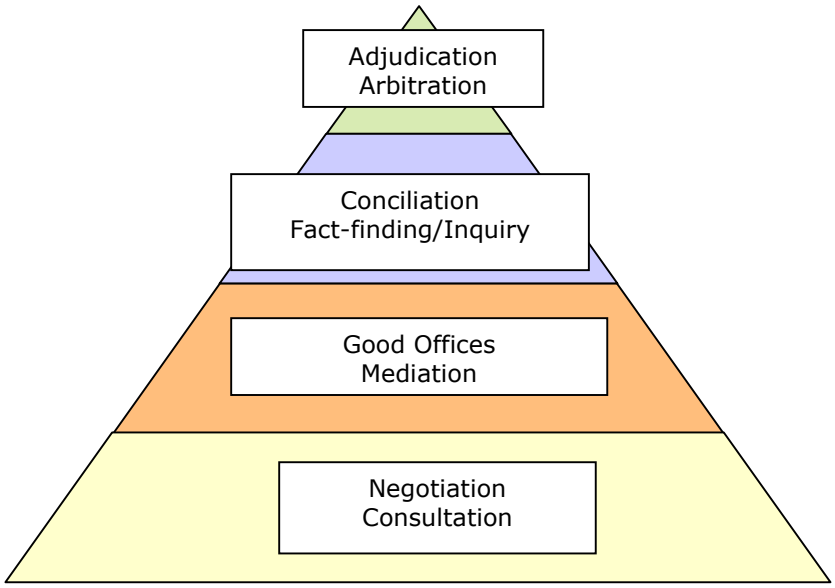


Figure 4.1. Dispute avoidance mechanisms

Analysis of several agreements at the global, regional, and basin level have identified key factors and patterns to be taken into consideration in negotiating international water-related agreements including:

- Initiation of negotiations: organizational setting, procedural rules and negotiation culture.
- Balancing of interests (upstream–downstream, inter-sector).
- Windows of opportunity; relationship with other, legally binding and non-binding instruments.
- Role of technology, research, and monitoring in the negotiation process.
- Negotiation on implementation and compliance.
- Role of human rights, transparency, and public participation.
- Role of management and financing issues in the negotiation process.

The level of development of water rights in the legislation and in the administrative practice of countries, and the ripeness of a dispute over such rights determines when adjudication comes into play before the courts of law, or before other institutions acting in an adjudicating capacity. Such adjudication has played, plays, and will continue to play a fundamental role to ensure security and dependability of title to water, and its enforcement against the claims of third parties.

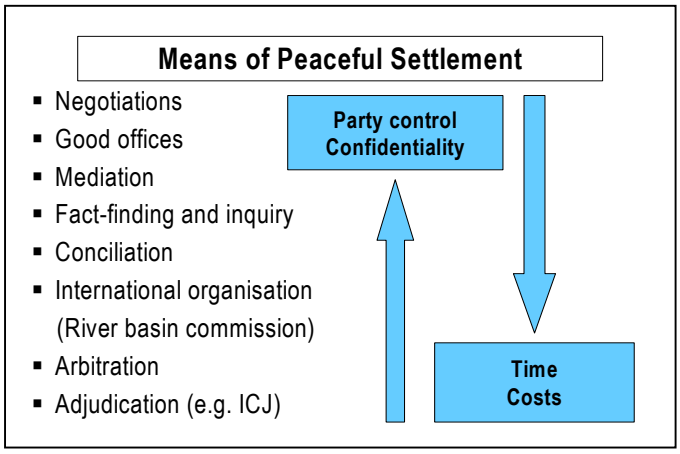
A premature judicial process may:

- Be very costly in time and money.
- Not always provide an adequate answer to the special needs of the parties.
- Not always provide an adequate answer to the special needs of society.
- Focus on procedural issues rather than the substantive issues that are the basis for the dispute.
- Damage the future relationship between the disputants. Implementation of the decision may not be enforceable.

For these reasons, in many countries when an internal water conflict erupts, the institutions, communities, and parties involved are beginning to forgo the option of the court in favor of alternative conflict resolution processes. These include negotiation, mediation, and consensus building as ways to resolve conflicts. The public, which for decades had no say in decisions that involved its interests, has become active and demands to take a role in the process and have a say in the outcome with which people will have to live. This same reaction will undoubtedly be extended to international disputes.

Some conflicts may not be resolved easily, and can last many years. Sometimes these conflicts persist in spite of the fact that they cause heavy losses of resources, and even human life. According to a study at Stanford University there are three categories of barriers to resolving conflicts:

- Tactical and strategic barriers, which stem from the parties' efforts to maximize short or long-term gains.
- Psychological barriers, which stem from differences in social identity, needs, fear, interpretation, values, and perceptions of one another.
- Organizational, institutional, and structural barriers, which can disrupt the transfer of information, and prevent leaders from reaching decisions that are in the interests of the parties in dispute.



A conflict may store within it the potential for a major future dispute, but at the same time it also contains the possibility of future creative cooperation, provided the parties

seek what is called the win–win solution. To accomplish this, one must learn to negotiate in a manner that is less competitive/adversarial, invoking the potential for cooperation. By working together as "joint problem solvers," seeking joint solutions and not working against one another, one can "enlarge the pie" which is to be divided. This can be done either by negotiation, or with the help of an impartial third party who will act as a mediator. Ideally, the ultimate outcome of this process should be a mutually acceptable solution that may form the basis of future cooperation or, at least, help to avoid the escalation of the conflict.

As the complexity of the means of peaceful settlement increases, the parties subject the process to less and less control and confidentiality. The costs and time also increase with the more complex means. However, states are free to select their own mechanisms for dispute settlement, and practice demonstrates a willingness to use the range of available options.

4.4.2. Negotiations

Negotiation is the means of dispute resolution most often employed by states when trying to resolve any international conflict, including those over transboundary water resources. Depending on the issues at stake and the number of states involved, negotiation can take various forms, from bilateral talks and diplomatic correspondence to an international conference. It can be used at all stages of the conflict. *Interest-based negotiation* shifts the focus of the discussion from positions to interests. Because there are many interests underlying any position, a discussion based on interests opens up a range of possibilities and creative options. The dialogue on interests should be transparent, in order for the parties to arrive at an agreement that will satisfy their needs and interests.

While interest-based negotiations have the potential of leading to the best outcomes, the parties may not adopt this method, and therefore negotiations are often "rights-based" or "power-based." When negotiations between parties fail, the parties may then attempt to enforce what they consider to be their rights. This means appealing to the court, and will result in a legal process in which the law is the dominant feature. Alternatively resorting to threat or even violence as a way of communication for the purpose of persuasion is called *power-based negotiation*. Negotiations are considered merely as the first step that states usually take in resolving their dispute. If they fail or if parties are unable to enter into negotiations altogether, other means of dispute settlement are available to them, and all are based on the involvement of a neutral third party.

Meetings of experts (similar to the "Picnic Table meetings" between Israeli and Jordanian water experts prior to the formal negotiations) sometimes precede diplomatic negotiations. It has been suggested that where an impasse in negotiation exists, states may consider separating the question into component parts or agreeing to a procedure to solve the problem rather than a definitive settlement of the legal interest. Negotiation was used at the outset of, and in ongoing attempts to finally resolve, the Danube River dispute between Hungary and Slovakia. Israel and Jordan negotiated their peace treaty, including its water-related provisions, in two parallel arenas: multilateral, which involved representatives of other interested states, and bilateral. Multilateral talks were not aimed at resolving the dispute but rather at enhancing the environment for the bilateral negotiations, although with mixed results.

One of the forms of negotiation is *consultation*. Consultations are normally ad hoc, but can be provided for in the agreement either within an institutional mechanism or as a dispute resolution procedure. They are usually envisaged with regard to planned measures that may affect the interests of other watercourse states. "Prior consultations" allow the parties concerned to jointly discuss and evaluate the impact of the proposed activity on their uses of water. As a mechanism of conflict prevention this creates an opportunity for project adjustment and accommodation

before plans proceed. The 1997 IWC Convention contains more than a dozen provisions that recommend consultation. A kind of consultation, although of a different and informal nature, has been seen in the multilateral process known as the Nile River Basin Initiative. It includes, as its important components, the work of the panel of experts entrusted with elaborating the Nile River basin cooperative framework, and a series of conferences held in each of the ten basin countries. The process brings together experts from the Nile River basin as well as international and external support agencies, and helps to exchange views and opinions on these countries' positions and plans concerning water resources of the basin.

Good Offices in the Indus River Dispute

In 1951 President Black of the World Bank offered the Bank's "good offices for discussion of the Indus water dispute and negotiation of a settlement." Both parties had to accept three preliminary conditions:

- The Indus water resources are sufficient to meet all existing uses and future needs.
- The water resources should be cooperatively developed and used to promote economic development; the basin was to be viewed as a unit.
- The problem should be solved on a functional, not political plan, independent of past negotiations, claims, and political issues.

4.4.3. Good Offices and Mediation

A third party offering good offices to the conflicting states acts as a "go-between" in order to persuade them to enter into negotiations. Neutral states, joint bodies, and international organizations, as well as individuals can offer good offices. The parties usually deem the functions of good offices to be completed once the negotiations have started. The World Bank initially offered its "good offices" to India and Pakistan in their conflict over the Indus River waters. As will be seen later, its role gradually extended to a more dynamic, and in many respects decisive, involvement in the resolution of the dispute.

4.4.4. Mediation

Mediation, as compared with good offices, is a step towards more active third-party participation in the negotiations. A mediator provides assistance to the disputing parties in finding a solution. The Israeli–Jordanian bilateral negotiations were combined with informal discussions where the American and Russian diplomats acted as "sponsors" and "facilitators," or in other words mediators. The facilitators made an effort not to impose their solutions and to remain "honest brokers," from which one or both sides from time to time sought informal help. Mediation processes are flexible, informal, confidential, and non-binding. They can be faster and less expensive than judicial procedures. They can improve the relationship between the parties. The parties and/or the mediator have the freedom to leave the process at any point.

The mediators, who are hired, appointed, or volunteer to help in managing the process, should have no direct interest in the conflict and its outcome, and no power to render a decision. The mediators have control over the process, but not over its outcome. Power is vested in the parties, who have control over the outcome: they are the architects of the solution. The mediators' role is multiple. They should help the parties to think in new and innovative ways and avoid the pitfalls of adopting rigid positions instead of looking after their interests. They should smooth discussions when there is animosity between the parties that renders the discussions futile and, in general, steer the process away from negative outcomes and possible breakdown towards joint gains.

In the Danube River dispute between Hungary and Slovakia, the Commission of the European Communities offered to mediate when the parties failed to resolve their

disagreements on the future of the project through bilateral negotiations. The preliminary agreement of the conflicting states to mediation is not mandatory, but without their consent mediation will never be successful. It is not unusual for the mediator not only to facilitate the discussion but also to suggest the terms of settlement.

The boundaries between good offices, mediation, and conciliation are sometimes blurred, and one procedure can often lead to another. The World Bank's role in the Indus River dispute is a good example of such escalating involvement. In that case the World Bank's participation increased until it was actively involved in finding a solution by providing significant financial assistance to the parties as a condition of their consent to the terms of settlement. It drafted and brokered the final agreement, which was signed by the heads of the two states and the President of the World Bank.

4.4.5. Fact-Finding

Many international disputes arise from disagreements over questions of fact. Inquiry and fact-finding are procedures specifically designed to produce an impartial finding of disputed facts. The UN International Law Commission (ILC) study of legal issues concerning dispute prevention and resolution established that fact-finding, as a course of action, will frequently resolve a dispute before any binding process is necessary. Fact-finding, or inquiry, allows states to refer questions to a panel of experts for impartial third-party investigation of factual or technical matters before diplomatic negotiations. Under the 1907 The Hague Convention for the Pacific Settlement of International Disputes, a commission of inquiry can be established "to facilitate a solution . . . by means of impartial and conscientious investigation." But its role is limited to providing "a statement of facts," which should not have the character of an award. Box 4.2 describes how this was done in the Danube River case.

Box 4.2. **Fact-finding in the Danube River case**

The Danube River dispute provides another example where the fact-finding procedure was extensively used to help the conflicting parties. Hungary and Slovakia agreed in 1992 to establish a fact-finding commission that included the Commission of the European Communities. The commission was asked to report on Variant C, a provisional solution proposed by Slovakia. It was to convene an independent group of experts to report on emergency measures, establish and implement a temporary water management regime for the Danube, and reach agreement on the terms to submit the dispute to the International Court of Justice.

Agreement was reached to establish a tripartite group of experts. The group included one expert from each party to the dispute and three from the Commission of European Communities. The group was requested to provide reliable and undisputed data on the most important effects of the water discharge and the remedial measures already undertaken as well as to make recommendations for appropriate measures. Although the experts designated by the Commission recommended several measures, the parties could not agree on them. Negotiations continued and eventually the parties reached an agreement "Concerning Certain Temporary Technical Measures and Discharges in the Danube and Monsoni Branch of the Danube." Being unable to resolve their dispute finally through negotiations and mediation, they agreed to submit the case to the International Court of Justice.

Examining issues initially at the technical level, often through joint institutions (made up of the representatives of basin states), is advantageous because experts in the field are reporting and making recommendations, minimizing the potential adverse impact of political factors and considerations. The Canada–US International Joint Commission (IJC) has successfully used this approach on numerous occasions. When confronted by controversial issues of water utilization or pollution that require technical expertise, the two governments usually refer them to the IJC. The commission's course of action is to appoint a technical advisory board of experts to collect the necessary data, to study the problem, and to recommend solutions. Thus, as early as in 1912, the IJC was asked to investigate and report on the scale of pollution of boundary waters causing harm to public health and to recommend means of remedying it. In the late 1980s, when a Canadian company's proposed mining project in the upper reaches of the Flathead River met serious objections from the downstream users in the United States, the IJC, at the request of the two governments, created a Study Board to assess the project and its possible implications. In that case, the IJC, based on the technical assessment of its Study Board, recommended against the project. One of the features of the fact-finding process under the IJC is that investigation is usually accompanied by public hearings, which allows the commission to verify the technical board's findings prior to formulating its own report and recommendations.

The 1997 UN IWC Convention has no compulsory dispute resolution mechanism, but does include a compulsory fact-finding procedure, which can be triggered by a request of any state party of the Convention.

4.4.6. Conciliation

In conciliation, an impartial third party is requested by the conflicting states to help them to resolve the dispute by examining the facts and suggesting the terms of a settlement susceptible of being accepted by them. Thus conciliation may combine elements of mediation and inquiry. However conciliation is a more formal procedure usually performed by a commission composed of representatives of the parties to the dispute as well as independent nationals of other states. A sole conciliator may also perform conciliation. The conciliator seeks to objectively establish the facts and applicable law in a dispute through independent investigation, and this is followed by reporting of findings and recommendations to the parties. The parties may accept the recommendations or choose another form of dispute settlement. There are a number of models of conciliation that states may adapt to their particular circumstances, including that proposed in the ILA 1966 Helsinki Rules.

> **Conciliation** "is a process of formulating proposals of settlement after an investigation of the facts and an effort to reconcile opposing contentions, the parties to the dispute being left free to accept or reject the proposals formulated."

4.4.7. Skills Required for Successful Mediation and Conciliation

The success of the processes of good offices, mediation, and conciliation depends on the personality and skills of the facilitator/mediator. The required skills and useful processes must be learned. A recommendation for more training is included in Chapter 11.

4.4.8. Institutional Mechanisms

Transboundary water controversies and disputes are often resolved under the auspices of various international organizations and bodies, such as river basin commissions established by multilateral or bilateral agreements. A number of such mechanisms have been created for individual river basins or watercourses. Thus, the

Canada–US International Joint Commission (IJC) includes among its responsibilities reporting on the findings of joint studies and recommending decisions on the questions of differences referred to it by the two governments. Under the 1944 Mexico–United States agreement related to the Colorado, Rio Grande, and Tijuana Rivers, the parties established the International Boundary Waters Commission, which continues to resolve disputes over waters shared by the United States and Mexico through a series of decisions adopted as "minutes," which are binding.

4.4.9. Arbitration

Compared with all other dispute resolution mechanisms involving impartial third parties, arbitration and adjudication are regarded as "legal" means of peaceful settlement leading to a legally binding decision. The parties must consent to arbitration – they agree to submit their dispute to an arbitrator or an arbitral tribunal, either in a prior agreement containing an arbitration clause, or after the dispute has arisen. In submitting a dispute to arbitration, parties may choose to follow the procedural rules and employ the administrative services of an arbitral institution, or they may organize the proceedings ad hoc.

While it is more formal than the ADR mechanisms described in the preceding sections, arbitration offers some distinct advantages over litigation. It allows for more flexibility in that the parties can not only nominate the arbitrator(s) who will hear the dispute, but they can also determine the law governing the substance and procedure of the case, where the dispute will be heard, and the language of the arbitration. The parties can also decide whether their dispute will be heard by a single arbitrator or by a panel of arbitrators. Generally, arbitration hearings are private. The arbitral decision can also be kept confidential, but in any event, it is binding on the parties; appeals procedures are only available if established by prior agreement. Under the framework of the 1997 UN Watercourses Convention, binding settlement procedures are to be resorted to after all other means of dispute resolution have failed.

4.4.10. Permanent Court of Arbitration

The Permanent Court of Arbitration (PCA) is the longest established treaty-based international arbitration institution, and the first global mechanism for international dispute settlement. It was founded in 1899, and it now has ninety-seven Member States, signatories to either one or both of the 1899 and 1907 Conventions for the Pacific Settlement of International Disputes. Originally designed for inter-state arbitrations, the PCA has evolved its capacity to administer disputes between states and non-states, between international organizations and states, and between international organizations and private parties. The Court offers services for fact-finding and commissions of inquiry, conciliation, good offices and mediation, in addition to arbitration. The governing body of the PCA is its Administrative Council, which consists of delegates of Member States and meets twice a year. The Secretary-General and the PCA International Bureau carry out the day-to-day work of the Court.

The PCA has in recent years become increasingly active in the field of natural resources dispute resolution. In 2001, it adopted procedural rules specially tailored to arbitrating disputes relating to natural resources and/or the environment. This was followed, in 2002, by optional rules for conciliation of such disputes. These rules outline procedures for the selection of arbitrators and conciliators, and they include provisions on confidentiality, evidence, interim measures, the role of experts, effect of failure to appear or make submissions, awards, and interpretation and correction of the award. Parties are given the flexibility to designate the law applicable to the dispute. Agreement or failure of designating applicable law empowers the arbitral Tribunal to apply national/international rules of law it finds appropriate. It may decide the case e*x aequo et bono* by agreement of the parties.

The tribunal may appoint experts to report to it, upon notice to the parties. The PCA maintains two separate lists of experts in the field, nominated by the Member States of the PCA, from which parties and the tribunal may draw, although they are not limited to the names on the lists: first, a panel of scientific experts in natural resources and/or environmental science, and second, a panel of arbitrators with expertise in international environmental law. In the absence of an agreed procedure, the Environmental Rules can be used to address disputes concerning conflicts of use and transboundary damages. The Rules may thus serve as a guide to convene an *ad hoc* tribunal or to summon expertise under the auspices of the PCA.

Given the urgent nature of disputes pertaining to water specifically, and to natural resources and the environment more generally, the Environmental Rules contain a procedure for expedited proceedings.[5]

4.4.11. Adjudication

Ultimately, the parties may agree to have their watercourse conflict heard by an ad hoc or permanent court. As described earlier, the most prominent standing judicial body is the International Court of Justice (ICJ), which has been used increasingly by states in their international disputes. As also noted earlier the Gabčikovo-Nagymaros case on the Danube River is the most important example of a judgment related to water by the ICJ

4.5. New Approach: Compliance Verification Mechanisms

A state's non-compliance with its international obligations can lead to conflicts and frustrate the very foundation of the agreement reached by states. States may not comply with international agreements because of indefinite ambiguous treaty obligations, lack of capacity, or changing economic, social and political conditions. Compliance mechanisms are not obvious in international water agreements, nor are they clearly defined in international environmental agreements. Compliance is defined as "those activities aimed at achieving the goals and objectives of the treaty regime," and a "compliance system" is a subset of treaty rules and procedures that influence compliance with the given rules. The experts' report to the working group on legal matters of the 1992 Helsinki Convention Manual of Practice further develops these concepts into a framework for analyzing international environmental agreements and international watercourse agreements, reporting that few international watercourse agreements have compliance verification mechanisms.

Compliance Evaluation – includes two components:

- **Information and Review** (broadly interpreted, including consultations where treaty goals may not be met);
- **Non-Compliance Response**: comprised of assistance and enforcement (sanctions, dispute avoidance and dispute settlement mechanisms).

(UNECE Compliance Strategy Report, 2001)

The London Protocol on Water and Health

Article 15, "Review of Compliance", provides: "The Parties shall review the compliance of the Parties with the provisions of this Protocol on the basis of the reviews and assessments referred to in Article 7. Multilateral arrangements of a non-confrontational, non-judicial and consultative nature for reviewing compliance shall be established by the Parties at their first meeting. These arrangements shall allow for appropriate public involvement."

Elements of a compliance system mechanism are:

- exchange of information
- monitoring and review of state actions
- assistance and cooperation
- consultations, dispute avoidance and dispute resolution mechanisms.

Recent advances in international environmental agreement compliance show that successful compliance regimes include mechanisms that enhance, improve, and ensure compliance, rather than enforcement mechanisms. A compliance system should contain measures and incentives that facilitate compliance strategy, and should include clear obligations, a compliance procedure for collecting, reviewing and evaluating information on compliance, and an institutional mechanism charged with carrying out this activity. Public access to information, and equal access to justice should be considered as important elements of a compliance regime.

Emerging examples of compliance can be found in the UNECE treaties relating to water (1992 Helsinki Convention), health (1999 London Protocol on Water and Health) and access to justice/public participation (Aarhus Convention). It also appears in the 2000 Revised SADC Protocol, under which the Committee of Water Ministers has as its first function to "oversee and monitor the implementation of the Protocol." It also has the task to "provide regular updates to the Council on the status of the implementation" of the Protocol. The Water Sector Coordinating Unit, the executing agency of the Water Sector, is also required to "monitor the implementation" of the Protocol." It has further responsibilities to "liaise with other SADC organs and Shared Water Institutions on matters pertaining to the implementation" of the Protocol, and to "provide guidance on the interpretation" of the Protocol.

It is recommended that watercourse states consider including compliance verification systems in their agreements, and provide mechanisms for facilitating this means as a dispute avoidance foundation for their relations over water. Effective compliance mechanisms could offer the means for the future peaceful management of the world's shared fresh water.

4.6. Protection of Water Facilities under International Law[6]

4.6.1. Existing International Law

International law has evolved in response to the changing character of international conflict. Most conventions and treaties were designed to cover "war" or conflicts of an international nature. The concept of war is changing, and the term is used more often in the international war against terrorism. The changing nature of conflict and shortages of fresh water will certainly increase the potential for instability in the years ahead. Water facilities, watercourses, and their sources in the environment are protected to some extent under law, both domestic and international. Each state has its own criminal laws that make the destruction of property a crime, but international law is a different matter. There are numerous documented cases where the destruction of a regional water supply as a result of armed conflict has resulted in widespread suffering for the local population. The international response to terrorism presents a number of different challenges.

