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Enhancing Sustainability in River Basin Management through Conflict Resolution: Comparative Analysis from the U.S. and South Korea*

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INTRODUCTION

Humans often alter river basins to such an extent that they are arguably as much cultural, as physical, constructs. Cross-basin transfers of water, engineering of stream channels, and effluents of massive quantities of point and non-point pollution from pipe, earth and sky merely manifest a few of the more obvious examples of how the modern basin is being impacted by human activities. The scale of such endeavors across time and space is truly astounding. From the Three Gorges Dam in China, to the often small and forgotten relics from times gone by that are broken dams blocking fish passages in the U.S. – humans alter landscapes and hydrology at multiple scales to place it in the'service of man' (McPhee, 1989).

These complex activities can take place in river basins that form a setting of intense competition – competition for water for economic development, for maintaining ecology that provides for livelihoods and food, for recreation, and for distribution amongst people of varying political and economic statures for direct consumption, and more. Maintenance of any balance struck between such diverse stakeholders and competing

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needs must consider both short- and long-term views of conflict resolution for multi-generational equity and sustainability to be achieved.

Conflict is inherent in river basin management,[1] wherein diverse 'stakes' are held, multi-purpose resources are shared, political leaders answer to many forces both within and beyond the basin, and heterogeneous visions of the past, present and future often collide. Thus, conflict mitigation is a core element of a sustainable basin management. Issues causing conflicts typically include, but are not limited to, diminished access to resources caused by impairment, denial of use for economic purposes, property rights, and concerns regarding environmental health.

The purpose of this chapter is to offer insight regarding how to mitigate conflict caused by multi-stakeholder competition for water in river basin settings. A lot of interesting work on water conflict has been in international in scope (Yoffe et al., 2004; Espey and Towfique, 2004; Just and Netanyahu, 2004; Mostert, 2003; Beach et al., 2000; and Murphy and Sabadell 1986). This chapter provides a comparative analysis of river basins that are situated in the U.S. and South Korea. The core argument of this chapter is that sustainable water quality and quantity (W) in a given river basin can be enhanced by conflict resolution through balanced consideration of socio-political equity (E), ecological viability (E) and economic development (E), or **WE**^{3}.

LITERATURE ON WATER CONFLICT RESOLUTION

Science clearly takes a 'back seat' in conflict mitigation analysis. In fact, although science provides important background data and information for making decisions, such as water quality measurements, conflict and its mitigation in the search for 'equity' are both very much cultural constructs.[2] Therefore, unlike some aspects of water management, it is not possible to ascribe very specific universal techniques to address conflict. Rather, only broad principles can be offered with any certainty and universality. The importance of 'place' results in incubating diverse conflicts, and necessitates the creation of equally diverse ways to address them.

It may be no longer necessary to plead a case for the worth of holistic basin management in academic literature. However, if the general public cannot make the connections associated with holistic basin management, improvements in governance including conflict mitigation are unlikely. This is one of the reasons that cultivating the notion of shared space is so

[1] Flack and Summers (1971) point out as early as the 1970s that computer-aided conflict resolution can also help facilitate making problems clearer in complex multi-user scenarios.

[2] As McGinnis et al. (1999) note, "...like science itself, watershed planning is carried out in a context that is conditioned by culture and society."

important when trying to help community-based organizations and the public adopts a basin-based identity, in addition to their many political ones. This shared identity provides a rationale for cooperation, rather than conflict (Smith Jr., 2003). Fostering a basin-based identity can help make clear to stakeholders just how vital cooperation is for positive change.

McGinnis et al. (1999) take a bioregional perspective regarding choosing the basin as a unit of analysis. Interestingly, they combine activism and ecology, two features that reveal themselves as key elements in the case studies that follow. They state that:

> Generally, bio-regionalists are involved in a process of cultural change at two levels – as a conservation and restoration strategy, and as a political movement that calls for devolution of power to ecologically and culturally defined regions and watersheds (1999).

The basin and bioregion is selected as a unit for conflict resolution because it lends itself to 'integrated' and 'comprehensive' approaches. But the authors also note that basin-based approaches nurture community-based organizations that can foster conflict resolution, support ecology, and maintain local control over resources (Thomas, 1997). To this end, they note that even the U.S. federal government (especially the Environmental Protection Agency) has funded many such groups.[3]

There are many studies that have been suggested for understanding basin conflict. This is likely a result of what Dinar (2004) notes as a trending upwards of interest in conflict and cooperation in the water resources arena in recent years. According to Dinar, one of two possible explanations is viable. First, water is a source of increased conflict and cooperation. Or, communication about conflict and cooperation has been significantly enhanced. Core issues, such as economic 'development' upstream resulting in water quality impairment and endangering public health downstream, are not exclusively national or international in nature. Nevertheless, much interesting work has been international in scope.

Yoffe et al. (2004) explore a large Trans-boundary Freshwater Dispute Database that provides a framework for quantitative explorations of the relationships between freshwater resources and international cooperation and conflict.[4] Espey and Towfique (2004) use a logistic model to determine factors that have influenced the formation of bilateral international water treaties over the last 60 years. They report that the larger a water basin in

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[3] As urbanization expands across the globe, the traditional connection with the natural world and the understanding of river's essential place in the sustainability of life diminishes without purposeful intervention. For example, it is difficult to see a basin between skyscrapers and through pavement covering once viable streams – so basin-based arguments find little public support without extra efforts to intervene by government, NGOs, or both.

[4] Mostert (2003) also provides an interesting analysis of conflict and cooperation at a global scale.

terms of percent of a country's size, the more likely the country is to form a management treaty. Notably, the more control over the watershed a given country has, the less likely it will sign a treaty.

Just and Netanyahu (2004) use the case of the Palestinian-Israeli shared aquifer to explore relationships between interconnected game theory and conflict mitigation:

> ... application of interconnected game theory to modeling of bilateral agreements for sharing common pool resources under conditions of unequal access. Linking negotiations to issues with reciprocal benefits through interconnected game theory has been proposed in other settings to achieve international cooperation because it can avoid outcomes that are politically unacceptable due to the "victim pays" principle (2004).

Murphy and Sabadell (1986) suggest that decision-makers (in various countries) have at their disposal legal bases for agreements buoyed by mainly hydrologic and economic models that are expected to produce 'equitable water allocations' that may mitigate conflict. The authors state that the under-appreciated gap that needs to be filled is a tool for testing the political aspects of proposed solutions to conflicts. Murphy and Sabadell propose a theoretical model to address this issue by objectively measuring the impact of an individual country's political decisions upon the negotiations between them.

Beach et al. (2000), in their discussion of 'general theory conflict resolution,' point to authors such as Kaufman and Bingham who have investigated the potential for consensus building in its various related forms, such as 'joint problem solving.' The authors, in addressing international river basin negotiations, note that being locked into extreme positions in negotiations leaves little space for bargaining. This does not leave room for the necessary acknowledgment of shared sovereignty necessary to compromise.

McGinnis et al. (1999) propose that "long-term watershed planning requires rebuilding a community-based infrastructure that can support important social and bioregional networks and partnerships" (1999). These authors concede the importance of a formalized process of collaborative decision-making and conflict resolution. They state that the collaborative decision- making model focuses on three issues: 1) Reliance upon scientific information; 2) Neutral facilitation and mediation (including issue audits); and 3) Public participation.[5]

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[5] In addition, seven general characteristics of "less formal" collaborative decision-making include: representation for weaker parties; equal access to scientific information; participation; accountability and legitimacy; commitment to the process through implementation (resources may be offered); sustaining cultural values; and creating *adaptive* decision-making.

Sneddon (2002) points out that some models based on co-management aspire to constant cooperation and 'win-win'-like scenarios. The author examines this theory in practice in a 'medium-sized, altered' river basin in NE Thailand, and explores obstacles and co-management techniques for mitigating social conflicts occurring in the study area. He points out in the course of this analysis the mismatch in scale of governance between resource management agencies with natural unit boundaries and governmental ones with boundaries dictated by politics. Sneddon notes how this mismatch in scale can impact decision-makers and make them feel insecure regarding the questioning of their logic and authority. Thus, it is the institution itself that may begin to wage conflict on those who wish to co-manage.[6]

Steinberg and Clark (1999) point out that many basin conflicts have less to do with abhorrence towards others, and more to do with 'positive attempts' to hold on to or reclaim a place. At times, what the conflicts are about on the surface is merely a representation of the tug-of-war regarding values occurring under the surface. Recognizing this as being the case is worthwhile as the shareholders position to begin negotiations. In addition, this exposes the fact that conflict analysis that merely paints a picture of upstream-downstream clashes over resources may lack proper context.

Smutko et al. (2002), based on original data from stakeholder assessments conducted in North Carolina, indicate how individual interests or preferences affect stakeholder participation. A factor such as level of uncertainty can increase the need for collaboration, but can, at the same time, decrease the willingness to engage. Conversely, the need for collaboration can decrease as clarity increases, while willingness to engage may increase as the problem becomes clearer. Other factors like risk and urgency of decision show a positive relationship between need for collaboration and willingness to engage. The authors conclude that citizens are more likely to get involved when they perceive an issue to poise some type of threat to their welfare.[7]

Leach and Pelkey (2001) explore how to make watershed partnerships successful and mitigate conflict by reviewing the empirical literature on

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[6] The author goes on to point out the similarity between co-management regimes and conceptual models for "common-pool resources" managed by diverse groups. The idea is that collective actions for "sustainable watershed management" must ensure that all stakeholders in a basin are included in the building of management schemes and third parties develop cooperative avenues.

