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**The Ixtapa Draft Agreement Relating to the  
Use of Transboundary Groundwaters**

by

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# The Ixtapa Draft Agreement Relating to the Use of Transboundary Groundwaters<sup>†</sup>

The law and institutions for the management and equitable distribution of groundwaters have been slow to develop.<sup>1</sup> This is particularly true of transboundary aquifers. At the international level, "references to groundwaters are scant and too limited in scope to propose them in terms of customary law."<sup>2</sup> International practice and international law principles related to "shared" groundwater resources are fragmentary<sup>3</sup> at best.

In regard to groundwater we are faced more with "a case of non-management than of mismanagement."<sup>4</sup> This striking absence of law and institutions for dealing with transboundary groundwaters is on a collision course with greatly increasing demands being placed on those water supplies by rapidly increasing populations. Estimates of world population vary, and factors which may influence that growth are numerous, but the extent of current population growth has to be the single, most salient factor affecting both water supply and water quality.<sup>5</sup>

Increased population means increased competition for water. In particular, competition for groundwater supplies is increasing at a rapid rate. Already, in many countries, great reliance is placed upon groundwater. Israel relies upon groundwater for more than two-thirds of all the water used in the country, and in Europe more than three-fourths of the public water supply comes from groundwater sources in Denmark, the Federal Republic of Germany, and the Netherlands. In Tunisia and Belgium, nine out of every ten people are dependent upon underground sources, and the aquifers surrounding many major cities are becoming severely depleted as the withdrawals exceed the natural recharge of the aquifer. For

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1. For a more complete discussion see Utton, *The Development of International Groundwater Law*, 22 NAT. RES. J. 95 (1982) and INTERNATIONAL GROUNDWATER LAW (Teclaff & Utton eds. 1981). Hayton, *The Groundwater Legal Regime as Instrument of Policy Objectives and Management*, 2 ANNALES JURIS AQUARUM 272, 275 (1976).

2. Caponera & Alheritiere, *Principles of International Groundwater Law*, 18 NAT. RES. J. 589, 618 (1978).

3. *Id.* at 610.

4. Hayton, *supra* note 1, at 275.

5. United Nations, *World Population Prospects, 1965-2000, As Assessed in 1968*, U.N. Doc. ESA/P/WR (1968); L. BROWN, *BY BREAD ALONE* 35 (1974).

example, London, Copenhagen, Hamburg, Basel, and Vienna are urban areas in Europe which face a chronic problem of falling groundwater levels.<sup>6</sup> In Africa, most of the capital cities are heavily dependent on groundwater sources for their water supplies. As a result wells in many coastal areas in Africa have been overexploited, resulting in the intrusion of sea water. In Latin America, major cities have looked more and more to groundwater as the least expensive means of obtaining water, and shortages of surface waters (accentuated by prolonged droughts) have stimulated farmers in arid and semiarid regions to expand the use of groundwater, particularly in those areas which do not have reliable surface water supplies. Again, the result often has been the overpumping of aquifers and the consequent deterioration of water quality which generally occurs when the water pressure of the aquifer is reduced thus allowing the intrusion of overlying saline waters.<sup>7</sup>

The experience in North America has been similar to that in Africa, Europe, and Latin America, and it has been observed that "the general picture is one of more recent resort to groundwater, except in arid zones, without an adequate understanding of the physics of the resource and without regard, generally speaking, for the future."<sup>8</sup>

#### DEVELOPMENT OF NATIONAL GROUNDWATER LAW

Society has responded slowly to the need to manage and equitably distribute groundwater. Hayton points out:

[B]ecause law, and governments, respond (with few exceptions) only to felt needs of a society it comes as no surprise that traditionally there has been a failure to focus on the regulation and management of groundwater use in most legal systems. Demand for regulatory action simply has not been insistent.<sup>9</sup>

It has truly been a case of groundwater being out of sight and out of mind.

The laws governing groundwater are inadequately developed generally. "[T]raditionally there has been a failure to focus on the regulation and management of groundwater in most legal systems."<sup>10</sup> Professor Robert Emmet Clark adds that "legislative attention to the physical relationship between surface and groundwater sources is scarcely older than the concern for pollution."<sup>11</sup> The primary attention of domestic water law has

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6. Teclaff, *Abstraction and Use of Water: A Comparison of Legal Regimes*, U.N. DOC. ST/ECH/154 at 62 (1972).

7. Hayton, *supra* note 1, at 274.

8. *Id.* at 275.

9. *Id.*

10. *Id.*

11. Clark, *Western Groundwater Law*, in 5 *WATERS AND WATER RIGHTS* 411 (R. Clark ed. 1972).

focused on surface water, and there is a very limited groundwater practice at the international level.

"[T]he problem, then, . . . is to fashion a legal regime and a management machinery"<sup>12</sup> which will be integrated in order to achieve the optimum use of a nation's, or a region's, total water resources. In order to ensure the efficient use and distribution of available water resources, institutions must be developed to manage the world's water resources rationally. This is especially true of groundwater where the development of laws and institutions has been much slower than that for surface water.

At the national level trends are changing and more attention is being paid to the regulation of groundwater, although in most countries groundwater is still a separate legal regime.<sup>13</sup> However, even with the increased attention being given to groundwater, the modern legislation in most countries is inadequate. At the national level, "we are still faced . . . with unsatisfactory results. . . . The difficulties that have faced us in this field still persist: problems of supply, of quality, of the impact of surface waters, and the social, political and economic consequences of the still deteriorating conditions."<sup>14</sup>

#### THE "COMMONS" OF TRANSBOUNDARY AQUIFERS: SOME ECONOMIC CONSEQUENCES OF UNCONTROLLED COMPETITION

Transboundary aquifers present many of the "Tragedies of the Commons" experienced in exploiting other common resources such as fisheries on the high seas.<sup>15</sup> Since the resources are owned in common, that is, owned by everyone, yet owned by no one, there is no regulation, no security of legal rights, and no protection from the exploitation of the resource by others.

In the case of transboundary groundwaters, no party sharing the aquifer can have the assurance of a fair share of the waters of the aquifer or that the waters will be of a useable quality. Because groundwater is mobile, other users can take possession of the resource without regard to political boundaries. A strong economic incentive, moreover, exists to exploit the resource as quickly as possible, before the mobile fluid resource is captured by others—in a phrase, there is a strong incentive to race "each other to the bottom of the aquifer."<sup>16</sup>

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12. Hayton, *supra* note 1, at 293.

13. *Id.* at 278.

14. *Id.* at 284.

15. G. HARDIN & J. BADEN, *MANAGING THE COMMONS* (1977); Hardin, *The Tragedy of the Commons*, 162 SCIENCE 1243 (1968) (Presidential Address to Pacific Division of American Association for the Advancement of Science).

16. Hansen, *Economic Growth Patterns in the Texas Border Lands*, 22 NAT. RES. J. 805, 819 (1982).

### In an uncontrolled transboundary aquifer:

[The] definite property rights belong only to those who are in possession—that is, who gets there “fustest with the mostest.” Every user tries to protect himself against others by acquiring ownership through capture in the fastest possible way. Deferred use is always subject to great uncertainty; others may capture the resource in the meantime.<sup>17</sup>

A common property resource has been defined as one which may be used by many different users, “none of which have any well defined rights to any specific amount in the common pool.”<sup>18</sup> In this unregulated situation the various users have

[no] incentive to extract the resource at a rate that maximizes its value over time. The operative rule is simple: *Use it or lose it*. This rule follows from the obvious notion that if one reduces production or extraction rates today in order to have more of the resource available tomorrow when resource values are higher, there is nothing to prevent other users from extracting the “saved” resource. In the absence of well-defined (and enforced) property rights, extraction costs impose the only limit on extraction rates—potential future uses and values are irrelevant inasmuch as future rights or access to the resource do not exist.<sup>19</sup>

### Veeman adds that

[i]n the absence of effective social institutions to guide resource use, private groundwater use can be predicted eventually to generate excessive investment and extraction costs; induce a pumping rate which is greater than socially optimal, and which may lead to irreversible depletion; dissipate economic rent or producer surplus; and in general create economic waste and resource inefficiency.<sup>20</sup>

In sum the effect of unregulated human actions makes the supply less reliable for all users. There is incentive for each user to protect himself from his neighbor’s actual or potential pumping by capturing as much of the “fugitive resource” as quickly as possible. Because the movement of water within an aquifer does not respect political boundaries, a state’s or a country’s groundwater supply may be depleted and its economic development retarded by development of the same groundwater supply.

17. S. CIRIACY-WANTRUP, *RESOURCE CONSERVATION, ECONOMICS AND POLICIES*, 142 (3d ed. 1968).

18. Muys, Cummings & Burke, *Interstate Groundwater Management*, 56 (paper prepared for Western Governor’s Policy Office 1984).

19. *Id.*

20. Veeman, *Water Policy and Water Institutions in Northern India: The Case of Ground Water Rights*, 18 *NAT. RES. J.* 569 (1978).

The economic incentive for over-development and, consequently, the over-investment in pumping capacity leads to the depletion of the resource. In the process, lift distances and, therefore, pumping costs are increased for the later user. Both economic waste and resource waste are the likely results of inadequate legal protection of water rights. In addition, the water quality of the aquifer may be affected adversely by human activities on the other side of a political boundary, including pumping which can lower the water pressure allowing the intrusion of saline waters.

In order to avoid such adverse consequences before they occur, a central challenge is laid down to design mechanisms that will:

1. insure each party a fair share of the use of transboundary groundwaters.
2. encourage the prudent use of the resource over time.
3. resolve potential and actual disputes over the use of the resources, and
4. protect the underground environment of the aquifers.<sup>21</sup>

All this suggests that as populations increase, as economic development advances, the need to regulate the use of transboundary groundwaters increases. Rational management requires the formulation of water policies aimed at the preservation of the resource, particularly in view of its high vulnerability to long-lasting contamination or salt water intrusion and its very slow recharge and movement in many cases.<sup>22</sup>

Along with new policies affecting groundwater there must be established adequate administrative machinery to carry out the management tasks.<sup>23</sup> The resulting integrated management should be designed bearing in mind that there are peculiar physical characteristics of the movement and availability of groundwater that require special regulations and coordinated management with surface waters. The ultimate challenge is for specialists, working with other disciplines and administrators, to fashion legal regimes and management machinery which can prudently manage national as well as transboundary groundwater resources.

## DEVELOPMENTS IN TRANSBOUNDARY GROUNDWATER LAW

### A. *Treaty Practice*

Caponera and Alheritiere, after surveying international treaty practice, were unable to find any decisions of international courts specifically on

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21. For example, Sepulveda suggests that groundwater is "one of the questions which can most affect diplomatic relations between Mexico and the United States in the latter part of the Twentieth Century." *Los Recursos Hidraulicos en la zona Fronteriza Mexico-Estados Unidos. Perspectiva de la Problemática Hacia El Año 2000-Algunas Recomendaciones*, 22 NAT. RES. J. 1081 (1982).

22. Hayton, *supra* note 1, at 287.

23. *Id.*

the question of groundwater.<sup>24</sup> However, they anticipate a more rapid development of groundwater law and institutions for two principal reasons: first, the nature of the resource itself makes it an ideal subject for international cooperation and second, because groundwater resources are becoming so important in supplying the world's needs for water.<sup>25</sup>

Groundwater, like surface water, often transcends political boundaries, and there are many large aquifers which are shared by several countries. For example, the Northeastern African aquifer underlies Libya, Egypt, Chad, and Sudan, and on the Arabian peninsula there are the aquifers shared by Saudi Arabia, Bahrain, and perhaps Qatar and the United Arab Emirates. These aquifers, being in arid areas, are absolutely essential for the development of industry and agriculture. Other important international aquifers are the northern Sahara Basin shared by Algeria, Tunisia, and Libya, and the Chad aquifers shared by Chad, Niger, Sudan, and the Central African Empire, Nigeria and Cameroon. There are also the Taoudeni Basin in Chad, Egypt, Libya, and the Sudan, and the Maestrichian Basin shared by Senegal, Gambia, Guinea Bissau, and Mauritania. These groundwater basins are in arid and semiarid areas, are divided by international boundaries, and are likely to be the subject of increasing development.

The development of international law and legal institutions for managing groundwater resources and for resolving disputes is in its infancy.<sup>26</sup> There are but a handful of international treaties which refer to groundwater specifically. For example, Minute 242 under the 1944 treaty between the United States and Mexico<sup>27</sup> restricts groundwater pumping on one segment of the boundary. Other examples are the 1925 Agreement between Egypt and Italy on the Ramba Well,<sup>28</sup> the 1927 Convention and Protocol between the USSR and Turkey regarding the use of frontier waters,<sup>29</sup> and the 1947 treaty of peace between the Allies and Italy which outlines guarantees between Italy and Yugoslavia concerning springs in the Commune of Gorizia.<sup>30</sup> Also there is the 1958 agreement between Yugoslavia and Bulgaria<sup>31</sup> and the 1955 Yugoslav-Hungarian Water Economy Commission Mission Agreement.<sup>32</sup> There are also treaties between Czechoslovakia

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24. Caponera & Alheritiere, *supra* note 2, at 618.

25. *Id.* at 591.

26. *Id.*

27. Treaty on Utilization of Waters, Feb. 3—Nov. 14, 1944, United States-Mexico, 59 Stat. 1219, T.S. No. 944.

28. UNITED NATIONS, LEGISLATIVE TEXTS AND TREATY PROVISIONS CONCERNING THE UTILIZATION OF INTERNATIONAL RIVERS FOR OTHER PURPOSES THAN NAVIGATION 99 (1963), U.N. Doc. ST/LEG/SER. B/12, Treaty No. 6 [hereinafter cited as TEXTS & TREATY PROVISIONS].

29. *Id.* at 384 (Treaty No. 106).

30. *Id.* at 415 (Treaty No. 120). See also *id.* at 866 (Treaty No. 236).

31. *Id.* at 558 (Treaty No. 161).