The Geneva Convention at its origin addressed the treatment of sick and wounded soldiers in time of war. Revisions addressed international humanitarian issues as a result of the atrocities witnessed in the First and Second World Wars. They also contained the beginnings of modern concepts of environmental protection during wartime. In addition to the prohibition of "willfully causing great suffering or serious injury to body or health," the conventions prohibit the "extensive destruction and appropriation of property, not justified by military necessity and carried out unlawfully and wantonly." Water and its associated storage and delivery facilities can be considered to come under this prohibition.

The fundamental principles of customary international law applicable to the protection of water facilities are those of humanity, discrimination, proportionality, and military necessity. In addition to these four fundamental principles, a fifth has recently emerged, providing that "nature is no longer fair game in human conflicts." This can be seen in the World Charter for Nature, which provides that "nature shall be

secured against degradation caused by warfare" and "military activities damaging to nature shall be avoided."

On examination, these fundamental and emerging principles of international customary law are directly applicable to the protection of water facilities, including mobile delivery systems. However, the nature of modern conflict makes it particularly difficult to protect water facilities by the use of these principles. The principles of discrimination, humanity, proportionality, and damage to the environment apply to actions taken during times of armed conflict where belligerent armed forces are under an identifiable command structure. The recent increase in the activity of international terrorist groups evidences the changing nature and complexity of conflict that threatens water facilities around the world. Additionally, the concept of collateral damage further complicates the picture, when there are unintended consequences of an otherwise lawful attack by state actors.

4.6.2. Weaknesses in the Existing Law

International courts have limited utility in dealing with terrorism. There exists no "normative fabric to international law," just bits and pieces of overlapping norms, with significant gaps in coverage with respect to terrorism. The International Court of Justice (World Court) can hear only matters between states (nations) and it has no criminal jurisdiction, while the International Criminal Court (ICC) is years away from effective operation. It came into existence in July 2002, but without US support.

There are a number of deficiencies with respect to international law and the protection of water facilities and watercourses.

i) Terrorist acts are increasingly becoming the choice of groups unable to directly challenge world militaries. The term "armed conflict" does not include isolated attacks on water installations from terrorist groups. International humanitarian law was not designed to cover terrorism or short-term criminal activity. Coverage under the Statute of the International Criminal Court is problematic, even if that court begins to function effectively. Drafting and agreeing upon a comprehensive definition of terrorism has eluded the participants in all the previous meetings of the ICC committees.
ii) The principal conventions and treaties of international humanitarian law apply to water facilities only indirectly. There is a lack of clarity in the text and principles of proportionality, and military necessity could be used to justify an attack on a water facility even when there is substantial harm to the civilian population.
iii) The problems in identifying law in its customary form, and in determining the legality of a particular act, are made more difficult by the aspirational nature of many conventions and resolutions. But these aspirational documents, like the Stockholm declaration, serve an important function in the development of international humanitarian law. Parties who are now unable to accept a particular formulation as law are given the time to make the necessary political changes to accept the law in the future. Perhaps more important, public perception of the law, or what it should be, may be a factor for positive change when public support is necessary for the conduct of a conflict.
iv) Dissemination issues may exist. Belligerents may be unaware of the provisions of international humanitarian law, or may choose to disregard them. There is a general lack of understanding of the rules, and how they apply to water facilities and mobile delivery systems. The results can be seen in the recent conflicts described earlier in this report.
v) Enforcement mechanisms may be lacking. It can be fairly stated that impunity is the rule for those responsible for attacks against water facilities and related infrastructure. The UN Centre for International Crime Prevention has been underfunded and powerless, and INTERPOL has been only marginally useful. No

effective international criminal court exists, and domestic legal systems are often unavailable as a result of the same conflict that results in damage to water facilities. International crime-fighting institutions have been historically ineffective.

4.6.3. Measures to Correct the Weaknesses

There are two general areas in which water facilities, watercourses, and the environment in general deserve a greater degree of protection. The first is the protection afforded under international humanitarian law during times of armed conflict, and the second is protection from terrorist attack. Even without a new treaty or convention that formally establishes new law for the protection of water facilities, much can be done to move in that direction. Specific measures to address the identified weaknesses are proposed in Chapter 11. Through these actions, existing international legal obligations and state practice can be clarified and strengthened. This will promote an active interest in, and concern for, the protection of water facilities by the armed forces of all states.

Notes

1. This section is drawn from the PCCP Series Volume *Transforming Potential Conflict into Cooperation Potential: The Role of International Law,* Dr Sergei Vinogradov, Dr Patricia Wouters, and Patricia Jones, University of Dundee.
2. See PCCP Series document *Negotiations in the context of international water-related agreements*, Dr Branko Bošnjaković.
3. This section relies in part on material drawn from *Notification, Consultation, and Negotiation in International Water Resources Law,* presented by Maria Manuela Farrajota, University College London, at the International conference From Conflict to Cooperation in International Water Resources Management at IHE Delft November 21 2002.
4. This section is drawn partly from the PCCP Series Volume A*lternative Dispute Resolution and its Application*, Yona Shamir.
5. See *Resolution of International Water Disputes*, PCA Peace Palace Papers vol. 5, ed. International Bureau of the Permanent Court of Arbitration, Kluwer Law International, 2003.
6. Based on the PCCP Series volume *Protection of International Water Facilities Under International Law*, Fredrick M Lorenz, Jackson School of International studies, University of Washington.

5. TRENDS: EMERGING ISSUES AND OPPORTUNITIES FOR COOPERATION

Earlier in this report we mentioned that while humans may learn from history, there is always the possibility that the future will be different from the past. It is worth asking in what ways the future might be different. Already there are some trends that point us in a possible new direction. What new approaches or changing technologies might change the way we approach the management of transboundary waters?

5.1. Focus on Good Governance

In the Johannesburg Declaration on Sustainable Development that ended the World Summit on Sustainable Development, the heads of state declared, "We undertake to strengthen and improve governance at all levels, for the effective implementation of Agenda 21, the Millennium Development Goals and the Johannesburg Plan of Implementation." And well they might, because the weakness of governance systems has long been identified as the most important challenge facing development in general and good water resource management in particular. Some had thought that change could be introduced into and via the water sector without change in the overall system of governance in a country. However, this optimistic view has been proven to be wrong. The water sector does not exist in isolation from the other sectors. In fact, development in all sectors and the achievement of the Millennium Development Goals depend on the management and development of water resources in the context of supporting development in the other sectors. For this reason reform of the water sector can only take place in the context of overall reform of governance in a country.

The declaration by the heads of state recognizes that the transaction costs of governance – of providing services to the population through government-controlled and managed structures – do not only determine the level of services that an economy can support.[1] They also determine which private sector operations will survive, and which countries and regions will be economically stronger. The reactions to this realization may be grouped around two themes: decentralization and spatial redistribution of the population.

The trend toward decentralization is already evident. It has resulted in an increasing presence of the private sector in the provision of public services, with decentralization even within the traditional private sector. It has produced a beginning of experiments with public–private partnerships, and a rapidly increasing number of non-governmental organizations and cooperatives. Within the next thirty years it will have an impact on the structures of world trade and world government.

The perceived economic strength of countries and of regions within countries has always been a prime motivator for migration. During the coming decades this motivator will be influenced by the changing nature of work and structure of organizations in a knowledge-based economy, by climate change, by armed conflicts all around the world, and by the development of infrastructure that facilitates travel and communications. The combined result of these factors will almost certainly be a shift in the spatial distribution of the population within and among countries.

Most importantly, in the end, the management of transaction costs will require common recognition of a set of shared human values. This should be coupled with recognition of the differences among socioeconomic and cultural groups in the application of these values. The acceptance of the importance of women as contributors to our economy and society and the reform of our education systems to adapt them to a knowledge-based economy will present opportunities to develop recognition of this common set of values. Since more than half of the world population are under eighteen, it will be important to involve them in the process.

A number of issues will arise as the above developments play out. It is already known that efforts to restructure through outsourcing, downsizing, and decentralization bring a new set of problems to be managed. Not the least of these is unemployment, particularly of those with inadequate education. Regulatory systems to ensure service to the disadvantaged and protect the environment are still being tested. The line between individual and community rights has been different for centuries in Eastern and Western cultures, and will be redefined. Progress will require overcoming resistance to change, particularly by conservative and fundamentalist movements. Questions of equity, among others between rich and poor countries, men and women, present and future generations, will have to be addressed. And throughout the period there will be the threat of instability of society at all levels.

Today's society lives in a postmodern world of ambiguity and of irreconcilable realities, where adherence to historical processes of political and economic power is loosening. Outside of the military bureaucracies, command and control no longer depend on a strict hierarchy but on an ongoing balancing of individual and community preferences. In some places formal and informal ties among regional and local public and private organizations risk making them as powerful as non-democratic traditional state authorities. This is why the reformed institutions and their management systems must provide predictability, openness, and accountability. Processes for conflict management will be critical. Systems of reformed institutions will undoubtedly provide for decentralization, recognizing the principal of subsidiarity, and through local communities ensure participation by all. This last subject is so important that it is dealt with in the following chapter as a key trend. Other issues concerning the development of institutions are discussed more fully in Chapter 10.

5.2. Changing Social Values

Once predominantly the preserve of lawyers, engineers, and economists, water disputes now engage sociologists, biologists, chemists, and geologists, to name only a few of the involved professions. The response to water problems becomes less the control of nature and more the management of people. More attention is paid to reducing or eliminating negative affects on fish and wildlife.

Emerging social values force us to re-examine traditional planning objectives. Rather than maximizing economic efficiency or optimizing the opportunity to meet public objectives, planners – especially in industrialized countries – now often set limits to growth. This new planning world compels us to ask many questions and share some very real concerns. Can benefits and costs be weighted according to ethical criteria? Are moral obligations to be assigned values that are somehow measurable? Who is to determine these values (government, a public–private sector committee, an "ethics court," etc.)? Can decision arenas identified primarily in terms of water control or market preferences be used in a meaningful way to adjudicate competing claims between nature and civilization? These are all questions that require further thought and debate among all stakeholders.

5.3. New Technologies for Negotiation and Management

More than ever the world of the future will be complex and uncertain. In many ways the basic approach to water management has not changed for centuries. Yet some aspects are profoundly different. As described earlier, understanding and change are making institutions better and more resilient. The issues discussed in this volume are more and more a concern of water managers. But most importantly, the twenty-first century has access to new technology that could not have been dreamed of even half a century ago. This adds substantially to the ability both to negotiate and to manage

transboundary waters more effectively. Some of the tools (described more fully in Chapter 11) include:

- modular modeling systems for comprehensive modeling of hydrologic and human systems
- geographic information systems (GIS) and remote sensing that allow several layers of biophysical, socioeconomic, and geopolitical parameters to be viewed and analyzed graphically
- real-time monitoring tools providing more options for real-time management of water resources
- graphical user interfaces to allow components to be brought together in an intuitive, user-friendly setting.

While new technologies cannot replace the political goodwill necessary for creative solutions, and are not yet widely available outside the developed world, they can if appropriately used allow for more robust negotiations and greater flexibility in joint management.

Global warming further complicates the picture. New precipitation models are complex and often contradictory, yet their reliability is critical to water planning. Models dealing with changes in ecosystems also are subject to conflicting interpretations, although it appears clear that global warming will result in changes in various growing periods and vegetation zones. Most water resources plans have been based on the assumption that climate is more or less stationary from region to region. Climate change challenges this historical approach and raises questions about the data we have used for water planning.

The work of the scientific community, water managers, and disaster relief organizations is dependent on having historical and real-time data on which to plan and make model-based forecasts and predictions. New satellite technology is improving information gathering techniques for the future. However the monitoring systems it is dependent on for ground-proofing (calibration) are being weakened everywhere in the world, and particularly in developing countries, as governments faced with budget constraints reduce funding for an activity that seems to have no immediate benefits. The need is recognized in the WSSD Implementation Plan, and attention is particularly drawn to this in the section dealing with Africa, where not only are the data collection systems being weakened, but there is a danger in some cases of losing the historical data on which to base trends. The plan calls for strengthening and coordination among global observing systems, sharing of data from ground-based observations, and support to countries, developing ones in particular, in their efforts to collect data that are accurate, long term, consistent and reliable. It is to be hoped that recognition of this problem by the WSSD will lead to a re-examination of priorities by governments, and support for international data gathering programs.

5.4. The Geopolitics of Desalination[2]

Twice in the last fifty years – during the 1960s nuclear energy fervor, and in the late 1980s, with "discoveries" in cold fusion – much of the world briefly thought it was on the verge of having access to almost free energy supplies. "Too cheap to meter" was the phrase during the Atoms for Peace Conference. While neither the economics nor the technology finally supported these claims, it is not far-fetched to picture changes that could profoundly change the economics of desalination.

The marginal cost of desalinated water (between US$0.80 and US$1.00 per cubic meter) remains relatively high. This makes it currently only cost-effective in the developed world where, first, the water will be used for drinking, second, the population to whom the water will be delivered lives along a coast and at low

elevations, and third, there are no alternatives. The only places not so restricted are those where energy costs are especially low, notably the Arabian Peninsula. A fundamental shift in either energy prices or membrane technology could bring costs down substantially. If either happened to the extent that the marginal cost allowed for agricultural irrigation with seawater (around US$.08/$m^3$ on average), a large proportion of the world's water supplies would shift from rivers and shallow aquifers to the sea (an unlikely, but plausible, scenario).

Besides the fundamental economic changes that would result, geopolitical thinking about water systems would also need to shift. Currently, there is inherent political power in being an upstream riparian, and thus controlling the headwaters. In the scenario for cheap desalination above, that spatial position of power would shift from mountains to the valleys and from the headwaters to the sea. Many nations, such as Israel, Egypt, and Iraq currently dependent on upstream neighbors for their water supply would, by virtue of their proximity to sources of seawater, become sources themselves.

5.5. Globalization: Private Capital, WTO, and Circumvented Ethics

Very little of the recent attention on globalization and the World Trade Organisation (WTO) has centered on water resources, but there is a definite water component to these trends. One of the most profound is the perceived shift of development funds from global and regional development banks, such as the World Bank and the Asia Development Bank, to private multinationals, such as Bechtel, Vivendi, and Ondeo (formerly Lyonnaise des Eaux). Development banks have, over the years, been susceptible to public pressures and ethics and, as such, have developed procedures for evaluating social and environmental impacts of projects, and incorporating them in decision making. On international waters, each development bank has guidelines that generally prohibit development unless all riparians agree to the project, which in and of itself has promoted successful negotiations in the past. Private enterprises have no such restrictions, and nations eager to develop controversial projects have been increasingly turning to private capital to circumvent public ethics. The most controversial projects of the day – Turkey's GAP project, India's Narmada River project, and China's Three Gorges Dam – are all proceeding through the studied avoidance of development banks and their mores.

There is a more subtle effect of globalization, though, which has to do with the World Trade Organisation (WTO) and its emphasis on privatization and full cost recovery of investments. Local and national governments, which have traditionally implemented and subsidized water development systems to keep water prices down, are under increasing pressure from the forces of globalization to develop these systems through private companies. These large multinational water companies in turn manage for profit and, if they use development capital, both push and are pushed to recover the full cost of their investment. Unless controlled, this can translate not only into immediate and substantial rises in the cost of water, disproportionately affecting the poor, but also to greater eradication of local and indigenous management systems and cultures. If there is to be water-related violence in the future, it is much more liable to be in the form of the "water riots" against a Bechtel development in Bolivia in 1999, in which eight people were killed, than of "water wars" across national boundaries.

As WTO rules are elaborated and negotiated, real questions remain as to how much of this process will be *required* of nations in the future, simply to retain membership in the organization. The "commodification" of water as a result of these forces is a case in point. Over the last twenty years, no global water policy meeting has neglected to pass a resolution, which, among other issues, defined water as an "economic good." This set the stage at the 2000 World Water Forum for an unresolved

showdown against those who would define water as a human or ecosystem *right*. The debate looms large over the future of water resources: if water is a commodity, and if WTO rules disallow obstacles to the trade of commodities, will nations be forced to sell their water? While this may seem far-fetched now (even though a California company is challenging British Columbia over precisely such an issue under NAFTA rules), the globalization debate between market forces and social forces continues to play out in microcosm in the world of water resources.

5.6. Turning Political Commitments into Action

One of the biggest challenges the water sector faces is that of satisfying expectations. The setting of goals is important to making progress. If they are not achieved, new targets can be set and efforts intensified. However, when the goals set are recognized by the majority as impossible to achieve, they may discourage action rather than prompting it. An example of such an apparently unachievable goal is that of the WSSD Implementation Plan to develop integrated water resources management and water efficiency plans by 2005 (Article 25). While the measures proposed to achieve this target are all laudable, the unrealistic target date for completion of the exercise reduces its credibility. This is especially true in those countries that share waters with other countries and where the preparation of such plans will require bilateral or multilateral agreements.

Taken as a whole, the targets or incentives of the WSSD Implementation Plan related to water are excellent. However the possibility of achieving them does not only depend on water managers, although they must help by translating the generalized statements into concrete action plans. Achieving these ambitious targets is more dependent on the will of the decision makers in both the developing world and the developed world to support the development of such plans and, through partnerships, to ensure their realization. A demonstration that such will exists can be made if even a few such partnerships announce concrete plans at the Ministerial Conference during the third World Water Forum in Kyoto in March 2003. Hopefully some of these will deal with the management of transboundary watercourses.

5.7. The Changing Sources of Water and the Changing Nature of Conflict

Both the worlds of water and of conflict are undergoing slow but steady changes that may obviate much of the thinking in this report. As surface water supplies and easy groundwater sources are increasingly exploited throughout the world, two major changes result: quality is steadily becoming a more serious issue to many than quantity, and water use is shifting to less traditional sources. Many of these sources – such as deep fossil aquifers, wastewater reclamation, and inter-basin transfers – are not restricted by the confines of watershed boundaries, our fundamental unit of analysis in this study. Moreover, population-driven food demand will grow exponentially in coming years, putting unprecedented pressures on water demand.

Conflict, too, is becoming less traditional, increasingly being driven by internal or local pressures, or more subtle issues of poverty and stability. The combination of changes, in water resources and in conflict, suggests that tomorrow's water disputes may look very different from those of today.

Notes

There are contributions to this chapter from the PCCP Series Volume *Historical Explanation and Water Issues;* Martin Reuss, Office of History, US Army Corps of Engineers.

1. Transaction costs are the sum of all the financial costs, human effort and emotions required to undertake an action or do business.

2. This section is drawn from the PCCP Series volume *International Water Conflict and Co-operation: A Survey of the Past; Reflections of the Future,* Aaron T. Wolf.

6. EMERGING TRENDS: PUBLIC PARTICIPATION AND THE ROLE OF CIVIL SOCIETY

Within the high politics of international water negotiations, the concerns of local people and the need to involve the public in the process of arriving at basin management strategies and agreements are often overlooked. The achievement of cooperation and resolution of conflicts over the world's international basins would bring major benefits, including stability and security, the strengthening of democracy and human rights, reduction of environmental degradation, and improving access to drinking water and sanitation. But without the participation of citizens and the involvement of civil society partners at all levels, none of these benefits will be secured on the ground. It is increasingly clear, and demonstrated in the examples presented in this chapter, that unless stakeholders are involved and feel a sense of ownership in the political process, it is difficult to implement the recommendations or achieve tangible results at the community level.

6.1. Citizen Participation Should Not be Overlooked

Conflicts related to water resources tend to be at their most intense at the local level, between different sectors and stakeholders in direct competition over inadequate water supplies. Actions are already being taken across the world to bring water decisions closer to the stakeholders, to link water issues with other fundamental human and environmental needs, and to resolve conflicts which prevent efficient and sustainable and equitable use of water and provision of water and sanitation services. All these efforts to make water management more cooperative and participative at the local level strengthen peace, stability, governance, and the rule of law, and make people more aware of their position within a wider regional water system.

In many cases, the public first needs to be made aware that they live in a river basin, which, for billions of people will mean a river basin that crosses national borders. At the same time, river basin and state water managers need to be aware of the very real effects their water management decisions have on ordinary people, many living thousands of kilometers from the state capitals where decisions are reached. Civil society groups can fulfill both these functions, raising awareness and building capacity on the ground, and bringing the voices of the people – and of the natural environment – to the attention of decision makers. This exchange must take place at all levels, with NGOs and other groups bringing the concerns of local people to the table at every forum, from the WSSD and international trade negotiations, to national parliaments and ministries, to village and regional councils. Whether the decisions in question concern international development strategies, potential for privatization, large dam construction, or where to position a standpipe, affected communities should be active participants in the process, and environmental and social considerations always taken into account. Water issues are naturally linked to many of the central concerns of civil society groups, including poverty, environment, disease, gender, and peace. The all-encompassing nature of water thus lends itself to partnerships between sectors of society.

The role of civil society in water management, as in all matters of environmental and social affairs, has changed dramatically in the last few decades.[1] Previously completely closed governmental and inter-governmental processes have slowly, and to various extents, opened up to a wider range of stakeholders. In many new areas of the world, notably Eastern Europe and Latin America, decision making has become more transparent and accountable to the public and civil society organizations have been permitted far more freedom to engage in the political process. The growing

acceptance of the logic of public participation in environmental decision making, the benefits of decentralized management and the subsidiarity principle, and the resurgent interest in traditional and indigenous management practices, has led governments and intergovernmental organizations to look to NGOs to help reach the grass-roots level.[2] Reaching down to the smallest units of water management – to the citizen and local councils – is essential to achieving the efficiency and equality necessary for water security.

At the same time, NGOs have gained in experience, professionalism, and credibility, and have established stronger relations with the stakeholders they seek to represent. The strengthening of inter-NGO cooperation through networking bodies, joint campaigns and projects, and the use of internet communication has also helped make civil society a stronger force in international relations, and in specific regions and states. This strengthening of civil society institutions has occurred simultaneously with, and been mutually supported by, the increased awareness and interest of local people across the world in the natural resources issues which affect their lives. Increased literacy rates, wider access to information, awareness of global interdependencies generated through globalization, urbanization and the empowerment of women have all supported this process – as have the increasingly visible effects of mismanagement, environmental degradation and climate change, and disillusionment with governmental and international failures to meet development targets.

The rise in public participation and the influence of civil society is still an emerging rather than established trend. It has yet to take hold at all in some regions of the world and still faces many obstacles and restrictions. But it is already possible to identify certain fields of activity where the contribution to water management is strongest. Generally, NGOs aim at empowering local communities rather than the implementation of large-scale projects or works. In the water sector, NGOs are involved in mobilizing communities to improve their own water supply and management by strengthening local capacities, providing technical training and expertise, and promoting local democracy and sustainable livelihoods. Part of this task often involves the resolution of conflicts between sectors of society, or between stakeholders and government authorities. In transboundary basins, as some of the examples cited below indicate, this conflict resolution can extend to addressing cross-border and inter-ethnic tensions.

NGOs act as catalytic agencies for local initiatives; as facilitators in forging alliances and exchanging information; as mediators among the state, local communities, and external support agencies to encourage public participation and promote the interests of disenfranchised populations. They also act as the educators and stimulators of civil society toward the sustainable and equitable use of water. Activities include everything from action-oriented projects focused on small water supply and sanitation operations close to target populations, to international campaigns on issues of global relevance such as large dams and privatization.