[7] The authors used an issue attribute approach to evaluate the need for collaboration and stakeholder willingness to engage for specific issues based on a number of fundamental explanatory characteristics. This short list of seven attributes is based in part on other studies (Yoder, 1999), and includes: 1) Level of uncertainty; 2) Balance of information; 3) Risk; 4) Time-horizon effects; 5) Urgency of the decision; 6) Distribution effects; and 7) Clarity of the problem.

the subject in order to generalize what has been learned and suggest future research paths. After reviewing a compilation of 37 studies on the issue, they were able to form 210 conclusions that were further simplified into 28 themes. Through a factor analysis utilizing Sorensen's similarity index,[8] they were able to explain 95% of variance in themes based on four broad factors: 1) Resources and scope; 2) Flexibility and informality; 3) Alternative dispute resolution; and 4) Institutional analysis and development.[9]

Demand-side management can also play a role in avoiding conflict over scarce resources. If water pricing is done properly, sustainable water use can be fostered as significant conservation is achieved without overburdening low-income customers. This occurs while reducing water intakes from streams so as to mitigate any stresses in stream ecosystems and increasing water volume for competing downstream users (Wang et al., 2005).

BUILDING ON THE LITERATURE

In summary, water conflict literature reviewed in this chapter highlights the following:

- Reliance on scientific information and hydrologic and economic models (Smutko et al., 2002; McGinnis et al., 1999; Yoder, 1999; Murphy and Sabadell, 1986);
- Notion of shared space of bio-region and co-management (Smith Jr. 2003; Sneddon, 2002; Leach and Pelkey, 2001; Beach et al., 2000; McGinnis et al., 1999);
- Politically acceptable and socially equitable resolution (Just and Netanyahu, 2004; Murphy and Sabadell, 1986);
- Local control and public participation (McGinnis et al., 1999; Thomas, 1997);
- Uncertainty, risk, and values under the surface (Smutko et al., 2002; Steinberg and Clark, 1999);

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[8] A formula is used in biodiversity studies, it calculates similarity based on the number of themes two factors have in common.

[9] Factor 1 explains 24% of variance and suggests odds of a successful outcome are enhanced when a partnership has adequate time, abundant resources, and a limited scope. Factor 2 explains 21% of variance and stresses the fact that a partnership's strength is its ability to provide a flexible, informal alternative to traditional forms of resource management. Factor 3 explains 33% of variance (including funding) and describes methods that partnerships can employ when participating in negotiation or resolution processes. Factor 4 explains 17% of variance and uses a "rational actor" model of collective action to explain why some communities overcome the desire to "free ride" and effectively manage common resources.

- Conservation and restoration, economic development and environmental health (Wang et al., 2005; Dinar, 2004; McGinnis et al., 1999; Thomas et al., 1997);
- Property rights and percent of control over the watershed (Espey and Towfigue, 2004; Just and Netanyahu, 2004);
- Neutral third party facilitation and medication (Sneddon, 2002; Beach et al., 2000; McGinnis et al., 1999);
- Mismatch in scale of governance between resource management agencies (Sneddon, 2002);
- Joint problem solving and common ground (Beach et al. 2000);

The literature points to major values of finding politically, socially, environmentally, and economically justifiable common grounds in resolving water conflicts. In fact, it is pointed out that 'Negotiated Rulemaking' was established as an official tool in a U.S. Congressional Act in 1990. Again, the dimensions of water conflict resolution such as third parties to facilitate,[10] public participation,[11] and reliable information,[12] and shared space and values[13] are underscored.

On the basis of these findings in the above literature, we investigate how conflict resolution can enhance opportunities to achieve sustainability in river basin management. Conflict resolution, for the purpose of this chapter, is characterized as a method of mitigating conflicts through transparent, democratic and participatory 'social transactions' or 'trade-offs.' Sustainability is defined here as a measure of the potential to enhance current and future water quality and quantity (W) in a given river basin through balanced consideration of social-political equity (E), ecological

[10] "Efficiency" for some may result from limiting the 'interference' of third parties or NGOs. However, not carving out a role for civil society in the process will likely reduce democratic practice, spur public resistance, rather than engage the public in pushing forward progressive ideas, and likely damage opportunities for sustainable resolutions.

[11] It can be argued that a better role for government to play in regard to civil society and resource management is to empower it. Thereby allowing the public to become a positive force in pushing positive action in a basin and encouraging institutional support (Smith Jr., 2003). This stands in contrast to assuming a position wherein "giving away" power makes a government feel weakened or threatened. This is, at times, an alternative to bringing issues to court. Also, there is a difference in approach in that empowering is often *proactive* in nature, and this has the potential to mitigate conflict rather than waiting for periods of "crisis."

[12] Information *transaction* occurs between all parties, regardless of whether there is agreement regarding that information. This facilitates negotiation in the public sphere and governmental scales regarding what options are equitable and environmentally sound enough in the long and short-term to be considered sustainable (Fraser, 1993).

[13] The scope of analysis may have to expand beyond the basin scale to reveal forces underlying the stresses that are manifest in basin conflicts. Commodification of water resources can come packaged with a utilitarian logic that might not make recognizing other values (i.e. cultural) possible, and this can have harmful impacts, reducing opportunities for conflict mitigation. This is one reason that conflict management and basin management in general must be multi-scale, socially and ecologically adaptive for long-term success.

viability (E) and economic development (E), or **WE³**. Conflict is considered to be resolved when **WE³** is balanced.

Conflicts in regional river basin management can arise among coalitions representing varied economic, environmental and socio-political interests as shown in Figure 1. Coalitions can be formed in private and/or public entities when their members share interests. Conflict resolution is a process of addressing differences among stakeholders aims (**WE³**) so that the outcome is sustainable water. 'Sustainable water' is defined here as socio-politically equitable, economically efficient, and ecologically viable water management outcomes.

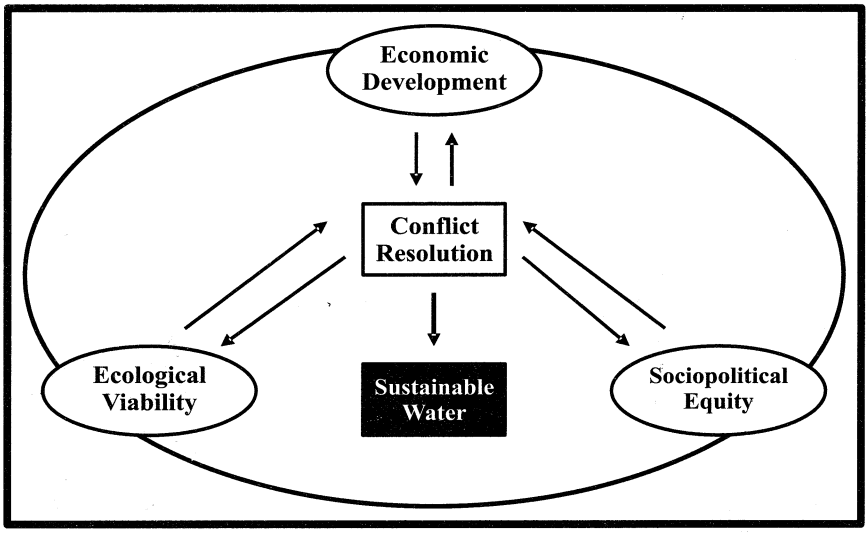

Fig. 1. Institutional Framework of WE³: Toward a Sustainable Regional River Basin Management

In order to explore the viability of the **WE³** approach, conflict resolution cases are examined using two U.S. and two South Korean river basins. Before introducing the Delaware (established in 1961) and Susquehanna River Basin groups (established in 1973), a brief review of compacts, a prime tool for conflict management in the U.S., is undertaken. This is followed by the South Korean cases of Nakdong and Han River Basin being evaluated. Comparative evaluations of both U.S. and South Korean cases are then considered in relation to the **WE³** framework.

U.S. Water Compacts

Sherk (2004) has compiled a bibliography of interstate water compacts. A number of important interstate water compacts were established in the

U.S. during the early 1950's. Literature during this period recognized the phenomenon, noting the significance of such agreements for water allocation and natural resource conservation (Zimmerman and Wendell, 1952; Lepawsky, 1950). While the interstate compact is actually older than the Constitution, use of such agreements in natural resource issues had been limited before this time. Interstate compacts were most often used to settle disputes directly related to boundary areas. However, with the 1950's came the emergence of more interstate compacts than in any time of U.S. history (Zimmerman and Wendell, 1952).

In the United States, the present status of interstate water compacts indicates a significant resource management divide between the eastern and western states. While some western compacts address issues other than water allocation, in most cases they do not (McCormick, 1994). This is in significant contrast to the eastern states, where these agreements delegate significant power to multi-state regulatory commissions, including the power to allocate water and approve specific water resource projects in their jurisdiction. This difference may be, in part, a result of the profound contrast between Eastern (Riparian) and Western (Prior Appropriation) water law.[14]

Federal-interstate compacts are widely recognized as more effective than interstate compacts when it comes to managing interstate water resources and resolving multi-stakeholder conflicts (Sherk, 1994; McCormick, 1994). Federal-interstate compacts use federal-interstate basin commissions as a means to provide for joint exercise of sovereign powers over water resources in river basins. As the preferred institutional arrangement for water resource planning and management in multi-state watersheds, the National Water Commission first recommended in 1973 that federal-interstate compacts be utilized to resolve interstate water conflicts.[15]

Often, water allocation and diversion disputes between states are addressed using different methods like litigation, legislation, and market mechanisms. While these methods have their strengths, most agree the establishment of a federal-interstate compact is the most effective strategy

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[14] Riparian law ensures no user impedes another adjacent user's water rights, while Prior Appropriation guarantees access for only those with primary right to the resource ("first in time"). Eastern water law allows upstream residents to use the resource as needed, so long as their consumption doesn't hinder the rights of downstream users. Since western water law developed according to a first-in-right basis, water is like a property right. Any management scheme that takes away that property would be met with resistance (McCormick 1994). Thus, while law clearly designates user rights in the west, allocation in the east needs to be regulated.