32. *Id.* at 830 (Treaty No. 228).

and Poland,<sup>33</sup> between Poland and the U.S.S.R.,<sup>34</sup> and between Poland and the Democratic Republic of Germany,<sup>35</sup> as well as the 1972 convention between Switzerland and Italy concerning water pollution control.<sup>36</sup> Even in these treaties, however, groundwater is usually only a secondary issue which is mentioned almost in passing.

### B. Interstate Practice in Federal Countries

Perhaps one of the most fruitful sources of nourishment for the development of transboundary groundwater law is the interstate practice in federal countries. Although not technically international practice, the decisions of the courts in countries like the United States, Canada, the Federal Republic of Germany, and Switzerland nonetheless have been influential in the development of international surface water practice. Interstate practice, moreover, provides a potentially rich reference for international law in the development of groundwater at the international level. Switzerland, Germany, Canada, Yugoslavia, India, Argentina, and the United States provide considerable experience which reflects a variety of approaches<sup>37</sup> in regard to transboundary surface waters. The groundwater practice, however, is limited.

The richest field for transboundary groundwater law is the United States' experience, but even so the United States' experience is also quite scanty. Thirty-five interstate compacts have been enacted regarding water management, but, in fact, very few of them deal with groundwater.<sup>38</sup> Generally, the goal of the interstate compact is the allocation of water between the various signatory states and, generally, the compact refers to surface water only.

Several interstate compacts now, however, do refer to groundwater. The Lower Niobrara River and Ponca Creek Compact apportions resources shared by Nebraska and South Dakota, and the Upper Niobrara River Basin Compact apportions water resources shared by Nebraska and Wyoming.<sup>39</sup> The Upper Niobrara River Compact explicitly recognizes the interdependencies of groundwater withdrawals and surface stream flow. The compacts of the Delaware<sup>40</sup> and Susquehanna River Basins are of

33. Agreement Concerning the Use of Water Resources in Frontier Waters, March 21, 1958, Czechoslovakia-Poland, 538 U.N.T.S. 89.

34. Agreement Concerning the Use of Water Resources in Frontier Waters, July 17, 1964, Poland-U.S.S.R., 552 U.N.T.S. 175.

35. S.D.R. Gesetzblatt, Jul. 20, 1967.

36. Convention of April 20, 1972, Italy-Switzerland, Rev. Gen. de Droit Int'l Publ. 265 (1975).

37. Caponera & Alheritiere, *supra* note 2, at 604. See also S. JAIN & A. JACOB, INTERSTATE WATER DISPUTES IN INDIA (1971); and Interstate Water Disputes Act of India, 4(1) (1956).

38. J. MUYS, INTERSTATE COMPACTS (1971).

39. Act of Aug. 4, 1969, Pub. L. No. 91-52, 83 Stat. 86 (1969).

40. Delaware River Basin Compact, Pub. L. No. 87-328, 75 Stat. 688 (1961).

41. Susquehanna River Basin Compact, Pub. L. No. 91-575, 84 Stat. 1509 (1970).



particular interest.<sup>41</sup> Professor Clark observes that "The Delaware and Susquehanna Compacts of 1961 and 1970 have gone the farthest in providing a legal framework for management of surface and groundwaters across state lines."<sup>42</sup> The Delaware River Compact grants broad powers to its Commission. The Commission has the power to equitably apportion "the waters of the basin . . . and to impose conditions, obligations and release requirements."<sup>43</sup> It can veto water projects,<sup>44</sup> control pollution,<sup>45</sup> promulgate "rules, regulations and standards,"<sup>46</sup> issue orders "to cease the discharge" of pollutants<sup>47</sup> and take legal action "in its own name . . . to compel compliance. . . ."<sup>48</sup>

A number of United States Supreme Court decisions have dealt with interstate surface waters,<sup>49</sup> but few related to interstate groundwaters until recently.<sup>50</sup> The *Sporhase* case and the federal district court *El Paso* case have now focused attention on transboundary groundwater allocation.<sup>51</sup>

In sum, there is helpful but limited interstate practice in federal systems. At the international level there is little guidance provided by the meager international treaty practice.

#### LOOKING TO THE FUTURE

Considering the increasing competition for groundwater and the admonition that "economic development presupposes the protection of adequate legal guarantees. . . ,"<sup>52</sup> how do we provide users who are dependent on groundwater a secure supply? How may transboundary groundwaters be protected from contamination? The U.N. Water Conference has exhorted countries sharing water resources to "review existing and available techniques for managing shared water resources, and coordinate development of such resources."<sup>53</sup> Yet being aware that groundwater, because

42. Clark, *Institutional Alternatives for Managing Groundwater Resources: Notes for a Proposal*, 18 NAT. RES. J. 153, 157 (1978).

43. Pub. L. No. 87-328 § 3.3, 75 Stat. 688 (1961).

44. *Id.* at § 3.8.

45. *Id.* at § 5.2.

46. *Id.*

47. *Id.* at § 5.4.

48. *Id.*

49. Clark, *supra* note 42, at 157.

50. See, e.g., *Washington v. Oregon*, 297 U.S. 517 (1936).  
 51. *Sporhase v. Nebraska*, 458 U.S. 941, 102 S.Ct. 3456 (1982); *City of El Paso v. Reynolds*, 563 F. Supp. 379 (D.N.M. 1983). See DuMars, *New Mexico Water Law: An Overview and Discussion of Current Issues*, 22 NAT. RES. J. 1045, 1057 (1982); Tarlock, *So, It's Not "Ours"—Why Can't We Still Keep It? A First Look at Sporhase v. Nebraska*, 18 LAND & WATER L. REV. 137 (1983); Corker, *Problems of Interstate Allocation of Groundwater*, GROUNDWATER: ALLOCATION, DEVELOPMENT, POLLUTION (Univ. of Colo. 1983).

52. JENKS, *THE COMMON LAW OF MANKIND* 172 (1958).

53. Report of the United Nations Water Conference, E 77, II Annexes (Agenda Item 12), at 51 (1977).

of its association with that sovereignty which has always attached itself to land, "may be the very last element of the environment to be considered,"<sup>54</sup> what suggestions can be made to improve the security of water supply and thereby the investment of transboundary groundwater users? How can we ensure that each party will receive a fair share of the transboundary resources in the border region, adequately protected so as to avert unnecessary and damaging conflict? How can we avoid what has been called "education by disaster?"<sup>55</sup>

#### THE IXTAPA WORKING GROUP: SOME THRESHOLD SUGGESTIONS

In an attempt to respond to these questions and others regarding the development of transboundary law and institutions, a small, multi-disciplinary working group of water resources specialists has met over a period of three years to prepare a draft agreement for the allocation and management of transboundary groundwaters. The Working Group wrestled with the problems of allocation and regulation, and debated and exchanged views from the vantage point of different disciplines. They did not meet with the idea of dictating to governments, but rather worked to explore the kinds of problems which may be encountered in the sharing of transboundary aquifers, and in the process to make some suggestions as to how the allocation and regulation issues might be addressed. They did not intend to lay out a definitive blueprint, but rather to provide some threshold thinking which, in turn, may stimulate others to explore the issues further. In so doing, it is the hope of the Working Group to advance the understanding of the allocation and prudent use of transboundary groundwaters which is at a pioneering stage. In short, it is an attempt to address the problems before the crisis is upon us.

The Working Group met in Mexico twice at Ixtapa and once at Puerto Vallarta, and provided numerous written commentaries over a period of three years as the draft was repeatedly revised. The Working Group undoubtedly reflected their experience with the U.S.-Mexican border region in particular. The conditions and institutions along the U.S.-Mexico frontier were used as a working example by the Group. The Ixtapa draft, therefore, might be most relevant to that region. However, the draft agreement is not directed exclusively at any specific frontier, and it is hoped that it will be of broader relevance.

The group was far from complete agreement on many issues, and no single member would agree with every word of this revision. The rapporteurs labored valiantly to consider and respond to the comments of

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54. L. Teclaff & E. Teclaff, *Transboundary Groundwater Pollution: Survey and Trends in Treaty Law*, 19 NAT. RES. J. 629, 667 (1979).

55. Clark, *supra* note 42, at 157.

the group and are responsible for any failures to accurately reflect the thinking of the participants. We have tried to indicate the diversity of thinking on particular issues in the comments to the draft agreement. We think it is as important to display the spectrum of opinion as it is to report general consensus. In so doing we hope to stimulate and be of assistance in the further exploration of mechanisms for sharing transboundary groundwaters fairly and prudently, while minimizing conflict over their use.

The members of the Ixtapa Working Group were:

Thomas G. Bahr (Limnologist), New Mexico Water Resources Institute

F. Lee Brown (Economist), University of New Mexico

Randall J. Charbeneau (Engineer), University of Texas at Austin

Robert Emmet Clark (Lawyer), University of Arizona

Ronald G. Cummings (Economist), University of New Mexico

Charles T. DuMars (Lawyer), University of New Mexico

Leonard B. Dworsky (Engineer), Cornell University

Roger L. Eldridge (Policy Analyst), Colorado Commission on Higher Education

Enzo Fano (Economist), Chief, Water Resources Bureau, United Nations

Robert D. Hayton (Lawyer), Hunter College

Helen Ingram (Political Scientist), University of Arizona

Will Knedlik (Lawyer), Lincoln Institute for Land Policy

George O'Connor (Biologist), New Mexico State University

Ann Berkley Rodgers (Lawyer), Natural Resources Center, University of New Mexico

Stanley R. Ross (Historian), University of Texas at Austin

Cesar Sepulveda (Lawyer), Bonn, Germany

Ross Shipman (Geologist), University of Texas at Austin

Alberto Szekely (Lawyer), El Colejio de Mexico

Ludwik A. Teclaff (Lawyer), Fordham University

Jose Trava (Engineer), Centro de Estudios Fronterizos del Norte de Mexico

Albert E. Utton (Lawyer), University of New Mexico and others

## GENERAL CONSIDERATIONS

In approaching the task of drafting a hypothetical transboundary agreement, the Working Group formulated some threshold premises including the following:

1. There must be conjunctive management of surface and groundwater in areas where supplies are interrelated. In the management of transboundary groundwaters it is essential to recognize the interrelationships

between surface and groundwaters, which are frequently interconnected. Contrary to hydrologic reality, the law frequently has made distinctions which separate surface water from underground waters; these distinctions have failed to recognize interrelationships between surface and underground waters.

2. Legal rights should take into account the hydrologic fact that water is a fugitive resource. Therefore, the legal rights are to the control and use of the water, not the ownership of the water.

3. Decisions such as the spacing of wells and the rate of drawdown need to be carried out according to a reasoned development scheme.

4. Hydrologic information needs to be developed carefully in order to plan for the use of the supply over a calculated period, to determine sustained yield, and to prevent salt water intrusion.

a. There should be a system of measurement of withdrawals from wells.

b. Records must be kept of withdrawals over a period of time.

5. Controls must be placed on drilling in those areas where present and future uses may be endangered.

6. Allocation procedures, including permits, must be flexible in order to anticipate and minimize conflicts and shortages and to facilitate transfers to other uses.

7. The planning process should be flexible enough to allow for planned depletion over a calculated period by certain uses such as irrigation or municipal water supply. The planned depletion or mining of water can be justified in the same way as the mining of nonrenewable mineral resources such as oil, coal, or copper. The decision to mine, however, has to be made after thorough investigation and the development must be orderly and rational. This is particularly so where the groundwater resource is divided by an international boundary, because depletion of the resource and the consequent damage to the other country cannot be easily corrected by natural recharge.

8. The management effort must include and be related to all water quality matters.

9. Management should be placed in an agency with authority which is broad enough to carry out the policies of the parties concerned and strong enough to enforce the policies designed for particular groundwater areas along and near the border.

10. The use of groundwater resources divided by political boundaries may be equitably apportioned and in that apportioning, shared groundwater may be treated in the same manner as shared surface water.

11. The amount and quality of groundwater available to the affected countries within their shared international drainage basins and from shared groundwater aquifers should be included as elements in the determination of an equitable apportionment of their shared water resources.

12. The allocation of shared groundwater should not be determined by parties acting unilaterally, but rather the parties should determine through amicable deliberations and negotiation their respective rights to shared natural resources.

13. The actual allocation, administration, and enforcement of water rights as to each party's portion of water in a transboundary groundwater conservation area would be within the jurisdiction of that party and its appropriate political subdivisions.

14. In addition, there should be a general supervisory power lodged in the Commission to ensure that each party abides by its obligations.

15. In the event of prolonged drought the Commission should be authorized to use transboundary groundwaters as drought reserves.

16. The Draft Agreement is based on the sovereign power of nations to enter into agreements. Thus, in large part, political and institutional implications of the draft agreement that are intra-national in character are not discussed. While the issues of how local or provincial support for a treaty within a nation is to be gained and how the provisions are to be implemented are important, they are not addressed in this draft. Absent knowledge of specific parties and circumstances such matters are difficult to anticipate and analyze. Some flavor for such implications is considered in the comments pertaining to specific provisions of the Draft Agreement.

## THE IXTAPA DRAFT AGREEMENT RELATING TO THE USE OF TRANSBOUNDARY GROUNDWATERS

### PREFACE

This Draft identifies issues which we think should be considered in agreements concerning the management of transboundary groundwater basins. Persons involved in this effort are from universities and organizations which have interests in the equitable management of natural resources. We recognize that the process of negotiating fair rules for managing any resource which may be in severely deficient supply demands great skill and diplomacy of persons officially representing the various interests and constituents.

The laws concerning water and other natural resources differ from nation to nation. Physical conditions, economies and customs vary greatly. Customs and traditions may not have legal weight, but they are factors that wise diplomats may find difficult to ignore. These and other factors mean that the successful negotiation of international water agreements is a most difficult task.