6.2. Examples of Stakeholder and Civil Society Involvement in Water Security

6.2.1. International NGOs and Networks Promoting Sustainable, Cooperative Water Management

Internationally active environmental NGOs and networks are increasingly focusing their work on the promotion of dialogue, partnerships, and cooperation processes, rather than individual short-term projects. This reflects the realization that reaching the goal of integrated water resources management is a highly complex political process, requiring that the long-term social, economic, and ecological benefits of healthy freshwater ecosystems and sustainable patterns of water use be given priority over short-term financial or political gain. Initiatives aimed at promoting IWRM must

engage decision makers and stakeholders across a basin. This frequently entails transboundary cooperation between countries, sometimes spanning geographic, cultural, political, and economic divides, and calls for conflict prevention, mediation, and resolution strategies to be incorporated into project plans. NGOs are also drawing attention to the effects of long-term changes in rainfall, river flow, and underground water supplies due to climate change and to the benefits that new technologies and decision-support tools can have in pre-empting conflicts that could result from these changes if they are not properly understood. In this way, global NGOs with the capacity to reach both the highest levels of government and the representatives of communities and grass-roots initiatives, are playing an important role in many basins towards bringing all sides together to generate better understanding and cooperation.

The recently launched Water and Nature Initiative of the International Union for the Conservation of Nature (IUCN) is a partnership for action aimed at maintaining healthy ecosystems through improved management and thereby helping to alleviate poverty and contribute to solving the looming water crisis. The Initiative will be active in forty countries, creating partnerships between organizations from the global to the local level, working with governments, stakeholders, and the private sector to demonstrate the benefits of ecosystem approaches, good governance, and public participation.

Within the framework of the Water and Nature Initiative, in September 2002, during the World Summit on Sustainable Development, agreements were signed between IUCN and the governments of Botswana, El Salvador, and Vietnam. They will work together on the management of (respectively) the Okavango Delta, the Perfume River, and the Barra de Santiago–El Imposible Basin, to identify water management strategies that ensure healthy ecosystems while improving livelihoods for the poor. In the Barra de Santiago–El Imposible basin in El Salvador, the project partners provide direct support for the stakeholders of the basin, such as women's associations, governmental organizations and the private sector. This is being done through a "round table" approach that includes the identification of incentives for cooperation and will provide tools for conflict resolution within local communities.

***Box 6.1*. Orinoco River Basin**

One example of WWF's activities is in the Orinoco river basin, shared by Venezuela and Colombia, one of the world's most pristine rivers but currently threatened by plans to re-channel the river to facilitate transport. WWF and partners are encouraging the governments to consider the long-term costs and benefits of such schemes, and to search for alternative means of increasing transport capacity and accelerating regional development. Important tools in this process are hydrologic models that can simulate the basin-scale impacts of development and provide decision makers with a tool to compare different outcomes. Many approaches and technologies for integrating biodiversity conservation with plans for economic development are being made available to help communities in the Orinoco River basin to protect their unique natural heritage at the same time as improving their standard of living. The pristine nature of the basin offers great potential to use these new technologies and approaches to avoid many of the negative impacts of development that have already damaged many of the world's transboundary basins.

The World Wide Fund for Nature's (WWF) Living Waters program states that: "Positive change is possible if it is recognized that sustainable water management begins with conserving and restoring the springs, rivers, lakes and marshes that are natural

regulators of water quality and quantity." It also fully realizes the importance of cooperation between stakeholders and government authorities. The program is active in raising awareness of the need to implement sustainable and participative alternatives to the destructive "quick fix" development projects of the past. This applies especially to the construction of large dams and channeling of riverbeds in many important international river basins, such as the Danube, the Mekong, and the Niger. WWF champions the protection and management of freshwater wetlands, promotes activities to restore river basins crucial to both wildlife and people, and seeks to influence private sector practices and government policies to safeguard freshwater resources.

Green Cross International's Water for Peace project, introduced in Chapter 1, has as its principal objective the prevention and resolution of water-related conflicts. Green Cross International is the only international NGO that specifically works to address conflicts caused by environmental degradation, mismanagement, and injustice, with a strong focus on international waters. Currently working in six international river basins, the Water for Peace project focuses on addressing the following questions. What is preventing the political will, active public participation, empowered institutions and investments needed to avoid conflicts and achieve cooperative basin management? How can these obstacles and conflicts be overcome? Each basin project is managed by regional partners and shaped to suit the particular problems and political situation of the basin, with an overall focus on building partnerships and enhancing the role of civil society and local authorities in conflict resolution and the process towards cooperation.

In the Danube basin, activities have included a survey of and research into the roles and challenges of local and regional authorities, public participation, and the privatization process. Working with the Council of Europe, Green Cross's activities in the Danube basin have been stimulated by the direct engagement and support of several local authorities from different regions of east and west Europe. They will hold a regional conference to analyze the findings of the Green Cross work in Romania in April 2003. In the Jordan basin, Green Cross and partners have analyzed and developed strategies to enhance levels of public awareness about water conflicts and the need for cooperation, and have investigated the potential of new sources of water, in particular through joint projects such as the proposed Red Sea–Dead Sea project. Green Cross has been active as a mediator between parties in the Jordan River Basin for several years, and proposes to help facilitate the strong interstate cooperation needed for joint water projects.

In the Okavango basin, the Green Cross project is lending support to the river basin organization, aiming to enhance the existing cooperation process by linking OKACOM with the scientific, expert, and civil society communities to help develop the integrated basin plan. A workshop held in September 2002 brought OKACOM together for the first time outside of an official OKACOM meeting. This increased the level of trust between the representatives from the riparian states, laying the foundation for greater long-term integration. A hydropolitical model has been developed that maps the fundamental drivers of potential conflict. This was discussed with OKACOM and other stakeholders at the Water for Peace workshop in February 2003. The purpose of this hydropolitical model is to start the process of consensus building between the governments of the three riparian states so that a negotiating climate can be created where trade-offs can be developed.

The La Plata basin project responds to water problems affecting citizens, and works with the governments to facilitate the involvement of stakeholders in future infrastructure projects. Work has begun in the important sub-basin of the Upper Paraná river, shared by Brazil, Argentina, and Paraguay, where Green Cross' South American affiliates are stressing that proper water management must be framed

within the broader territorial and human development strategy of the basin as a basis for sustainability.

Pilot conflict resolution initiatives are also being launched in the Volga River basin among citizens of the Russian Federation, along with campaigns to raise public awareness and the promotion of new basin management legislation. The objective is the creation of the legal, institutional, and social conditions to resolve existing and prevent future water-related conflicts in the Volga basin, where the current absence of cooperation and compensation mechanisms fuels disputes between upstream and downstream regions. Finally, in the Volta basin in West Africa, Green Cross is providing a forum for the involvement of civil society in the elaboration of a basin agreement and integrated management plan. This project is focused on civil society capacity building and has already held a regional stakeholder consultation process and conference to elaborate and approve a Volta Basin Declaration and Communication Strategy.

6.2.2. NGOs Linking Water to Other Security and Development Issues

The nature of water has led NGO groups active in different areas of development and security to be more and more concerned and vocal about the links between water quality and access and issues of peace, human rights, and all aspects of development. The recognition of the potential for humanitarian and environmental disasters caused by the military targeting of pumping stations, sewage treatment plants, dams, electricity infrastructure, and heavy industries alongside watercourses, is increasing, and can now also be associated with terrorism as well as conventional military attacks. A recent example is a letter sent to the British government in September 2002 by Save the Children and other charity groups. It drew attention to the links between war and water, specifically warning of the humanitarian crisis that would be caused by damage to water supply and sanitation infrastructure in the event of further hostilities in Iraq.[3] In 1999, Green Cross similarly alerted international attention to the risks of contamination that the bombings in Kosovo posed to transboundary water resources in the region, notably to tributaries of the Danube River.

At a more grass-roots level, there are many examples of water issues becoming entangled in conflicts and struggles over other resources shared between different communities and sectors. One case is the conflict between the Maasai community living close to Tanzania's Tarangire National Park and miners and prospectors in the region.[4] The lives of the Maasai people, numbering over 200,000 in this region, have been severely disrupted in the last few decades by mining activities that leave vast areas of their land unsuitable for human settlement or grazing cattle. The Maasai argue that the miners have consistently violated their basic rights to water access, use of community-owned pastoral land, and cultural heritage and practices. The conflict has encouraged the establishment of the Olkenerei Pastoralists Survival Program, which promotes sensitization on land and water rights and lobbies for changes in government policies that violate indigenous human rights.

The creation of civil society forums to represent the voices of traditionally unempowered communities and take their concerns to national governments and the international community is an important development, and one which is often stimulated by the need to resolve conflicts over natural resources such as freshwater.

6.2.3. National and Local NGOs as Mediators

The role of international NGOs as potential conflict mediators and facilitators of cooperation has already been mentioned, but there are also cases of local-level civil society groups being active in water conflict resolution. These "insider-facilitator" initiatives can either emerge as a result of civil society impatience with the lack of government action to resolve lingering conflicts which hinder development, or come

about through government invitations to NGOs to use their neutral status to act as mediators between different stakeholders and authorities.

***Box 6.2*. Cebu Uniting for Sustainable Water (CUSW)**

A relatively early, groundbreaking example of facilitating cooperation is the *Cebu Uniting for Sustainable Water* (CUSW), a citizen initiative and multi-sector movement for water resources and watershed protection in the Cebu region of The Philippines. This initiative began in 1994, when representatives of a local NGO network, tired of deficiencies in water resources planning and management in the rapidly expanding city of Cebu, agreed to take action to integrate and broaden citizens' involvement and resolve conflicts in watershed management and planning. Despite early resistance to its activities, CUSW is now a full partner of the Cebu City government. It has become a key player in water management and continues to act as a forum facilitator–convener–mediator where stakeholders can voice their opinions, as well as become educated on various water resource problems and conflicts, and discuss possible solutions. In a country with little history of natural resources conflict mediation, CUSW remains an important, civil society-initiated, multi-sector coalition dealing with water resources policy and management, and continues to demonstrate the effectiveness of insider-facilitated water conflict resolution.

Source: Sustainable Development Village, The Philippines, http://www.sdvillage.ph/water/cusw3.htm

In 2000, Green Cross Argentina was invited to contribute to the resolution of the long-standing environmental and social conflict created by the construction of the Yacyreta dam between Argentina and Paraguay. By acting as a mediator between the different parties, they made it possible to earn back the trust of the affected communities through genuine efforts to understand and meet their most pressing needs. The construction of the Yacyreta Dam between Argentina and Paraguay began in the 1970s, and has seriously damaged the environment and disrupted the lives of some 80,000 people. For decades the project was fraught with corruption, delays, and lack of consideration for the people and ecosystems affected. Total lack of trust and serious conflicts between the governments, dam contractors, investors, and affected persons resulted in a virtual stand-off, and failure to compensate for losses caused by the dam. The Green Cross project has seen the resettlement into more suitable housing of thousands of people, development of sources of employment and recreation, and the establishment of consultation centers where problems can be aired and resolved in a spirit of true partnership. The affected people now have opportunities to rebuild their lives, find jobs, and begin new enterprises.

The PCCP Series volume on civil society and the resolution of water conflicts has compiled a unique collection of case studies regarding the role of NGOs and other civil groups in this issue, clearly displaying their increasing importance.[5] One example comes from the indigenous Berber communities in the high Atlas mountains of Morocco, where each village selects an "a'alam" to work on the equitable resolution of conflicts, including disputes over water between villages, using traditional mediation techniques. Several interesting transboundary examples are also cited in this PCCP paper. One describes a joint study on regional cooperation over the waters of the eastern Himalayas, prepared by three NGOs from Bangladesh, India and Nepal. This joint NGO work, unusual in a region where India and Bangladesh currently have no common water programmes, resulting in much waste and serious environmental problems, proposed an integrated approach to transboundary water as the only way

to avoid conflicts. The study encouraged the government of Bangladesh to resurrect a plan for the waters of the shared Ganges–Brahmaputra river basin.

Village communities in Senegal are often faced with disputes over rights to grazing land and water points.[6] Responding, they have developed a system of mediation. It can begin with one person who is close to both parties. If unsuccessful, that person may bring in two or three more persons who discuss with both sides. The process consists first of listening to each party's view of the facts, then visiting possible witnesses. Then they obtain the permission of both parties for mediation. They carefully prepare a mediation meeting, inviting the persons to be heard and their order of speaking. The meeting opens with prayers. Followed presentation of the facts and statements by witnesses and other respected individuals, solutions are proposed and negotiated. When agreement is reached it is recorded and the meeting closes with prayers. If all else fails, the matter may be referred to community arbitration in a meeting attended by all in the community.

6.2.4. National and Regional Civil Society Networks and Capacity Building

Examples of civil society groups acting as lead mediators remain relatively rare, but the role of NGOs in water management in general is growing consistently stronger, even in regions where civil society is not encouraged to engage in decision making.

Community participation in water and sanitation in Nepal has become much more widespread in the last decade, partly as a result of Nepal Water for Health (NEWAH), an NGO which works all across the rural areas of the country to provide safe drinking water, sanitation, and health education.[7] Since its establishment in 1992, NEWAH has helped to improve the standard of living of the rural poor by assisting hundreds of NGOs, small farmers' associations and women's groups to implement thousands of community water supply and sanitation projects. It also provides training to its project partners and community representatives in hygiene, project management, and how to maintain the new facilities. This is a good example of capacity building aimed at creating community level partnerships to improve water access and encourage people to learn the necessary skills and take ownership of their water facilities in order to ensure the self-sufficiency of projects. Enabling the rural poor to realize the potential for improving their lives is arguably the only way that development goals will be reached; such initiatives may be aimed specifically at water and sanitation, but they encourage other poverty-alleviation and sustainable development grass-roots action to be taken.

***Box 6.2*. Hydrosolidarity in Sri Lanka**

In Sri Lanka, which has suffered decades of horrific ethnic conflict, there are civil society activities emerging to reinstate water as a symbol of peace in peoples' minds, in order for it to become an element in preserving the recently achieved state of peace on the island. A project aimed at "Hydrosolidarity and Ethnic Solidarity through Youth Water Awareness in the Pinga Oya Watershed" is being implemented by NetWwater and other partners, which promotes inter-ethnic cooperation in activities to address the serious pollution and degradation of a watershed.[8] The environmental degradation can be largely traced to the negative attitude of the community towards the stream: once respected as the source of life it is now treated as a waste depository by the people and neglected by the regulatory authorities. Re-emergence of ethnic tensions between Muslim and Sinhala communities in 2001 led NetWwater and partners to launch a project to mobilize high school students in the Pinga Oya catchment. They became catalysts changing the attitudes and behavior of the Sinhala and Muslim communities towards river abuse and water conservation. By involving fifty-five Muslim and

Sinhala schools, as well as local authorities, mosques, and community leaders, and addressing the role of women in water management and environmental education, this project also contributes to inter-community cooperation and the realization of the need for common solutions to shared problems. Once the project demonstrates conclusively that inter-ethnic community action can prevent river abuse, the program will be extended to other rivers that flow through inter-ethnic communities.

6.2.5. Community Empowerment in Response to Conflicts

Conflicts and problems related to water management can themselves lead to the strengthening of civil society involvement. This can arise purely as a result of stakeholders organizing and mobilizing themselves to take action to resolve conflicts and ensure fair distribution of resources, or be deliberately nurtured as a means of enhancing stability in a region. An example of the latter situation can be found in Central Asia, where USAID is prioritizing civil society involvement in decision making as part of its strategy to promote peace and good governance in the geopolitically important region. The aim is to help communities to solve their problems by increasing citizen participation in decision making, using traditional methods for conflict resolution, and encouraging cooperation within and between communities, and between NGOs and local governments.

Building a strong civil society is seen as essential to the objectives of stability and sustainable development. Assistance strategies are therefore placing increased emphasis on the local level, targeting individuals, communities, and traditional institutions. Some projects are aimed specifically at reducing inter-ethnic tensions over water through negotiation and dialogue, especially in border areas, where there are many examples of tensions over water shared by villages and farmers in different states. Engaging the public in environmental management, while providing the necessary legal and technical tools, is regarded as a vital step to promoting peace and democracy in the region.

In other cases, no external encouragement or support is needed in order for communities to take action to assert their rights to water. In the Andean region of Peru, clashes between local, often ritualized, systems of water distribution and the centralized monetary model adopted by the state led to cases of direct "peasant resistance" by indigenous communities in the highlands. They disputed the state's control over their water and refused to alter traditional irrigation practices. One case occurred in response to the construction of the Majes Canal, a major internationally financed development project built in the late 1970s, which channels water from the highlands to the desert and coastal areas, and which was constructed on land inhabited by thousands of people. The community of Cabanaconde originally tolerated the disruption caused by the project because they had been promised an off-take of water from the canal and subsequently an increase in irrigated land. When these promises repeatedly failed to materialize despite consistent imploring of the local authorities, the community took matters into their own hands and drilled an unauthorized hole in the canal. They collectively stood their ground and in the end were officially granted an off-take from the canal.

After this, other affected communities that had been excluded from the process and denied benefits used the case as a precedent and were also granted water. This example clearly demonstrates the advantage of involving, and compensating, all affected stakeholders in the development of water projects, and shows that the vital nature of water can lead to communities taking extreme measures to secure it. The engagement of civil society from the beginning of an initiative greatly reduces the risk of disruptive conflicts developing later on.

6.2.6. Awareness-Raising Initiatives

There is an awareness-raising element to most of the work done by civil society groups, whether at the global or local level, as without information it is impossible for stakeholders to identify their needs and concerns and promote themselves as full partners in decision making. However, some organizations and initiatives consider awareness raising as their main objective, and specifically concentrate on informing the public about either the potential for conflicts over water or about the action being taken to avert them in a particular basin.

The Green Cross Water for Peace project also has a strong awareness-raising and communication focus. At the international level, Green Cross is one of the very few organizations that consistently draws attention in the media and other forums to the risks of conflicts developing over shared watercourses, and promotes international agreements to cooperate over their management. The failure of states to ratify the 1997 UN Convention on the Non-Navigational Uses of International Watercourses and the lack of political will to address the challenge of transboundary basins clearly indicate the need to keep lobbying this issue within the international community and at the highest political levels. In the Volta basin, the Water for Peace team has engaged stakeholders from Burkina Faso, Ghana, Togo, and Benin in developing a "Basin Declaration" and a capacity-building strategy for information, communication and sensitization of the public in the basin states on the need for water conflict prevention.

The objective is not only to generate understanding among people within the basins of the risks of conflicts over shared water, but also to encourage people to see their water from a new and wider perspective: as a vehicle for peace and development across their entire region. For many people the concept of a basin is not clear, and there is limited understanding of the fact that water is a shared resource. By both targeting the highest political levels, and reaching and responding to local people and local authorities, the Water for Peace initiative is facilitating the process towards cooperative basin management and resolution of conflicts.

6.2.7. Legal Context

The rights related to the access to information, participation in decision making, and access to justice have been enshrined in the Aarhus Convention. The provisions of the Aarhus Convention have been partly anticipated by the provisions on the information and participation of the public in earlier ECE conventions. The Protocol on Water and Health also refers to "access to information and public participation in decision making concerning water and health."

Not surprisingly, the public in general, and interest groups in particular, played an important role in the development of water-related agreements. The Rhine River basin is a good example, as the interest groups played an important role in the creation of the Rhine River regime. In the Dutch context, the drinking water companies, the Clean Water Foundation (*Stichting Reinwater*, a non-governmental organization) and the City of Rotterdam influenced the viewpoints of the Dutch government. Internationally, they used their networks to influence the governments of the riparian states upstream. The drinking water companies have since the 1930s warned the Dutch government of the effects of the increased dumping of waste from potassium mines on the salinity level. The Rhine Commission of the Drinking Water Companies (RIWA) started several lawsuits against the French potassium mines in the early 1980s. The Clean Water Foundation started a lawsuit with the financial backing of the Dutch government, and joined forces with several horticulturists who had suffered damage from the high salt load. The option to claim compensation through legal procedures was boosted in 1976 by a court ruling that within the EU, the courts

at both the locations where the damage was incurred and where it originated had jurisdiction over the matter.

The role of the stakeholders in the negotiations of water-related instruments has been increasing at the ECE regional level. Whereas the three water-related conventions, adopted in the early 1990s were still negotiated exclusively by government delegations, the subsequent follow-up instruments are negotiated in the presence of numerous stakeholders who could freely participate in the discussions. One may conclude that the negotiations of water-related instruments are entering a new era of interaction and communication involving key actors in that field.

6.3. Lessons Learned

The cases highlighted in this chapter are just a small selection of the thousands of initiatives being carried out across the world. They indicate the wide range of methods of civil society involvement, as well as the different positive and negative developments that can spark public engagement in water management in a region. Although the importance of stakeholder participation is increasingly recognized, there remain many obstacles to attaining truly participatory, equitable, and sustainable water management. Some of these obstacles are specific to regions or states, the primary problem being political and cultural systems that do not permit or welcome the involvement of civil actors. Others are fairly universal, such as the constant struggle to finance civil society initiatives and make them self-sufficient in the long term.

The diversity of types of NGO, and the wide variety of methods and approaches to encouraging cooperation and participation over water, reflect the equally rich diversity between different regions and situations. The growth of civil society institutions around the world is a major positive development in international relations of the past few decades. While this diversity is necessary and inspiring, it also makes it more difficult for civil society to coordinate its efforts. Although increasing, civil society action is far from fully systematized, and can in certain cases be found wanting in transparency, expertise, representation, and willingness to cooperate with other partners. Not surprisingly, there are wide divisions between civil society actors, which makes it difficult to present a united position in international negotiations. Differences of opinion are inevitable when dealing with such critical and complex issues as privatization and dams. What is more important is that there be consensus through public participation on the method of implementing water projects while avoiding permanent damage to the environment.

Another problem is the lack of unity and communication between groups active at local, national, and global levels. There is still a long way to go before NGO participation in the negotiation and implementation of water-related elements of global environmental conventions and agreements is systematized. More consistent exchanges of information and experience sharing between NGOs of the North, South, and East on water and civil society are needed to enhance progress on common problems.

Civil society should work towards greater consistency in intervention between local, national, regional, and global levels in the promotion of water equity, stakeholder participation, local sustainability, and regional cooperation. Just as strong institutions and legal instruments at the national and basin level can encourage good management at the local level, widespread active participation of and cooperation between stakeholders at the local level can have a "trickle-up" effect in enhancing security throughout a river basin.

Notes

Green Cross International contributed this chapter based on their experience in their Water for Peace Program and other experiences of community and NGO involvement in water initiatives.