[15] However, it seems this recommendation has not been followed, as the number of compacts approved since that time has decreased when compared to those approved before 1973 (Sherk, 1994). (Of course, this may partially be due to the fact that the most urgent scenarios may have been addressed earlier.)

for resolving interstate water disputes in the U.S. This is especially true when the compact leads to the establishment of a regional management entity (Sherk, 1994).[16] Four federal-interstate compacts have been enacted in the United States: the Delaware River Basin Compact (1961); the Susquehanna River Basin Compact (1970); the Alabama-Coosa-Tallapoosa River Basins Compact (1997); and the Apalachicola-Chattahoochee-Flint River Basins Compact (1997).[17]

THE CASES: TOWARD SUSTAINABILITY

The Delaware River Basin

The Delaware River, 330 miles (531 km) in length from Hancock, New York to the Delaware Bay, is the longest un-dammed river east of the Mississippi River. The Delaware River directly drains an area of over 13,539 square miles (35,066 sq. km) that includes the states of Delaware, New Jersey, New York and Pennsylvania along the east coast of the United States (Figure 2). Due to the massive region that is supplied water by the river, approximately 15 million people rely upon the Delaware River Basin to provide water for drinking and industrial use (DRBC website 2005). Consequently, the regional influence of the Delaware River across political boundaries requires management so as to integrate all concerned federal, state, and local organizations and governments.

After several decades of litigation between Delaware, New Jersey, New York and Pennsylvania over the Delaware River, the Delaware River Basin Compact was envisioned (Featherstone, 2001). The Compact, established on October 27, 1961 recognized for the first time since the nation's birth an equal partnership of the federal government and a group of states for river basin planning. This resulted in the development of the regulatory agency named the Delaware River Basin Commission (DRBC). Since 1961, the DRBC, represented by the governors of the four participatory states and a federal designee, has been charged with regulatory, management, planning and coordination powers.

Within the selected powers are the duties of water quality protection, water supply allocation, regulatory review (permitting), water conservation initiatives, watershed planning, drought management, flood control, and

[16] Such an organization can be effective in implementing policies and addressing complex intergovernmental problems spanning state boundaries and agency functions. This effectiveness, however, is dependent on the political and financial support of all parties involved with the organization (Featherstone, 2001).

[17] A fifth compact, the Interstate Compact on the Potomac River Basin (1940), has federal membership, but the federal government is not a signatory party to the Compact (Featherstone, 1999).

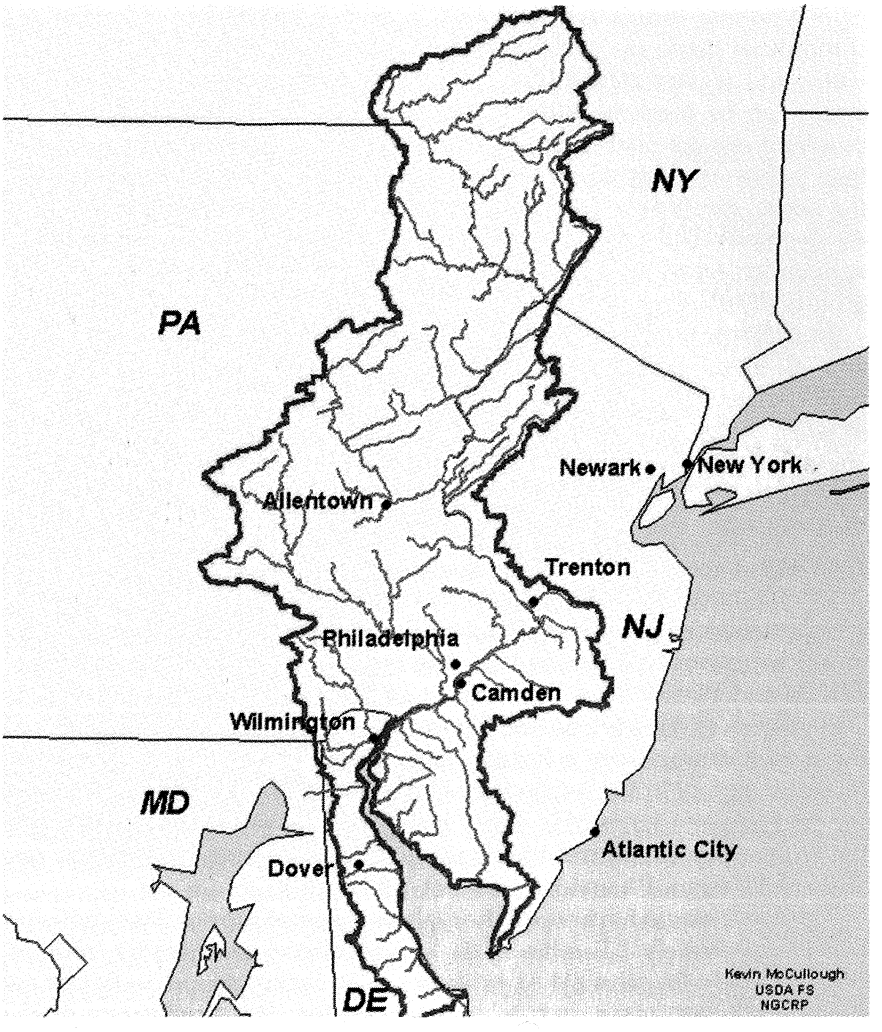

Fig. 2. Major tributaries of the Delaware River Basin
Source: Delaware River Basin Collaborative Environmental Monitoring and Research Initiative, 2003.

recreation. These duties are accomplished through business meetings and hearings on policy matters and water resource projects under regulatory review, as well as meetings of advisory committees, all of which are open to the public (DRBC website 2005). Given the scale of the area and wide variety of rural, urban and mixed stakeholder interests that exist, it is not uncommon for the DRBC to have to cope with conflicting citizens and advocacy groups.

Addressing issues typically begins with consideration by advisory committees made up of the public and government officials, as well as water and wastewater utilities and public interest groups. Often most issues can be resolved without making proposals to the DRBC. When problems are not readily solved by committees, conferences, or seminars, then public meetings are sponsored to gain greater insight into ways that the DRBC can resolve conflict. Among those opinions that are critical to the decisions chosen by the DRBC include environmental groups, industry, agriculture, water and wastewater utilities, recreation, academia and civic groups (Featherstone, 1999).

In addition, the Compact requires all proposed policies, rules, regulations and additions or modifications of the Comprehensive Plan be subject to public notice and formal hearing. Finally, when the commission is prepared to make its decision, it still is driven to make sure that there is a consensus among all members, regardless of the need for just a majority. This is because the DRBC relies on funding from each signatory and consequently does not want to alienate any viewpoints (Featherstone, 1999).

The Conflict

One of the most public conflicts that the DRBC has had to mitigate was the construction of the Point Pleasant Pumping Station that began as part of a flood control project. In 1966, the Pennsylvania (PA) Department of Forests and Waters (now Department of Environmental Resources), U.S. Department of Agriculture-Soil Conservation Service and the counties of Bucks and Montgomery in Pennsylvania prepared a joint study and report on water supply in the Neshaminy Creek Basin. The report evaluated the construction of a series of 10 flood-control and/or multipurpose dams on the Neshaminy Creek and its tributaries, and two pumping stations, one at Point Pleasant, PA and the other at Yardley, PA.

The water would be pumped through a single underground transmission line approximately 2.5 miles (4.02 km) to a storage reservoir built on approximately 28 acres (11.33 hectares) of land designated as Bradshaw Reservoir. Also, water was to be pumped into the headwaters of the Neshaminy Creek where some of the withdrawal would be used for public water supply at the North Branch Water Treatment Plant in Chalfont, PA. The project was preliminarily approved by the DRBC and added to their Comprehensive Plan on October 26, 1966 (Delaware Water Emergency Group et al. 1981).

Controversy was to surround the construction. In 1974, the Nuclear Regulatory Commission granted a construction permit to the Philadelphia Electric Company (PECO) for the Limerick nuclear generation plant. The permit contained a provision for withdrawal of water from the Delaware River at Point Pleasant, and transportation of water through the use of transmission lines and the waterways of the Perkiomen Creek Watershed

to the plant as additional cooling water. As a matter of protocol, environmental impact assessments (EIA) were prepared (as had been completed for the prior projects), and the withdrawal for the Limerick plant was approved. The validity of the construction permit was challenged through court proceedings where specific objections were raised as to the adequacy of the past EIAs in relation to the Limerick project. The Court of Appeals for the Third Circuit affirmed the issuance of the construction license in Environmental Coalition of Nuclear Power et al. v. Nuclear Regulatory Commission and Philadelphia Electric Co. (Delaware Water Emergency Group et al. 1981).

Work on the Chalfont water treatment plant began in the mid-1970s, but was then suspended when studies projected a smaller demand for public water in Bucks County due to lower projections of the future population. Subsequently, the plant was down-scaled from 80 million gallons per day (mgd) to 40 mgd, reducing the approximately 150 mgd maximum withdrawal to a 95 mgd withdrawal. In 1980 the DRBC made a decision on the basis of past environmental assessments by DRBC and the U.S. Department of Agriculture-Soil Conservation Service. This statement had concluded that the projects would be 'beneficial' to the communities of both creeks, and not detrimental to the Delaware River (provided various express conditions as to the control and use of water were enforced), and decided to recommend a 'negative declaration.'