Those of us who contributed to this document do not represent any government. Moreover, we recognize that our work only covers concepts which we believe are worthy of consideration in international or interstate

agreements concerning groundwater resources which are divided by political boundaries. We present options when sensitive and difficult issues are addressed. Nonetheless, we know that potential conflicts arise when negotiators hammer out agreements which cannot include the "easy solution" of offering options. Although such agreements may be difficult to achieve, we believe that failure to work patiently and fairly to achieve them can serve no purpose and can lead to abusive use of resources to the future detriment of all interested parties. Our goals will have been fulfilled if scholars and those who have the responsibility for officially representing various parties find this document helpful in identifying some of the allocation and regulation issues and how they might be addressed. We wish them well in their difficult tasks.

### *Key Concepts*

The development of the international law of rivers in its simplest form followed a somewhat predictably human pattern. Typically State A, the upstream riparian, took an "I am entitled to it all" position, or, in legal terms, the position of absolute territorial sovereignty. State B, the lower riparian, commonly responded by also taking an "I am entitled to it all" position, or one of absolute territorial integrity. See Figure 1. International and interstate practice responded to the "I am entitled to it all" claims with a "no, you must share the waters" or the doctrine of equitable apportionment or equitable utilization. "No one party can unilaterally determine its share."<sup>56</sup>

In regard to transboundary aquifers (Figure 2), we have very little international practice. But by analogy with the international and interstate law of rivers, we can say:

1. no one party is entitled to all of the waters of a transboundary aquifer;
2. the use of the waters of the aquifer must be shared by those parties which overlie it; and
3. no one party may unilaterally determine its share.

In regard to those transboundary aquifers which are tributary to or interrelated with an international stream (Figure 3), we can say that:

1. both State A and State B must share the use of the waters of the aquifer equitably, and
2. neither state may use the aquifer so as to impair deliveries of surface waters pursuant to existing agreements governing surface waters.

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56. Griffin, *The Use of Waters of International Drainage Basins Under Customary International Law*, 53 AM. J. INT'L. L. 50 (1959); THE LAW OF INTERNATIONAL DRAINAGE BASINS, (Garretson, Hayton & Olmstead eds. 1967); L. TECLAFF, THE RIVER BASIN IN HISTORY AND LAW (1967); Utton, *International Streams and Lakes*, in 2 WATERS AND WATER RIGHTS 402 (Clark ed. 1967).

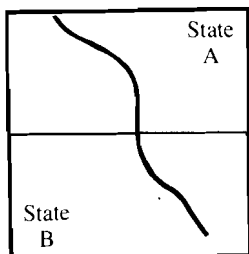


Figure 1

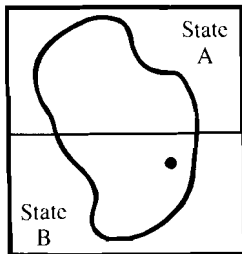


Figure 2

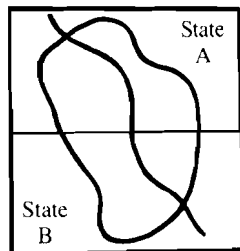


Figure 3

Building on these fundamental premises, the Ixtapa Draft Agreement has several key concepts, including:

1. decision by mutual agreement,
2. critical area protection (or case by case decision making), and
3. administration by the respective parties themselves.

The allocation and regulation of the use of transboundary groundwaters should be by the mutual agreement of the parties. Conversely, no one party may unilaterally determine its share of the uses of the groundwaters of a transboundary aquifer.

The critical zone concept is a common practice under which the responsible agency would not assert jurisdiction along the entire length of a common frontier, but would rather only proceed selectively in areas which were determined to be "critical areas" because of, for example, the threat of severe overdraft or aquifer contamination. In these critical areas the administering agency could, for example, regulate withdrawals by controlling the size, number, or placement of wells.

The actual administration of water rights and regulating measures is left to the respective Parties so as to minimize intrusions into the territorial sovereignty of the parties.

#### OUTLINE OF IXTAPA DRAFT

This draft generally follows a simple structure.

- I. First, the designated joint agency is called on to carry out a continued research program to identify and understand transboundary aquifers.
- II. Using the developed information, the agency may declare "Transboundary Groundwater Conservation Areas."
- III. Groundwater uses in declared conservation areas are subject to a spectrum of protective measures, ranging from interim and per-

manent measures regulating withdrawals to equitable apportionment.

- IV. Special attention is given to "mining" and using groundwater as a "drought reserve."
- V. Special provision is made for protecting the quality of transboundary groundwater.

DRAFT AGREEMENT  
RELATING TO THE USE OF  
TRANSBOUNDARY GROUNDWATERS

THE HIGH CONTRACTING PARTIES, \_\_\_\_\_ and  
\_\_\_\_\_;

Motivated by the spirit of cordiality and cooperation which governs the relations between them;

Desirous of expanding the scope of their concerted actions with respect to the problems confronting their peoples along their common frontier;

Recognizing the critical importance of their shared water resources and the need to enhance the use and conservation of the said resources on a long-term basis;

Noting especially the present unsatisfactory state of protection and control of their shared groundwaters, as well as the prospect of crisis conditions in some areas because of increasing demands upon, and the decreasing quality of, those groundwaters;

Seeking to provide for the sharing and protection of those groundwaters on an equitable basis and, to that end, for the creation and maintenance of an adequate data base;

Seeking to promote the rational use of these groundwaters and an equitable sharing of the available groundwaters in the border region;

Recognizing that the efficient use of their shared water resources is essential to the interests of both Parties;

Resolving to protect the quality of the groundwaters for present and future generations;

Wishing to resolve amicably any differences that may arise in connection with the use, protection or control of the said groundwaters and, for that purpose, to strengthen their joint agency; and

Concluding that the best means to achieve the rational management of their shared water resources and the protection of the underground environment is to adopt, in principle, an in-



tegrated approach including, where appropriate, the conjunctive use of surfacewater and groundwater;

Have agreed as follows:

*COMMENT:*

I. This document presumes a common interest of all Parties in coming to an agreement concerning groundwater, but by no means assumes all interests in relation to the resource are in common. There may be differences between or among Parties in the extent of concern about the management of the resource. There may be differences in the priority of goals such as economic development and the protection of environmental quality. Further, there may be differences in the financial and other resources which the Parties may bring to bear in participating in the management of this joint resource. While all Parties to the agreement are equal in a legal sense, it is recognized that some suggested substantive provisions may appear more advantageous to some Parties depending upon their particular attributes and their extent of control over the resource. While we may cite specific examples of where suggested provisions may be favorable to certain interests under particular circumstances, we leave it to diplomatic negotiations to identify specific interests in an actual application.

II. This preamble purports to set forth, in addition to iterations of friendship and good will, the Parties' salient policy principles with regard to groundwaters of common concern, including implied acknowledgement of the interrelationships between water resources on the surface and those underground.

III. Both water quality and water supply, interdependent in any event, receive express attention; use of the phrase "underground environment" imports a concern for the water body (aquifer) as well as the water stored in, and flowing through, it.

IV. The means proposed for actually accomplishing the Parties' policy objectives—duties of the Parties, augmentation of the functions of their commission (presumably heretofore restricted, or largely so, to surface waters), and the special powers under specified conditions—are left to the operative provisions of the agreement.

V. General terms are employed at the outset (*e.g.*, "shared water resources" and "on an equitable basis"), leaving to the substantive articles, including definitions, the establishment of the agreement's words and phrases of art.

ARTICLE I—DEFINITIONS

As used in this Agreement:

I. "Aquifer" means waterbearing geologic formation.

- II. "Border Area" means that area within \_\_\_\_\_ Kilometers from the mutual boundary.
- III. "Drought" means a condition of abnormal water scarcity in a specific area resulting from natural factors.
- IV. "Groundwater" means all water beneath the surface of the ground.
- V. "Impairment" means any change in a water resource under the jurisdiction of the Commission which significantly reduces or restricts the potential for the use of that water resource.
- VI. "Interrelated Surface Water" means those surface waters in the territory of either Party the quantity or quality of which is affected by the outflows from or inflows to transboundary ground waters.
- VII. "Mining" means the withdrawal of waters from an aquifer over a period of time in amounts greater than the recharge to the aquifer over the same period of time.
- VIII. "Pollutant" means any waterborne substance or property which in concentration or combination may be toxic or harmful to public use, to human, animal, or plant life.
- IX. "Pollution" means the introduction of pollutants into transboundary groundwaters that results in an impairment of human, plant, animal or public use.
- X. "Recharge" means the addition of water to an aquifer by infiltration of precipitation through the soil, infiltration from surface streams, lakes or reservoirs, flow of groundwater from another aquifer, or pumpage of water into the aquifer through wells.
- XI. "State(s)" means the Parties to this treaty.
- XII. "Sustained Yield" means the maximum quantity of water permitted to be withdrawn from an aquifer intersected by a common boundary, calculated to provide that quantity either indefinitely or for a period of years.
- XIII. "The Commission" means the joint agency designated in Article 3 of this Agreement.
- XIV. "Transboundary Groundwater Conservation Area" means the areas declared by the Commission to be a Transboundary Groundwater Conservation Area pursuant to Article 5.
- XV. "Transboundary Groundwaters" means waters in aquifers intersected by a common boundary.

## COMMENT ON ARTICLE I

I. These definitions are applicable in a variety of geographic settings. However, because conditions do vary greatly from one location to another, local factors including not only physical but also political, economic, and cultural conditions need to be considered. Some definitions merit specific comment.

II. The definition of "aquifer" is meant to cover any underground water source. An alternative definition would be "a waterbearing geologic formation that yields significant quantities of water to wells or springs." This alternative definition includes two characteristics of most aquifers: (1) ability to hold significant quantities of water; and (2) permeability sufficient to transmit that water. The alternative definition is adequate for aquifers where water is extracted at the present time or that have a natural discharge. The broader definition in the Article covers untapped aquifers that might be in danger or pose a threat to critical aquifers as a result of a variety of human activities such as mining for other resources.

III. The definition of drought is interpretive and most applicable where the climate of the geographical area results in great deviations from the average annual quantity on an annual basis. In such situations, numerical standards for the point at which drought occurs may be difficult to establish. Some members of the Ixtapa Working Group, however, supported a more objective standard. One member suggested that "we must come up with a period of time and a measurable degree of diminution by which to specify the physical conditions that trigger so vast an exercise of governmental power" [as described in Article 8]. A suggested alternative definition of drought is:

a period of time exceeding two years where a combination of natural factors results in the diminution by 30% or more of the average annual quantity of water available for use in a given water basin.

This alternative definition looks not to the amount of water received in a geographical area, but to the water available for use. Thus, drought conditions become a direct function of runoff waters that are stored. The volume of water received in a watershed can vary from the volume of water available for use by several hundred percent, depending on many natural and manmade conditions.

IV. Pollutant, pollution, and impairment have been defined to complement Article X on water quality. Issues concerning pollution and impairment will be controlled by the standards determined under the provisions of Article X. The definition of pollutant depends on a determination of what concentrations or combinations of substances or properties are toxic or harmful to life and other uses. For example, the parties must agree on what concentration of soluble mineral content is harmful in saline water. The numerically specified threshold varies in the United States from 500

parts per million (ppm) soluble mineral content for drinking water to 1000 ppm for other uses.

The definition of pollutant is written broadly to include substances or properties or their combinations which affect color, taste or odor of groundwater and therefore possible uses of it. Also the word "property" could include temperature change which could be harmful to some uses.

V. "Transboundary Groundwaters" is surely the most important definition, since protection of those waters is the ultimate goal of this agreement. Although all of the participants appreciated the need for a system wide approach to groundwater management, most felt that any definition beyond this would be so broad as to require system wide management by the Commission, an unrealistic expansion of powers in most circumstances.

Where the Parties have previously agreed to permit an existing Commission to manage water resources, an alternative definition could be used:

"Transboundary Groundwaters" means waters that are below the surface that discharge into or are fed by international surface boundary waters or are intersected by the common frontier, whether such underground waters flow in channels, percolate, are in direct contact with ground or subsoil or are ecologically isolated.

This definition identifies the kind of groundwater that is of concern in this treaty, and is broad enough to include nearly all kinds of groundwater. The definition also ensures that groundwaters that begin or end in international surface waters are not excluded. With regard to surface waters the Great Lakes Agreement of 1978, Article I(h),<sup>57</sup> extends to waters flowing into or out of boundary waters, and the Helsinki Rules of 1966, Article 1,<sup>58</sup> make groundwaters that flow into surface waters of an international basin part of the waters of that basin. A broad definition of the groundwaters of concern might avoid controversies as to the areal extension of the Commission's jurisdiction, thereby avoiding a situation where an international basin is subject to conflicting and possibly mutually defeating administrative systems. Political reality, however, would surely indicate that this definition is likely to be too broad to be acceptable. The limits placed by the 1944 Treaty between the United States and Mexico on the jurisdiction of the International Boundary and Water Commission to the "limitrophe"<sup>59</sup> sections of surface flows reflect the kind of resistance that could be expected to an expansive definition and thereby grant of jurisdiction to an international commission.

57. Agreement Between the United States and Canada on Great Lakes Water Quality, 30 U.S.T. 1383, T.I.A.S. No. 9257 (1978).

58. Helsinki Rules on the Uses of International Rivers, International Law Assn., Report of the 52nd Conference held at Helsinki, Aug. 17-20, 1966 (1967).

59. Treaty on Utilization of Waters, Feb. 3—Nov. 14, 1944, United States-Mexico, art. II, 59 Stat. 1219, T.S. No. 994.

## ARTICLE II—GENERAL PURPOSES

The Parties recognize their common interest and responsibility to ensure the amicable, prudent and equitable use of groundwaters divided by their common boundary for the well-being of their citizens in the border region. The Parties further recognize the critical importance of water to the economic development, productivity, and progress of their citizens.

Accordingly, the Parties have entered into this Agreement to ensure the optimum use of transboundary groundwaters on the basis of equitable sharing, and to protect the quality of the underground environment. It is also the purpose of the Parties to develop and share adequate and reliable information concerning transboundary groundwaters in order to use and protect these waters in a prudent, secure, and informed manner.