1. For the purposes of this chapter, "civil society" is not taken to include the private sector, also a key non-governmental actor in water management, which is dealt with specifically in other chapters. This chapter concentrates on activities aimed at increasing public participation.
2. The subsidiarity principle states that decisions and actions should be taken at the lowest level capable of carrying them out, as close as possible to the citizen. It has recently been accepted, for example, as one of the underlying principles of the European Water Framework Directive.
3. *Joint NGO Statement on Iraq*, 26 Sep 2002, signed by: Save the Children UK, CARE International UK, Christian Aid, CAFOD, Tearfund, Help Age International, Islamic Relief and 4Rs.
4. *Maasai Pay the Price of the Gem Rush*, Mercy Wambui, Programme Officer with the Nairobi-based NGO Econews.
5. Philippe Barret (GEYSER) and Alfonso Gonzales (GEA), UNESCO-IHP technical document, PCCP series volume *Societé Civile et Résolution des Conflits Hydriques.*
6. Described by Philippe Barret (Geyser) and Alphonso Gonzalez (GEA) in the UNESCO–IHP technical document – PCCP series *Société Civile et Résolution des Conflits Hydriques.*
7. www.newah.org.np
8. *Hydrosolidarity and Ethnic Solidarity through Youth Water Awareness in the Pinga Oya Watershed*, project document, NetWwater, 2002; presentation of Ms Kusum Athukorala, President of NetWwater, at the UNESCO–Green Cross International conference From Conflict to Cooperation in International Water Resources Management at IHE Delft November 20–22 2002. NetWwater is the Network of Women Water Professionals, a group of professionals who are dedicated to the promotion of the Dublin–Rio principles and creating an awareness of the relevance of gender in water resources management.

7. OBSTACLES TO COOPERATION

7.1. Sources of Conflict

Problems in the water sphere are mainly caused by various human and natural factors. These problems can normally be grouped into three major kinds in the water sphere: water quality, water quantity, and ecosystem problems. Increasing populations impose increasing demands for water supplies, often leading to unsustainable withdrawals. Human consumption and activities of humans in industry and agriculture generate wastes that are usually discharged into water bodies. Finally the environment and supporting ecosystems require water, and meeting those requirements often conflicts with meeting other demands.

The natural factors include the erratic natural distribution, extreme climatic events (such as floods, droughts, and cyclones), arid and semi-arid climates, and local natural conditions. While human intervention may minimize the impact of these natural factors, lack of consideration and ignorance of the important roles of ecosystem functions, together with lack of consultation with stakeholders, may aggravate water conflicts.

Global environmental change is also identified as a potential driver for water conflict. There is insufficient evidence to support attributing recent trends of climate change and extreme events in water-related natural disasters (such as the more severe impacts of El Niño, and the more frequent occurrence of extreme floods that affect many regions of the world) to global environmental change. However these trends towards climate change and extreme events are on a global scale and need to be properly handled so as to prevent them from escalating into water conflicts.

The economic and political factors are treated as separate driving forces. Although these factors have a strong interaction with the key factors affecting the water sphere directly, they may originate independently from the water sphere. Often, the problems in the economic and political spheres are caused by a lack of detailed information on good management of water resources or by differences in the perception of a fair and equitable share of the water resources. Possible drivers for disputes in the economic and political spheres are identified in Figure 7.1.

In a river basin that traverses an international border, a political regional boundary, or a general boundary of different jurisdiction, the basis of a conflict is most often the implementation of developments by a stakeholder within its territory. Such implementation impacts at least one of its neighbors during water shortage conditions, and may lead to a number of water conflicts. Water conflicts may be related to a number of other issues including water quantity, water quality, management of multiple use, political divisions, geopolitical setting, level of national development, hydro-political issues at stake, and institutional control of water resources.

7.2. Obstacles to Cooperation

Very often the source of the conflict is itself an obstacle to cooperation. Greater upstream use, for example, may be difficult to reduce when it is due to a rise in population. Water-quality-related conflicts due to pollution resulting from extensive agricultural development upstream might have implications for food security in the upstream country. In a large river basin water may be managed for multiple uses such as power generation, food production, industrial development, municipal water supply, recreation, or a combination of these. Different user groups having different objectives will have difficulty in arriving at a common schedule of quantity and time of water distribution.

Political decisions driven by other factors may impact on water resources management. For example shifting political boundaries may demarcate new riparian

areas in the international river basins. Political power, or the lack of it, may also make cooperation more difficult. Thus a group occupying the upstream area of a basin or having more political power has more control over the others in implementing development projects. Differences in the levels of economic development may also be hindrances. More developed nations may have better options for alternate sources of water, and may be less demanding over a conflict with a less developed neighbor. Water conflicts resulting from human-initiated developments such as dams and diversions are more likely to be severe than those resulting from natural events like floods and droughts.

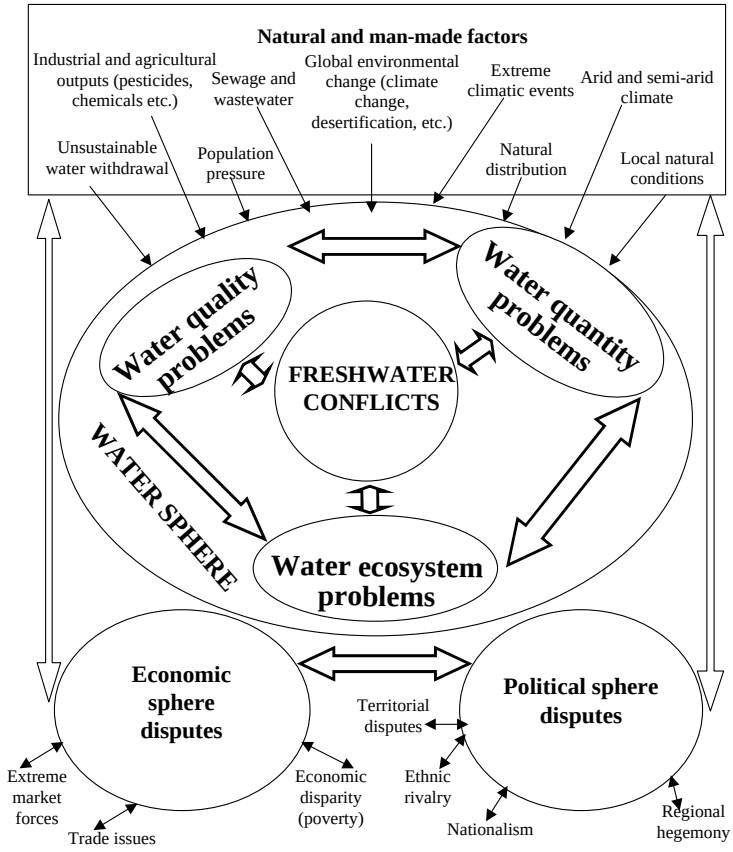


Figure 7.1. Causes of freshwater conflicts (after Le-Huu, 2001)

Among other obstacles to cooperation there are the potential for socioeconomic political disturbances and poverty and socioeconomic underdevelopment. One cannot blame individuals preoccupied with their daily survival for lack of interest in cooperative measures that will bring benefits in the future. Other challenges are lack of information; inequalities in existing water allocation procedures, knowledge, or military force; geographic advantages; and the weakness of globally ratified laws and conventions, especially enforcement mechanisms. Countries in many international basins also suffer from weak institutions (including lack of democracy and good governance, lack of political will, and lack of financing and other support for development of institutions).

7.3. Complex Issues Require More Time and Attention

Conflict should not be looked upon as always negative. It can be healthy when effectively managed. Healthy conflict management can lead to growth and innovation,

new ways of thinking, and additional management options. Understanding the conflict clearly is primary in that process. Then it could be effectively managed by reaching consensus that meets the needs of all stakeholders. This may result in mutual benefits and strengthen the relationship. The goal is for all to "win" by having at least some of their needs met. Recognition of this fact undoubtedly led to the Nile Vision with the sharing of benefits.

There is a range of dispute resolution mechanisms from negotiation to arbitration that are available to help those who wish to avoid or resolve conflict. Some conflicts or potential conflicts may be resolved fairly easily, where they concern fewer interested parties or less serious issues, or where few of the obstacles described above exist. Others may be much more complex, involving many stakeholders and many possible ways to allocate the benefits of using the available water resources. In these cases the step-by-step processes described in Chapter 4 must be applied. Such a process may be helped in the case of complex situations by use of the Decision or Negotiation Support Systems described in Chapter 12.

Note

Part of The *State-of-the-art Report on Systems Analysis Methods for resolution of Conflicts in Water Resources Management* prepared by K. D. W. Nandalal and Slobodan P. Simonovic as a PCCP Series volume was used in preparing this chapter.

8. INDICATORS OF POTENTIAL FOR COOPERATION

8.1 Why Indicators?

8.1.1. International Conflict Indicators

The international community cannot act everywhere at once. It would therefore be useful if one could identify those places where action can head off potential conflict and build the capacity of enduring institutions. Much research has already been done that has identified the factors that should be included in such indicators. There is an impressive body of literature that deals with the questions of international conflict and indicators of conflict in general.[1] There is a growing literature, although still weak on water and conflict.

However, there is currently little empirical work being done to bolster any of the common conclusions being so widely reported. Most literature suggests that competitions for limited freshwater lead to severe political tensions and even to war. Water resources are described by some as military and political goals, using the Jordan and Nile as examples. A smaller body of work argues more strongly for the possibilities and historic evidence of cooperation between co-riparians. It has even been suggested that this can be a training ground for civilization.

8.1.2. Weaknesses of Past Approaches[2]

There are several problems with the approaches of much current literature and, as a consequence, questions about their conclusions as well:

- *Loose definitions*. Terms such as conflict, dispute, tensions, and war are regularly used interchangeably. So too are several types of incidents all relating to water but otherwise vastly dissimilar, such as water as a tool, weapon, or victim of warfare.
- *Exclusion of cooperative events*. An entire branch of the conflict–cooperation spectrum is missing from almost all studies relating water to international relations, such that any tests of causality are, by definition, incomplete.
- *Lack of consideration of spatial variability*. Such popular measures as "water stress" are regularly determined by country (e.g. population per unit of water), whereas political interactions over water are generally precipitated at the basin (watershed) level. The variability of spatially diverse parameters such as population, climate, water availability, and national groups are either ignored or their significance is generalized.
- *Selected case studies only from the "hottest" basins*. Most studies of trends in international basins tend to focus on the world's most volatile basins – the Jordan, Tigris–Euphrates, Indus, and Nile, for example – making general conclusions concerning international basins as a whole incomplete and questionable.

8.1.3. Conditions Favorable to Adoption of Bilateral Water Treaties

One recent approach looked at the conditions that seem to lead from conflict to the adoption of bilateral water treaties, and those that make these treaties more explicit and hopefully more durable.[3] This study examined the influence of socioeconomic and political variables on the existence of bilateral water treaties between countries sharing international water basins. It also estimated what factors influence the contract structure of bilateral water treaties.

This study was based on the theoretical assumptions that ill-defined property rights may lead to externalities, and that assigning property rights internalizes these

externalities. It accepts too that transaction costs lead to inefficiencies (and hence costs) in the markets. It is also based on the argument that cooperative behavior is likely when there is repeated interaction, and finally, that cooperation may be the result of "spontaneous order" or "organization." Underlying economic theories are that physical, economic, and political geography define hydro-politics in river basins. As a consequence the variables examined were economic, geographic, hydrologic and socio-political.

A probability analysis showed that a treaty is more likely to be concluded if:

- The countries are economically similar.
- The river basin is large.
- There is high per capita water withdrawal.

A treaty is less likely to be concluded when:

- There is reliance on international trade.
- Countries are socio-politically similar.
- At least one country is large.
- One country controls a high percentage of the river basin.
- Countries use most water for agriculture and/or domestic purposes.

The study also indicated that a treaty is likely to be more explicit if:

- Countries are economically/politically dissimilar.
- Countries have non-water linkages.
- Countries have similar per capita water use.
- The principal focuses are water supply, hydropower, and/or flood control.

These results lead to the conclusion that economics and politics play an interactive role in determining whether agreement can be reached. They also indicate that geographic characteristics do define constraints and that linkages facilitate an enforcement mechanism. Their analysis showed that renegotiations or mediation by a third party can enhance cooperation. Finally, a free flow of information is a prerequisite.

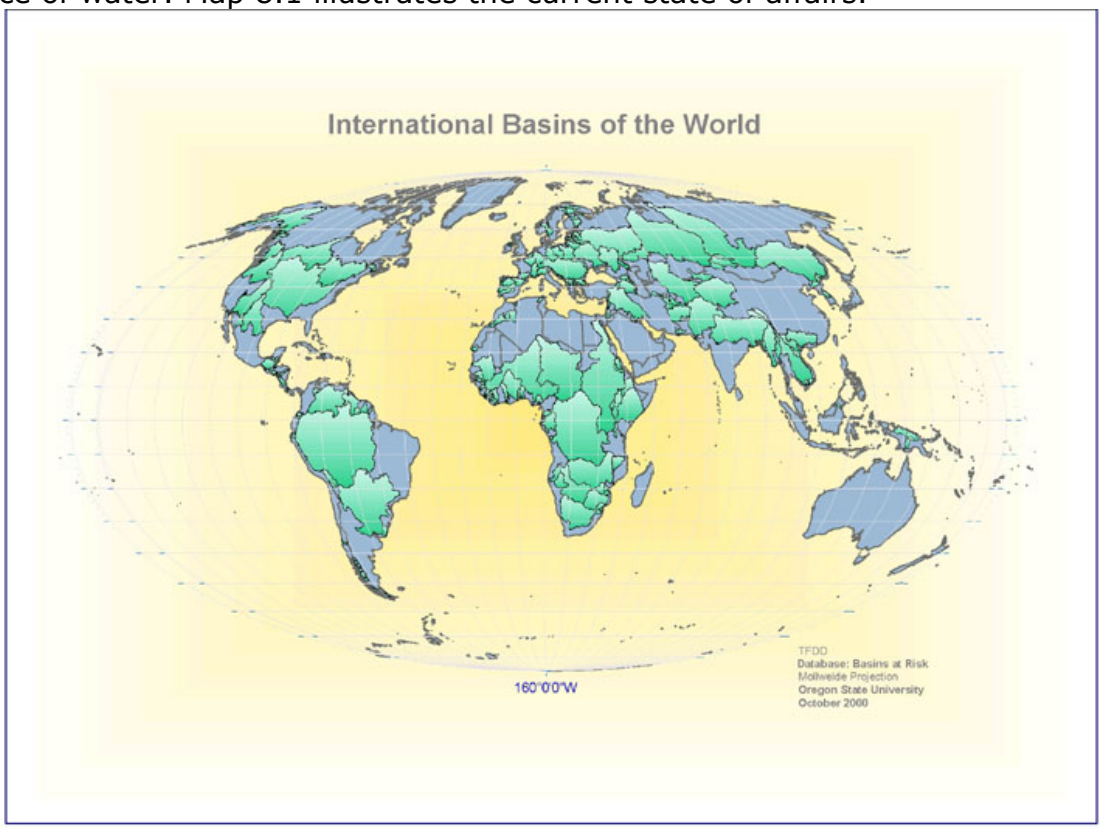
8.2. Developments in Basin-Level Transboundary Water Management

A closer look at the world's international basins gives a greater sense of their significance in terms of area and conflict potential. Their growing number is one indication of this. There were 214 international basins listed in 1978 (United Nations, 1978), the last time any official body attempted to delineate them, and there are 261 today. The growth is largely the result of the "internationalization" of national basins through political changes, such as the break up of the Soviet Union and the Balkan states, as well as access to better mapping sources and technology.

Even more striking than the total number of basins is a breakdown of each nation's land surface that falls within these watersheds. A total of 145 nations include territory within international basins. Twenty-one nations lie entirely within international basins, and, including these, a total of thirty-three countries have more than 95 percent of their territory within one or more international basins. These nations are not limited to small countries, such as Liechtenstein and Andorra, but also include, for example Hungary, Bangladesh, Belarus, and Zambia.

Beyond their importance in terms of surface and political area, a look at the number of countries that share individual watercourses highlights the precarious setting of many international basins. Approximately a third of the 261 international basins are shared by more than two countries, and nineteen involve five or more

sovereign states, while the Danube receives runoff from eighteen nations. Five basins – the Congo, Niger, Nile, Rhine, and Zambezi – are shared by between nine and eleven countries. The remaining thirteen basins – the Amazon, Ganges–Brahmaputra–Meghna, Lake Chad, Tarim, Aral Sea, Jordan, Kura–Araks, Mekong, Tigris–Euphrates, La Plata, Neman, and Vistula (Wisla) – have between five and eight riparian countries. Another way to think of possible transboundary competition for water is to consider the extent to which some countries are dependent on neighboring countries as their source of water. Map 8.1 illustrates the current state of affairs.



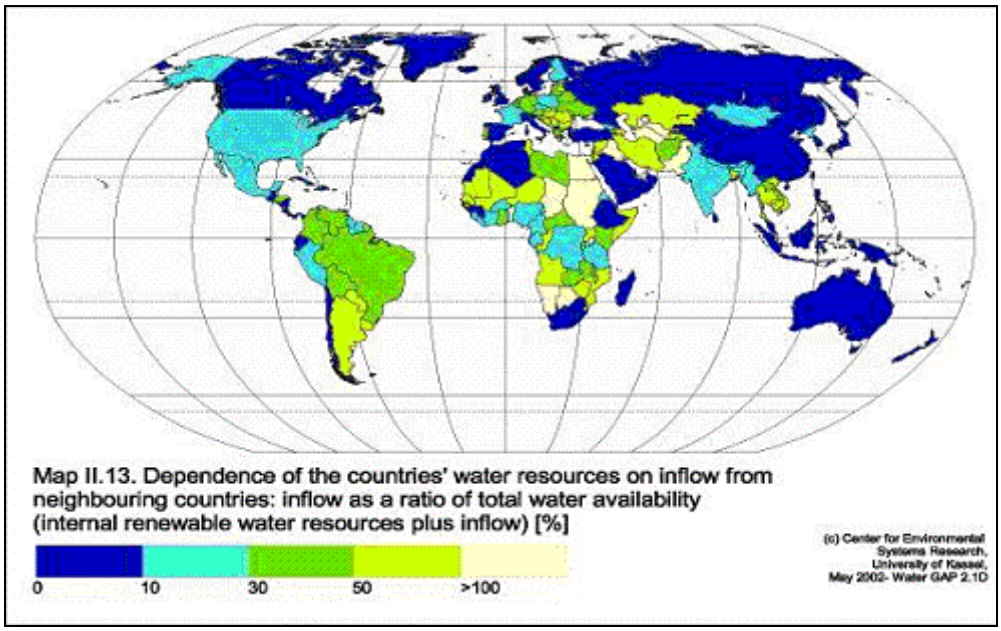
Map 8.1. International basins of the world

8.3. Conflict, Cooperation, and the Importance of Resilient Institutions

The complex dynamics of managing international waters can be seen through a review of co-riparian relations. The largest empirical study of water conflict and cooperation, completed in 2001 at Oregon State University, documents a total of 1,831 interactions, both conflictive and cooperative, between two or more nations over water during the past fifty years. An analysis of the data yields the following general findings. First, despite the potential for dispute in international basins, the record of cooperation historically overwhelms the record of acute conflict over international water resources. The last fifty years have seen only thirty-seven acute disputes (those involving violence) while during the same period approximately 200 treaties were negotiated and signed. The total number of water-related events between nations of any magnitude are likewise weighted towards cooperation: 507 conflict-related events versus 1,228 cooperative, implying that violence over water is not strategically rational, effective, or economically viable (Figure 8.1).

Second, nations find many more issues of cooperation than of conflict. The distribution of cooperative events shown in Figure 8.1 indicates a broad spectrum of issue types, including quantity, quality, economic development, hydropower, and joint management. In contrast, almost 90 percent of the conflictive events relate to quantity and infrastructure. Furthermore, looking specifically at military acts, of which

there were only twenty-one (eighteen of them between Israel and her neighbors), almost all events fall within these two categories.



Map 8.2. Dependence of countries' water resources on inflow from neighboring countries

Note: The map illustrates the current state of affairs with regard to countries' reliance upon water coming from neighboring countries. This is an important consideration when assessing a given county's water supply and its quality. A good part of countries in Africa and the Middle East depend upon foreign water resources for more than half of their own water, as does the southern tip of Latin America.

Source: Map prepared for the World Water Assessment Programme (WWAP) by the Centre for Environmental Research, University of Kassel, based on information from Water Gap version 2.1.D.

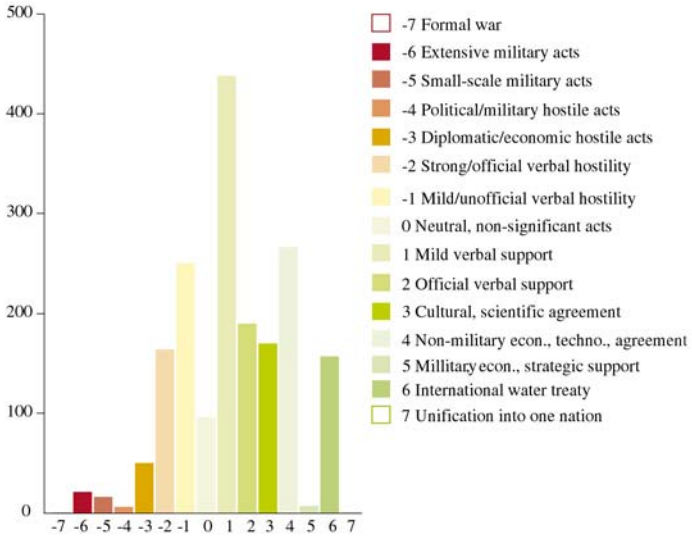


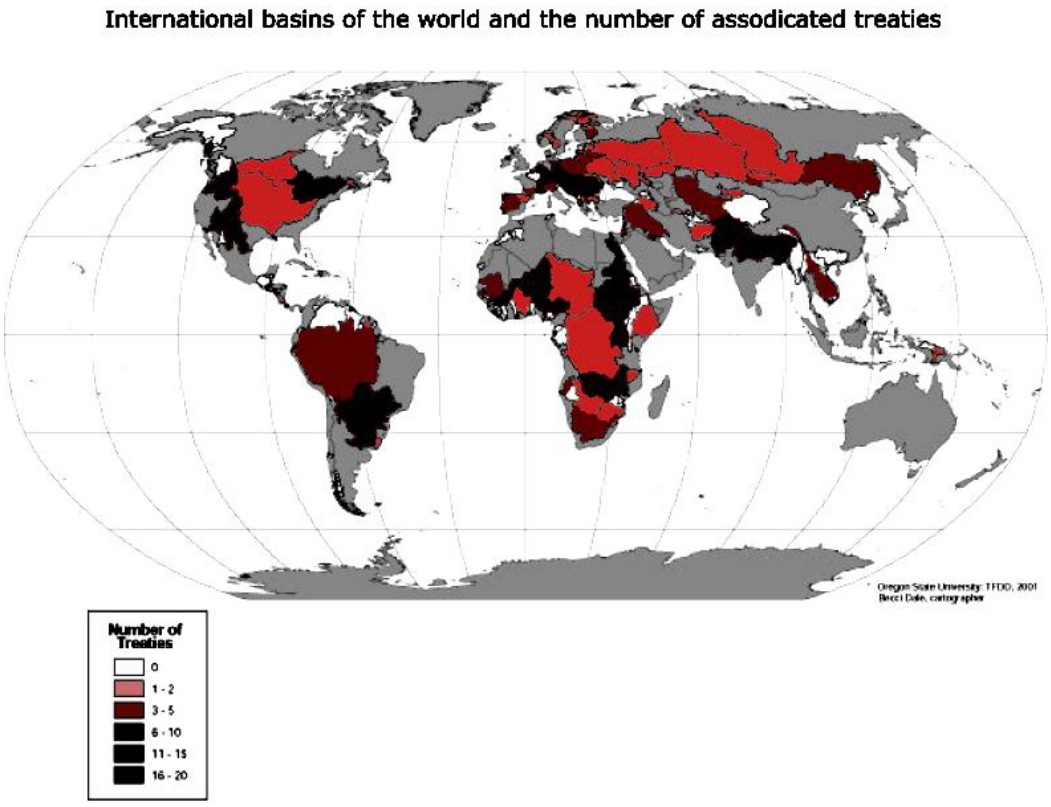
Figure 8.1. Events related to international water basins

Note: Although transboundary water resources can be fodder for hostility, the record of cooperation is vastly greater than that of acute conflict; that is to say, water is much more a vector of cooperation than a source of conflict.