A 'negative declaration' would do away with the need to prepare another EIA for the projects due to the reduction in maximum withdrawal. Public notice of intent to issue a negative declaration and of the preparation of the environmental assessment was given and public hearings were held. Consequently, the DRBC published a "Final Environmental Assessment For the Neshaminy Water Supply System" project sponsored by the Neshaminy Water Resources Authority (NWRA) and PECO, without an additional assessment of the decreased withdrawal. In 1981 the DRBC approved the Neshaminy Water Resources Authority's and PECO's application for the projects, with final approval for the construction of the pumping station, the conduits and the water-treatment facilities, as originally contemplated in 1966 (Delaware Water Emergency Group et al. 1981).

These issues in the 1970s were motivation for the formation of an environmental coalition (including many conservation and ecology groups) to rally against the proposed projects. The proposed discharge of river water into the relatively clean headwaters of two Bucks County streams caused outrage, as did the use of precious water resources for cooling dangerous and 'unnecessary' nuclear facilities. One of the most contested aspects of the projects was the use of the 'negative declaration' to accept the project after the overall withdrawal of water was decreased from 150

mgd to 95 mgd. This was underscored in 1981 through the case of Delaware Water Emergency Group, et al. v. Gerald Hansler (head of DRBC), Neshaminy Water Resources Authority and Philadelphia Electric Company.

Litigation was used to challenge the validity of approvals granted by the DRBC to PECO and NWRA to construct facilities for the withdrawal, diversion and use of water from the Delaware River by means of the pumping station at Point Pleasant, PA. The concerned citizens that became the plaintiffs in the case wanted to challenge the DRBC's approvals because they believed that the 'negative declaration' was a failure of DRBC to have a new, updated environmental impact statement (EIS) prepared. They also believed that there was a failure to adequately consider various potential environmental effects of the projects.

From the point of view of the defendants, all environmental issues were fully considered in prior environmental impact statements, and present facilities authorized by DRBC approvals merely down-scaled the size of previously approved projects. As the smaller size would have less adverse impacts on the environment, the defendants asserted that the 'negative declaration' was fully justified. The defendants asserted that every environmental impact had been fully studied and was carefully considered by the DRBC in the environmental assessment prepared for the present applications and in the prior analysis. And, that there was more than adequate public notice and participation, all appropriate governmental agencies had been notified, and the responses of the agencies were carefully considered prior to the approvals.

The judge overseeing the case concluded the proceedings by stating that, "Under the circumstances of this case, the decision of DRBC approving the applications of NWRA and PECO by way of a 'negative declaration' and without preparing another EIS was a reasonable determination based upon the facts presented to it" (Delaware Water Emergency Group, et al. 1981). Thus, in 1983, construction of the Point Pleasant pump began after two decades.

Following the beginning of construction, the opposition only grew more intense. In 1983, 'Del-Aware Unlimited' emerged as the non-governmental organization (NGO) leader of opposition to the project. They were able to obtain a non-binding referendum question on the ballot in Bucks County (whose taxpayers would provide the money to build the system) as to whether the constituents supported the construction. A 56% to 44% vote politically killed the Point Pleasant Pumping Station. Also through the election, the Bucks County electorate voted out the county commissioners who supported the project and replaced them with a majority of officials who had spent years fighting to stop the pump through the courts (Carluccio, 1987).

Consequently, the new commissioners appointed anti-pump members to the NWRA of Bucks County, which had originally contracted to build the pump, and the executive director of Del-Aware Unlimited, Tracy Carluccio, became executive secretary of the NWRA. In 1984, the NWRA shut down the project, but proponents for the project filed suit to have the construction contract enforced and the project reopened. The suit was settled in 1987 when a judge ruled the contracts valid and ordered the construction to resume (Stevens, 1987).

The Outcomes

Backed by litigation efforts, the Point Pleasant Pumping Station project was legally determined to be environmentally safe, and thus, the decision of the DRBC was upheld to allow the construction of the project. In 1987 construction of the Point Pleasant project resumed after three years, along with the arrest of more than 200 demonstrators violating court injunctions prohibiting interference at the construction sites. Ten objectors, ranging in ages from 20-67, were jailed for contempt, two of them fasting and only drinking water. 'Dump the Pump' became the slogan of anti-pump demonstrators who felt that forestland would be destroyed, and were against the inter-basin transfer of water over land (Carluccio, 1987). As the project was completed in 1994, the Bucks County Commissioners sold the finished Point Pleasant Pumping Station to North Penn and North Wales Water Authorities in Montgomery County for $55.2 million (Lazar and King, 1994).

Sustainability Implications

While some aspects of the **WE³** model have been resolved in the Point Pleasant pumping station project, some stakeholders believe the ecological component remains in doubt. It can be said that the use of the station itself is one aspect of the project where sustainability is found: 1) The station provides safe drinking water to 150,000 customers in the growing regions of Bucks and Montgomery counties (Partners 2003; North Wales Water Authority, 2003); 2) The station meets its required withdrawal limits as determined to be sufficient to preserve the environmental integrity of the area; and 3) The Limerick Nuclear Power Plant is supplied by the station which produces electricity for over 1 million homes with 2,268 net megawatts (PECO, 2003).[18]

The pumping station, however, has been blamed for erosion of the banks of the Perkiomen and Neshaminy Creeks, causing changes to the natural habitats of living organisms. In addition, a 95 mgd intake entraps fish and other organisms. Finally, some believe that the use of potable

[18] Also, according to Gregory Cavallo, a DRBC hydrogeologist, the Point Pleasant project has been the primary developed surface water supply that has helped to reduce the need for ground water withdrawal in southeastern Pennsylvania in drought years.

water for the production of nuclear powered energy is unsustainable, and thermal pollution remains a concern.

The level of sustainability of a project outcome depends on the extent to which balanced **WE**[3] through conflict resolution has been achieved. Without opportunities for public participation in the conflict resolution process, the Point Pleasant outcome would have been considered less sustainable. A few sustainability implications, however, can be pointed out in the case of the Delaware River Basin with respect to conflict resolution:[19] 1) Active public participation started in the implementation stage rather than in the planning stage; 2) Initial approval was based on the EIA required by the National Environmental Policy Act which is basically an expert-driven approach, and environmental impacts were not fully evaluated; and 3) Litigation was an effective mechanism to resolve conflict, but it is time and resource consuming and is less public-driven.

The Susquehanna River Basin

The Susquehanna River is the largest river situated entirely in the U.S. and flows into the Atlantic Ocean. With a 27,510 square mile (71,251 sq. km) watershed that includes parts of New York, Pennsylvania, and Maryland, it accounts for approximately 50% of freshwater supply to the Chesapeake Bay (Figure 3). Such a large, multi-jurisdictional region requires a unique management strategy that addresses the many state, regional, and federal interests. On December 25, 1970 the Susquehanna River Basin Compact was signed into a law by the U.S. Congress and the state legislatures of New York, Pennsylvania, and Maryland. This document provides mechanisms to guide conservation, development, and administration of water resources in the river basin. It established the Susquehanna River Basin Commission (SRBC) as a federal-interstate commission agency to coordinate state and federal efforts.

The Commission develops and implements water resource plans, policies, projects, and facilities necessary to carry out the Compact mission (SRBC Compact, 1972). SRBC provides coordination, management, pathways for communication, and resolves controversies. It conducts water resource investigations, surveys, and studies, and initiates legal action when appropriate (SBRC website 2002). The objectives include: reducing

[19] DRBC's objectives for conflict mitigation in the Delaware River Basin are found in the Comprehensive Plan established in 1962. The criteria they use to endorse any project or proposal incorporates social, economic and environmental aspects as follows: The project must provide beneficial development of water resources in a given locality or region; it must be economically and physically feasible; It must conform with accepted public policy; and it must not adversely influence the development of the water resources of the basin (DRBC website 2003).