### COMMENT ON ARTICLE II

The Statement of General Purposes focuses on the reasons why governments negotiate with each other as to the use of shared resources, in particular, ground waters. It is contemplated that this type of agreement is the beginning of an ongoing process to manage the resource and provide that degree of certainty necessary to make prudent decisions as to the use of the resource. One vital component of any such effort is a strong research effort to learn about the characteristics of underground waters. As one Working Group commentator stated:

Hydrologically we operate largely in a sphere of ignorance, not because we lack understanding of the laws of nature as they relate to groundwater flow and quality, but because we lack the practical means to assess the extent of the resource . . . (we) are not able to map fresh groundwater supplies in the same way as we quantify surface waters . . . [we] have to learn to operate within the range of uncertainties which exist of a given data base.

The purpose of this prototype agreement, then, is to provide a model for governments. This agreement seeks to ensure that the present and future uses of shared groundwaters will represent an equitable sharing of the use of the resource throughout the life of the resource.

## ARTICLE III—DESIGNATION OF THE COMMISSION

The \_\_\_\_\_ Commission is designated as the joint agency to implement the responsibilities and functions provided for by this agreement.

## COMMENT ON ARTICLE III

Article III assumes the existence of a commission such as the International Boundary and Water Commission in the case of Mexico and the United States. Many governments already have administrative bodies with varying degrees of authority over transboundary water resources. Separate agencies for groundwater only would complicate resource management where these agencies already exist, in view of the need for conjunctive management of surface and groundwaters. If no joint agency exists, the Working Group assumed that one would be formed.

## ARTICLE IV—IDENTIFICATION AND INVESTIGATION OF TRANSBOUNDARY GROUNDWATERS

- I. The Commission, in addition to other duties and obligations, which may have been or may be assigned to it by the Parties, shall identify, investigate, and verify transboundary groundwaters, and the underground environment. It shall carry out directly or by means of national or other joint agencies or bodies, public or private, continuing research programs which shall include but will not necessarily be limited to:
  - A. a comprehensive inventory of all transboundary groundwater supplies considering quantity, quality, aquifer geometry, recharge rates, interaction with surface waters, and other pertinent hydrologic factors;
  - B. identification of gaps and imbalances in presently available data, and the preparation of research programs to remedy these deficiencies;
  - C. a comprehensive examination of present and possible future uses for said groundwaters, taking into account demographic projections and economic development potential;
  - D. a study of the quantities, qualities, present and possible future uses of other surface and groundwaters, actually and potentially available for use in the Border Area;
  - E. detailed studies of the potential for and consequences of drought, extended drought, and pollution in the areas served by transboundary groundwater.
- II. The Commission, utilizing its technical staff and the technical staffs of the Parties, is charged with the creation and maintenance of comprehensive, coordinated joint data files pertaining to transboundary groundwaters, in the lan-

guages of the participating Parties. The files should be continuously updated.

- III. The Parties undertake to facilitate the acquisition of information and data by the Commission on a timely basis in accordance with the Commission's requirements.
- IV. The Commission will collate, analyze, and disseminate the information and data resulting from inventories, examinations and studies.

#### COMMENT ON ARTICLE IV

A broad research charge is given to the Commission in this article. The Commission must assess the resource's quantity, quality, hydrological characteristics and present and future uses, given contemporary knowledge. There was a consensus of the Ixtapa Working Group that the authority of any Commission is rooted in its technical understanding of the resource. In addition, the Commission must also be impartial in assessing the characteristics of an aquifer. It must be able to collect and interpret data from all the Parties to the agreement and do research on its own initiative to reach an integrated understanding of transboundary groundwater resources.

In this regard the Commission is to identify gaps and imbalances in data which may exist. For example, one side of the frontier may have more data regarding withdrawals than the other side, thus creating an imbalance in information. Also the Commission is charged with establishing and maintaining a data base in the languages of the Parties so as to provide equality of access to the information.

The Commission must have a technical staff to accomplish the goals of this Article. Included within the staff's duties is the responsibility for model research standards and units of measurement that the Commission will use to study the characteristics of the resource.

#### ARTICLE V—THE DECLARATION OF TRANSBOUNDARY GROUNDWATER CONSERVATION AREAS

- I. The Commission shall on the basis of testing programs and studies determine the desirability of declaring any area within the Border Area containing transboundary groundwaters to be a "Transboundary Groundwater Conservation Area." Any determination of such desirability shall be reported to the respective Governments of the Parties with a draft of the proposed declaration. If no Party files an objection with the Commission within 180 days, the Commission shall issue the formal declaration. Any objection(s) filed shall specify the objectionable sec-

tion(s) of: (1) the proposed declaration; and/or (2) supporting data.

Within ninety (90) days of receipt of such objections, the Commission shall report to the respective governments a "revised determination" and a "revised proposed declaration," to be effective within ninety (90) days, unless a Party files an objection with the Commission. If no objection is filed within the said ninety (90) day period, the formal declaration shall be issued by the Commission. If objection is filed by a Party within the ninety (90) day period, the Commission shall refer the matter, together with the entire record, to the Governments for resolution.

The legal status of the aquifer or aquifers named in the declaration, and of its waters, shall be that of "Transboundary Groundwater Conservation Area," as herein provided, from the date of publication of the declaration by the Commission.

In making its determination, the Commission shall consider whether:

- A. groundwater withdrawals exceed or are likely to exceed recharge so as to endanger yield or water quality;
  - B. groundwater withdrawals are likely to diminish the quantity or quality of interrelated surface waters;
  - C. prudent management of the groundwater resources including the decision to mine groundwater makes such designation desirable;
  - D. the area's use as an important source of drinking water is likely to be impaired;
  - E. the aquifer is contaminated or is highly susceptible to contamination; or
  - F. recurring or persistent drought conditions necessitate emergency management of all or some water supplies in a particular area.
- II. For the purposes of this article,
- A. water quality may be impaired through chemical point source pollution as well as non-point source pollution;
  - B. in reaching any conclusions the Commission may take into account adverse effects on waters previously allocated by agreements between the Parties including any deterioration in water quality, quantity, or rate of flow.
- III. The Commission shall, based on continuing studies, review the appropriateness of continuing or modifying ex-



isting Transboundary Groundwater Conservation Areas, and the desirability of declaring additional Transboundary Groundwater Conservation Areas. These determinations of such desirability shall be made at intervals not to exceed 10 years.

#### COMMENT ON ARTICLE V

I. The data gathered by the Commission under Article IV may identify various adverse impacts on groundwaters. Once the Commission makes this finding, an area can be declared a Transboundary Groundwater Conservation Area, thereby triggering the Commission's powers under Article V of the treaty. This "critical area" approach is not novel. "In the common pattern, the state engineer is given the power to identify aquifers that are subject to severe overdraft conditions and to limit or impose controls for the drilling of new wells."<sup>60</sup> Examples of the "critical area" approach would include the Arizona Groundwater Management Code<sup>61</sup> and the New Mexico Groundwater Code.<sup>62</sup>

II. The Ixtapa Working Group discussed a spectrum of options. These options clearly reflected the tension between the need to give power to act to a technical body and the reality of what is possible politically. One member said, "I still believe that the Commission should be limited to recommending. Otherwise we are being politically unrealistic." Another argued that if the agreement attempts too much, nothing will be accepted. "The urge for utopia flies in the face of the possible." Another said "there are limits to what sovereign nations will accept. It would be better to leave these matters to the parties to work out." Yet, another member said "We are in a pioneering endeavor; if we do not suggest that the technical body be able to act affectively, who will? The Commission on the spot with hands on information needs to be able to act. Governments have too much on their agenda to be able to respond expeditiously."

The variety of options discussed ranged from the polar positions of giving the Commission the power to declare a Transboundary Groundwater Conservation Area, at one extreme, to giving the Commission only the power to recommend, at the other extreme. The Working Group opted for a middle position which allows the technical body to declare a Transboundary Groundwater Conservation Area, but which makes the declaration subject to the disapproval of the respective governments. This is aimed at allowing the specialist commission to act effectively, while allowing the ultimate political decisions to be exercised by the govern-

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60. Muys, Cummings & Burke, *supra* note 18, at 49.

61. ARIZ. REV. STAT. ANN. §§ 45-401 (Supp. 1981-82).

62. N.M. STAT. ANN. § 75-11-1 (1968).

ments. The Working Group thus chose a middle ground between effectiveness and legitimate political checks and balances.

The approach allows for declaration by the Commission subject to the approval of the Parties during a 180-day ratification period. In the absence of any objections, the Commission has a mandatory duty to issue a declaration. A review procedure has been added should any objections be made by a Party.

At least one commentator felt that the Working Group was being overly sensitive to "political realities" in debating whether the Commission should have power to declare Transboundary Groundwater Conservation Areas. It was argued that the Commission in fact would not be separate from participating governments but rather would be an extension of them. It was therefore argued that the Commission should be more than merely a technical advisory board which would lead to inefficiency at best and disaster at worst. In response to this suggestion the Working Group has given the Commission certain emergency powers set out in Articles VIII and XI.

III. The Working Group also discussed another option which provided the alternative of the Commission being given either the power to declare or only the power to recommend. It follows:

*Alternate Option*

- A. The Commission (may declare) (may recommend that the respective governments declare) any transboundary groundwater area to be a "Transboundary Groundwater Conservation Area" when in its judgment:
  - 1. demand has exceeded or is likely to exceed recharge so as to endanger yield or water quality;
  - 2. groundwater withdrawals are likely to diminish the quantity or quality of interrelated surface waters;
  - 3. prudent management of the groundwater resources including the decision to mine groundwater makes such designation desirable;
  - 4. the area is an important source of drinking water;
  - 5. the aquifer is contaminated or is highly susceptible to contamination; or
  - 6. recurring or persistent drought conditions necessitate emergency management of all or some water supplies in a particular area.
- B. For the purposes of this article,
  - 1. the Commission may determine the appropriate yield from an aquifer through consideration of economic, hydrological, and hydrogeological criteria selected by the Commission;
  - 2. water quality may be endangered through chemical point source pollution and non-point source pollution.

3. in reaching any conclusions the Commission may take into account adverse effects on waters previously allocated by agreements between the Parties including any deterioration in water quality, quantity, or rate of flow.

C. The Commission shall, based on continuing studies, review the appropriateness of existing Transboundary Groundwater Conservation Areas, and the desirability of declaring additional Transboundary Groundwater Conservation Areas. These determinations of such desirability shall be made at intervals not to exceed \_\_\_\_\_ years.

IV. There is precedent for giving a Commission a broad spectrum of responsibility and authority. Perhaps the best example is that of the Delaware River Basin Commission which is given broad powers, including the power of equitable apportionment and power to veto water projects.<sup>63</sup> It is necessary, however, to add the caveat that this is an interstate agreement which is remarkable even within the context of a federal system. It could be expected that such an international agreement would be even more difficult to negotiate.

Section 3.3 of the Delaware River Basin Compact provides that "the Commission shall have the power from time to time as the need appears, in accordance with the doctrine of equitable apportionment, to allocate the waters of the basin to and among the states signatory to this compact . . . and to impose conditions, obligations and release requirements. . . ."

Section 3.8 provides: "No project having a substantial effect on the water resources of the basin shall hereafter be undertaken by any person, corporation or governmental authority unless it shall have been first submitted to and approved by the commission, subject to the provisions of Sections 3.3 and 3.5. The commission shall approve a project whenever it finds and determines that such project would not substantially impair or conflict with the comprehensive plan and may modify and approve as modified, or may disapprove any such project whenever it finds and determines that the project would substantially impair or conflict with such plan. . . ."

Section 3.1 provides: "The commission shall develop and effectuate plans, policies and projects relating to the water resources of the basin. It shall adopt and promote uniform and coordinated policies for water conservation, control, use and management in the basin. It shall encourage the planning, development, and financing of water resources projects according to such plans and policies."

V. A variety of situations are listed which could result in the declaration

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63. Delaware River Basin Compact, Pub. L. No. 87-328, 75 Stat. 688 (1961).

of a Transboundary Groundwater Conservation Area (TGCA) because of danger to the resource. The first situation introduces the concept of an appropriate yield. Where an aquifer is recharged on a continuing basis by the hydrologic cycle, an appropriate yield would limit the amount of water to be withdrawn from the aquifer over a period of time. The discussion in paragraph II emphasizes the nontechnical approach of this agreement in that the determination of what constitutes an appropriate sustained yield is left up to the Commission, and is not the result of any preexisting definition. These options also require the Commission to consider the effects of nonpoint source pollution, such as saline waters and fertilizer leachates. The Commission is asked to consider effects on interrelated surface waters under existing treaties or compacts.

VI. Paragraph III mandates a review of a TGCA declaration every ten years. This seeks to accommodate the goal of flexibility, in order to respond to increased knowledge about the TGCA and its use, with the need for certainty. Certainty is necessary to provide a time frame by which people can rely upon the use of the resource for capital investment decisions. Although many would argue that certainty is the more vital need, flexibility is also necessary in order to adjust to changing conditions including economic development and new technology and to take into account new knowledge of the aquifer. One commentator said, "I have trouble with apportionment. It is too inflexible. The degree of uncertainty about future developments is too great." Economists have commented that the tradeoff between certainty and flexibility may be the heart of the problem of equitable allocation.