Source: Wolf et al., forthcoming.

Third, at the sub-acute level, water acts as both an irritant and a unifier. As an irritant, water can make good relations bad, and bad relations worse. Threats and disputes have raged across boundaries with relations as diverse as those between India and Pakistan and between the United States and Canada. Water was the last issue resolved in negotiations over a 1994 peace treaty between Israel and Jordan. An interim agreement on water between Israel and the Palestinians was reached in Oslo II (1995), while the permanent agreement was relegated to "final status" negotiations, along with other of the most difficult issues such as Jerusalem and refugees.

Some of the most vociferous enemies around the world have negotiated water agreements or are in the process of doing so, and the institutions they have created frequently prove to be resilient over time and during periods of otherwise strained relations. The Mekong Committee, for example, has functioned since 1957, exchanging data throughout the Vietnam War. Secret "picnic table" talks were held between Israel and Jordan from the early 1980s, a decade prior to the initiation of the Madrid Process that led to the peace treaty of 1994. The Indus River Commission survived through two wars between India and Pakistan. All ten Nile riparian states are currently involved in negotiations over cooperative development of the basin.



Map 8.3. Number of treaties by basin

In the absence of institutions, however, changes within a basin can lead to conflict. To avoid the political intricacies of shared water resources, for example, a riparian, generally the regional power, may implement a project that impacts at least one of its neighbors. This might be to continue to meet existing uses in the face of decreasing relative water availability, as for example Egypt's plans for a high dam on the Nile or Indian diversions of the Ganges to protect the port of Calcutta. Or it might be to meet new needs and associated policies such as Turkey's GAP project on the Euphrates. When projects such as these proceed without regional collaboration, they can become a flash point, heightening tensions and regional instability, and requiring

years or, more commonly, decades to resolve. Evidence of how institutions can diffuse tensions is seen in basins with large numbers of water infrastructure projects (e.g. in the Rhine and Danube Basins). Not surprisingly, co-riparian relations have shown to be significantly more cooperative in basins with high dam density that have treaties than in similarly developed basins without treaties. Thus, institutional capacity together with shared interests and human creativity seem to ameliorate water's conflict-inducing characteristics, suggesting that an important lesson of international water is that as a resource it tends to induce cooperation, and incite violence only in the exception.

The international community faces a choice. On the one hand is a traditional chronology of events, where unilateral development is followed by a crisis and, possibly, a lengthy and expensive process of conflict resolution. On the other hand, there is a process whereby riparian states are encouraged to avoid the crisis through preventive diplomacy and institutional capacity building, as is being done under the Nile Basin Initiative. It feels both counterintuitive and precarious that the global community has often allowed water conflicts to drag on to the extent they often do. It is unfortunate, but the reality is that these processes take time. The Indus treaty took ten years of negotiations, the Ganges thirty, and the Jordan forty – and during such protracted arguments the water quality and quantity degrades to the point where the health of dependent populations and ecosystems is damaged or destroyed. A re-read through the history of international waters suggests that the simple fact that humans suffer and die in the absence of agreement apparently offers little in the way of incentive to cooperate, and even less so the health of aquatic ecosystems. This problem gets worse as the dispute grows in intensity. While the Jordan–Israel Treaty contains stipulations for protecting the ecology of the Jordan and Yarmuk rivers, and there are projects to stabilize the delta of the Aral Sea, which has come to world attention, one rarely hears talk about the ecosystems of the lower Nile; they have effectively been written off to the vagaries of human intractability.

8.4. Identifying Indicators of International River Basins Requiring Attention

Little exists in the environmental security literature regarding empirical identification of indicators of future water conflict. The most widely cited measure for water resources management is Malin Falkenmark's Water Stress Index, which divides the volume of available water resources for each country by its population. Though commonly used, Falkenmark's index has been criticized on a number of grounds. It does not account for either spatial variability in water resources within countries, or the technological or economic adaptability of nations at different levels of development. To account for the latter critique, but not the former, Ohlsson developed a "Social Water Stress Index," which incorporates "adaptive capacity" into Falkenmark's measure, essentially weighting the index by a factor based on the UNDP's Human Development Index. While Ohlsson's is a useful contribution, he also misses the spatial component. Similarly, neither Falkenmark nor Ohlsson suggest much about the geopolitical results of scarcity, focusing instead on implications for water management.

The only author to explicitly identify indices of vulnerability that might suggest "regions at risk" for international water conflicts is Gleick. He suggested four:

- ratio of water demand to supply
- water availability per person (Falkenmark's water stress index)
- fraction of water supply originating outside a nation's borders
- dependence on hydroelectricity as a fraction of total electrical supply.

Gleick's indices, like Falkenmark's and Ohlsson's, focus on the nation as the unit of analysis and on physical components of water and energy. These indicators were neither empirically derived nor tested.

8.5. Indicators: Empirical Methodology

In order to identify indicators of water conflict/cooperation as completely as possible, researchers at Oregon State University took the following approach in a recent three-year study:

1) They identified the set of basins to be assessed as *all* of the world's international river basins; their period of study was from 1948–99.
2) Utilizing existing media and conflict databases, they attempted to compile a dataset of *every* reported interaction between two or more nations, whether conflictive or cooperative, that involved water as a scarce and/or consumable resource or as a quantity to be managed. Water was to have been the *driver* of the event. Using these events, they were able to compile a seamless, systematic database for water conflict/cooperation of 1,831 events – 507 conflictive, 1,228 cooperative, and ninety-six neutral or non-significant. Each event included a brief summary and source of information, and was coded by date, country pair (dyad), basin, issue area, and intensity of conflict/cooperation measured on a scale of –7 to +7.
3) They also developed a geographic information system (GIS) including approximately 100 layers of global and/or regional spatial data falling into one of three general categories: biophysical (e.g. topography, surface runoff, climate), socioeconomic (e.g. GDP, dependence on hydropower), and geopolitical (e.g. style of government, present and historic boundaries). They backdated relevant parameters so that the GIS is both uniformly formatted and historically accurate (e.g. 1964 boundaries coincide with 1964 GDPs and government types). They used each international watershed, subdivided by national boundaries, as the unit for analysis.

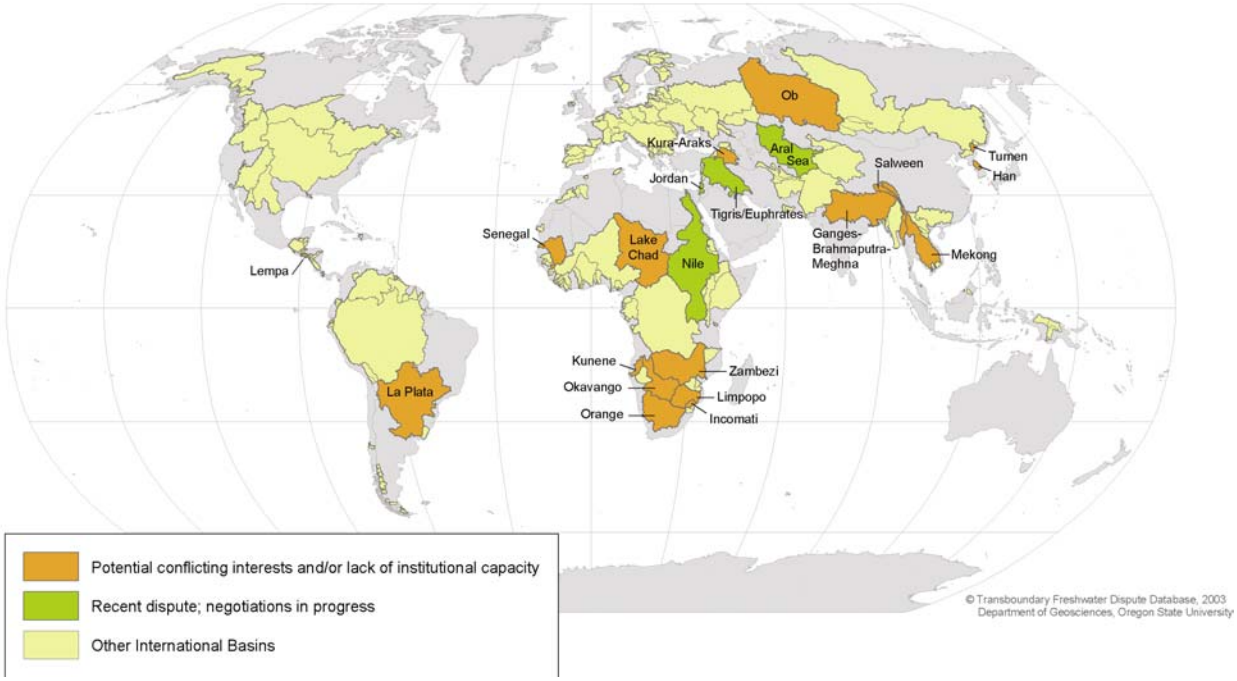
With this GIS in place, the team was able to assess the historical setting within which each event of conflict/cooperation took place. By hypothesizing the relevance of sets of parameters, and by testing each set by running single and multivariate statistical analyses of the events against the parameters that define their historical settings, they were able to cull factors that seemed to be indicators of conflict/cooperation.

In general, the team found that most of the parameters regularly identified as indicators of water conflict are only weakly linked to dispute. However institutional capacity within a basin, whether defined as water management bodies or treaties, or generally positive international relations are as important, if not more so, than the physical aspects of a system. Very rapid changes, then, either on the institutional side or in the physical system, are at the root of most water conflict, as reflected in three sets of indicators:

- "Internationalized" basins, i.e. basins that include the management structures of newly independent states
- Basins that include unilateral development projects *and* the absence of cooperative regimes
- General hostility over non-water issues.

By taking their parameters of rapid change as indicators – internationalized basins and major planned projects in hostile and/or institutionless basins – they were able to identify the basins with settings that suggest potential conflicting interests and/or lack of institutional capacity over the coming five to ten years. These basins include: the

Ganges–Brahmaputra, Han, Incomati, Kunene, Kura–Araks, Lake Chad, La Plata, Lempa, Limpopo, Mekong, Ob (Irtish), Okavango, Orange (Sengu), Salween, Senegal, Tumen, and Zambezi. Map 8.4 shows these basins, as well as the four that have been subject to recent dispute (all of which are currently in various stages of negotiations): the Aral, Jordan, Nile, and Tigris–Euphrates.



Map 8.4. Basins under observation

8.6. Monitoring for Indicators

Two indicators are suggested for identifying basins at risk: tenders for future projects and countries with active nationalist movements. Almost more important than helping identify the basins at risk themselves, these indicators allow us to monitor for "red flags," or markers that may suggest new basins at risk as they arise.

8.6.1. Tenders for Future Projects

The best sources for cutting through the rhetoric and wishful thinking inherent in public pronouncements of development projects are the public calls for project tenders. Tenders are not put out until project funding has been ascertained, so countries must be fairly certain that a project will actually be developed. However they still can give three to five years lead time (more for large projects) before impact will be felt in neighboring countries – enough time to exercise preventive diplomacy. There are two good print sources for water development tenders: the *Financial Times*' Global Water Report (biweekly) and the *Global Water Intelligence* (monthly). Also, the website of Water International Publishing Ltd (www.e-waternews.com/) provides daily updates of water project tenders and contracts in developing countries.

8.6.2. Countries with Active Nationalist Movements

If internationalizing a basin provides a setting of potential dispute, one might monitor the world's nationalist movements and ethnic conflicts and, if one wanted to be proactive, one could assess the potential impacts of a successful drive for independence. Two sources might be monitored to gauge these movements: first,

Armed Self Determination Conflicts, as identified by Professor Ted Gurr's Minorities at Risk Project, at the University of Maryland's Center for International Development and Conflict Management (www.bsos.umd.edu/cidcm/mar/autonomy.htm); and second, Unrepresented Nations and Peoples Organizations (UNPO). Participation in UNPO is open to all nations and peoples who "are inadequately represented as such at the United Nations and who declare adherence to the Organisation's Charter." Since these principles espouse non-violence, the conflict level associated with many of these movements is lower. Data on unrepresented nations and peoples are drawn from the UNPO website: (www.unpo.org).

This new approach to identifying and monitoring basins at risk, while holding promise, is still to be tested in practice. If an international institutional approach is taken to identifying and monitoring hotspots and providing mediation services (see "Impartial Sources of Support," Section 11.3.2), this organization could undertake further development of the indicators.

Notes

1. See *Water Resource Scarcity and Conflict*; Pal Tamas in the PCCP Series.
2. The main source for this section is the PCCP Series Volume *International Waters: Identifying Basins at Risk*, Aaron T. Wolf, Oregon State University.
3. Socio-economic Analysis of International Bilateral Water Treaties by Basman Towfique and Molly Espey; presented at the International conference From Conflict to Cooperation in International Water Resources Management at IHE Delft, November 21 2002.

9. WHAT WE HAVE LEARNED FROM RECENT EXPERIENCE

9.1. An Overview

Examination of experience in sharing water, especially transboundary water, has taught us many lessons. Examples from several basins studied, including those of the twelve case studies that were part of the PCCP–WfP program, show that cooperation is an iterative process that begins with sharing information and getting to know each other in order to build trust and confidence. In the end though, institutions must be created for the efficiency and effectiveness of management of transboundary waters and sustainability of peaceful cooperation.

9.2. Conflict, Cooperation, and Effective Institutions

As demonstrated in Chapter 8 through comparisons of the number and nature of conflicts with the number of agreements, water is more often a catalyst for cooperation than a source of conflict. The many case studies carried out directly, reviewed by desk study, and serving as references in the previous chapters have enabled us to identify certain critical lessons learned from global experience in international water resource issues:

- Water that crosses international boundaries can cause tensions between nations that share the basin. While the tension is not likely to lead to warfare, early coordination between riparian states can help prevent potential conflicts.
- More likely than violent conflict is a gradual decreasing of water quantity or quality, or both, which over time can affect the internal stability of a nation or region, and act as an irritant between ethnic groups, water sectors, or states/provinces. The resulting instability may have effects in the international arena.
- Once international institutions are in place, they are tremendously resilient over time, even between otherwise hostile riparian nations, and even as conflict is waged over other issues.
- An approach to creating institutions to share of the benefits of water in a basin rather than focusing on allocating the limited water resources is proving useful in some cases (e.g. Nile, Mekong) and offers hope for the future.

9.3. Effective Transboundary Water Resource Management

The centrality of institutions, both in effective transboundary water management and in preventive hydro-diplomacy, cannot be over-emphasized. Twentieth-century water management offers lessons for the conception and implementation of international transboundary water institutions. In combination with the existing efforts of the international community, the following lessons may help shape future policy and institution-building programs directed specifically to the world's international basins.

- *Adaptable management structure.* Effective institutional management structures incorporate a certain level of flexibility, allowing for public input, changing basin priorities, and new information and monitoring technologies. The adaptability of management structures must also extend to non-signatory riparian states, by incorporating provisions addressing their needs, rights, and potential accession. The International Joint Commission (United States–Canada) has been particularly successful in dealing with such an evolving agenda of issues.
- *Clear and flexible criteria for water allocations and quality.* Allocations, which are at the heart of most water disputes, are a function of water quantity and quality as well as political fiat. Thus, effective institutions must identify clear allocation

schedules and water quality standards that simultaneously provide for extreme hydrological events, new understanding of basin dynamics, and changing societal values. Additionally, riparian states may consider prioritizing uses throughout the basin. Establishing catchment-wide water precedents may not only help to avert inter-riparian conflicts over water use, but also protect the environmental health of the basin as a whole.

- *Equitable distribution of benefits.* This concept, subtly yet powerfully different from equitable use or allocation, is at the root of some of the world's most successful institutions. The idea concerns the distribution of benefits from water use – whether from hydropower, agriculture, economic development, aesthetics, or the preservation of healthy aquatic ecosystems – *not* the raw resource of water itself. Distributing water use benefits allows for positive-sum agreements, whereas dividing the water itself may create winners and losers. Multi-resource linkages may offer more opportunities for creative solutions to be generated, allowing for greater economic efficiency through a "basket" of benefits. The Colombia River Basin Treaty (United States–Canada) provides an example of such an approach.
- *Detailed conflict resolution mechanisms.* Many basins continue to experience disputes even after a treaty is negotiated and signed. Thus, incorporating clear mechanisms for resolving conflicts is a prerequisite for effective, long-term basin management. The Rhine River basin is a good example of a case where treaties are in place but disputes still arise from time to time.

As most examples of hydro-diplomacy involve support from the international community, one may have to conclude that encouragement and participation by them is an essential ingredient for success.

9.4. Some Functioning Institutions[1]

There are many functioning institutions with a range of mechanisms and practices. These vary from meetings of the stakeholders to discuss issues to a high level of integration of water resources management. The Permanent Indus Commission and the Permanent Water Commission for Namibia and South Africa have little power to allocate water resources and basically run regular consultative meetings.

The International Joint Commission (IJC) between Canada and the United States and the International Boundary and Water Commission (IBWC) between the United States and Mexico both have dedicated but separate staffs. The IJC monitors developments in the basins for which it is responsible and responds to questions referred to it by the two governments. The IBWC has somewhat more authority.

While their powers differ, both influence individual and joint decisions in the United States and Canada. In the end it is the degree of joint functions such as joint diagnosis, joint planning, joint operations, and joint monitoring that really determines the level of integration.

The OMVS, IBWC, the Niger Basin Authority, and Kagera Basin Organisation have some authority to plan development and some degree of authority to execute the plans. The Tennessee Valley Authority (TVA) while not international, is a good example of a highly integrated organization.

Others, like Lake Chad Basin Commission, are limited to technical committees that gather data and information, and make but do not implement plans. The Intergovernmental Coordinating Committee of River Plate Basin and the Elbe Commission gather technical data and have limited authority to make plans and recommendations. But, as noted earlier in the case of the IJC, even an organization limited to gathering data and information can achieve a great deal of authority and influence over decisions to allocate resources, implement policies and construct

infrastructure. A Joint River Committee established for the Ganges has, among other mandates, to seek to resolve disputes. Its main mechanism is the use of Joint Expert Committees. These committees have equal numbers of Indians and Bangladeshis. Unlike some other expert commissions, these committees do not include a neutral party from outside the region.

The realities of water flows required to meet increasing economic development, interdependence, sustainability, and population growth seem to push many water professionals to prefer institutions with as much power to manage the resource as possible. Legitimate and important political realities generally create resistance to such regional water management notions. The flexibility of organizations to respond to water flow fluctuations and to accommodate future uses has been central to recent successful negotiations of international environmental regimes.

Note

1. See PCCP Series volumes *Conflict and Cooperation in the Management of International Freshwater Resources: A Global Review*, Erik Mostert, RBA Centre, Delft University of Technology; and *Institutions for International Freshwater Management* by Melvin Spreij and Stefan Burchi (FAO)

10. THE CRITICAL ROLE OF INSTITUTIONS

10.1. Introduction

Institutions are more than organizations. They consist of all the formal and informal practices that determine our behavior. They exist from the community to the national and international level. They reflect the ethics that are shared at each level. Changing institutions means changing value systems and therefore takes time, perhaps generations. Some of the problems we face cry out for faster solutions.

Institutions are everybody's concern. They determine how society does business. They embody the constraints and incentives that shape opportunities in every sector of society. There are formal and informal institutions. The formal side consists of the organizations and written rules and policies that govern our transactions. These include things as diverse as the structure of government and the private sector, the tax system, the communication and transportation systems, the agricultural extension service, the banking system, law enforcement, school curricula, freedom of speech, property rights, national constitutions, legislation and municipal by-laws.

Institutions go beyond the formal structure, however. Even the way we react to the formal structure may be determined by our cultural heritage. Our religious beliefs and practices, family and societal values and norms, social mobility, homogeneity of language and culture, the perceived transparency and accountability of the formal institutions, even the architecture and functioning of our homes and workplaces are all part of the institutional framework that surrounds us.

Together these formal and informal institutions determine the transaction costs of doing business, and ultimately much of the behavior of society. Institutions differ from country to country and community to community. In turn, what is demanded from institutions and how one responds to them determines how they develop and change.

Water too is everybody's business. As is discussed elsewhere in this volume, humanity and the ecosystems of which humans are part are already suffering water-related crises in many parts of the world. This situation will get worse if society continues doing business as usual.

Most of us think of the management of water as relating to the technology of reservoirs, dams, purification plants, and irrigation systems. Yet, while technology provides us with the tools, our fundamental need for water for human existence and development, and the impact of water on our lives and our environment, have driven us to create institutions to manage water. The types of institutions created in the future will determine what is use made of new technology.

Humankind has been very innovative about directing social organization toward water management for as long as human history has existed. All early settlements were located where water was available. Slavery to construct water reservoirs; payment in kind to the monarch, chief or priest for water withdrawals; centuries of written records of water use; and collective efforts at diversion, flood protection, and water collection are all part of water institution history. Some suggest that these efforts provided the rationale for the organization of some of the first groups of human settlements.

Our water institutions reflect the philosophical, ethical, and religious views of our societies. Many of these are deeply held. For example, because water is essential for life, some see water access as a right. Others see water as a gift of God. If it is a right or a gift of God, can charges be made for it? In particular, is it compatible with the battle against poverty to charge the poor for water? At the other end of the spectrum, some societies believe strongly in the primacy of private property rights and extend this view to ownership of water. Much of Judeo-Christian tradition interpreted the human role as the domination of nature. Until very recently, many societies coupled

this with the widespread belief that constant economic growth and expansion was unquestionably good as the precondition for general prosperity. This belief is embedded in the tax structures, land laws, and water rates of these countries. Even now it is widely believed in many places that nature will always restore itself. This assumption too, rather than the imperative to protect our ecosystems, is embedded in laws, regulations, and behavior where this belief dominates. Finally, it must be added that most institutions operate in favor of the interests, positions, and views of those who are more (rather than less) powerful in society.

Our institutional arrangements have in many places been very successful. They bring water to close to five billion people, sanitation to half the world population. They have provided the irrigation that has helped feed the world. Water quite literally powers and sustains industrial processes. Increasingly institutions have put in place the rules and practices that are protecting some parts of the global ecosystem.

Some countries have adjusted their institutions to respond to changing situations. But the sharp increases in the magnitude of the current problems and the ever-increasing stresses in freshwater management argue that the pace and direction of institutional adaptation need to change. Our behavior as individuals is included in that, and so is the functioning of national and international parts of the water management system.

In short, institutions provide the rules of the game in our different societies. They don't change quickly. Most organizations, practices, laws, and beliefs that impact on our water habits today derive from a period before the population of the world began to double within a human life span, and before humans realized that they were doing significant damage to the ecosystem.