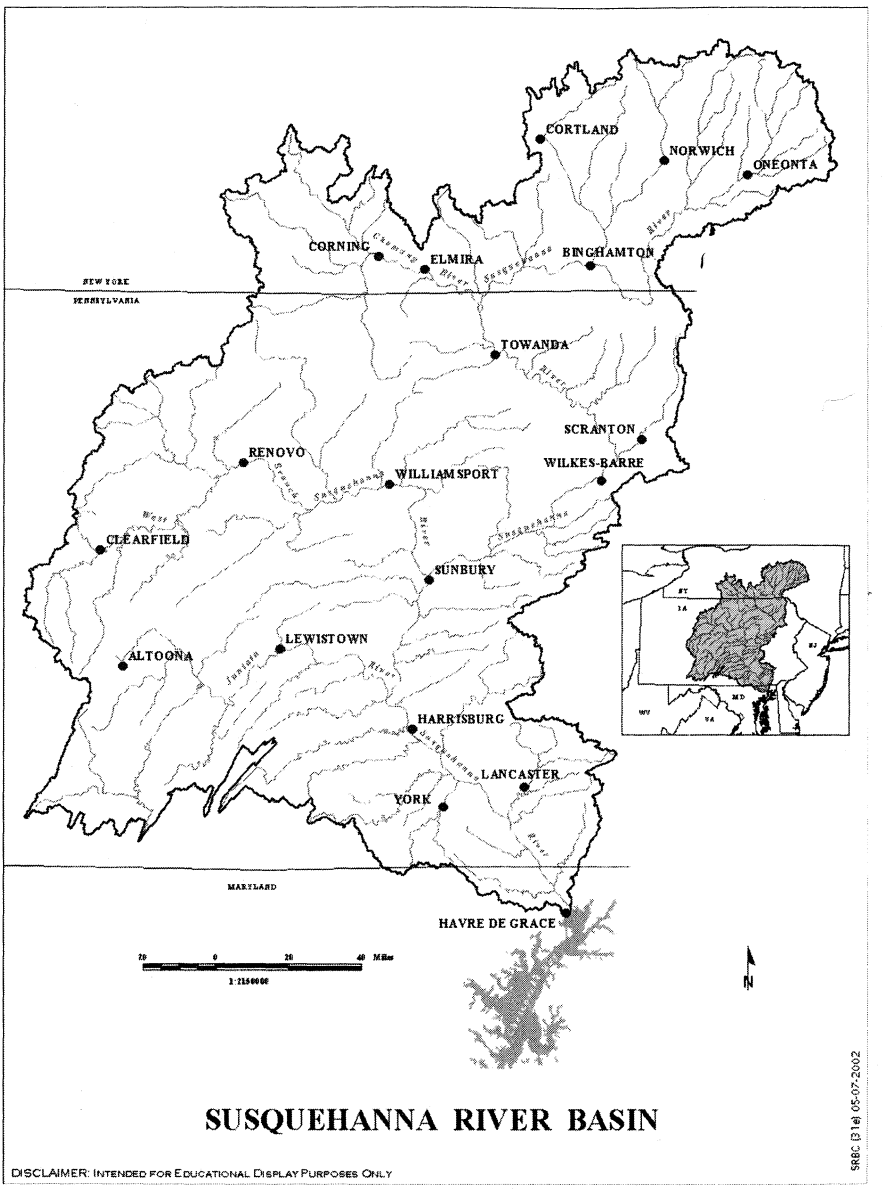

Fig. 3. Main tributaries in the Susquehanna River Basin
Source: Susquehanna River Basin Commission, 2003.

flood damage; providing for sustainable development and use of surface and groundwater ; protecting and restoring fisheries, wetlands, and aquatic habitat; enhancing water quality; and ensuring future availability of flows to the Chesapeake Bay.

An Executive Director oversees a 25-member staff of technical, administrative, and clerical personnel. A commissioner who serves as spokesperson during periodic meetings represents each signatory member. At these meetings projects are discussed, regulations are adopted, and direct planning and management occurs. Each member has a single vote for situations where specific issues must be resolved by consensus. Commissioners can be presidential appointees, governors, or governor appointees (SRBC website 2003).

One place where multiple stakeholder interests collide is the Conowingo Pool. The Conowingo Pool is a 15 miles (25 km) long reservoir on the lower Susquehanna River formed by the Conowingo Hydroelectric Dam. Located 10 miles (16 km) north of the river's mouth in Maryland, the dam is owned by Exelon's subsidiary Susquehanna Electric Company. It is the largest of the four hydroelectric projects on the lower Susquehanna River, covering 8,650 acres (3,500 hectares) and reaching 90 feet (28 meters) at maximum depth. The reservoir straddles the Maryland-Pennsylvania border, with two-thirds falling on the Pennsylvania side in Lancaster and York counties. On the Maryland side, the pool borders both Harford and Cecil counties. The impoundment is a vital source of water for energy production, water supply, recreational opportunities, and habitat protection. Approved users of Conowingo Pool water include Peach Bottom Nuclear Power Plant, Muddy Run Pumped Storage Hydroelectric Project, Chester Water Authority, and the City of Baltimore Public Water Supply.

As part of a 1980 re-licensing program, the Federal Energy Regulatory Commission (FERC) mandated an operating condition requiring the dam to make periodic conservation releases. This guideline is intended to protect the fishery habitat and diadromous fish species that return to the Susquehanna each year to spawn. Additionally, this action maintains low salinity levels downstream where several municipalities have intake structures for public water supply (SRBC Conowingo Information Sheet, 2001).

The Conflict

The city of Baltimore first constructed an intake structure at Conowingo Pool in 1966 with capacity to withdraw and divert up to 137 mgd. Since that time, the City used Conowingo only intermittently during periods of low-flow and drought. In 1993, Baltimore announced its intention to sell up to 30 mgd of water to Harford County, Maryland. To offset the effects of this increased demand on the City water system, officials considered expanding use of Susquehanna River waters. In 1994 the SRBC notified the City it needed prior approval from the Commission before expanding their current intermittent use pattern (SRBC Settlement Agreement, 2001). It cited section 3.10 of the Susquehanna River Basin Compact where it

states that no project affecting water resources in the basin may be undertaken without submitting plans for approval to the SRBC.

Baltimore questioned the Commission's authority in this matter, citing the Maryland Reservation to the Susquehanna River Basin Compact in disagreement. This section of the Compact confirms the right of the mayor and City Council of Baltimore to construct and operate water facilities in a manner that benefits the City and its service area the most (Susquehanna River Basin Compact, 1972).

In July 1994, legal issues were set aside when both parties agreed to attempt to reach a solution that addressed the impacts of large water withdrawals from the river during low flows. Baltimore completed a study of its water systems ability to adjust to reduce river withdrawals during low flows in 1997. The parties determined there to be a need for a second study on the water quality impacts of withdrawing water during low flows. At this point, a settlement seemed imminent. However, the Commission and the City were unable to reach an agreement on a set of interim low flow requirements pending completion of the second study and execution of a final settlement. This sudden divide was possibly the result of Baltimore retaining a more aggressive counsel midway through the negotiation process. SRBC officials maintain the new lawyer effectively killed the settlement process by drastically changing the City's position on previously made points of agreement. As a result, no settlement was reached at this time (Cairo, 2003b).

The SRBC held a public hearing in April 1998 in York, PA to discuss the potential impact of future withdrawals or diversions by the city of Baltimore from Conowingo Pool. Approximately 40 different interest groups and stakeholders attended to provide insights and opinions. Among those in attendance were the city officials, citizens, fisherman, boaters, recreational seekers, and many other community groups with interest in the operation of Conowingo Reservoir. Approximately one month later, the Commission issued a final determination listing potential projects that, if undertaken by Baltimore, would be subject to SRBC review and approval. These specific actions included:

- Constructing a new water treatment facility to treat water withdrawn and diverted from the Susquehanna River that will be distributed within the City's water supply system or other areas;
- Installing additional, new, or upgraded pumps, motors, or other improvements to the City's Conowingo Pool intake and pumping facilities to increase the structures water withdrawal capacity;
- Modifying the Baltimore intake structure's historic method of operation. This includes: using Susquehanna River water at a constant rate instead of as a backup source, and withdrawing water when the

river's flows at the Marietta Gage are less than trigger flows set by the FERC; and

- Selling Susquehanna River water to Harford County (including implementing the 1993 Agreement Between Baltimore City and Harford County for Raw Water Supply) or to any other county or entity not presently served by the City's system (SRBC Press Release, 2000).

Baltimore, displeased with the regulatory nature of this determination, appealed to the United States District Court of Maryland in 1998 to declare the determination null and void. On March 30, 2000, Federal Judge William Nickerson ruled in favor of the SRBC, stating:

> There can be no serious dispute that, absent the applicability of some specific exception or overriding consideration, the Commission's authority encompasses the regulation of the City's withdrawal of water from the Basin. There is substantial evidence in that record that the potential projects identified, if undertaken by the City, would have the potential of causing adverse impacts to the basin's resources, particularly during critical drought conditions (SRBC Press Release, 2000).

Still unsatisfied with the situation, Baltimore appealed this ruling to the United States Court of Appeals for the 4th Circuit. Before a second ruling was handed down, the court agreed to temporarily suspend litigation in hopes of an out-of-court settlement being reached. In July 2001, a tentative agreement materialized when negotiations between the Commission and City were completed. The Commission agreed to accept additional comments and hold a public hearing on the agreement. On August 9, 2001, the agreement was unanimously approved by SRBC commissioners and officially put in action (SRBC Press Release, 2001).

The Outcomes

Out-of-court settlement negotiations between the SRBC and the City of Baltimore resulted in an agreement benefiting both parties. The City was authorized to divert and withdraw up to 250 mgd for use within its service area.[20] Any system improvement projects undertaken by the City will not require approval from the SRBC provided these activities do not increase withdrawal capacity above the 250 mgd limit. The term of the docket approval is August 2051, though the SRBC has the authority to impose other reasonable conditions during this time. During periods when river flows drop below QFREC levels[21] as measured by the USGS Marietta Gage, Baltimore is limited to a 30-day average of 64 mgd with a peak single day rate of 107 mgd. The 30-day average is based on 'pre-Compact'

[20] The Maryland counties of Baltimore, Carrol, Anne Arundel, Howard, and Harford are included in this service area.

[21] QFREC rates are flow levels established by the Federal Energy Regulatory Commissions related to the operation of Conowingo Dam.

use patterns, while the peak day rate is based on the amount Baltimore withdrew and diverted in 1966. If the Commission declares a drought emergency, the City is required to impose mandatory restrictions on its customers that are consistent with the Maryland Drought Monitoring and Response Plan. In this sense, the SRBC drought emergency powers remain intact with this settlement (SRBC Settlement Agreement, 2001).