#### ARTICLE VI—APPORTIONMENT AND INTERIM AND PERMANENT MEASURES

- I. After declaring a "Transboundary Groundwater Conservation Area" the Commission shall prepare and administer with appropriate periodic revisions, a Comprehensive Plan for the rational development, use, protection, and control of the waters in the Transboundary Groundwater Conservation Area. Pursuant to said plan the Commission may:
  - A. Equitably apportion the uses of groundwaters and interrelated surface waters consistent with any other apportionment previously made by the Parties in the Transboundary Groundwater Conservation Area between the Parties and/or
  - B. Prescribe interim measures including, *inter alia*:
    1. limiting the pumping of groundwater within the Transboundary Groundwater Conservation Area to

- specified quantities, or number and capacities of pumps;
  2. establishing criteria for the placement of, and requiring approvals for, new wells, where permitted;
  3. retiring existing wells in cases where continued operation substantially threatens the quality of groundwaters;
  4. establishing pumping fees or charges for groundwater extractions, to be paid to the account of the respective National Section of the Commission;
  5. reserving groundwaters or portions of Transboundary Groundwater Conservation Areas for future use;
  6. other measures as may be deemed appropriate by the Commission, including the collection and reporting of information and data.
- C. Prescribe permanent measures to govern abstraction of groundwaters within the Transboundary Groundwater Conservation Areas after monitoring the effects of interim measures for a reasonable time.
- II. The Commission shall have the power to approve advances against future years' planned withdrawals under an equitable apportionment or as a variance to interim or permanent measures because of demonstrated need.
- III. The Commission shall carry on continuing studies to determine the appropriateness of interim measures which have been prescribed and whether such interim measures should be continued or modified. Determinations of whether interim measures should be continued shall be made at intervals not to exceed \_\_\_\_ years.
- IV. In making the decisions under this Article the Commission shall consider the following:
- A. The geography of the area, including each Party's proportion of total surface area overlying the Transboundary Groundwater Conservation Area;
  - B. The hydrology and hydrogeology of the area, including:
    1. the proportion of the total volume of the available water in the Transboundary Groundwater Conservation Area which lies within each Party's territory;
    2. the contribution of recharge by each Party;
    3. other relevant hydrogeologic considerations such

as aquifer geometry, flow characteristics including inflow and outflow, groundwater quality and vulnerability to contamination, aquifer transmissibility, permeability, recharge areas and rates, and other data pertinent to apportioning, protecting, and controlling the waters of the Transboundary Groundwater Conservation Area; and

4. interaction between the aquifer and any surface waters.
- C. Existing utilization by each Party with particular attention to present and possible future uses for human consumption, and for sanitation, health services, and public safety such as for fire control and other municipal uses;
- D. The protection of the water quality necessary for each Party's utilization of the shared resource;
- E. Economic implications;
- F. Water conservation practices and efficiency in water use and management;
- G. Other considerations deemed to be relevant by the Commission.

The weight to be given to each factor is to be determined by its importance in comparison with that of other relevant factors. In determining what is an equitable share and/or appropriate interim measure, all relevant factors are to be considered together with a conclusion reached on the basis of the whole.

- V. An appropriate sustained yield may be determined by the Commission through consideration of economic, hydrological, and hydrogeological criteria selected by the Commission.
- VI. Any determination by the Commission to equitably apportion or prescribe interim or permanent measures shall be reported to the respective governments of the Parties with a draft of the proposed action. If no Party files an objection with the Commission within 180 days the Commission shall proceed with the proposed action.

Any objection(s) filed shall specify the objectionable sections of: (1) the proposed action; and/or (2) supporting data.

Within ninety (90) days of receipt of such objections, the Commission shall report to the respective governments a "revised proposed action," to be effective within ninety

(90) days, unless a Party files an objection with the Commission. If no objection is filed within the said ninety (90) day period, the proposed action shall be put into effect. If objection is filed by a Party within the ninety (90) day period, the Commission shall refer the matter, together with the entire record, to the Governments for resolution.

#### COMMENT ON ARTICLE VI

I. The Working Group discussed two principal options, each of which has the same ultimate goals of structuring an ongoing process that leads to a fair and secure sharing of the use of the resource and the protection of the underground environment.

In earlier drafts of the prototype agreement, each option was based strictly upon the doctrine of equitable apportionment. The Ixtapa Working Group rejected this approach because of the need for a more flexible range of possible regulatory measures.

One participant said, "I prefer the option with the interim measures. In general, management through interim measures makes better sense to me than apportionment." Although another was "uncomfortable with the interim measures, on the basis of giving too much power to the Commission." He went on to say, "However, if the problem is overdraft, some interim measures may be necessary."

II. The Commission has been given the authority to equitably apportion the use of the resource and/or manage it through the listed interim or permanent measures. Included in the list of interim measures is the power to reserve groundwaters for future use. The power to reserve groundwaters for future uses can be used as a variation to equitable apportionment in that the Commission might want to apportion only some of the groundwaters and set aside a portion as a reserve pending the development of more information about the aquifer, or changes in technology or patterns of use, demand, and economic development.

The interim measures provide a degree of flexibility on an aquifer-wide basis. This would complement the transfer provisions of Article IX which allow for flexibility on an individual use basis. The interim measures can be used in a variety of ways: as steps taken in place of equitable apportionment based upon a management scheme or, once the use of a resource is apportioned, these measures can be taken to maintain the allocation of all Parties to the agreement.

Hydrological uncertainty also makes interim measures attractive to some commentators. Any quantification of an aquifer is at best a partially informed guess. The same would be true for any quantitative apportionment. Flexibility allows for change as knowledge of an aquifer increases, or as natural or artificial additives affect the aquifer.

One participant commented, "I think the process would be more logical and acceptable if the Commission were required to impose interim measures and monitor them and give them a chance to work before imposing the step of equitable sharing or any other permanent or semi-permanent measures."

III. Reevaluation of interim measures serves the same purpose as reevaluation of the TGCA declaration because it gives the certainty necessary for investment and promotes prudent planning and management while providing opportunity for change with changing conditions. Also, it was concluded that there should be provision for permanent measures in lieu of or in addition to apportionment after monitoring the effects of interim measures for a reasonable time.

IV. In order to strike a workable middle position between administrative effectiveness and political responsiveness, the Commission is given the power to take a spectrum of actions ranging from interim measures to equitable apportionment, but subject to disapproval by the respective governments within a 180 day period.

V. Equitable apportionment is a common approach to the allocation of surface water resources between sovereigns and is accomplished through negotiation or adjudication.<sup>64</sup>

The end result of any equitable apportionment is a rather inflexible set allocation, thus leading to the criticism that an equitable apportionment cannot adequately anticipate changing conditions.<sup>65</sup> Interim measures that can become permanent provide considerable flexibility and to a significant extent overcome the rigidity of equitable apportionment as the sole alternative. Additional flexibility can be achieved by permitting the transfer of water as provided in Article IX.

VI. As an alternative to the centralized, regulatory approach to managing an aquifer implied in Article VI, Cummings suggests a decentralized approach which relies on price mechanisms as a means of controlling pumping rates. In such a system, a tax is imposed on water use which is based on the scarcity value of water. The scarcity value of water is based on each state's *share* of groundwater stock as well as the impact of mining on pumping costs. In cases where these latter impacts are uncertain, scarcity values are revised periodically as additional information becomes available. With appropriately structured measures for scarcity values, and the imposition of user charges or taxes in these amounts, water users would have *no incentive* to extract the resource at rates in excess of allotted amounts —indeed, disincentives would exist for more rapid rates of pumping. Cummings further argues that decen-

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64. Management of International Water Resources: Institutional and Legal Aspects, U.N. Doc. ST/ESA/5144 (1975).

65. Utton, *International Water Quality Law*, 13 NAT. RES. J. 282, 309 (1973).



tralized decision-making by individual water users could result in rates of resource use that are the same as those which might be "imposed" by limiting pumping by regulation. He goes on to say that such taxes, once collected, *must not* be returned to water users in any way proportional to their water use. The redistribution of tax collections in proportion to water use would have the effect of reducing the effective tax paid per acre foot. If tax collections are ultimately returned, all or in part, to water users, such returns must be in the form of "lump sum" payments which are in no way related to quantity of water pumped by each water user.<sup>66</sup>

This pricing or decentralized approach is provided as a possible tool under I(B)4 by giving the Commission the option of establishing pumping fees or charges for groundwater extractions. Cummings adds the caveat that the pricing or decentralized method

is not a panacea in terms of assuring compliance with terms of any agreement. Its use presupposes the existence of substantial amounts of information (which is many times unavailable) concerning revenue and cost relationships relevant for all water users; further, distributive and equity considerations are ignored: relatively high cost water users may be put out of business as a result of the tax. To the (likely) extent which equity considerations weigh heavily in states' considerations of transboundary agreements concerning groundwater resources, few options may exist to some sort of the regulatory commission. . . .<sup>67</sup>

VI. Most of the criteria set out in this Article to be considered in determining an apportionment or other measures can be evaluated objectively, reducing subjective determinations from the Commission. It is important, however, to remember the words of Justice Holmes in *New Jersey v. New York*: "[T]he effort always is to secure an equitable apportionment without quibbling over formulas."<sup>68</sup> Commentators disagreed on the value of the concept of the proportion of total volume of available water in the TGCA which underlies a Party's territory because it would be necessary to determine what water was referred to. For example, the reference may be to all waters, including those unfit for use, or to only usable water. Other members of the Working Group expressed concern with the listing of relevant hydrogeologic considerations because these terms represent contested concepts of the physical sciences which could be used as labels to achieve a preconceived expectation rather than raw data.

Other considerations might include:

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66. Muys, Cummings & Burke, *supra* note 18, at 64.

67. *Id.* at 68.

68. 283 U.S. 336, 337 (1931).

The population dependent on the waters of the aquifer in each border area;

The comparative costs of alternative means of satisfying the economic and social needs of each basin nation;

The availability of other water resources;

The avoidance of unnecessary waste in the utilization of waters of the area;

The degree to which the needs of one nation may be satisfied without causing substantial injury to the other nation;

The protection of the water quality of each nation's uses;

Also of interest are the criteria suggested by U.S. federal law and Spanish law for the equitable apportionment of surface water. The United States Supreme Court has said that equitable apportionment

calls for the exercise of an informed judgement on a consideration of many factors. Priority of appropriation is the guiding principle. But physical and climatic conditions, the consumptive use of water in several sections of the river, the character and rate of return flows, the extent of established uses, the availability of storage water, the practical effect of wasteful uses on downstream areas if a limitation is imposed on the former—these are all relevant factors. They are merely an illustrative, not an exhaustive, catalogue. They indicate the nature of the problem of apportionment and the delicate adjustment of interests which must be made.<sup>69</sup>

Seven principles have been identified that were used in deciding water disputes under Spanish colonial and Mexican law:<sup>70</sup>

1. *Title*. Without question, a Spanish or Mexican judge would first ask Parties to the case to produce their titles.
2. *Prior Usage*. Prior usage was not synonymous with the oldest usage; a firmly established newer usage would be taken into consideration as well in a subsequent division of water.
3. *Need*. If a litigant or group of litigants asked for a new grant of water or an amount above and beyond that which they had been using, the judge would inquire about the increased need, a fundamental concept in water allocations. If, for example, population increase seemed to substantiate the claim of increased need, he might well have extended additional water rights. At the same

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69. *Nebraska v. Wyoming*, 325 U.S. 589, 618 (1945).

70. Michael C. Meyer & Susan S. Deeds, *Land, Water, and Equity in Spanish Colonial and Mexican Law: Historical Evidence for the Court in the Case of State of New Mexico vs. R. Lee Aamodt et al.* 69 (Aug. 1979).

time, he would weigh this decision against the needs of others who might be using the water or who might have legitimate claim to it.

4. *Exclusivity and Injury to Third Party.* If a group of petitioners asked for exclusive rights to all of the water from a given source or as much water as they wanted to take from the source, without reference to the needs of others, the judge would be hard put to find many precedents for such exclusivity.
5. *Intent.* The judge hearing the case would inquire about intent. Why did a petitioner or group of petitioners want more water? How did they intend to use it? Were their goals in harmony with those of the larger community? Would the grant of water contribute to an expansion of agriculture, would it increase tax revenues for Church or State, would it benefit the poor?
6. *Legal Right.* In the water disputes, the establishment of legal right was important for the contending Parties. All would have a decided advantage over a competitor without it. But the concept of legal right was not an absolute. Other considerations, such as need and prior use, could subordinate legal right to a secondary position in the process of adjudicating water controversies.
7. *Equity and the Common Good.* Finally, in the solitude of his chambers, the judge might well ponder the doctrines of equity and the common good, the foundations of all Spanish colonial and Mexican law. He would ask himself what was equitable for the petitioners, for other individuals, and for the larger community.

VII. The theory of Equitable Participation moves away from notions of quantification of the volume of a nation's allocation to the protection of a nation's rights and duties as a participant in the management of a shared resource. Three basic principles have been set out by the International Law Commission:

1. The waters of an international watercourse system shall be developed and used by the system States on an equitable basis with a view to attaining optimum utilization of those waters, consistent with adequate protection and control of the components of the system.
2. Without its consent, a State may not be denied its equitable participation in the utilization of the waters of an international watercourse system of which it is a system State.
3. An equitable participation includes the right to use water resources of the system on an equitable basis and the duty to contribute on an equitable basis to the protection and control of the system as particular conditions warrant or require.

The emphasis of this approach is that uses should be equitably shared between nations, and that participation involves both the right to use and

the complimentary duty to protect the rights of others to use the resource. To these ends, this option gives the Commission responsibility for the development and administration of a comprehensive plan to bring about equitable participation.

An alternate Article VI would be:

#### ARTICLE VI—EQUITABLE PARTICIPATION

- I. The Commission shall prepare, and as approved by the Parties shall administer with appropriate periodic revisions, a comprehensive plan for the rational development, use, protection, and control of the Parties' transboundary waters. The plan shall, *inter alia*, include provisions:
  - A. to assess, as between the Parties and at the request of any Party, the equities in relation to the uses of transboundary waters, of parts thereof, or of a particular use as required under the circumstances, and to determine on the basis of such assessment whether a use or uses are consistent with the Parties' equitable participation in the transboundary waters under this agreement and other agreements in force;
  - B. to prescribe standards and measures for the protection of transboundary groundwaters generally and to modify such standards and measures with respect to any controlled aquifers to include restrictions or prohibitions with respect to effluent discharges and the dumping, injection, or application of substances deemed by the Commission likely to result in significant contamination of transboundary groundwaters.
  - C. to restrict the extraction of, and discharge to, transboundary waters in any Transboundary Groundwater Conservation Area.
  - D. to prescribe interim measures with respect to Transboundary Groundwater Conservation Area.
- II. Transboundary waters shall be developed and used by the Parties on an equitable basis with a view to attaining optimum utilization of those waters, consistent with adequate protection and control of the components of the system.
- III. An equitable participation includes the right to use water resources of the system on an equitable basis and the duty to contribute on an equitable basis to the protection and control of the system as particular conditions warrant or require.