10.2. The Problem with Status Quo 2002

10.2.1. National Level

Every country to some extent has formal institutional structures that are ill suited to managing water to meet the challenges of this century and the future. To a greater or lesser degree, they are fragmented. Policy making and the management of different uses of water (e.g. for drinking, irrigation, hydropower) and the protection of the environment are done separately and with little, if any, consultation. The current jurisdictions of institutions are, in many cases, too small to deal with system-wide issues. While it is obvious that the natural disposition and flow of water is in surface and groundwater basins, the political and administrative boundaries of the institutions responsible for their management rarely follow the same patterns. Governments take decisions about allocation, often without involving or informing users. In fact, there is generally a lack of transparency and availability of information concerning such decisions. Legal arrangements inhibit the reallocation of water among various users because historic water allotment, now locked into legal rights, does not reflect today's changing needs. In the absence of enforced sanctions, water quality is in decline in most of the world and still threatened even in the world's richest countries.[1]

The principle of subsidiarity, or the management of resources at the level closest to the user, is increasingly widely accepted, but still a challenge to democracy. User committees with management powers can be found in many places. Yet participation of citizens in planning and decision making at the local level is still uncommon.

It seems to be a characteristic of human nature that access to resources – whether it be jobs, capital or services – depends on whom you know. This for the poor generally leaves them dependent on their family members, neighbors, and close friends: people also without economic status or political power. They have almost no links to people in positions of influence in formal institutions. Thus discrimination or lack of resources usually excludes them from the places where major decisions regarding their welfare are made. This accounts for their lack of access to water and

sanitation and their vulnerability to floods and droughts. Gender biases accentuate this problem for women.

Unsuitable water pricing policies induce wasteful consumption of water. There is usually not enough money in water management systems to provide for system upkeep. Public funding is in decline, including official development assistance. The requirement for capital is enormous, especially if the needs of the underserved and unserved are to be met. However, traditional capital sources from public funding are in ever-shorter supply as globalization pushes public spending down and competition for public funding increases.

10.2.2. Regional Water-Related Conventions[2]

Regional cooperation in Europe provides a prime example of how transboundary water issues may be dealt with at that level. The founders of ECE already saw economic collaboration among all the countries of Europe in 1947 as making an important contribution to the political unity of the major powers. Although that contribution was severely constrained in the early years of the cold war, all members of the Commission agreed on its importance as an instrument of consultation and a "bridge" between east and west. Cooperation among governments in ECE has focused on a large number of narrowly defined technical problems, on which the interested parties could negotiate without raising larger questions about their economic and social systems. The latter constraint has now diminished, but in fact this type of "grass-roots" or bottom-up cooperation has proved to be very successful in the fields of environment, transport, trade, energy, and standardization. The larger significance of this technical work is that it helped to create a framework in which the habits of cooperation to overcome differences and seek common ground have become deeply entrenched over the course of nearly fifty years.

The first international environment-related agreement that came into existence under the auspices of ECE was the Convention on Long-Range Transboundary Air Pollution, signed in 1979, and in force since 1983. The development of similar international agreements for other environmental areas was a topic of discussion at various seminars held during the 1980s. In the light of relevant provisions of the Final Act of the CSCE, ECE started paying increased attention to environmental impact assessment, and started developing an international framework agreement to regulate the application of EIA in a transboundary context.

As regards water-related agreements, the main breakthrough occurred during the Meeting on the Protection of the Environment of the Conference on Security and Cooperation in Europe (CSCE) in 1989. The participating States recommended *inter alia:*

- that the ECE elaborate an international convention, code of practice or other appropriate legal instruments on the prevention and control of the transboundary effects of industrial accidents
- that the ECE elaborate a framework convention on the protection and use of transboundary watercourses and international lakes.

Three new UNECE conventions were indeed adopted by 1992. In view of the role played by CSCE in the initiation phase, it is not surprising that the UNECE conventions have a considerable potential to prevent conflicts and settle transboundary environmental disputes.

10.2.3. International Level

As reflected at the World Summit on Sustainable Development in Johannesburg in September 2002, the international community seems to have accepted that protecting Earth and meeting humanity's basic needs on an enduring, intergenerational basis are

two of the three "vital" planetary interests.[3] Yet there is little immediate prospect of finding a way to give legitimacy to processes for decision making and management at the planetary level. In the meantime, nations will continue to act in their own self-interest, even though their decisions may adversely affect the lives of others on the planet, and thus ultimately be wrong for their own citizens.

In the meantime, one must work through the institutions one has. International organization in water management is as fragmented as its domestic counterpart. There are at least as many international agencies involved in the water and environment sectors as there are at the national level. The former Subcommittee on Water Resources of the United Nations Agency Coordinating Committee (ACC-SCWR) had no role in policy making and could not be effective in ensuring an integrated coordinated approach to management of water and protection of the environment. In October 2002 it was restructured as UN-Water. The mechanisms now proposed seem to address these weaknesses. Using their World Water Assessment Programme they are committed to producing every three years a World Water Development Report. The first report is to be released at the third World Water Forum with subsequent issues to be released at future Forums. This is a major step in the right direction.

As demonstrated in Chapter 3, international law on shared waters is weak. It is remarkable that even the limited and relatively weak United Nations Convention on the Law of the Non-Navigational Uses of International Waters has taken twenty years to negotiate and is still not ratified.

Some issues that have enormous impact on water are outside the reach of institutions directly concerned with water. Let us take just two examples. Agricultural subsidies to wealthy sectors in industrialized countries determine the flow and quantity of international agricultural trade, a trade in "virtual water." The agricultural lobbies have tremendous clout and present high resistance to increased water pricing. Second, there has been too little positive national or international response to the emergence of cities as separate systems of governance. Yet cities, often without their own power to tax or raise funds, will have the main responsibilities for the provision of new water and sanitation services in an increasingly urban world. These two issues will have a great effect on water resource management, but are outside the scope of the regulatory power of the water sector institutions.

10.3. Good Institutional Frameworks: Establishing the Direction of Change

10.3.1. Integrated Water Resource Management (IWRM)

To ensure their sustainability, water resources must be viewed holistically, both in their natural state and in balancing competing demands on them: domestic, agricultural, industrial (including energy), and environmental. Sustainable management of water resources requires systemic, integrated decision making that recognizes the interdependence of three areas. First, decisions on land use also affect water, and decisions on water affect the environment and land use. Second, decisions on our economic and social future, currently organized by socioeconomic sectors and fragmented, affect the hydrology and ecosystems in which humans live. Third, decisions at the international, national, and local levels are interrelated.

At the operational level the challenge is to translate agreed principles into concrete action. The response to this is often referred to as *integrated water resources management* (IWRM). The concept of IWRM is widely debated. Hence, regional and national institutions must develop their own IWRM practices using the collaborative framework emerging globally and regionally.

The Global Water Partnership (GWP) has defined IWRM as "a process which promotes the coordinated development and management of water, land and related resources to maximize the resultant economic and social welfare in an equitable manner without compromising the sustainability of vital ecosystems."

The concept of *integrated water resources management* – in contrast to "traditional," fragmented water resources management – at its most fundamental level is as concerned with the management of water demand as with its supply. Thus, integration can be considered in two basic categories:

- The natural system, with its critical importance for resource availability and quality, and the wide range of environmental services that it provides.
- The human system, which fundamentally determines the resource use, waste production, and pollution of the resource, and which must also set the development priorities. Integration has to occur both within and between these categories, taking into account variability in time and space.

Historically, water managers have tended to see themselves in a "neutral role," managing the natural system to provide supplies to meet externally determined needs. IWRM approaches should assist them in recognizing that their behavior also affects water demands. In effect, if integrated water resources management were adopted as a standard approach everywhere, it would help to foresee, and contribute to avoiding, issues that arise that could create conflicts.

10.3.2. River Basin Organizations (RBOs)[4]

The key to IWRM and RBO institution building is to facilitate dialogue and bargaining on the interests driven by values that underlie organizational positions. The value changes described earlier in this report are driving both the substance and the process by which society does its business.

Figure 10.1 describes a variety of institutional mechanisms and a simple range of options ranging from low power/authority to high power/authority to allocate water. To the left of the spectrum is represented power to allocate based solely on individual sovereign right. To the right, one finds regional, comprehensive authority for decisions in the water resources field. Moving from individual autonomy towards regional authority, a variety of approaches are noted: individual studies, regional study centers, treaties, conventions, and river basin authorities, up to comprehensive regional authority.

Individuals and their networks are informal institutions that can be imagined as mechanisms functioning at the left-hand end of the scale. Moving to the right, institutions become more and more formalized. For their effective functioning they should still include the informal institutions in their processes.

The power/authority of water resources agencies to allocate resources in quantity and time can also be thought of as moving from low planning levels to higher levels of operations. Regional and comprehensive water basin authorities, while they exist, tend to be for planning rather than for operations, construction, or legal oversight. Those empowered with higher levels of power/authority tend to focus on single purposes such as navigation. Few comprehensive authorities that cross jurisdictional boundaries exist for allocation of water resources and operation of water systems. The TVA is one outstanding and almost unique example. Still, as described earlier a variety of river basin authorities have existed and do exist, along with treaties and numerous regional centers. Such regional and international transboundary basin authorities are still mostly concerned with planning.

There is a tendency when discussing institutions to begin with structures. If one were to do this when talking of water, one might think that the way to achieve more integrated water resource management would be to have one ministry dealing with all aspects of water and the environment, and everything having a major impact on them. Even if this were done, such an organization would still split up into functional units. Society needs, if anything, stronger functional units dealing with irrigation, drinking water, the relationship between the ecosystem and hydrology, and other

issues. Comprehensive and coherent national water policies and strategies are the only means of ensuring strong and flexible coordination between sector agencies. A supportive resource mobilization strategy will demonstrate the political will required for implementing the policy. Formal institutions are discussed below in that order: policies, organizations, and resources.

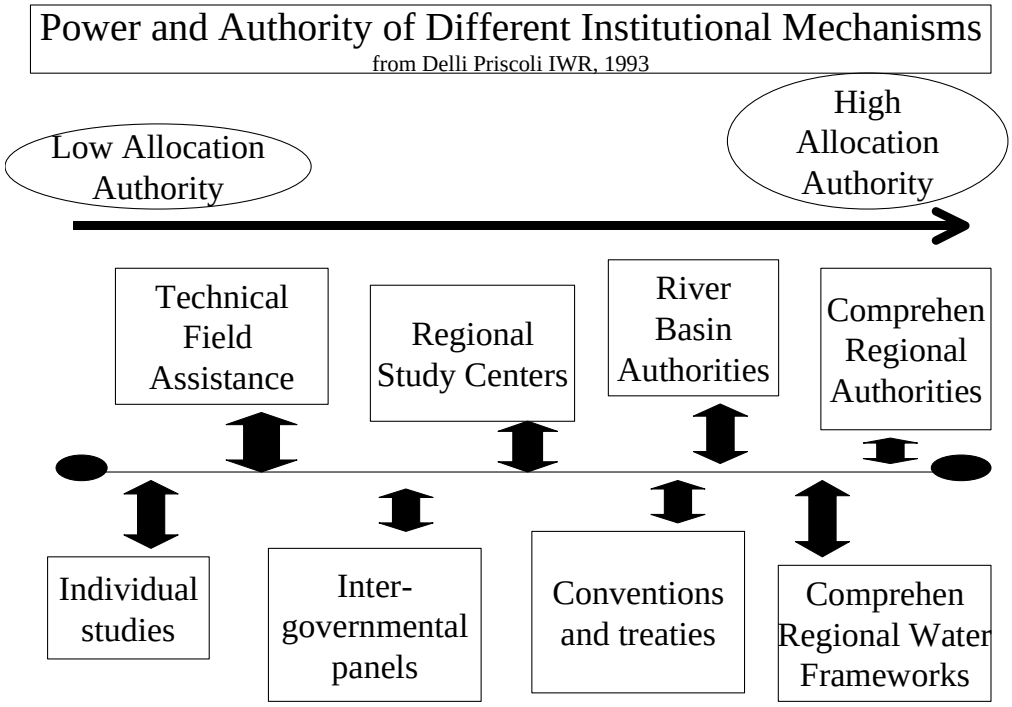


Figure 10.1. Institutional mechanisms and options

10.4. Improving Institutions at the National Level

Creating strong institutions at the national level is almost essential to the creation of institutions to manage water across international boundaries.

10.4.1. National Policy is a Prerequisite

Clearly, no single model of institutional arrangement can suit all countries on all continents. But there is growing agreement on the essential characteristics that will create the conditions for improved water management. All countries need to work toward a statement of water management principles either through a water law or a national policy declaration, from which all subsequent actions are derived. The top priorities should be both the qualities of human existence and ecological protection. All other concerns must be incorporated, but remain subsidiary to these two priorities.

All national (and international) policies must recognize that water can only be managed holistically, taking into account its natural state, the impacts of the socioeconomic activities of humans, and other variables such as climate change.

Every individual is a stakeholder when it comes to the management of water. The act of establishing policies for the planning and management of land and water resources should involve participation of women and men stakeholders representing the economic, environmental, and social interests of the community. Participants should fully share all related information. The process should make productive use of the collective knowledge and wisdom of formal and traditional sciences (indigenous knowledge).

It is the responsibility of states to create an information system that depicts the trade-offs being made in decision making. Transparency includes information related to risk of droughts on the one hand and floods on the other. Populations need to be informed in order to assess and share the risk or vulnerability to hazards and disasters, as well as the need to take measures to prevent and mitigate these. It is a national responsibility to set standards that are realistic and can be monitored. There must be provision for review of those standards at regular intervals.

Since the balance between water as an economic good and water as a social good must change constantly to reflect environmental, income, and usage shifts, the institutional system that governs these changes also needs to be capable of change. Legislation should require periodic reviews of national policy based on an assessment of changes that have occurred in the interval.

10.4.2. Organization.

National management accountability needs to be vested in the ministry that will give it the broadest cooperative framework to mitigate the fragmentation of water management. Governments should establish apex bodies such as national environmental or water resources councils to coordinate and negotiate between sector, regional, and local concerns through systemic management agencies at the basin and aquifer levels.

Ultimately, at least some aspects of water management during the next twenty-five years need to be at the level of river basins and aquifers. This process can begin today with something as simple as Water Use Committees but must be extended over time. Planning, designing, implementation, operation, monitoring, decommissioning, and financing should all be conducted at that level; all systematic change could reflect this as an ultimate, even if not currently achievable, goal. Whether this involves national or transnational activity, such integrated water management can build social stability and provide an opportunity for conciliation to resolve larger issues.

Multi-use arbitration and multi-use participation need to be incorporated into the overall management strategy. Environmental information and environmental advocates must be included in this process from the outset. Sensing and monitoring agencies need to be linked in for disaster preparedness. Drinking water, health, agriculture, environment, industry, and recreation interests have to be represented around the planning table. Such nascent water "parliaments" will respond to growing stakeholder demand to be part of allocation decisions.

Governments should encourage the establishment of such management agencies at the basin and aquifer levels. As the World Commission on Water has pointed out, to make this operational it is necessary to recognize a hierarchy in space of catchments, sub-basins and basins. Each is nested within the larger one. They are part of an organic whole. The functions of the basin agencies must also reflect that hierarchy, with decision making pushed down to the lowest appropriate level: the principle of subsidiarity. But clarification is needed for how a geographic-based agency relates to the mandate of the sector agencies and the administrative/political units that do not generally correspond to the basin boundaries. This clarification will be needed and codified in each case for effective action to flow from the institutional arrangements, and to avoid these new agencies becoming only another bureaucratic layer that contributes to the current fragmentation of decision making in water.

At the water services delivery level, it will very often work best if there is a conversion of water management organizations to service business, responsive to a multi-sector clientele.

10.4.3. The Role of the Private Sector

Private–public partnerships are emerging in a number of countries, and there is a growing separation of policy-making bodies and administrative entities. With decentralization, the fundamental rethinking of water policy is taking some communities back to remembering first principles.

Officials accountable to the citizens must retain the responsibility and have the authority to oversee the management of water services. In the foreseeable future most consumers will still get their water services from public companies. These public companies are typically subject to no regulation and have no accountability to or contract with their users. Improving performance of these companies is a vital policy challenge. Emerging experience in several countries shows that a major stimulus to improving performance of public service companies is the introduction of private companies. It is the insertions of the private sector that catalyze a demand for regulation, for information on comparative performance, and for transparency and accountability. Such regulatory frameworks should apply to both the public and private sectors.

Although international water companies can and will play a vital role, mainly for large cities in creditworthy countries, local companies and local entrepreneurs also have a positive role to play. There is little disagreement that the local private sector can play very useful roles in improving the efficiency of water distribution systems. From billing and bookkeeping to maintenance and use monitoring, the local private sector can often improve the technical and financial performance that characterizes many public utilities in developing countries. Work of this nature depends on good contractual arrangements, and the system must generate enough revenues to pay for the services provided.

Beyond this type of service contract arrangement, in some places the private sector has invested in improved delivery services with claims on the revenue from new or improved system functioning as the return on investment. For such investment to be publicly acceptable, investment needs to be accompanied by transparent arrangements, which extend to performance criteria. These include consulting with local communities to determine their needs, providing public information at regular intervals, and observing appropriate environmental considerations and monitoring. By ensuring transparency good regulatory frameworks can provide, among other benefits, the means to discourage corruption that too often exists. Of course, they must be backed up by a strong independent judicial system that can enforce the application of contracts.

A major issue is how to encourage private sector profit-motivated organizations to respond to environmental and social needs. The environmental movement is increasingly organized with resources to make sure that it is represented whenever true participatory processes make it possible. But this is not so for the poor.

10.4.4. Empowering the Poor

The state can play a vital role in helping the poor gain access to places where decisions are made concerning water that have a direct impact on them. First, governments should frame their policies and legislative and administrative systems so that no citizen is excluded. Second, services should be provided using client-centered, problem solving approaches. This should apply to all government services, but also be a requirement of the regulatory framework and contractual arrangements with private sector suppliers of public services. Finally, to the extent that it is necessary, affirmative action programs may be used, requiring service providers to meet targets or quotas for the poor and disadvantaged.

Governments can also help by creating an understanding of the need for enlightened self-interest among the elite in their societies. A number of forces and

movements at work in society make this more politically acceptable than in the past. These include the proliferation of NGOs and the human rights movement; democratic transitions underway in many countries; and new forms of organization of indigenous peoples and claims for ancestral domain and worldwide interest in their cause. If national elites come to a better understanding of poverty in their countries, they may engage in better policy making to ensure access to processes that enable the poor to meet their basic water needs.

10.4.5. Resource Availability

The requirement for capital is enormous, especially if the needs of the under-served and unserved are to be met. However, traditional capital sources from public funding are in ever shorter supply as globalization pushes public spending down and competition for public funding increases.

Current users, not taxpayers, should pay the full costs of delivery as consumers, with a compensation system for poor people. For conservation and demand reduction, as well as to raise revenue, everybody should pay something, with the ultimate goal being full cost payment in water supply and sanitation. These funds must be made available to the water system managers together with a clear understanding of the equity and efficiency goals expected in the delivery systems.

Proven social mobilization approaches that have worked to engage the resources of those not served by current water and sanitation systems must be implemented now. These may need subsidies, but primarily they need the recognition that traditional central finance has simply not provided water and sanitation to all people. Especially where public funds cannot be found, and private funds cannot be attracted, new partners must now be engaged to allow new forms of organization to flourish. There are dozens of examples that this works; public authorities must cease to see such approaches as threatening or competitive to their own efforts.

Public funds are in scarce supply and there is no indication that they will be any less scarce in the future; demands on them will continue to increase. It is imperative that public funds be used only for those purposes for which it would be impossible to attract other source of funds:

- subsidies for poor people
- water resource studies
- some forms of research and monitoring
- the establishment and institution of regulatory systems
- ecological zone preservation and restoration
- flood protection.

Subsidies should be paid directly to poor people to help them out of poverty, not the water departments to administer social welfare. The level of such subsidies will be high, and may require governments to maintain their budgets at current levels even though they transfer much of their previous investment plans to the private sector. Unless countries deal internally with the issue of poverty to create social harmony, international cooperation in basins they share will not be sustainable.

For money to be available from the private sector for the development of urban water, irrigation, and hydropower generation services requires a predictable, transparent regulatory framework that simultaneously protects the interests of investors and consumers alike. International investment in the water sector could add to the estimated $250 billion a year of private capital that now flows to developing countries (and which is now five times the size of official development assistance).

10.5. The Role of International Agencies

Official development assistance cannot be the source of financing for the massive investments required. However, it can play a useful role in assuring the financing of complementary services such as research, reforms of governance, and setting up subsidy systems for the poor that must accompany private sector participation. International institutions that are a source of capital should set guidelines on accountability by incorporating management norms in their loan criteria and devising output performance measurements.

They can help with institutional reform as well by providing expertise on the techniques to create transparency and provide for public consultation, and the enabling environment for community participation, especially enhancing the role of women. However, they should be required to demonstrate their comparative advantage in providing these services. One important way to demonstrate this would be by applying the relevant practices to their own functioning. Another would be by demonstrating that they can compete with the private sector to provide these services.

The international system should promote information exchange, and serve as a source of data and best practices in water management and private sector participation. It should gather and regularly report data on water quantity, quality, withdrawals, and consumption. It should continue monitoring environmental performance criteria and encourage research into the links between ecosystems and the hydrologic cycle. This research, in turn, will help the state and local level implement sound water management policies. The international information disseminated by the international system would help create an international climate of opinion on water management, so that general awareness of water issues increases, allowing for better water management. Public education that begins at the international level will later be transmitted to the national and local levels.

The international system can also help empower the poor and disadvantaged by collecting information on participatory systems that successfully involve them. It could stimulate a reinforcing worldwide movement by bringing those responsible for these successes into contact with each other, and with others still coming to grips with the problem of access to water services by the poor. It can also help by spreading at the international level an understanding of the need for enlightened self-interest in governments and within the population of countries who are rich in water and other resources.

The World Trade Organisation should help address the question of the supply of food to countries without adequate water resources to produce their own by placing this issue on the agenda for the next round of trade negotiations. Of course, representatives of these nations will need to play an active role in such negotiations.

Two observations and corollaries are important. First, whereas official development assistance was a dominant form of capital ten years ago, it is now recognized that in many ways it created perverse incentives. Official flows will now be dwarfed by private sector flows, domestic and international. The corollary is that official flows must be seen as instruments facilitating the capture of private flows and complementing them. Second, it is clear that development assistance can play an enormous positive role when countries themselves have the right policies and priorities, but that conditionality does little to correct policy distortions. The corollary is that international agencies should increasingly be directing their limited resources first to those countries that have embarked on paths of equitable and sustainable reform, including cooperative approaches to managing water resources shared with other nations. This will encourage those who have started such action and demonstrate to those who have not that the international community does reward such behavior.

As noted earlier, the UN agencies that have water-related issues as part of their mandate have recently reorganized themselves under the title UN-Water. New operating procedures are being put in place. If supported with adequate resources, the international system will be in position to ensure continuity through UN-Water in programs and policies across governments, despite frequent regime changes.

10.6. International Waters and National Sovereignty

Two or more countries share some 261 rivers. The management of water resources across natural boundaries strains the capabilities of institutions. Rarely do the boundaries of watersheds correspond to the existing administrative boundaries, be they local, national, or international. Regional politics can exacerbate the already formidable task of understanding and managing complex natural systems, and disparities between riparian states – whether in the level of economic development, infrastructure capacity, political orientation or cultural values – can complicate the development of joint management structures.