Baltimore had to carry out a number of water conservation measures as a result of this agreement. Within 18 months of the effective date of the settlement, a complete review of the water conservation measures currently in effect throughout the service area had to be completed. Within 48 months of the agreement, the City had to implement water conservation measures consistent with SRBC standards or State of Maryland water conservation requirements. Baltimore is responsible for conducting monitoring programs so that records and documents are readily available if needed by the Commission. Meters capable of measuring the quantity of water diverted from the Susquehanna were installed and maintained to ensure an error of no more than 5%. Calibration and repair records should be maintained and made available to the Commission on request along with daily records of withdrawal quantities.[22] In periods of low flow or drought, these records may be requested more frequently.

This settlement agreement legally affirms SRBC's authority to regulate the City of Baltimore's withdrawals and diversions of water from the river. With approval of the agreement, Baltimore was provided with long-term certainty regarding the availability of water from the Susquehanna River. They could enter into a 1993 raw water supply agreement with Harford County without sacrificing overall productivity in their service area. The SRBC was recognized as a regulatory authority responsible for the effective environmental management of basin resources. The City cannot legally increase their use of Susquehanna River water without approval from the Commission.[23]

Sustainability Implications

Both positive and negative results are evident in the outcome of this conflict. Baltimore will considerably increase its use of river water, increasing the stress on the multi-use reservoir and possibly diminishing flows to the

[22] The SRBC will confer with the U.S. Geological Survey and the Safe Harbor Water Power Corporation to assure the Marietta stream gage is calibrated and maintained in accordance with applicable specifications.

[23] Also important to this settlement is a provision that orders the development of a Conowingo Pool Operating Plan. The SRBC convened a stakeholder group, including the City of Baltimore and other reservoir users, to participate in the development of an operating plan for the Conowingo Pool. Following completion of the plan, the Commission considered impacts of current diversions and uses of the reservoir, and the effect that may result from new or increased withdrawals, particularly during low-flow or drought periods (SRBC Settlement Agreement, 2001).

Chesapeake Bay. However, water conservation measures and withdrawal limitations (for drought emergency periods) mandated by the agreement are significant victories for those concerned with sustainability. Baltimore must comply with SRBC advisories and modify their resource use during low flow periods. Although more water will be consumed, preventative requirements for critical time periods will ensure availability and wise use of basin resources.[24] Metering and water conservation measures outlined in the agreement will considerably enhance the overall efficiency of the City supply system.

Significant to this case is the extent to which public participation and stakeholder involvement was included in the resolution process. Although the dispute eventually ended in litigation, the resolution process leading up to this point was participatory. The public hearing held in York, Pennsylvania in April 1998 was an important example of how SRBC involved the public in this resolution process. Having been unable to reach an agreement with City officials, the Commission held this hearing as a way to inform stakeholders about the issues surrounding the conflict. By acting on the opinions of river basin stakeholders, we believe SRBC's position in this conflict was strengthened. Both sides had apparently valid legal claims. Once the citizen-based determination was issued, however, the City's position became weakened. All aspects of **WE**^{3} seem to be balanced in this case. Water conservation measures provide ecological harmony, while the participatory nature of the resolution process ensures social equity and accounts for all economic concerns.

The Nakdong River Basin

The management of water quality in the Nakdong River Basin is a crucial issue that affects the people and the industry in the south-east part of South Korea. The Nakdong River is the longest river in the country, flowing through two provinces (Gyeongsangbuk and Gyeongsangnam) and two large cities (Daegu and Busan) (Figure 4 illustrates the Nakdong and Han River Basins). The population in the river basin is about 13 million, with over 90% of that population receiving its drinking water from the river. Big cities and industrial complexes in its upper and midstream areas represent significant threats from pollution of water, especially for the people in Busan and Gyeongsangnam Provinces who draw water from the river downstream.[25]

[24] This provision protects water quality and ensures quantity of water flow through the Conowingo Dam to end of river communities like Port Deposit, Perryville, and Havre de Grace.

[25] The basic profile of the Nakdong River basin is as follows: Main stream length of 324 miles (522 km); Basin area of 12,464 square miles (32,280 km^2); Average annual precipitation of 45 inches (1,137 mm); Population of 13,160,000; Livestock of 3,600,000; and Number of discharge sites of 12,058.

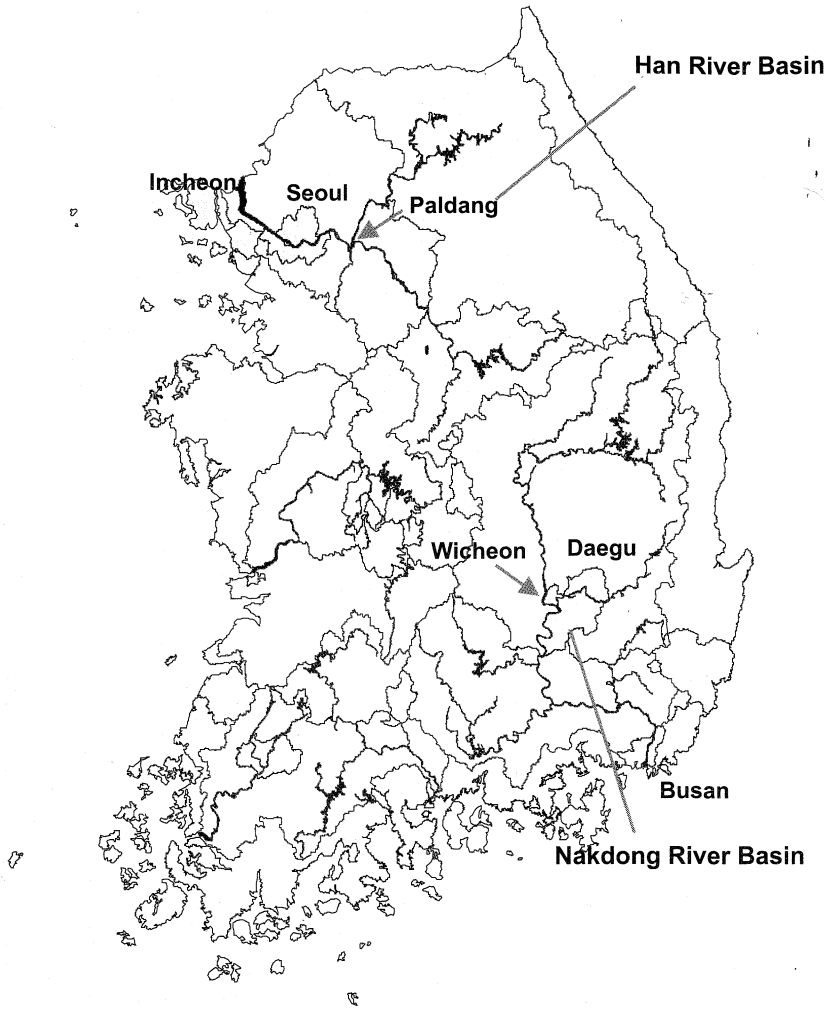

Fig. 4. River basins of South Korea
Source: Ministry of Environment. South Korea 2003a.

According to the water quality standard set by the Ministry of Environment, the Nakdong River corresponds to 'third-rate' water, which can be used for drinking water only after intensive purification treatment. Whereas, in comparison the Han and Geum Rivers correspond to 'second-rate' water that can be made portable by normal purification treatment (MOE, 2003b).[26]

[26] The BOD at Mulgeum, the location for drawing water for downstream use, is 3.5-5.0 mg/l which is much higher than the Han River and the Geum River whose BODs are 1.1-1.6 mg/l at their main drawing locations, Paldang and Daechung.

The central government created a comprehensive river basin management plan in 1992, investing US$2.5 billion (3 trillion won) for the enhancement of Nakdong water quality. The money was used for building basic environmental facilities like sewage treatment plants, wastewater treatment plants, and livestock manure treatment plants in the region. However, the government had difficulties in reconciling fundamental and political measures such as land use regulations due to economic development needs in upper and midstream regions of the basin. The government could only designate some areas near water intake points as "Areas for Limiting Wastewater Discharge Facilities."

The Conflict

The water quality of the Nakdong River had continued to deteriorate since the 1970s as urbanization and industrialization in the upper and midstream regions increased. In response, Busan City and Gyeongsangnam Province began to demand stronger regulations for the improvement of water quality. The phenol pollution accident that occurred in 1991, and the organic solvents pollution accident occurred in 1994 inflicted damage to public health of people in the basin. What made the concern more intense was the plan to construct the Wichon Industrial Complex near Daegu City.[27] Accordingly, the downstream demand for strict regulations became virulent. The Complex, built to boost the economy of Daegu City, brought about organized opposition from communities in the downstream area, especially Busan City.[28] A wide range of civil movement organizations, local governments, the press, politicians, and people in this area participated in the opposition campaign.[29]

The main demand of the downstream polity, especially the main city of Busan, was that regulation against pollution should be reinforced and the plan for the construction of new industrial complex canceled. Specifically, their demands included the reinforcement of environmental impact assessment systems, strengthening regulations on land use such as the designation of an additional source water protection area, restrictions on the new discharge facilities, and the designation of buffer zones.

Conflict increased as up- and midstream areas argued that the demands of the downstream to restrict the economic activities of the upstream severely inequitable, and that there was no 'trade-off' in return for such restrictions. To the further frustration of opponents, arguments were made that the construction of the industrial complex should be hastened, and to

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[27] Daegu City is the largest city in the midstream area of the Nakdong River.

[28] Busan City is the second largest city in South Korea located at the mouth of the Nakdong River.

[29] The overall water quality issue and the Wichon industrial complex plan became the hottest issue in the 1990s in the basin.

facilitate this, the regulations on land use should be lessened. Thus, leaders were caught in a political vise.