- A. The right of a Party to a particular use of the transboundary water resources depends, when questioned by another Party, upon objective evaluation of:
  1. contribution of water to transboundary waters, in comparison with that of the other Party (Parties),
  2. development and conservation of the transboundary water resources,
  3. degree of interference, by such use, with uses or protection and control measures of the other Party (Parties),
  4. other uses of transboundary water, in comparison with uses by the other Party (Parties),
  5. social and economic need for the particular use, taking into account available alternative water supplies (in terms of quantity and quality), alternative modes of transport or alternative energy sources, and their cost and reliability, as pertinent,
  6. efficiency of use of transboundary water resources,
  7. pollution of transboundary water resources generally and as a consequence of the particular use, if any,
  8. cooperation with the other Party (Parties) in projects or programs to attain more optimum utilization and protection and control of transboundary water resources, and
  9. stage of economic development;
- B. the total adverse affect, if any, of such use on the economy and population of other Parties, including the economic value of and dependence upon existing uses of the transboundary waters, and the impact upon the protection and control measures of the Parties;
- C. the efficiency of use by the other Party (Parties);
- D. availability to the other Party (Parties) of alternative sources of water supply, energy or means of transport, and their cost and reliability, as pertinent;
- E. cooperation of the other Party (Parties) with the Party whose use is questioned in projects or programs to attain optimum utilization and protection and control of transboundary waters.

One commentator speculated that equitable participation could result in a stronger Commission since it could command the cooperation of the Parties. There would be no incentive to use non-participation as a strategy to obtain concessions. Another commentator argued that theories such as

equitable apportionment and equitable utilization are inadequate. He urged the need "to explore and articulate" Equitable Participation as a part of "the progressive development" of international water law. Equitable Participation imports

a sense of affirmative cooperation, even collaboration, in order to achieve reasonable and rational use, protection and control—in short, not just a determination of 'rights' against the others, but a partnership in development and safety. Such affirmative obligations and opportunities cannot, it is submitted, be adequately handled with the Principle Equitable Utilization, based on equality of right, alone. The right, as it were, to have the other system States co-operate with you in protection and control measures should be expressed in a larger fashion, encompassing the entire bundle of rights and obligations associated with system-State status which, after all, implies co-system State status.<sup>71</sup>

#### ARTICLE VII—PLANNED DEPLETION

The Commission, after evaluating all relevant considerations, may approve depletion of an aquifer over a calculated period with the consent of the Parties. After considering the environmental, economic, social and hydrologic consequences, the Commission may apportion the use of groundwaters and/or prescribe interim or permanent measures in a way that allows either Party or both Parties to withdraw groundwater at a rate that exceeds the rate of recharge.

After approval of the decision so to deplete by the respective governments, a groundwater management plan for such depletion shall be drawn up and promulgated by the Commission. The management plan shall be carried out by the respective governments, each of which shall make annual reports to the Commission reflecting the measures taken, the quantities withdrawn from the aquifer or aquifers designated for depletion in the plan, and any problems encountered in adhering to the plan.

#### COMMENT ON ARTICLE VII

##### *I. Flow v. Stock Resources*

A useful concept is the distinction between flow and stock resources. Flow resources are self-replenishing and include those groundwaters which are being recharged on a continuing basis as part of the hydrologic cycle

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71. Hayton, *The Law of International Water Resources Systems*, in RIVER BASIN DEVELOPMENT, 209 (Zaman ed. 1983).

of precipitation and evaporation. It is these groundwaters which one would try to use on a "sustained yield" basis. The concept of what constitutes a "sustained yield" is dynamic in that much depends upon the extent of knowledge about a system. What would be an appropriate withdrawal rate at one specific time might be superfluous two years later. There are, however, aquifers with small recharge, but with a large amount of water in underground storage which "for all practical purposes . . . has been sidetracked from the hydrologic cycle and is no longer in transit. In human time, at least, it is not self replenishing, but an exhaustible resource, similar to petroleum and other minerals."<sup>72</sup> These nonreplenishing groundwaters are, for all practical purposes, exhaustible "stock resources." They are not being replenished. Thus, continued extraction will lead in time to their complete exhaustion. When exhaustion occurs, or when further mining becomes impractical, the economic activities and other uses dependent upon that supply must turn to other sources or be abandoned:

With a *stock resource* the decisions to be made are whether and when to use it. A property rights doctrine should recognize that rights to such resources do not involve a perpetual supply. It should permit a decision to hold the stock for use at a later time if it is so desired.

In a *flow resource* the problem is to make the best uses of the supply which is continuously available though not necessarily, and in the case of water ordinarily not, at a constant rate. . . .<sup>73</sup>

Thus, the concept of sustained yield is useful for aquifers recharging on a continuing basis, and the concept of mining is appropriate for "stock resource" groundwaters which are not being recharged significantly.

## *II. Management of Groundwater Mining*

The Ixtapa Working Group unanimously agreed that the Commission should be given authority to develop a plan for the use of groundwater once the Parties agree that the aquifer shall be used in such a way as to deplete it. If the Parties have left planning and management decisions to the Commission, the Commission could be given the express power to prepare a plan without waiting for the Parties to act. It is worth making special note of the merit of rationally deciding to mine groundwaters in appropriate circumstances. It has been postulated that a principal purpose of groundwater laws should be "to provide for an orderly development of groundwater supplies, in the interest of the best utilization of this

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72. Bagley, *Water Rights Law and Public Policies Relating to Ground Water "Mining" in the Southwestern States*, 4 J. L. & ECON. 144, 147 (1961).

73. *Id.* at 153 (emphasis added).

natural resource."<sup>74</sup> Therefore, these laws ordinarily do not sanction diversions that would adversely affect the "complete development of the safe yield found to exist in the area,"<sup>75</sup> in order to preserve the water supply in perpetuity. This is an admirable statement when related to "flow" groundwaters, but what of "stock" groundwaters?

The decision in "stock" groundwaters is "whether and when to use"<sup>76</sup> them, because they are not a replenishing, perpetual supply. In order not to oversimplify, it must be pointed out that flow resources groundwater also can be mined when withdrawals exceed recharge, and this fact is what actually gives rise to the concept of sustained yield.

There may be situations where it is advisable to "mine" water in basins where there is significant but inadequate recharge to meet water needs. Such decisions should be made consciously, with the knowledge of the economic consequences and the fact that future generations' options will be limited.

Corker argues that sustained yield should not be a sacred principle. The decision to mine can be a rational alternative, but that "'safe yield,'" if a proper term can be discovered or if the old term can be acceptably defined, should be the basis of operation of every groundwater resource,<sup>77</sup> until the decision to mine is made consciously and with full knowledge of its implications.

Development has to be made in an orderly, rational manner, based upon thorough investigation and consideration. This is particularly so where the groundwater resource is divided by an international boundary, in view of the fact that damage done to the resource and to the other country cannot easily be corrected by natural recharge. At least these "'stock' groundwaters once removed, are for all practical purposes gone forever."<sup>78</sup>

The New Mexico Supreme Court has recognized the validity of mining groundwaters for reasoned policy goals and at the same time recognized the need for careful management of such mining.

[T]he administration for a non-rechargeable basin, if the waters therein are to be applied to a beneficial use, requires giving to the stock or supply of water a time dimension, or, to state it otherwise, requires the fixing of a rate of withdrawal which will result in a determination of the economic life of the basin at a selected time.

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74. W. HUTCHINS, *SELECTED PROBLEMS IN THE LAW OF WATER RIGHTS IN THE WEST* 178 (U.S. Dept. of Agric. Misc. Pub. No. 418, 1942).

75. *Id.*

76. Bagley, *supra* note 72, at 153.

77. C. CORKER, *GROUNDWATER LAW, MANAGEMENT AND ADMINISTRATION* 174 (Nat'l Water Comm'n 1971).

78. Fischer, *Management of Interstate Groundwater*, 7 NAT. RESOURCES L. 521, 524 (1974).



The very nature of the finite stock of water in a non-rechargeable basin compels a modification of the traditional concept. . . . Each appropriator, subsequent to the initial appropriation, reduces in amount, and in time of use, the supply of water available to all prior appropriators, with the consequent decline of the water table, higher pumping costs, and lower yield.<sup>79</sup>

### III. Economic Complexity

In Transboundary Groundwater Conservation Areas, the "time dimension"<sup>80</sup> is an essential aspect of the water right.<sup>81</sup> Particularly in closed or nontributary areas, the capability to plan depletion over a calculated period is essential. Often the hydrologic and economic considerations are quite complicated; for example, the State Engineer of New Mexico suggests that if it were determined to set

a fixed "life" for the basin and then apportion the water by fixing the annual rates for each nation, deferral of development would be discouraged and there would be a race to achieve the allowed rate of withdrawal at the earliest time to maximize the quantity that could be taken within the "life" of the basin. On the other hand, if there is no limitation on the annual rate, that nation which takes its allocated quantum at a slower rate will have greater pumping lifts and possibly a worse quality of water; this could be mitigated by imposing a reasonable limitation on the annual rate of withdrawal as well as specifying the quantum allocated to each nation. In most situations it probably would be useful also to require some areal distribution of withdrawals to insure that one country does not damage the other (and perhaps itself) by concentrating its withdrawals along the international boundary.<sup>82</sup>

The economic considerations can be even more complex in the case of transboundary aquifers in which the states sharing the aquifer are at different stages of economic development.

One commentator suggests that

the state with the higher development level will most likely be pumping water at faster rates than the neighboring state, giving rise to that state's fear of losing part of its resource endowment—the specter of "use it or lose it" may also be relevant from states' points of view.<sup>83</sup>

79. *Mathers v. Texaco, Inc.*, 77 N.M. 239, 243-44, 421 P.2d 771, 775 (1966).

80. Bagley, *supra* note 72, at 154-55.

81. *See Fundingsland v. Colorado Groundwater Comm'n*, 171 Colo. 487, 468 P.2d 835 (1970) (the court approved a rate of depletion based on a 25-year period).

82. Letter from S.E. Reynolds, State Engineer, Santa Fe, N.M., to Albert Utton (Aug. 29, 1977). *See* Bagley, *supra* note 72, at 159.

83. Muys, Cummings & Burke, *supra* note 18, at 59.

The problem can be illustrated by the following:

[S]uppose that on State A's side, substantial irrigation as well as municipal/industrial activity takes place. . . . Suppose also that State B has little in the way of economic activity in its area overlying the aquifer; . . .

Now suppose that States A and B enter into an agreement — compact—whereby each state is entitled to half of the recoverable stock plus half of annual recharge. While shares of the resource apportioned to each state are equal and might thereby seem equitable, it is highly unlikely that the end result would be so viewed. This follows from the fact that one can expect that State A will rapidly exhaust its share, while State B will develop and use (or attempt to use) its share in future years. Of course, as State A exhausts its "share" of the stock, State B's *access* to the resource is affected: recoverable stock may be affected; more importantly, water tables fall thereby increasing lifts and pumping costs. Thus, the economic "quality" of State A's share of the aquifer is quite high because pumping costs are relatively low; but the economic quality of State B's share is much lower because pumping costs will be higher.

The question becomes how to handle these problems and the same commentator suggests two possible approaches. One would be joint mining of the aquifer, but this could have the problem that

. . . (i) State B must accelerate its development so as to match its annual beneficial use of mined water (in quantitative, physical terms) to that of State A, a "solution" that State B might find highly objectionable; (ii) or State A must *reduce* its rate of mining to that required for State B's level of development, a "solution" that State A would surely find objectionable given the depressive effect implied for its current level of economic activity.<sup>84</sup>

Another solution would be to have State A compensate State B for the additional pumping and other costs incurred by State A's earlier use of the groundwater stock. Cummings suggests that

State A would compensate State B for all external costs. While this solution is simply stated, its application will undoubtedly be much less simple. Higher pumping costs to State B, one of the bases for compensation, must be related to that proportion of total mining by State A that gives rise to higher costs to State B. Such calculations may be a source of serious controversy, particularly in (usual) instances where the structure of the shared aquifer varies across the transboundary area.<sup>85</sup>

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84. *Id.* at 63.

85. *Id.*

Yet a third possibility would be for State B to transfer a portion of its present allocated uses to State A pursuant to Article IX for a fixed term at a negotiated price.

#### IV. *Some Physical Considerations*

When an aquifer is being mined, a common problem is degradation of water quality due to the intrusion of unusable water. This problem is especially significant where the aquifer is a practically closed system, stock resource, since these aquifers generally contain greater concentrations of dissolved solids. This consequence represents a fundamental limitation on how much can be withdrawn from an aquifer.<sup>86</sup>

It should be noted that when a flow resource is studied for possible depletion, a lowering of the water table can result in a savings of water since less is lost through evaporation. This might also result in undesired environmental and economic changes when wetlands disappear.

#### V. *A Final Caveat*

In allowing the mining of groundwater stocks, annual water withdrawals are, by definition, at levels which are not sustainable over an indefinite period of time. Groundwater mining allows an expansion in economic activity in the area and the attending in-migration of people and an expansion of private and social infrastructure (roads, hospitals, utility facilities, etc.). Once these economic structures are in place—communities and institutions exist—the Commission must anticipate the problems of *dismantling* these structures when the inevitable time comes at which levels of water use must decline. Too often, the falling water tables which must attend the sustained mining of an aquifer give rise to strong political pressures for some means of “rescuing” the water short area; see, for example, the controversy surrounding the Central Arizona Project in the United States.<sup>87</sup> The essence of the “rescue operation” problem is described as follows:

Labor and Capital in irrigation areas may be immobile over substantial periods of time once the areas have been developed. Land improvement investments are sunk and capital equipment . . . may have only low salvage values. Agricultural labor may not have the skills required to make moving attractive. . . . Making new (water) supplies available to such regions may be termed a ‘rescue operation.’<sup>88</sup>

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86. For example see Charbeneau, *Groundwater Resources of the Texas Rio Grande Basin*, 22 NAT. RES. J. 957, 969 (1982).