Since the 1992 United Nations Conference on Environment and Development in Rio de Janeiro, management of international freshwater resources has become a major concern of the international political and professional community. Actions taken have included the pronouncement of non-binding declarations, the creation of global water institutions, and the codification of international water principles. While clearly more work is required, these initiatives have not only raised awareness of the myriad issues related to international water resource management, but have also led to the creation of frameworks in which the issues can be addressed.

The challenge is to facilitate integrated water resources management in international basins and aquifers and to minimize conflicts between states that share them. Actually, many of these rivers have brought countries together and promoted collaboration between them, though not always on issues of water. Transport, trade, and many other issues have been actively managed by various institutions. The experiences of the United States and Canada through the International Joint Commission, the countries of the Rhine Basin, and the Southern African countries show that riparian states do not have to define their relationships exclusively around the sharing of water. General political cooperation and agreements facilitate the resolution of water issues. Yet the effective management of water also could become a vehicle for collaboration as much as its absence could be a potential source of conflict. International institutions could help manage water conflicts across countries, and provide mediation within countries when possible. For example, they could initially facilitate consensus on the process techniques of shared basins, then move on to assist in development of regional conventions.

10.7. Institutional Reform Rainbows: Is There a Pot of Gold at the End?

The good news is that change is underway in many countries and regions of the world. And there is very good news where these changes have begun:

- Incentives work: those who pay more for water use less.
- Readiness to pay more for better service has been proven in many places.
- Crop-per-drop irrigation promises more yield and less water use.
- Significant transformations have been brought about through water harvesting.
- Gains in water conservation have been made while levels of economic growth and development have increased.
- Communities of the poor can organize to produce rich results.
- Shared water has led more often to collaboration than conflict, even between traditional adversaries.

The stage is set for even greater benefits through expanding institutional reform through the measures described above. Where these improvements have occurred, they will facilitate cooperation in the management of water across international borders as well. They will be essential to achieving the Vision for Water, Life and the Environment in the twenty-first century. The challenge is to multiply and accelerate the process.

Notes

This text is drawn partly from a chapter prepared by Margaret Catley-Carlson and William Cosgrove for the unpublished *Scenarios* volume of the World Water Vision.

1. Almost 30 percent of the largest industrial, municipal and federal facilities in the United States were in serious violation of the Clean Water Act at least once during a recent 15-month period, according to a report by the US Public Interest Research Group. Nearly 270 million pounds of toxic pollution were released into US waters in 1997. (Poisoning Our Water: How the Government Permits Pollution, February, 2000).
2. See again Dr. Branko Bošnjaković, PCCP Series document *Negotiations in the Context of International Water-Related Agreements*.
3. The third is global strategic security: avoiding self destruction. See Kennedy, Graham, *The Planetary Interest,* London, UCL Press, 1999.
4. This section is drawn largely from the PCCP Series Volume *Participation, Consensus Building and Conflict Management: Training course,* prepared by Jerome delli Priscoli of the Institute for Water Resources, US Army Corps of Engineers.

11. MEANS AND TOOLS OF MANAGING SHARED WATER RESOURCES

The PCCP–WfP exercise has identified several tools and mechanisms suitable to develop trust and build institutions that secure cooperation. Some of these are related to developing shared values that support justice and equity. Some are related to improving processes of conflict avoidance and resolution. They include mixtures of building human skills and using the latest engineering and management technologies.

11.1. Global Goals Guiding Water Management

11.1.1. What Will the Future Hold?

It is not difficult to see that the changes described earlier may have significant impacts on the management of water. But what will these be? What will be the size and location of population growth? What are the likely patterns of spatial distribution and settlement patterns of populations? To what extent will the availability of water determine settlement patterns? How will land use evolve? Will global trade include trade in fresh water? How will we resolve the definition of water as an economic good – as is necessary to manage demand and encourage investment in infrastructure – while recognizing the social nature of water and the presumed right of communities and individuals to have access to it? What will be the roles of community action, of the poor, of women in managing water resources? What forms of organization will work? How much regulation is required? How can we raise the awareness of the world population, especially that large block of children and young people, to the importance of water? Finally, what mechanisms can be used in setting investment priorities and making investment decisions that will adequately reflect the importance of water to life and the environment? Are there some guiding principles that may be used in building institutions to cope with the future?

11.1.2. Some Guiding Principles

Recognizing the current shortcomings and building on nascent trends, major institutional change over the next twenty-five years should indeed be based on a few sound and generally agreed guiding principles. The following paragraphs describe some of the characteristics of a desirable and achievable society.

An ideology of sustainability would be promoted to displace the consumption-oriented values present in, and spreading from, the Western industrialized world. New attitudes and behaviors are needed among individuals and society everywhere. Resource management principles increasingly recognize that human activity is determining or co-creating future ecosystems. The design of institutions should reflect a shift from developing new water resources to demand management and sharing water, as well as from issues of quantity only to one of quality–quantity.

Water management during the next twenty-five years should occur through planning at the level of river basins, with the designing, implementation, operation, decommissioning, and financing conducted at the appropriate subsidiary level or even by the private sector. The design of institutions would reflect this. This will lead to greater diversity in the types of institutions, based on a higher degree of agreement on the principles of sharing water. Multi-use arbitration and multi-use participation, including public–private partnerships, should be incorporated into the overall management strategy. Drinking water, health, agriculture, environment, industry, and recreation interests would be represented and have established arbitration in the river basin management system. The human and environmental values of rural areas will be given more weight in the allocation and regulation of resources to counter the rapid trend to urbanization.

Management systems should incorporate the maximum possible transparency to explain the issues to the widest possible public. Maximum possible user cost recovery would become another management goal. There would be recognition that water is a social good and that some benefits do not lend themselves to charges. Subsidies for such uses will continue to be necessary, but would become more transparent, with the recipients of subsidy having greater accountability. Delivery of water for both drinking and irrigation has monopolistic characteristics that do not allow for the kind of competitive supply that is possible with other utilities. Regulatory systems to control them will be responsive to citizen input. At the same time, there will be recognition that competition drives good service and low prices, and efforts will be made to encourage this, not by entrenching monopolies with blanket licenses but with fixed-term contracts with clearly defined requirements as to outputs.

To promote capital flows, management would be given objectives and practices of stability, predictability, openness, respect of contracts, accountability, and conflict resolution. These global management objectives would become the ones with which systems on all levels comply. Therefore, the management framework would be centralized, but administered at all levels.

Governance structures must be based on universal ethics and human values that recognize the rights of citizens in a universal democracy, promote equity, and replace confrontation with partnership mechanisms. Empowerment at the local level would promote social and environmental accountability, and enable all stakeholders to participate in decision making. Development and application of locally appropriate technology will improve lifestyles without causing harm to the environment. Institutional design should reflect this wide range of present circumstances and these guiding goals.

While the processes described above reflect agreements reached at the World Summit on Sustainable Development, they will not be achieved without a greater demonstration of political will and provision of more resources than are being made available to the water sector today.

11.2. Values, Processes, and Institutions

As was discussed previously, while the terms are often used synonymously, institutions differ from organizations. Institutions are routine and stable patterns of behavior over time. They are formed and driven by values, which over time often become implicit and unexamined assumptions embodied in a variety of organizations. Changing values held by clients of these traditional institutions and by influential external institutions challenge the values underlying traditional water institutions. The litany of Impact Assessment "add-ons" to traditional water management policy such as Environmental and Social Impact Statements (EIS, SIA), and Risk Assessment (RA) are testimony to the growing concern that traditional water institutions are somehow not including a complete enough picture of values at stake. The broadened array of approaches to flood management illustrates this trend.

Moving people from flood plains or providing insurance after modifications to structures bring in different interests and values. Reorganization alone is insufficient to provide better management of water resources. Not only the positions advocated, but also the data used by new and old institutions are driven by values (or assumptions about the way that the world ought to be). The processes and tools described in the remaining sections of this chapter recognize that the values and interests of stakeholders must be taken into account in evolving institutional frameworks.

11.3. Alternative Dispute Resolution

11.3.1. Skills, Strategies, and Techniques

On the spectrum between an agreement reached by the parties involved in a direct negotiation, based on a full and mutual understanding, and a binding decision rendered by a third party's authority in a procedure of adjudication, there are many ways of resolving disputes. These options and possibilities create "a menu" of ADR (Alternative or Appropriate Dispute Resolution) mechanisms that were described in Chapter 4. These middle-of-the-range options include negotiation (with or without a facilitator) and mediation. The credibility and impartiality of the institutions that intervene in these roles is most important. However the quality of the individuals selected is also important.

Negotiators, facilitators and mediators must acquire the skills and learn the techniques required by their roles. First and foremost they need communication skills (active listening, talking clearly and precisely, and understanding and perception). Some of the techniques associated with using these skills include reframing positions as interests, using open questions, and separating the persons from the problem.

These same skills and techniques are basic requirements for mediators too. In addition they should have the following desirable traits:

- ability to create trust among the parties
- ability to define the issues of the dispute
- patience, endurance, perseverance
- thoughtfulness, empathy, flexibility
- common sense, rational thinking
- likeable personality
- experience
- neutrality, impartiality
- problem-solving skills, creativity.

Among the techniques and strategies that may contribute to building consensus are:

- Strategies based on interest-based negotiation.
- The facilitative/passive strategy: the mediator acts as a facilitator of the process, and does not evaluate or suggest solutions. Strategies and techniques of facilitating and assisting the parties to understand their situation encourage the parties to communicate, and help them to reach an agreement.
- The intervening/active strategy: the mediator evaluates the case and suggests solutions and options.
- Use of experts and expertise in the disputed issues and seeking guidance for resolution of the dispute, based on law, industry practice, etc.
- Mediators meet first with all parties in joint meetings, sometimes with each party in private caucus, and assist the parties in understanding their own underlying interests, and those of the opposing side.
- During mediation the focus is on the future, but it does not ignore the past, which provides information about the issues and the causes of the conflict.
- Mediators elicit ideas from each side for possible resolution, and assist the parties to develop a negotiated settlement, an agreement, which is usually put into writing, and can be ratified by the court.

Some of the above traits are part of the personality of the individual, and would be difficult to learn. However most of the skills can be learned through training and practice, as can the useful strategies and techniques.

11.3.2. Impartial Sources of Support

It has been suggested that there is a need for additional outside sources of help with institutional reform as well to provide expertise on the techniques for creating transparency and providing for public consultation. This would help to create an enabling environment for community participation and especially to enhance the role of women. This service could be extended to the coordination of identifying and monitoring hotspots so that mediation services may be offered early in the process to prevent tensions from leading to conflict.

UNESCO's involvement in the field of water conflict management started in 1996 when the thirty-six Member States of the International Hydrological Program Intergovernmental Council (IC-IHP) approved the inclusion of "Water Conflicts" as a majot theme in the work plan of the program. The organization's implication in these matters grew efficiently until the same Council adopted in 1998 a resolution endorsing the creation of a center that "aims at promoting co-operation for sustainable water resources" in the city of Valencia, Spain. Because of some national political events this project remained unfinished.

In 2000 at the conclusion of the Second World Water Forum, Dr Mahmoud Abu Zeid, President of the World Water Council, proposed the creation of the World Commission on Water, Peace, and Security to provide an opportunity for third-party mediation of shared water disputes. The role of the commission would have been to assist nations in current and potential transboundary water issues, providing an independent opinion to help bridge the gap between concerned parties, to develop and promote common interest for "win–win" solutions. However the Council recognized that the lead in some of these areas rests with the United Nations family. Dr Abu Zeid approached the Director-General of UNESCO with the suggestion of creating a Water Cooperation Facility. The creation of this facility was announced at the Third World Water Forum, in keeping with a recommendation of the Statement to the Ministerial Conference adopted in the Water and Peace Theme of the Third World Water Forum.

The Water Cooperation Facility is an UNESCO/World Water Council (WWC) initiative linking these two bodies with two other pivotal organizations, the Permanent Court of Arbitration (PCA) and the Universities Partnership for Transboundary Waters (UPTW). It will:

- foster peace and cooperation among stakeholders using common shared water resources by – on demand only – harnessing and/or developing the necessary financial and human resources, the favorable environment, political backing, and where needed and agreed, judicial resources
- draw upon the resources of these renowned institutions (each bringing a unique perspective and set of skills to promote the resolution of water disputes) as well as those of other key organizations with a stake in the success of such a facility
- serve as a nexus for education, research, technical expertise and the development of dispute resolution techniques for integrated water resources management, incorporating a multi-disciplinary approach.

11.4. Strengthening International Law to Protect Water Facilities

Declarations of new standards and promulgation of guidelines, though not legally binding, could achieve many of the same objectives. By placing increased emphasis on the international law of terrorism, prospects may be enhanced that those who attack water facilities will be brought to justice, and further acts of terrorism will be deterred. Finally, support for the International Criminal Court will improve the climate of accountability and enforcement of international law. These actions will contribute to

a more stable and prosperous world, where citizens will have safe and reliable water supplies.

11.4.1. Utilize the International Year of Freshwater

The United Nations General Assembly in resolution 55/196 proclaimed the year 2003 as the International Year of Freshwater. The resolution, adopted on December 20 2000, was initiated by the Government of Tajikistan and supported by 148 other countries. It encourages governments, the United Nations system, and all other actors to take advantage of the year to increase awareness of the importance of sustainable freshwater use, management and protection. This will provide a unique opportunity to raise the issue of legal protection to the highest level.

11.4.2. Third World Water Forum

Resolutions of the General Assembly can be an important tool in establishing norms that advance the standards of international humanitarian law. State participants in the Ministerial Conference at the Water Forum could seek a resolution that could be a basis for a rule of customary international law. Although the initial resolution would be purely aspirational, this can lead to the development of conventional and customary international law. The Secretary-General's report of August 19 1994 to the General Assembly referred to the "Guidelines" for environmental protection discussed above, and could be used as a model for a resolution concerning the protection of water facilities. It was stated in the following paragraph of Resolution 49/50 (on the UN Decade of International Law) of December 9 1994 that the General Assembly:

> *11. Invites* all states to disseminate widely the revised guidelines for military manuals and instructions on the protection of the environment in times of armed conflict received from the International Committee of the Red Cross and to give due consideration to the possibility of incorporating them into their military manuals and other instructions addressed to their military personnel.

Participants in the Water Forum could also issue a declaration that calls on all belligerents to abstain from attacking water treatment plants and distribution systems for civilian use and the staff engaged in repairing and maintaining them. Disputants should also take all measures necessary to avoid the pollution of surface and groundwater by fallout from weapons or damaged industrial installations.

11.4.3. Develop Guidelines for Military Manuals and Instructions on the Protection of Water Facilities in Times of Armed Conflict

Guidelines for the protection of water facilities and watercourses during armed conflict should be developed. The objective would be to promote an active interest in, and concern for, the protection of water facilities during times of armed conflict. It should be noted that this type of document would be of use only for organized military forces that attempt to comply with international humanitarian law. Terrorist organizations present another set of challenges.

11.5. Systems Analysis, Models, and Decision Support Systems[2]

11.5.1. An Overview

In dealing with water resource management pressures up to the present, water resources experts have been using various tools, ranging from speculative, observation-based, and experimental to theoretical approaches. In the past, many different tools have been used for simulation and optimization of complex water

resources systems and their operation under different conditions to provide improved basis for decision making. To assess and to help offset the pressure on water in the future, water management will more and more rely on sophisticated information management technology. The continuing evolution of information technology creates a good environment for the transition to new tools. Some current trends indicate greater future reliance on computer networking, easily accessible databases, decision support systems, object oriented programming, and system dynamics simulation.

Complexity and uncertainty are two features that will shape the tools for future water management. The first focuses on the complexity of the water resources domain and of the modeling tools in an environment characterized by continuous rapid technological development. The second deals with water-related data availability and natural variability of domain variables in time and space affecting the uncertainty of water resources decision making.

11.5.2. Future Tools for Water Management

Based on the two aspects above, there are four main directions in which future water management tools will be developed. They are

- object-oriented simulation
- evolutionary optimization
- integration of fuzzy set analysis with simulation and optimization tools
- integration of spatial analysis with simulation and optimization tools.

11.5.2.1. Object-Oriented Simulation

Object-oriented modeling, a new way of thinking about problems using models organized around real-world concepts, is being identified as a powerful approach for water management. By separating policy questions from data, object-oriented modeling makes the model results functionally transparent to all parties involved in water management. The proposed approach is flexible, transparent, and allows for easy involvement of stakeholders in the process of water decision analysis.

There are numerous tools used for implementing the object-oriented modeling approach, which is an appropriate approach for the implementation of systems thinking. Complex water resources planning problems heavily rely on systems thinking, which is defined as the ability to generate understanding through engaging in the mental model-based processes of construction, comparison, and resolution. Computer software tools such as STELLA, DYNAMO, VENSIM, and POWERSIM help the execution of these processes.

The power and simplicity of use of object-oriented simulation applications is not comparable with those developed in functional algorithmic languages. In a very short period of time, the users of the water management tools developed by object-oriented simulation can experience the main advantages of this approach. The power of object-oriented simulation is the ease of constructing "what if" scenarios and tackling big, messy, real-world problems. In addition, general principles upon which the system dynamics simulation tools are developed apply equally to social, natural, and physical systems. Using these tools in water management allows enhancement of water models by adding social, economic, and ecological components into the model structure.

11.5.2.2. Evolutionary Optimization Using Powerful Computers

Use of Darwinian "survival of the fittest" approaches to solve difficult numerical optimization problems in various different forms such as genetic algorithms, evolutionary strategies, evolutionary programming, or simulated annealing, will shape the future of optimization.

The general characteristics of evolutionary optimization approaches include: generation of a population of initial solutions, evaluating them, selecting a small fraction of the best solutions, and applying the recombination and mutation operators to generate solutions with better fitness values. The progress is achieved as long as the best solutions that are selected as "parents" are capable of producing better "offspring." A termination condition is met when there is no significant improvement in the objective function after a sufficient number of trials, or when a pre-specified number of trials have been reached.

11.5.2.3. Integration of Fuzzy Analysis with Simulation and Optimization Tools

Two basic forms of uncertainties are, first, uncertainty caused by inherent hydrologic (stochastic) variability, and second, uncertainty due to a fundamental lack of knowledge.

Simonovic (2000) points out that it is not the type of uncertainty that determines the appropriate way of modeling, but rather data sufficiency and availability. If sufficient data are available to fit a probability density distribution, then use of stochastic variables will be the best way to quantify the uncertain values. On the other hand, there is a scarcity of information if we are to address the requirements of sustainability, such as the needs of future generations, expanded spatial and temporal scales and long-term consequences. In this case, a fuzzy set approach can successfully utilize the information that is available.

Quantification of complex qualitative criteria, a process often encountered within water resources management, is a typical example where fuzzy systems modeling are favorable. Water quality, flood control, recreation, and many other qualitative criteria are still far from having precise analytical descriptions. Intuitive linguistic formulations are worth considering since fuzzy set theory provides a successful way to capture this information and use it in formal analysis.

11.5.2.4. Integration of Spatial Analysis with Simulation and Optimization

Most of the simulation and optimization tools used in water management up to now do not consider spatial dynamics of water systems in an explicit manner. In most cases, the approach has been to summarize the spatially important features of the water system with one or two aggregate relationships. For example, in the case of a reservoir, the spatially important details are summarized by non-linear functions linking surface area and elevation to the volume of water in the lake. Our understanding of some systems may be improved by introducing spatial dimensions in an explicit manner.

Spatial modeling can be implemented with any of the system dynamics simulation stock-and-flow software packages. The information in the dynamic model can be integrated with a Geographic Information System (GIS) to improve communication and interpretation. In this way, dynamic simulation models can deal with spatially explicit information while allowing fundamental laws to be expressed at one point in space (at the cellular level). The power of GIS is enhanced as well. When linked to a system dynamics simulation model, a GIS provides a dynamic perspective as well as a spatial perspective.

11.5.3. Use of Virtual Databases

Collection of data or information and sharing them among stakeholders is crucial in the water conflict resolution process. The advancement of computer sciences and information technologies provides improved measures in handling data and information. The present Internet technology is mature enough to support the development of virtual databases for a complex domain such as water-related conflict resolution. This mode of support has many advantages when compared to more

traditional centralized database models. The virtual database (VDB) is an Internet-based data catalogue that facilitates search by data type, custodian, location, and other attributes from a distributed confederation of data holding organizations.

There is a large amount of relevant data that is usually maintained by various agencies, each with different levels of complexity. In general, each data series may consist of several data sets. Each data set may contain several features. A database system is a combination of one or more databases and a database management system. A database is a collection of data, and a database management system is a collection of programs that enable users to create, maintain, and explore a database.

Internet technology can be used to support data collection, processing, and dissemination. At present, the Internet can be accessed through the local area network (LAN), telephone line, cable, or wireless (mobile) technology. The facilities that the Internet provides include information browsing, database access, and file transfers at any time and from nearly anywhere.

11.5.4. Will Needed Data be Available?

At the beginning of VDB development it is necessary to communicate with all the stakeholders involved in the conflict, to capture all the relevant data and (numerical and descriptive) information, aspirations, proposals, modeling tools and so on. The major challenge that may be faced is that much needed data may simply not be available. Increasingly countries are abandoning their observation stations on the assumption that satellite-based measurements will provide the data required. While these will be of great value, and indeed reduce costs and provide interpretation that is impossible using physically disconnected observation stations, they will be of no value unless they can be ground-proofed (calibrated) from by a sufficient number of terrestrial observations. Participants in the Third World Water Forum recommended to the assembled ministers in the Ministerial Conference that "stakeholders be helped to obtain the capacity to fully participate in the process of development of basin and aquifer strategies, agreements and institutions, through transparency and information." The required information will not be available if the basic data is not collected.

11.5.5. Decision Support Systems

A Decision Support System (DSS) is envisioned as a tool for analyzing diverse development and management alternatives in water resources projects. It makes the decision-making process more transparent and efficient, which will aid in reducing future probable conflicts among different stakeholders.

A DSS allows decision makers to combine personal judgment with computer output, in a user–machine interface, to produce meaningful information for support in a decision-making process. Such systems are capable of assisting in solution of all problems (structured, semi-structured, and unstructured), using all information available on request. They use quantitative models and database elements for problem solving. "They are an integral part of the decision maker's approach to problem identification and solution" (Simonovic, 1996, 1996a).

A DSS provides decision makers with assistance, including database access, descriptive and predictive models, geographic information systems, methods to involve stakeholders in the basin, and other tools and services.

11.5.6. Web Interaction

The World Wide Web (WWW) is a truly global communications vehicle and as such it plays an important role within the international water resources community.

In water resources management, especially in water-related conflict resolution, providing all the stakeholders involved in the conflict with access to data, analysis

tools, and other relevant information is vital. It enables each interested party or stakeholder to investigate probable solutions to the conflict by themselves, and then negotiate with a better understanding of the consequences of the alternative solutions. The Web can provide this opportunity of giving all stakeholders access to the tools developed to analyze the conflict and a common database that has data and information relevant to the water conflict.

Stakeholders should not only have access to the databases, but also should be able to use the decision support system developed to analyze the conflict from their own computer. Also they can use various web-based decision support systems applicable in analyzing their problem via the Internet.

11.5.7. Summary

Common access to databases, models, and ultimately decision support systems built through a participatory process will increase transparency and trust. This technology may be added to the tools that negotiators, facilitators, and mediators may use along with their human skills to arrive at consensus solutions to sharing water resources.