It was quite difficult for the central government, political parties, or the National Assembly to resolve the conflict between the upstream and the downstream through existing institutional solutions or policies. Given the multi-stakeholder competing demands, it was difficult to come up with a solution to satisfy both upstream and downstream, also it was politically too risky to side with one coalition due to the resistance of the other.[30] Accordingly, the resolution of the problem was delayed for almost 10 years. The conflict exacerbated as the problem remained unsolved. In the last stage, even calmly hosting the actual discussion for resolving the conflict between both regions became difficult.

The Ministry of Environment (MOE) thought that this kind of daunting task required the mediation of the central government, and began to devise various measures to resolve the conflict. The measures included adoption of the total load management system (TLMS) to address concerns regarding pollution from upper reaches, and a water use charge collected from downstream residents intended for fulfilling upper and midstream needs not met due to regulation of water quality. These transactions were the core measures for harmonizing the interests of the upstream and downstream.

In February 1999, MOE launched a task force for formulating a comprehensive plan for Nakdong River water resource management. The task force was composed of MOE officials and experts in the field. The task force made its draft for the plan in July 1999 based on field research, many expert meetings and local hearings, and the collection of individual plans from related agencies and local governments. However, it was not easy to attain local consensus for the final plan. The local hearings on the draft plan were prevented from being held by angry resident people who fiercely opposed it.

What protesters opposed was the construction of more dams for supporting maintenance flows, and the failure to abolish the Wichon Industrial Complex plan. MOE reconsidered its plan for constructing dams and decided to set up a local level experts body that would search for alternative ways to secure the required quantity of water. The Minister of Environment sent a mailing to 22,000 residents appealing for their understanding and cooperation. MOE held over 40 meetings, hearings and seminars over the policy measures. All stakeholders, such as the central government officials (including MOE), local government officials, representatives of local communities, civic groups, specialists, and business

[30] Since over a quarter of the nation's population live in the Nakdong River basin area, any improper handling of the issue could bring serious political consequences.

representatives, participated in the meetings, hearings and seminars. Officials in MOE, including the Minister, worked extraordinarily hard to persuade local representatives in the meetings and seminars in local gathering places, which often continued as unofficial discussions that lasted deep into the night.

The Outcomes

Eventually, a consensus for improving water quality of the Nakdong River was settled through a tough negotiation process. A comprehensive plan was finalized under the agreement among up and downstream areas on December 30, 1999 (MOE, 2003a). To bolster the agreement, the government drafted "The Act Relating to Water Resource Management and Community Support for the Nakdong River" and presented it to the National Assembly in June 2000. However, it took time and effort for the Nakdong River Bill to pass the National Assembly due to differences in the positions of the congressmen who represented each area, as well as the revival of conflicts between up and downstream.[31]

Congressmen who were aware of the revived conflicts were not active at all in reviewing and passing the bill. The bill was essentially adrift in the National Assembly. In September 2001, although the regular session of the National Assembly began, there was no passage of the bill. Worries arose that the bill would actually be discarded if it did not pass in that regular session, due to the consecutive election schedule in the coming years. This inspired a few NGOs to take action to urge the National Assembly to pass the bill. They announced their position that they demanded the passage of the bill by the end of the year, and visited congressmen and the dominant party to express their demand. The press also criticized the National Assembly for failing to address the crucial issue due to defending their personal political interests.

The MOE seized the opportunity to save the bill. The Minister and staff visited the local communities that opposed the bill the most, and explained the contents of the bill and sought their support. Over 100 times the Minister and MOE officials, and to some extent environmental NGOs, had meetings and hearings with local people since June 1999. Thanks to these efforts, the bill was passed and put into effect in January 2002. This became a permanent institutional framework for ending conflicts between upstream and downstream stakeholders that has lasted almost 10 years and improved water quality of the Nakdong River (MOE, 2003a).

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[31] In October 2000, Congressmen representing Busan City submitted a bill that demanded stricter regulations for upstream areas, regardless of the bill the government already submitted. In response to this, residents of local governments of upstream areas demanded the regulations they had conceded should be lessened and congressmen representing upstream areas became negative about the passage of the bill. The residents of upstream area demonstrated their objection to the bill in the National Assembly.

TLMS has been enforced in all areas of the Nakdong River, seeking to harmonize preservation and development by allowing regional development to be carried out in an environmentally-sensitive manner so that the desired water quality improvements are realized. Under the system, pollutant sources are managed so as to keep the total amount of pollutants in the watershed under a certain level (total allowance). In September 2002, MOE designated riparian buffer zones for protection of 88.3 square miles (228.8 km^2) in the upstream areas of Youngchon, Unmun, Imha, and Milyang dams (MOE, 2003a). Within this 547 yard-wide zone (500 m) on both sides, any construction of restaurants, lodging facilities, saunas, multi-family housings, factories and barns has been banned.

Water use charges have been levied on, and collected from, downstream users to secure revenue for upstream community support and water quality improvement projects. However, users in water source management areas and other areas designated by presidential decree are exempt from having to pay the water use charge. To efficiently coordinate the imposition and collection of water charges, community support projects and other important policies concerning the watershed, a Watershed Management Committee (WMC) was established.[32] The Watershed Management Fund derives its revenue from the collected water use charge determined by WMC, donations from non-governmental parties, loans, and earnings from investing the fund. The Fund is used for purchasing riparian buffer zones and other lands and implementing community support projects. The Fund also contributes to the establishment, operation and maintenance of environmental infrastructure, and the operation of water pollution prevention facilities.

Sustainability Implications

The Nakdong case showed that it was very difficult for the central government, local governments, political parties, or the National Assembly to resolve conflicts between the upstream and downstream communities through institutional solutions or policies. A solution that would satisfy both regions was politically too risky to be with one side due to the resistance of the other side. Accordingly, the resolution of the problem was delayed for almost 10 years, and the conflict exacerbated as the problem remained unsolved. Despite several major confrontations, MOE, civic and religious groups, specialists and representatives from the regions were finally able to find a road to coexistence after holding numerous meetings and discussions. The breakthrough was finally possible because all stakeholders were committed to the common goal of reviving a dying river and public pressure became irresistible.

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[32] WMC is composed of the Minister of MOE, mayors and governors of the Nakdong River Basin area, and the President of the Korean Water Resources Corporation.

The Nakdong River's water quality management projects stand as a sustainable outcome of how confrontations and conflicts can be resolved through dialogue and cooperation among stakeholders. Both TLMS and water use charges succeeded in fostering sustainability by harmonizing development needs with water quality preservation on a permanent basis. Ecological viability is accounted for, while economic issues are resolved. Both measures have also been successful in terms of equity, providing compensation for upstream sacrifice.

The Han River Basin

The population of the Han River Basin is approximately 24 million, nearly half the entire population of South Korea. The Han River represents the largest basin and includes three provinces (Gyeonggi, Gangwon and Chungcheongbuk) and two large cities (Seoul and Inchon). Most of the population is concentrated in the downstream area (Seoul and Gyeonggi Province), and only 9.1% live in the upstream areas). This makes for much easier water quality management compared to that of the Nakdong River. The primary sources of water intake from the Han River are Paldang Lake (2.03 billion gallons per day) and Jamsil Lake (1.67 billion gallons per day).[33]

The central government has designated the area near the Paldang Lake, which is 61 square miles (157 km^2), as an 'Area for Water Source Protection', and prohibited many sources of pollution since 1975. In 1980 the government also designated seven cities and counties of the Gyeonggi Province above Paldang Lake as 'Areas for Environment Preservation', an area of 1,277 square miles (3,307 km^2) to constrain the building of facilities that induce population inflow.[34] In addition, the government invested US$3.2 billion (3.81 trillion won) for the improvement of water quality in this region from 1993 to 1998. Despite such aggressive management strategies, water quality in the Han River Basin continued to be a significant problem throughout the decade.

The Conflict

Water quality of the Paldang Lake, which is the water source for 20 million people in the metropolitan area of Seoul, had become progressively worse

[33] The basic characteristics of the Han River are as follows: Main stream length of 299 miles (481.7 km); Basin area of 12,471 square miles (32,300 sq km^2); Average annual precipitation of 51 inches (286 mm); Population of 23,490,000; and Number of discharge sites of 17,999.

[34] The government re-designated part of the seven cities and provinces in the upstream areas as "Area for Special Measures for Water Quality Management" (812 square miles or 2,102 km^2) and has regulated the construction of restaurants, lodging facilities, and wastewater discharges since 1990.

in 1990s.[35] The deterioration of the water quality was partly because of the deregulation of land uses that took place in early 90s. Great pressure was placed on the government to come up with special measures to cope with the problem. In May 1998, the central government decided that new special measures should be taken for the improvement of water quality of the Han River and began to prepare a special plan to improve the water quality of Paldang Lake to 'first-rate' water by 2005.[36] Communities in the upstream area regarded the measures as the introduction of new regulations and opposed them fiercely.

As described above, the government regulated the land use of the area above the Paldang Lake, redefining several special actions to promote water quality protection. Accordingly, communities in that area have held the view that they are victims of the 'power of Seoul'. They have believed that their development is being sacrificed for the water supply needs of downstream communities. They made it clear that they could not accept additional regulations. Their opposition movement became stronger, taking some organizational forms. They even stopped by force the hearings prepared by the government for collecting the opinions of the local people.