87. M.M. KELSO, WILLIAM E. MARTIN & LAWRENCE E. MACK, WATER SUPPLIES ARE ECONOMIC GROWTH IN AN ARID ENVIRONMENT, AN ARIZONA CASE STUDY (1973). See also R.G. Cummings, *Interbasin Water Transfers, A Case Study in Mexico* (1974) (Chapter 1, section 3).

88. CHARLES W. HOWE & K. WILLIAM EASTER, *INTERBASIN TRANSFERS OF WATER* 28 (1971).

## ARTICLE VIII—PLANNING AND MEASURING FOR DROUGHT CONDITIONS

- I. Recognizing that drought conditions occur from time to time, the Commission shall within \_\_\_\_\_ year(s) develop a Drought Management Plan for the administration and allocation of shared water resources, including transboundary groundwaters, during periods of drought.
- II. This Plan may authorize the use of certain groundwaters as a “drought reserve,” and, therefore, the conjunctive management of ground and surface water supplies.
- III. This Plan shall be submitted to the Governments.
- IV. After acceptance of the Plan, the Commission shall be empowered to take action applicable to any part or all of a Transboundary Groundwater Conservation Area. Consistent with the Plan, the authority of the Commission shall include but shall not be limited to the declaration of “drought alerts,” and in connection therewith the imposition of measures for the emergency management of groundwater supplies conjunctively with surface water supplies.
- V. The conservation and emergency management measures decided upon from time to time by the Commission under paragraph IV of this Article shall remain in effect and shall be implemented and observed by the Parties until modified or terminated by the Commission. Provided that all such measures shall cease to be binding upon the termination of the “drought alert” or “drought emergency” by the Commission and provided that the Governments, by agreement, may at any time impose extraordinary measures not authorized under the said Plan.
- VI. Enforcement in the territory of each of the Parties of the actions and measures taken under this Article shall be the responsibility of the respective Governments.
- VII. The Drought Management Plan may include structural or nonstructural measures; the mining of groundwater at variance with any groundwater management plan as provided by Article VII; apportionment; and/or other interim or permanent measures.
- VIII. The Commission in prescribing measures during a declared “drought emergency” may reduce or increase the total allowable withdrawal from Transboundary Groundwater Conservation areas, but the Commission shall maintain to the extent practicable the equitable sharing of benefits and burdens on both sides of the border.

## COMMENT ON ARTICLE VIII

I. There are three essential aspects to the Commission's function concerning drought: The Commission must have the ability to anticipate it, research the consequences of drought, and develop a plan for the best measures to alleviate its harsh consequences. This Article is written so as to allow for either reducing or increasing withdrawals in the event of drought. The plan must be approved by the respective governments.

II. Conjunctive management of the resource treats both surface and groundwaters as one system, using groundwater when surface flows are reduced and then using aquifers for storage when surface flows increase. Aquifers often are not immediately affected by droughts as are surface flows, and may provide excellent storage to be used to make up for reduced surface flows. For this reason, increased withdrawals may be desirable in case of drought. In other situations, prudent management could call for reduced withdrawals. For example, the Commission might reduce withdrawals in the event of a prolonged drought which would, in judgment of the Commission, significantly affect recharge.

As an example, one might cite the Delaware River Basin Compact, Art. 3.3(a) and Art. 10.4 (Emergency). Also, Teclaff in *Abstraction and Use of Water*, gives some examples of reduction in use of water during time of drought.<sup>89</sup>

III. The response to drought may be phased according to the length of the drought.

It should be noted that the Working Group specifically concluded that emergency plans should include non-structural measures including, but not limited to, insurance, and disaster relief to mitigate the consequences of drought.

IV. Paragraph IV of this article contemplates an equitable sharing of the burdens or hardship associated with drought. It was suggested that any increase or reduction in withdrawals shall be borne by each Party in proportion to the contemporary allowed withdrawal. The precise language suggested was "Each state's withdrawal otherwise allowable under an equitable apportionment and/or prescribed interim or permanent measures accordingly shall be increased or reduced proportionally." This was bothersome, however, to some commentators because the mandatory proportional sharing of the burden was seen as unnecessary and restrictive. It was pointed out that a Party might wish to give up its share for future gains. It was generally agreed that the Commission should determine the allocation of burden without relying on a rigid proportional formula.

It is interesting to note that the United States Supreme Court in *Arizona v. California*, rejected the special master's recommendation that there should be a "pro rata sharing of water shortages." The Court said that

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89. UNITED NATIONS, A COMPARISON OF LEGAL REGIMES 220 (1972), U.N. Doc. ST/ECA 154.

although the pro rata approach “seems equitable on its face . . . we should not bind the Secretary to this formula.”

The Court went on to give the Secretary flexibility to “devise reasonable methods of his own” and concluded “the Secretary may or may not conclude that a pro rata division is the best solution.”<sup>90</sup>

#### ARTICLE IX—TRANSFERS OF TRANSBOUNDARY GROUNDWATERS

Nothing in this agreement shall be so construed as to prevent either short-term or long-term transfers of waters to the other side of the common border under terms and conditions agreed to by the Commission.

In approving any transfer, the Commission must be assured that the transfer is consistent with established programs to protect the quantity and quality of the groundwaters in a Transboundary Groundwater Conservation Area.

#### COMMENT ON ARTICLE IX

The Comments to Article V, *supra*, point out that any apportionment of a water resource is subject to the criticism of inflexibility. The concept of transboundary transfers is rather novel for international water resources and remedies the inflexibility problem to a substantial extent. The transfers would be for fixed terms and subject to approval by the Commission.

One commentator has suggested that transfers could result in problems due to the financial inequality of the Parties, which, if unchecked, could undermine the benefits derived from an agreement. On the other hand, transfers can be an effective method for nations that have not fully developed their allocation of the resource to achieve an immediate benefit without forfeiting any rights to the future use of the resource. Any contemplated transfer must be approved by the Commission.

Another alternative discussed, but not adopted, would have made the Commission a water broker. Under this suggestion, where an aquifer is to be apportioned a certain percentage that could be used by any Party on a temporary basis would be allocated to the Commission. In this alternative, the Commission would be acting as a water broker and would have control over these uses to insure that an undesired increase in the total use of the resource did not result.

#### ARTICLE X—WATER QUALITY

##### *Option 1*

- I. The Parties undertake cooperatively to preserve and to improve, insofar as practicable, the quality of trans-

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90. 373 U.S. 546, 553 (1963).

boundary groundwaters in conjunction with their individual and joint programs for surface water quality control, generally, and to avoid appreciable harm to the territory of either Party.

- II. The Commission shall biennially conduct a review of the measures undertaken within each Party's territory and shall issue a report containing its assessment of the adequacy and effectiveness of programs of use, protection, and control of the Parties' shared groundwaters with particular attention to any declared Transboundary Groundwater Conservation Area.

### *Option 2*

- I. The Parties shall monitor pollution of transboundary groundwaters and after classifying them according to use:
  - A. identify toxic and hazardous pollutants;
  - B. maintain a continuing record of such substances from origin to disposal;
  - C. monitor the storage of toxic wastes;
  - D. provide the Commission with an inventory of dumpsites, abandoned as well as active, that have the potential for causing transboundary groundwater pollution.
- II. The actual administration of water quality standards and regulations within the territory of each Party shall be the responsibility of each Party respectively or its political subdivisions, as appropriate. In addition, the Commission shall biennially conduct a review of the measures undertaken within each Party's territory and shall issue a report containing its critique of the adequacy and effectiveness of programs of use, protection and control of the Parties' shared groundwaters with particular attention to any declared Transboundary Groundwater Conservation Areas. To that end each Party shall furnish the Commission through its National Section the relevant data and information on which the Commission must base its report in accordance with the reporting scheme provided by the Commission.

### *Option 3*

- I. The Commission shall formulate a Water Quality Pro-

- tection Plan to prevent and eliminate degradation of transboundary groundwater quality.
- A. The plan shall provide for the establishment of a sufficient number of test wells and other measures for monitoring and inspection for water purity.
  - B. The plan shall provide for contingency cleaning measures and financial responsibility for clean up.
- II. For that purpose the Commission shall classify transboundary groundwaters according to use and promulgate water quality standards and regulations. These standards and regulations shall, *inter alia*
- A. identify toxic and hazardous pollutants;
  - B. require a continuing record of such substances from origin to disposal;
  - C. establish approved routing plans for the transportation of toxic and hazardous pollutants;
  - D. establish criteria for the safe storage of wastes;
  - E. provide for the inventorying of dumpsites, abandoned as well as active, that have the potential for causing transboundary pollution.
  - F. provide for the establishment of protective zones in which land use may be regulated, if necessary.
- III. The actual administration and enforcement of water quality standards and regulations within the territory of each Party shall be the responsibility of each Party respectively or its political subdivisions as appropriate. In addition, the Commission shall biennially conduct a review of the measures undertaken within each Party's territory and shall issue a report containing its assessment of the adequacy and effectiveness of programs of use, protection, and control of the Parties' shared groundwaters with particular attention to any declared Transboundary Groundwater Conservation Areas.
- IV. In authorizing any discharge into transboundary groundwaters, or recharge areas, the Parties shall follow and enforce the standards, criteria, regulations and prohibitions established by the Commission.
- V. Each of the Parties covenants and agrees to prohibit and control pollution in Transboundary Groundwater Conservation Areas according to the Water Quality Protection Plan, standards, and regulations promulgated by the Commission, and to cooperate faithfully in the control of future pollution and abatement of existing pollution.



## COMMENT ON ARTICLE X

I. Water quality issues were of great concern to the Ixtapa Working Group, and there was great diversity of opinion as to what was the best approach. Therefore three different options are presented which range from what some called a "mere exhortation" to what others called "cradle to the grave regulation."

The quantity of groundwater available for use is limited by the quality of the resource. Groundwater is particularly susceptible to contamination, and, unlike surface water, once contaminated it is practically impossible to rehabilitate an aquifer at the present time. Some members of the Working Group felt that water quality might best be dealt with by a separate agreement rather than combining it with allocation issues in this document. Others felt that it was imperative that preservation of water quality be an express goal because if it were not mentioned, nothing would be done by any Party to prevent the deterioration of aquifers.

II. There was considerable difference of opinion within the Working Group over how extensive the power and jurisdiction of the Commission should be.

Some members definitely preferred a more general approach in which the specific powers given to the Commission were limited, and argued that to attempt to do more was politically unrealistic. There also was concern over the administrative burden and expense of "cradle to the grave" regulation. "Too much specificity and administrative responsibility could lead to agency overload and ineffectiveness." In addition, one commentator said "I prefer the more general option. The other options deal specifically with water quality and hazardous wastes, and I am not sure we yet know the best way to regulate groundwater pollution."

Others preferred to detail extensive powers for the Commission. They argued that "the problems are serious and therefore this draft should not be timid, but rather should be a model of what should be done, not necessarily only what can be done." One commentator said "Why are we bold when it comes to apportioning groundwater and timid in regard to groundwater quality?" Another who favored greater specificity said "this is a new area in water treaties; there are few guidelines and precedents. A detailed provision would be useful as a model and as a help to the Commission."

Many aspects of a water quality issue involve value judgments upon which Parties may be able only to agree to disagree, including such fundamental considerations as what constitutes a pollutant, and what is an acceptable concentration of the pollutant. With this in mind, plus the spectrum of opinion reflected by the Working Group, a series of options was developed to allow for gradations in the extent to which Parties could delegate such issues to a commission.

*Option 1*

Here the Parties expressly recognize a duty of each not to cause substantial harm to the others. The Commission acts as a "conscience," biennially reviewing the actions of each Party to the extent that the duty to other Parties is not forsaken. Where Parties cannot agree, except as to the existence of a mutual duty not to harm, this option would be appropriate.

*Option 2*

In addition to the general duty recognized in Option 1, Option 2 creates a duty on all Parties to monitor pollution and classify all transboundary groundwaters as to use. Additionally, each Party must identify pollutants and monitor their use within its territory. With this data available the Commission can competently assess the availability of an aquifer for certain uses, and whether it is endangered to the extent that it should be declared to be a TGCA.

Actual administration is left to the Parties, allowing them to make decisions based upon their political, social, and economic considerations that inform a water quality decision. This can minimize the intrusion into the sovereignties of the Parties.

*Option 3*

This option gives the Commission the most comprehensive responsibilities to deal with water quality problems. It is not without precedent to give a Commission broad authority to control pollution in a transboundary situation. The Delaware River Basin Commission has been given substantially more power than that proposed in Option 3. Of course, it should be observed that the Delaware River Basin Compact is interstate and not international, and was negotiated under the umbrella of a federal system. Further, even within the context of an overriding federal constitution, it has been unusual to grant such extensive powers to a Commission. Negotiating an international agreement could be expected to be even more difficult.

The Delaware River Basin Compact in Section 5.1 provides that "the Commission may assume jurisdiction to control future pollution and abate existing pollution. . . ." <sup>91</sup> Further, the Commission can "establish standards of treatment of sewage, industrial or other waste. . ." and can adopt "rules, regulations and standards to control such future pollution and abate existing pollution. . ." In addition, the Commission can issue orders to cease the "violation of such rules and regulations as it shall

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91. Delaware Basin River Compact, Pub. L. No. 87-328, 75 Stat. 688 (1961).

have adopted. . . .” The courts of the signatory Parties shall have jurisdiction to enforce . . . any such order.”<sup>92</sup>

In contrast to this extensive power of the Commission itself to establish its regulations, the Ixtapa Group left the actual enforcement to the Parties within their respective territories.