11.6. Visioning

Since the first World Water Forum sponsored by the World Water Council in Marrakech in March 1997, the futurist technique of visioning has been applied to the water sector. The most notable example was the World Water Vision exercise that employed scenario building (describing, with the use of models, what the world would look like if certain key drivers behave in certain ways) and visioning (a participatory process leading to a description of what the world ought to be). Using this process visions were developed for countries, sub-regions, and continents. In parallel with this, shared visions have been developed for river basins (the Nile and Mekong Delta basins being the best-known examples). The process is ongoing in other basins (Volga in Russia, Volta in Western Africa). The shared visions that are developed are not binding on anyone; they simply represent what the stakeholders believe would be the way they would like to live in interaction with the water resources in their basin. These shared visions do provide a framework for decision making in the future. The process of developing them creates awareness and understanding of the needs and expectations among the shareholders.

The use of modeling as a tool to assist in developing shared visions holds much promise. Shared vision modeling requires both the use of time-tested planning procedures and the active participation of those likely to be affected by a water resources plan. In simple terms, shared vision models are computer models developed by stakeholders, water managers, and water planners that incorporate planning objectives and performance measures into a framework that allows the generation and evaluation of alternatives in a manner that facilitates conflict resolution. These models typically contain assessments of social, economic, and environmental impacts as well as hydrologic and hydraulic analysis.

Shared vision modeling/conflict resolution appears to be more promising when applied to relatively new or low-intensity conflicts. Thus visioning would be best used long before legal or political alternatives have been considered, or for higher-intensity conflicts where agreements have been made or incentives have been imposed to maintain broad dedication to the process.

In the United States, one of the major advocates of shared vision modeling is the US Army Corps of Engineers. They have applied an interactive general-purpose model-building platform called Stella II™ in a number of exercises where conflicts existed over the design and operation of water systems. Each of these model-building "shared vision" exercises included numerous stakeholders together with experts in the use of Stella II.

Various social actors deploy strategies over varying spatial scales when competing or cooperating in accessing, using, or allocating water. They also deploy strategies over widely varying scales when competing to spell out the rules governing each of these activities. Farmers may resort to oral customary law to regulate their access and use of a neighboring spring or river for irrigation. This is often the case in the south of France where the new rules and regulations, especially those introduced by the European Union, clash with customary law. Very similar situations are also often found in the developing world, as examples in both the Middle East and South Africa illustrate. At the other end of the scalar spectrum, diplomats may consider the entire water resource lying in an international basin when negotiating a treaty with a riparian state. Is it conceivable that these two sets of actors act in full independence from each other? Is it possible that water conflicts and competitions occurring at local and national levels are irrelevant to an understanding of international water conflicts and conflict resolution? Those researching "water wars" have often assumed such independence between the various scalar levels of water conflict. This assumption has its roots in a perception of the state as the sole actor capable of spelling the rules of social control and as the sole actor capable of mobilizing legitimate means of violence.

Any understanding of international conflict concerning water and any successful conflict resolution proposals need to rely on multi-scalar analysis of the competitions and conflicts concerning water. Such an analysis explores the competition and conflict occurring over several scales. It explores the interactions between those who are active over different spatial and social scalar levels. The sum of these contradictory interests constitutes what is often reduced to "an international water conflict."

The advantage of "shared vision models," as the name implies, is that consensus in the model and in the computer results can be reached, since all parties participated in the development of the model and the model-based vision. The use of such models will permit stakeholders to confront their normative view of what the world ought to look like, with the physical and socioeconomic realities to which they must adapt at all scales.

11.7. Building River Basin Organizations

11.7.1. Conditions for Successful RBOs

Successful RBOs help us work toward better integration of demand and supply, encourage effective participatory processes, and help create incentives for cooperation by helping people to see interdependencies. They are a means for water managers and stakeholders to manage water efficiently across the basin instead of focusing on individual system efficiencies. For example, the return flow from irrigation may be managed to meet other uses downstream and to recharge groundwater, thus enhancing water use efficiency at the basin level while meeting ecosystem needs. By managing the flow of water in space and time as well as ensuring its quality, water managers at the basin level can also better align demand with supply.

Several conditions have been identified for successful RBO design.[3] These include high-level ministerial (political) commitment, meaningful community input, high knowledge levels, clear accountability among participants, and flexibility and creativity in the organization. Structures should be designed based on the functions or missions needed, fostering and/or using existing perceptions of the basin as a whole and as a shared resource among many users and using process orientations. Good design will separate the administrative and the larger policy issues, separate regulations and construction functions, and establish mechanisms for conflict management and resolution.

Participatory processes can help level the playing field and incorporate a wider range of values into management decisions. They can facilitate new partnerships among stakeholders. They encourage public access to data and information. In all of

this they affect the civic culture or governance culture. They help stakeholders understand how the water is a shared resource and recognize effects that flow up and downstream.

11.7.2. Designing RBOs

Experience and studies are beginning to show that the most important dimensions to consider in designing transboundary water institutions are: functions and responsibilities; membership and participation; operating rules, authorities, legal basis, and structures; financing methods; and consideration of a broad range of issues.

1. *Functions* can be thought of as soft (support roles) or hard (decision making with authority). The soft would include responsibilities such as research, monitoring, advising or advocacy, and regional focused data and information generation. Harder functions include power to modify and integrate policies of others, the power to allocate waters, and the authority and procedures to mediate conflicts. Most transboundary organizations start with softer functions and some expand into harder ones.

2. *Membership* relates to what jurisdiction and agencies and interest must be represented. Realistic power sharing and the relative balance of agencies and jurisdiction must be achieved. Also the type of leadership, technical versus political versus administrative, must be decided. This would include defining the roles of NGOs and interest groups as well as those of the technical staff and what they will do.

3. *The operating rules* must first confront the issue of whether the decision rule is unanimity/consensus versus majority rule or some other system. Consensus relies on negotiations, while majority rule supports coalition building. The nature of the decision rule will affect political aspects of creating the organization. Authorities and resources must be so deployed as to assure the rules are not bypassed. Parties must be assured equal access to information. Most importantly, it must be clear whether those responsible will be deciding actual allocations or advising others.

4. It must be clear what *authority* is needed to accomplish functions. Existing jurisdictions are reluctant to delegate authority to new organizations. Lack of formal authority means organizations will perform only soft functions. One should generally avoid appealing to negative powers such as taxation or regulation. The designers should try to appeal to positive powers such as creating new markets, resolving disputes, implementing agreements, responding to emergencies, and streamlining permissions. Care must be taken to recognize how much power can be delegated in the political environment.

5. *The legal basis* can range from informal to the formal. It can be based on agreements, treaties, compacts, or other instruments that ensure the required authority. At the same time, the social realities of fragmentation must be considered. Solid support must be identified or developed within society for the new organization. Existing systems of rights must be recognized. Another critical element in all successful cases is the emergence of competent and trusted technical staff. Finally, overall the design must allow for evolution and change.

6. The financial independence of institutions is critical. Probably the most important dimension to longevity is *financing*. It is necessary to assess how much is needed and how funding sources relate to the way the money is spent. Funds are raised in various ways, depending on particular situations. They may be direct appropriations.

However, reliance on one or a few outside sources can make the organization vulnerable. Contributions, voluntary or mandated, personal and from agencies, can also be sought. These help build a sense of accountability but are really ancillary. The most fruitful avenue is to be self-supporting through collection of abstraction fees, fines, user fees, bonds, and taxes on users and polluters. This is the most stable but politically the most difficult. It also tends to bias the organization functions toward services that are most easily sold such as hydropower and away from an integrated approach.

7. The *range of issues* under the purview of the RBO is important. Can the RBO deal with the cross cutting issues of water uses? Can it be a place where irrigation flow issues and hydropower interests meet?

11.8. Education and Training

A range of education and training tools is required, including basic education of all citizens, training of managers, planners, and decision makers, and university education for a new generation of "water champions."

11.8.1. Basic Education

Education on sustainability of natural resources is crucial for the future of the planet. Water can contribute to this awareness because water often centers on the most tangible aspects: boreholes, rivers, lakes, lagoons, rainwater, drinking water, dams technology, pricing, rights, and the like. Although these things are critically important, we have seen throughout this text that water education should also be about something less concrete. It is about the community's sense of duty: the obligation of members to each other, to the use of water itself, and to future generations. It is necessary to strengthen the community's sense of responsibility towards the management of water and other natural resources which took billions of years to evolve, yet which could be diminished or exhausted within a relatively short time. There are complementary modern schools of thought on the matter: value-based education and human values-based education.

The term "value" can be considered a quality of anything that makes it desirable, held in respect, deemed worthy, or esteemed. A "value" can also be considered a principle, a standard, or a quality that is considered worthwhile or desirable. It is a consciously preferred choice of the concept of desirable behavior, and is validated by social approval. By values are meant desirable qualities of character such as honesty, integrity, tolerance, diligence, responsibility, compassion, altruism, justice, and respect. Obviously communities that share these values will approach the sharing of water in a balanced way.

Human values, on the other hand, are fundamental to human existence. Surveys have shown that they are universal and inherent in all human beings and are found in varying degrees in all societies, religious traditions, and civilizations. While everything that exists has its own value and value system, human values are more appropriately applied to humans who are capable of rationalizing, conceptualizing, analyzing and applying these principles with an accepted standard of approval.

The five basic human values are truth, right conduct, peace, love and non-violence. They have as their offshoots a range of sub-values that includes the values listed for value-based education above, but go beyond them. Bringing out and nurturing human values in children during the formative years will result in caring and responsible adults in the future.

These values are "taught" both through experiential learning processes and by integration into academic subjects in school curricula. NGOs and community-based organizations (CBOs) working in the non-formal sector with children or adults who

missed school or dropped out can also teach it outside the official education system. The method has been applied with success in Côte d'Ivoire, Ethiopia, Ghana, Kenya, Senegal, South Africa, and Zambia. This obviously will lay the groundwork to develop the character of the generation following them. The impact of such a change on the way people will manage and share water and all natural resources is obvious. The challenge faced is how to expand this approach not only within Africa, but also in the rest of the world, including the "developed" world.

11.8.2. Training[4]

The world has changed for water resources managers, planners, and decision makers. Today, especially in the context of new demands for integrated water resources management, water managers and planners often work in teams involving multiple disciplines and not just engineering and associated technical fields. Increasingly they work in multi-agency teams, which involve a variety of public, NGO, and private sponsors. Today's water managers and decision makers must consult with a broader range of stakeholders, publics, and NGOs, locally, regionally, and often internationally. They must do all this while operating in a world of increasing demands on water.

Technical excellence remains necessary for creating sustainable water management decisions, perhaps even more necessary than ever. However, it is not sufficient. While people all over the world need technical engineering competence more then ever, the ability to use that competence in the service of those who need it depends, in many cases, on changing the relationship between the experts and those whom they are serving. This course aims at helping to build, modify, or create such new functional relationships.

This new water resources decision-making environment requires at least two sets of skills. First, it requires excellent and broad technical skills that reach across disciplines to consider alternatives that in the past were often not evaluated. In addition, today's water decisions often rest on a scientific basis that is itself incomplete. This sometimes means that water decision makers must first get agreement on what studies need to be conducted and data collected to ensure that decisions are based on science, not rhetoric. As a result, water planners and managers need a breadth of technical knowledge that goes beyond traditional excellence in engineering.

Second, water planners and managers need another set of skills: the skills of designing and conducting processes that draw together partners, stakeholders, and publics, resulting in decisions that enjoy broad cross-sector and often transboundary, public support. The era where water planners and managers decide, announce, and defend is rapidly disappearing. In the new era, water management is done *with* (as opposed to being done "for" or "to") potentially affected agencies, public and private organizations, individuals and others.

This second set of skills will help water resources decision makers avert conflict, deal with conflict should it arise, and use water decision making as a venue for dialog when others are closed because the parties are locked in various types of non-water conflicts. These include many of the skills described earlier as requirements for practitioners of ADR, for facilitating the visioning process, and building RBOs.

Training courses are particularly needed to teach this second set of skills. They must do more than teach concepts. When learning a skill, it isn't enough just to "know about" the skill. Skills have to be practiced, preferably in conditions that replicate the circumstances under which the skill will be used. For example, the sequence for each skill taught in this course might be:

1) a brief presentation
2) a class activity or team exercise in which you apply the skill

3) a class discussion or debriefing to focus in on key issues or important things that were learned from the activity.

If each exercise is looked upon as a team exercise, it provides an opportunity to learn more about working in teams. All skills require practice. Those attending training courses designed to teach these skills must be committed, and enabled, to practice and reinforce them on the job.

11.8.3. University Education[5]

In addition to training courses designed primarily to teach the skills described above, there is a need to educate a new generation of "transboundary waters champions" with management skills embracing equity, sustainability, and consensus. This could be done through university-level programs designed to complement existing programs with interdisciplinary, team-taught courses that address management concerns unique to shared water resources at the postgraduate and professional levels. Courses should be adaptable to any level of training and expertise, from water managers to top-level political decision makers.

From local to national to international levels, cooperation and sustainable management in shared water basins is difficult to achieve due to the diversity of stakeholders involved. One obstacle to cooperation is the persistence of disparate worldviews and jargon among professionals, be they engineers, agronomists, hydrologists, public health officials, political scientists, or sociologists. Water professionals are educated in separate colleges, and then employed by separate institutions, despite their common medium; people trained in either science or policy tend to treat the frameworks of the "other" side as a "black box." Therefore another objective of these multidisciplinary courses should be to break down communication barriers through the explicit integration of policy and technical tracks in an application-oriented, international learning environment.

For example, natural resources students and practitioners might need to bolster political knowledge or diplomatic skill, in order to effectively negotiate, while staff from foreign ministries might need to improve their understanding of uncertainty in aquatic ecosystems in order to evaluate the economic saliency of a transboundary initiative. Alternately, a course for NGO staff on globalization might be organized so that they can better understand their role in transboundary water management in an increasingly interconnected world, and bolster their capacity to represent and advocate for themselves in a political process. Curricula could also be drawn up to help organizations from different sectors, such as health and environment, develop integrative missions to achieve common goals.

Such courses could be designed, as a certificate program is designed, to augment existing graduate studies in various fields related to water resources management.

Professionals seeking transboundary water management certification could link a series of training courses and/or attend courses associated with the postgraduate program to complete an accredited certificate.

11.8.4. Outreach and Information Resources

It has often been noted that better outreach and communications are necessary preludes to improved institutions for sharing of the benefits of water resources. Thus the Nile Basin Initiative has launched a communications program in its first stages of operations. A workshop in the Volta River Basin identified the need for a communications strategy as one of the most important initiatives.[6]

The participants saw the objectives of the strategy to be initially:

- to inform and sensitize the authorities of member states of the Volta basin, the technicians and populations
- to raise awareness of the environmental stakes, problems and risks of conflicts.

If successful, they felt that this would facilitate the finding of sustainable solutions to management of the shared resources of the basin. They plan to use various modes of communications to:

- Collect and exchange information among all those concerned with the planning of a development action, with the objective of reaching consensus on defining environmental problems and finding possible solutions.
- Strengthen pedagogical skills and communication capacities of development agents at all levels so that they can interact with the public.
- Allow development actors to listen to the populations concerned.
- Increase the participation of actors in the programs and projects of IWRM.
- Ensure the political commitments of governments for conflict prevention.
- Bring assistance to political leaders and citizens to reduce the negative attitudes and behavior with regard to environment and water resources.

Given the widespread need for communication as a tool to address problems of sharing water resources, it might be desirable to establish an outreach and information resources program as a certificate program at university level. Such a program could assist regional authorities to develop distinctive, accurate, relevant, and credible information for delivery among stakeholders and to the public, in order to raise awareness and understanding of the complexity of managing shared water resources at multiple scales. It could consolidate information and data on transboundary basins at multiple spatial scales and make it available for use in different user-driven formats. It could develop and maintain:

- a global hydro-diplomacy database of consolidated, compatible, and credible biophysical and socioeconomic data[7]
- communication networks linking transboundary-waters academics, professionals, students, and sister watersheds
- interactive information technology tools to aid in decision making and education for students and the public
- communications education for water resource managers and other stakeholders as part of a multidisciplinary program.

Notes

1. Yona Shamir in the UNESCO–IHP Technical Document PCCP Series *Alternative Dispute Resolution and its Application to Water Conflicts*.
2. This section is drawn from the UNESCO–IHP Technical Document PCCP Series *State-of-the-art Report on Systems Analysis for Resolution of Conflicts in Water Resources Management*, edited by K. D. W. Nandalal, University of Peradeniya, Sri Lanka and Slobodan P. Simonovic, University of Western Ontario, Canada.
3. Jerome Delli Priscoli in the UNESCO–IHP Technical Document PCCP Series *Participation, Consensus Building and Conflict Management: Training Course*, Institute for Water Resources, US Army Corps of Engineers.
   Also discussed in *Conflict and Cooperation in the Management of International Freshwater Resources: A Global Review*, Erik Mostert, RBA Centre Delft University of Technology; and *Institutions for International Freshwater Management* by Melvin Spreij and Stefan Burchi (FAO).
4. The Welcome Note to the UNESCO–IHP Technical Document PCCP Series *Participation, Consensus Building and Conflict Management: Training course*, Institute for Water Resources, US Army Corps of Engineers.

5. Based on the concepts of The Universities Partnership for Transboundary Waters and Course Modules on Conflict Prevention, Water Diplomacy and River Basin Management for Equity and Sustainability (IHE) both projects under UNESCO's PCCP Program.
6. *Information, Communication and Sensitization Strategy for the Prevention of Water Related Conflicts in the Volta Basin*, Green Cross International/Burkina Faso, August 2002.
7. The global hydrodiplomacy database could be built from the existing Transboundary Freshwater Dispute Database: (http://www.transboundarywaters/edu), at Oregon State University, but housed "virtually", by linking existing and future data sets distributed over the internet in a common format.

12. EPILOGUE

At the Third World Water Forum, some eighteen sessions were held under the theme "Water and Peace" co-coordinated by UNESCO and Green Cross International. At the conclusion, the participants adopted a statement to be delivered to the Ministerial Conference that was linked to the Forum. This statement is repeated below as adopted.

Statement to Ministerial Conference

Kyoto, 21 March 2003

Key Issues

"Water for Peace" and "Peace for Water" are essential for achieving sustainable management of the world's hundreds of regional and international rivers, lakes and aquifers. The vital nature of water makes it a possible cause of tension but, more importantly, a potential source of cooperation. Many longstanding water-related disputes still remain unresolved and the growing demand for finite freshwater resources heightens the risk of future conflicts developing.

Water for Peace is about:

(a) sharing of benefits among nations for regional economic integration rather than polarized claims for water;
(b) protecting watercourses and infrastructure during wars and conflicts, and post-conflict rehabilitation of water resources;
(c) balancing competing uses of basin and aquifer resources in a transparent, participative way;
(d) acknowledging that unilateral upstream water development affects downstream uses; and
(e) improving our knowledge about the causes of conflicts and potential policy responses. Nations that learn to cooperate on sharing the benefits of water may then cooperate on other issues.

International law and development support for water cooperation over river basins and aquifers are both currently insufficient to meet these challenges. The vast majority of States have failed to reconfirm their commitment to cooperate over shared water by neither including this goal in the WSSD agreements, nor ratifying the UN Convention on the Non-Navigational Uses of International Watercourses.

Actions

Despite many excellent initiatives by river basin organizations (Mekong, Rhine, Danube, Senegal, Okavango, etc.) through bilateral agreements and regional efforts (SADC Water Protocol, EU Water Framework Directive), and by international organizations (UNESCO–Green Cross, GEF, GIWA, INBO, WWF, IUCN), much more needs to be done in a more integrated and coordinated way.

Recommendations and Commitments

Greater political will and integrated actions which respect both cultural and ecosystem diversity are urgently needed, with particular emphasis on:

Sharing benefits: The focus of discussions on transboundary cooperation should be changed from simply sharing water, and restricting sovereignty, to highlighting the myriad benefits to be gained and shared by all states from the recognition of

interdependence and integrated management both at a basin and aquifer level. Redistribution of these shared benefits at national level needs parallel stakeholder participation processes and should be integrated with poverty reduction strategies.

Environment: The integrity of ecosystems must be respected in the terms of inter-state and basin agreements.

Participation and capacity building: The right of stakeholders to take decisions regarding water resources should be respected in transboundary watercourses. All stakeholders should be helped to obtain the capacity to fully participate in the process of development of basin and aquifer strategies, agreements and institutions, through transparency and information.. Awareness raising and education strategies, including training of mediators, should be implemented to ensure that all people, including government leaders, learn how to best take up the challenges of sharing water. Stakeholders can include people "beyond the basin."

International law should become a more powerful tool in transboundary water conflict prevention and arbitration. Efforts should be increased across the world to reach integrated and effective basin-wide and shared aquifer management agreements among all states in each international basin. States should immediately ratify the 1997 UN Convention on the Non-Navigational Uses of International Watercourses. Additional measures are needed to clarify and strengthen the protection of water systems during times of armed conflict and from terrorist attack.

Financial support: International assistance can support cooperation in international river basins by financing and facilitating communication between basin stakes and stakeholders. The different activities of the various external actors should be coordinated. Funding mechanisms should be adapted to support activities related to internationally shared water bodies.

Facilitation and mediation: As originally raised at the Second World Water Forum, there is a need to establish a water mediation facility to provide services to assist with the management of transboundary waters, to avoid or resolve disputes. This international water mediation facility should be a joint endeavor of the appropriate United Nations entities, an international legal institution and a water-related international NGO, and work on request with basin authorities, governments and other stakeholders to resolve particularly intractable water related disputes.

In making the above statement, participants at the Forum were indeed summarizing the lessons learned and recommendations of this report.

History and a review of experience over the past hundred years both demonstrate that it is possible to manage the scarce resource that is water so that all benefit in a just and equitable manner. There still are many challenges ahead that will emerge from changing global physical systems and evolving socioeconomic and political systems. However, as seen above, the PCCP–WfP process has identified a number of tools and mechanisms that will build the capacity and resilience needed to cope with these challenges. The process has also identified future actions to add to a toolbox. There is every reason to hope that the world will live in water peace.

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Constitution of UNESCO (excerpt)

London, 16 November 1945

The Governments of the States Parties to this Constitution on behalf of their peoples declare:

That since wars begin in the minds of men, it is in the minds of men that the defences of peace must be constructed;

That ignorance of each other's ways and lives has been a common cause, throughout the history of mankind, of that suspicion and mistrust between the peoples of the world through which their differences have all too often broken into war;

That the great and terrible war which has now ended was a war made possible by the denial of the democratic principles of the dignity, equality and mutual respect of men, and by the propagation, in their place, through ignorance and prejudice, of the doctrine of the inequality of men and races;

That the wide diffusion of culture, and the education of humanity for justice and liberty and peace are indispensable to the dignity of man and constitute a sacred duty which all the nations must fulfil in a spirit of mutual assistance and concern;

That a peace based exclusively upon the political and economic arrangements of governments would not be a peace which could secure the unanimous, lasting and sincere support of the peoples of the world, and that the peace must therefore be founded, if it is not to fail, upon the intellectual and moral solidarity of mankind…

GREEN CROSS International

International Hydrological Programme

World Water Assessment Programme