The Outcomes

The Ministry of Environment, aware of the position of the upstream communities, prepared 'The Special Measures for the Water Quality Management of the Han River', based on a proposed 'win-win' spirit for upstream and downstream. The measures required upstream communities to use land in a manner that preserves water quality. Downstream areas are required to shoulder the financial burden that corresponds with restrictions placed on upstream users. By taking this reciprocal approach, the measure intended to promote a cooperative relationship between the upstream and the downstream.[37] The approach was so effective that it became the prototype of special plans for other river basins.

The government developed its Special Measures by collecting the opinions of specialists, residents, civic groups, and local governments. However, confirmation of the Special Measures was delayed due to the strong opposition of upstream residents. In August 1998, the residents of

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[35] The government converted much of the agricultural land in the basin into quasi-agricultural land as one of the sweeping deregulation programs at that time. This led to the increase of polluting facilities in the upstream areas, leading to deterioration of the water quality. The BOD of the Paldang Lake was 1.0 mg/l in 1990 and rose to 2.0 mg/l in the spring of 1998.

[36] BOD 1.0 mg/l or less corresponds to "first-rate" water, which can be used for drinking water after minor purification treatment such as filtration (MOE, 2003b).

[37] The measures were fundamental comprehensive plans that introduced effective preemptive measures, and the sharing of the burdens and costs between the upstream and the downstream made the arrangement sustainable to locals.

upstream areas that were under strong regulations prevented the hearing on the special measures from being held by force. The failure of the hearing elevated the national attention on the issue and prompted the participation of diverse stakeholders. The representatives of local residents, environmental NGOs, experts, and the press aggressively participated in the process. The Ministry of Environment recollected local opinions through resident polls and small-scale hearings and meetings.

Civic and environmental NGOs appreciated the integrity and advancement of the measures the government prepared and held a series of local meetings to reflect local opinions. As the dialogue between government officials and local representatives proceeded, it built relationships of mutual understanding and trust. Resident representatives and local governments in the upstream area tried to reduce regulations and expand compensatory and beneficiary measures, rather than object to the measures outright. As the issues in dispute were settled by continued dialogue between the government and upstream residents, the Water Management Policy Mediation Committee (chaired by the Prime Minister) formally adopted the Special Measures in November 1998 (Kim, 2000). With only a small NGO presence, governmental officials spent many late nights going from town to town – mixing recreational time with spreading their message to win local support.[38] To provide enduring legal support of the Measures, the Special Act of the Han River was enacted by the National Assembly in February 1999.

In order to prevent pollution in the Paldang Reservoir, restrictions were put in place. For example, land within 0.62 mile (1 km) of the main rivers and their tributaries, or 547 yards (500 m) in the case of land outside the Special Measures Zone for Water Quality Conservation, and for about 50 miles (80 km) upstream was designated as a Riparian Buffer Zone. Herein the location of pollution sources is severely restricted, and a special measure was adopted that forbids damaging publicly owned forests within 3.1 miles (5 km) of either the banks of tributaries or main rivers upstream of the Paldang Reservoir. In addition, the government has planned to purchase land in the upstream area to treat it like a buffer zone, creating a riparian forest that can mitigate pollution inflow from non-point sources.

Additionally, it was decided to gradually implement a total load management system (TLMS) to reduce pollution, while flexibly accommodating demand for regional development as far as science proved it was reasonable. The government planned to begin implementing a total load management system in the Han River basin starting in 2002 after research and the completion of legal details. TLMS would be applied only to those local communities that would want to adopt it voluntarily as a

[38] Such efforts would not reasonably be expected of civil servants in the U.S.

pilot program in its early stage. It would be expanded to other areas gradually as more local governments want to adopt it.[39]

If a local government accepts the burden of keeping the total load from the area under a certain level, it is allowed more flexibility regarding the matter of local development because the regulations on land use concerning special areas are exempted. This difference in the Measures between the Han River and the Nakdong River was the result of considering the fact that in the Han River Basin, there already existed strict regulations on land use such as the designation of Area for Water Source Protection, Area for Environment Preservation, Area for Special Measures for Water Quality Management of Paldang, etc. (MOE, 2003c).

A water use charge system was first adopted and implemented in the Han River Basin, and it became the model for other regions including the Nakdong River Basin. The characteristics of this system are nearly the same in both basins. The charge was negotiated at 80 won/ton (US$0.3/gallon) originally. The total amount of water use charges levied in the Han River Basin is currently about US$220 million/year (260 billion won/year). US$59 million (70 billion won) of this fund is spent on supporting residents in the upstream areas, and the rest is used on projects for improving water quality and the purchase of upstream land for conservation. As in the Nakdong River Basin, a Watershed Management Committee (WMC)[40] has been established to collect water use charges and coordinate community support projects and other important actions concerning the watershed.

Sustainability Implications

The Han River case is similar to that of the Nakdong River in that confrontations and conflicts were resolved through sustained dialogue and cooperation of all stakeholders. The main difference between the two basins is the implementation of TLMS. While the measures for the Nakdong River included a mandatory TLMS, the measures for the Han River involve a voluntary system, which gave the local government some incentives for local development. This difference was the result of the fact that in the Han River Basin, strict regulations on land use already existed. The designation of Riparian Buffer Zones, strong regulations regarding land use, and TLMS are regarded as having assured sustainability by harmonizing development and preservation of the Han River Basin.

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[39] The manner in which the total load management system is implemented is one of the main differences between the Measures for the Han River and the Measures for the Nakdong River. While the official Measures for the Nakdong River included a mandatory total load management system, the Measures for the Han River adopted a voluntary system, which gave to the local government some incentives and flexibility for local development.

[40] The WMC of Han River is composed of the Minister of Environment, mayors and governors of the Han River Basin and the president of the Korea Water Resources Corporation.

Ecological viability was ensured, while economic coexistence and equity between upper and downstream users was institutionalized through water use charges and community support projects.

LESSONS FROM THE COMPARATIVE CASES AND CONCLUSIONS

Before deriving lessons from the case studies, comparisons of river basin management practices between the U.S. and South Korea are helpful. It should be noted that there are differences between the U.S. and South Korean cases. The Han and Nakdong Rivers serve 70% of the population in South Korea, whereas the Delaware and Susquehanna Rivers serve only 20% of the population of the U.S. Consequently, the South Korean government's role in its river basin managements had especially significant socio-political implications.

In the case of the U.S., conflict mediation occurs mainly through: 1) Regional governance at the federal-interstate scale, backed by law and significant resources; 2) Heavy reliance on the court system to clarify and strengthen federal-interstate compact law; and 3) Powerful NGOs and community groups at multiple scales for reconciling conflicting land and water uses, as well as acting as third parties between government and communities.[41] In the case of South Korea, the following is emphasized: 1) The central government's role in sorting out river basin management conflicts not addressed by law; 2) Less use of the courts compared to the U.S. cases; and 3) Heavy reliance upon compensation schemes to build community consensus.

Although the core principles underlying the U.S. and South Korea approaches vary due to differences in government and civil society, as well as culture and geography, important similarities exist nevertheless . First, there is an emphasis on giving local communities an avenue for expressing their concerns. Second, a form of conflict articulation and debate is offered, rather than a simple 'command and control' structure, albeit with heavy NGO influence in the U.S. and more emphasis on civil service involvement in the case of South Korea. And finally, a commitment to equitably meet the needs of both upstream and downstream users guides those in the management and mitigation process.

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[41] The U.S. government has in recent times often supported a consensus-driven model for issues that, for instance, involves working with private property owners and water users. This controversial approach is opposed to turning to regulation and litigation for leverage in dealing with conflicts. Notably, in rural areas a desire to devolve control to the local scale is often enhanced, as in remote areas enforcement can be problematic, and voluntary action is even more favorable.

The results of our four case studies generally support our assertion that conflict resolution enhances opportunities for balanced **WE³**, leading to a higher level of sustainability in river basin management. The U.S. cases (Delaware and Susquehanna River Basins) show that litigation has been the major mechanism to resolve conflict, with aid from NGOs. Whereas in the South Korean cases (Nakdong and Han River Basins), an administrative role (played by the Ministry of Environment) has been the dominant mechanism in conflict resolution. In both the U.S. and South Korean cases, community-based transactions in the process of conflict resolution brought about litigation or administrative initiatives. Without these community-based transactions, environmental, socio-political and economical goals of river basin management (**WE³**) would have been considered less sustainable.

Additional valuable lessons can be drawn from the case studies. Major conflicts, as shown in these cases, can take more than 10 years (20 years in the case of the DRBC) to be resolved in the courts. To minimize transaction costs and to be more effective, conflict resolution mechanisms should be institutionalized to allow for community-based transactions in the planning stage of project. Without transparent, democratic and participatory transactions, such mechanisms as EIA, litigation, or administrative initiatives can result in less sustainable outcomes.

Additionally, the balanced consideration of both supply-side and demand-side options is important as shown in the Delaware and Susquehanna River Basin cases. Diversions and allocations from the rivers are certain to increase in years to come. Demand-side conservation strategies can work to offset potential negative effects of such changes. Instead of participating in lengthy, expensive battles over water rights and usage patterns, the SRBC case shows how comprehensive agreements that promote conservation measures and mandate drought period restrictions can be a more effective strategy and help for a "soft-path" approach to making resources available.

Finally, as illustrated in the Nakdong and Han River Basin cases, equity-driven programs are critical in the resolution of conflicts. Without the benefit of law or significant regulatory authority, MOE officials worked directly with stakeholders to ensure that an equitable solution was reached. In sum, community-based transactions, guided by the need to balance economic, environmental and social interests, can be vital to the resolution of major upstream-downstream conflicts. It appears that through these transactions, across widely differing policy, geographical, and cultural settings, the goal of sustainable river basin management can be secured.

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