Many of the concepts contained in this option are adapted from interstate compacts and the practice of the European Economic Community

92. *Id.* at §§ 5.2, 5.3 and 5.4 merit quoting in full (emphasis added):

5.2 Policy and Standards. *The Commission may assume jurisdiction to control future pollution and abate existing pollution* in the waters of the basin, whenever it determines after investigation and public hearing upon due notice that the effectuation of the comprehensive plan so requires. *The standard of such control shall be that pollution by sewage or industrial or other waste originating within a signatory state shall not injuriously affect waters of the basin as contemplated by the comprehensive plan.* The commission, after such public hearing may classify the waters of the basin and establish standards of treatment of sewage, industrial or other waste, according to such classes including allowance for the variable factors of surface and ground waters, such as size of the stream, flow, movement, location, character, self-purification, and usage of the waters affected. After such investigation, notice and hearing *the commission may adopt and from time to time amend and repeal rules, regulations and standards to control such future pollution and abate existing pollution,* and to require such treatment of sewage, industrial or other waste within a time reasonable for the construction of the necessary works, as may be required to protect the public health or to preserve the waters of the basin for uses in accordance with the comprehensive plan.

5.3 Cooperative Legislation and Administration. *Each of the signatory parties covenants and agrees to prohibit and control pollution of the waters of the basin according to the requirements of this compact* and to cooperate faithfully in the control of future pollution in and abatement of existing pollution from the rivers, streams, and waters in the basin which flow through, under, into or border upon any of such signatory states, and in order to effect such object, agrees to enact any necessary legislation to enable each such Party to place and maintain the waters of said basin in a satisfactory condition, available for safe and satisfactory use as public and industrial water supplies after reasonable treatment, suitable for recreational usage, capable of maintaining fish and other aquatic life, free from unsightly or malodorous nuisances due to floating solids or sludge deposits and adaptable to such other uses as may be provided by the comprehensive plan.

5.4 Enforcement. *The commission may, after investigation and hearing, issue an order or orders* upon any person or public or private corporation, or other entity, *to cease the discharge of sewage, industrial or other waste into waters of the basin which it determines to be in violation of such rules and regulations as it shall have adopted* for the prevention and abatement of pollution. Any such order or orders may prescribe the date, including a reasonable time for the construction of any necessary works, on or before which such discharge shall be wholly or partially discontinued, modified or treated, or otherwise conformed to the requirements of such rules and regulations. Such order shall be reviewable in any court of competent jurisdiction. *The courts of the signatory parties shall have jurisdiction to enforce against any person, public or private corporation, or other entity, any and all provisions of this Article or of any such order.* The commission may bring an action in its own name in any such court of competent jurisdiction to compel compliance with any provision of this Article, or any rule or regulation issued pursuant thereto or of any such order, according to the practice and procedure of the court.

Delaware River Basin Compact, Pub. L. 87-328, 75 Stat. 688 (1961). See INTERNATIONAL GROUNDWATER LAW (L. Teclaff & A. Utton eds. 1981).

without, however, giving the Commission a supranational character. It is desirable that the Commission would first of all formulate a general plan, and this is generally the task of international bodies even with weak advisory powers.

Classification and setting of standards are powers given to the Delaware River Basin Commission<sup>93</sup> (but contrast the Susquehanna Commission, which has weaker powers).<sup>94</sup> The Lake Lemman Convention of 1962, Art. 3,<sup>95</sup> provides for the drafting of regulations, and the Franco-Swiss Genevese Aquifer Arrangement of 1977, Art. 16,<sup>96</sup> for classification and standard setting. In the Great Lakes Agreement of 1978<sup>97</sup> the Commission has weaker powers, but the General and Specific Objectives in that treaty are a form of classification, as are the limited use zones. The EEC directives<sup>98</sup> all have standards and lists of polluting substances.

The importance of classification is shown by the protection of drinking water. One kind of classification is the "sole source" if it is the sole or principal drinking water source for an area. Such designated protection zones should include, if possible, the entire area of an aquifer shared by two or more states or at least that part of it in which activity in one state might cause pollution in another state or states.

Zero pollution may be the ideal objective, but it would be hard to achieve and may not be necessary. It is now generally understood, however, that toxic pollutants have to be more stringently controlled than other pollutants, and this is recognized in surface water provisions as, e.g., in the Great Lakes Agreement of 1978.<sup>99</sup> It is even more important for groundwater because of the enduring nature of such pollution, and the EEC Council Directive of 1979 on the Protection of Groundwater Against Pollution Caused by Certain Substances<sup>100</sup> exemplifies the concern, with its Lists I and II of prohibited and limited discharges, similar to the "black" and "grey" lists in marine conventions.

Because groundwater pollution often originates on land with no actual water use involved, it was argued that the Commission should have the

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93. *Id.*

94. Susquehanna River Basin Compact, Pub. L. 91-575, 84 Stat. 1509 (1970). See INTERNATIONAL GROUNDWATER LAW, *supra* note 93.

95. Convention on Protection of Lake Lemman Waters Against Pollution, Nov. 16, 1962, France-Switzerland, O.E.C.D. 418 (1978).

96. Arrangement relating to the Franco-Swiss Genevese aquifer, Sept. 6, 1977, France-Switzerland. See INTERNATIONAL GROUNDWATER LAW, *supra* note 93.

97. Agreement on Great Lakes Water Quality, 1978, United States-Canada, 30 U.S.T. 1383, T.I.A.S. No. 9257.

98. Proposal for Council Directive on Water Pollution from Wood Pulp Mills (20 Jan. 1975). 18 O.J. Eur. Comm. (No. C 90) 2, 2.5 (1975).

99. *Supra* note 98, at Art. V.

100. Council Directive on the Protection of Groundwater against Pollution Caused by Dangerous Substances (17 Dec. 1979), O.J. Eur. Comm. (No. L 20) 43; 26.1 (1980).

power to establish protective zones in which land use is regulated to control the entry of pollutants. Land use concepts, such as the "limited use zone," should be employed, whereby specific contaminating activities such as waste disposal would be limited to specific areas so as to contain the most polluting activities within the smallest possible area and thereby isolate them from areas of natural recharge value.<sup>101</sup> The prospect of an international agency having land use responsibilities, however, caused considerable discomfort among the members of the Working Group. This touches the most sensitive nerves of territorial integrity. One participant said, "Be careful of intruding into the national territory" and "Are we going too far?"

The concepts of "limited use zones" and "sole source" are really counterparts to each other. The sole source designation excludes polluting activities from the vicinity of the source of drinking water, and limited use zones confines contaminating activities to limited areas. Limited use zones are provided for in the Great Lakes Agreement of 1978.<sup>102</sup> The Finland-Sweden Agreement of 1971 on Frontier Rivers<sup>103</sup> (which pertains to groundwater also) contains a list of factories and other installations which may not be constructed without specific permission. The concept of zones is well known in municipal law, e.g., the Swiss Federal Law of 1971,<sup>104</sup> which empowers the cantons to establish protective zones. An outstanding example nearer home is the Long Island 208 Plan,<sup>105</sup> which divides Nassau and Suffolk counties into eight management zones, each with its own water quality objectives and land use guidelines.

It should be noted, though, that most political bodies would be very reluctant to give up the power to regulate land use.<sup>106</sup> Unlike agreements concerning surface waters where contamination can have a direct and immediate effect on an economic system, the contamination of an aquifer from land use is not as readily observed, and does not *seem* as urgent. Therefore, there is less incentive for a Party to give up this planning power.

The necessity for monitoring and continued supervision goes without

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101. L. Teclaff & E. Teclaff, *supra* note 54, at 629.

102. *Supra* note 98, at Art. IV.

103. Agreement concerning Frontier Rivers, Dec. 15, 1971, Finland-Sweden, 825 U.N.T.S. 272 (1972).

104. Federal law on . . . pollution (Switzerland 1971). II Feuille federale 909 (1971).

105. § 208 of the U.S. Clean Water Act, 33 U.S.C. §§ 1251, 1288(b)(2)(G) (Act of June 30, 1948, ch. 758, Titles I-V, as added Oct. 18, 1972, Pub. L. No. 92-500 § 2, 86 Stat. 816 and Dec. 27, 1977, Pub. L. No. 95-217 §§ 39-41, 5, 91 Stat. 1581), gives states power to engage in area-wide planning for wastewater pollution control. See Tripp & Jaffe, *Preventing Groundwater Pollution: Toward a Coordinated Strategy to Protect Critical Recharge Zones*, 3 HARV. ENVTL. L. REV. 1, 43-46 (1979).

106. See ARSANJANI, INTERNATIONAL REGULATION OF INTERNAL RESOURCES: A STUDY OF LAW AND POLICY 61 (1981).

saying. Monitoring is expressly provided for in the following agreements and directives: Great Lakes Agreement of 1978, Art. VI(1)(m); Rhine Chlorides Convention of 1976, Art. 12; Franco Swiss Genevese Aquifer Arrangement, Art. 16; EED Titanium Dioxide Directive of 1978 (especially on crossfrontier pollution); EEC Drinking Water Directive of 1975, Art. 6; and EEC Groundwater Directive of 1979, Arts. 8, 9, and 16.

A contingency plan is provided for in the Great Lakes Agreement, Art. VI (1)(i); also in the U.S. Clean Water Act, revamped in the Superfund legislation (Comprehensive Environmental Response, Compensation and Liability Act of 1980).<sup>107</sup>

Cleanup is very important in groundwater pollution and is recognized as established in U. S. federal law for oil and hazardous pollution of surface waters. The Superfund legislation provides for financing not only of water cleanup, but also of contaminated land which may present a pollution hazard. The Superfund has already been used for the cleanup of groundwater contamination in several states.<sup>108</sup> Financial responsibility for defective operation of a groundwater recharge station is also established in the Franco-Swiss Genevese Aquifer Arrangement of 1977, Art. 18; and the Rhine Chlorides Convention of 1976, Art. 7, also provides for a financing plan, the cost of which is to be prorated among the Parties.

Enforcement is left to the contracting Parties in accordance with the general enforcement of provisions of this agreement. A similar arrangement is quite common in federal law, as in the U. S. Clean Water Act<sup>109</sup> and in the Swiss federal law on pollution of 1971, Art. 2.<sup>110</sup> It is also to be found in the EEC Council directives, which leave implementation to the member states, and in the Rhine Chlorides Convention of 1976, Arts. 3 and 12.

#### ARTICLE XI—PUBLIC HEALTH EMERGENCIES

- I. Upon a determination that there is an imminent or actual contamination of groundwater, the Commission may, after notification to the respective Governments, declare a public health emergency.
- II. On the basis of the declaration, which shall not last for more than \_\_\_\_ days, the Commission shall have authority to:

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107. Clean Water Act 33 U.S.C. §§ 1251, as amended by Comprehensive Environmental Response, Compensation and Liability Act of 1980, Pub. L. No. 96-483 (1981), 94 Stat. 2767 [codified at 42 U.S.C. §§ 9601-57 (Supp. V 1981)].

108. 42 U.S.C. § 9601 (1981). See Dycus, *Development of National Groundwater Protection Policy*, 11 ENVTL. AFFAIRS L. REV. 211, 265 (1984).

109. 33 U.S.C. § 1288 (1981).

110. Federal Law on Pollution FF 11 (1971) 909.

- A. investigate the area of imminent or actual contamination;
- B. alert the affected parts of the imminent or actual health danger; and
- C. undertake, in consultation with the Parties, all necessary measures to eliminate the imminent or actual health danger.

#### COMMENT ON ARTICLE XI

##### *National Standards of Public Health*

I. The problem of defining what constitutes a "public health emergency" caused by contamination of transboundary groundwater is best illustrated by examination of the double ambiguity over (a) what is an unacceptable level of "public health" and (b) when is the probability of a drop in the level of "public health" sufficiently serious to constitute an emergency.

Between nations there will invariably be differences as to what levels of general public health the respective populations find acceptable. These variations make the protection of transboundary groundwaters more difficult and complex. Public health measures cannot be unilaterally imposed. Therefore, where pollution in one nation will affect the public health of the citizens of another, as noted in Article X, there is a need for cooperative action. This is particularly so in emergency situations.

##### *Mutual Agreement as to What Constitutes an Emergency*

Because of the nature of groundwater, which makes the location and extent of contamination difficult to predict, the constant changes in the types of toxic and dangerous substances to which the environment is exposed, and our evolving knowledge of the relationships of exposure to health, it is difficult to anticipate in a treaty what will constitute an emergency upon which parties can agree absent the facts of specific situations. The water quality section, Article X, of the treaty calls for the development of background data on water quality and the designation of critical public health areas that, because of the nature and source of their groundwater, are particularly vulnerable. This emergency provision simply empowers the Commission to act quickly at times when speed is important in preventing irreversible or extreme damages. Cooperation in scooping up and containing contaminated soils immediately after a toxics spill may, for instance, prevent contamination from ever reaching groundwater. The immediate provision of the alternative sources of drinking water may prevent serious and widespread damage to health. This article is intended to provide authority to act quickly when there is agreement that such action is needed.

## ARTICLE XII—ADMINISTRATION

- I. Administration of transboundary groundwater use in that portion of a Transboundary Groundwater Conservation Area located within the territory of a Party to this agreement shall be within the jurisdiction and responsibility of that Party or its political subdivisions, as appropriate.
- II. The Commission shall monitor the measures undertaken by each Party to implement this agreement, including measures decided upon by the Commission.
- III. The Commission shall biennially conduct a review of the measures undertaken within each Party's territory and shall issue a biennial report containing its assessment of the adequacy and effectiveness of programs of use, protection and control of the Parties' shared groundwaters with particular attention to any Transboundary Groundwater Conservation Area. To that end each Party shall furnish the Commission through its National Section the relevant data and information on which it must base its report in accordance with the reporting scheme provided by the Commission.
- IV. After investigation, notice, and hearing the Commission is empowered to adopt, promulgate, and from time to time amend and repeal such rules, regulations, and standards as may be necessary within the scope of this agreement, which become binding on the Parties if not disapproved by one of the Governments within 180 days of issuance.
- V. The settlement of all disputes which may arise out of the observance, implementation, and interpretation of this agreement shall be entrusted to the Commission.

## COMMENT ON ARTICLE XII

The actual administration of transboundary groundwater uses within the territory of a Party would be under its jurisdiction and its appropriate political sub-divisions. This is designed to minimize impinging on the territorial integrity of the Parties. The United States Supreme Court in the equitable apportionment case of *Nebraska v. Wyoming* spoke in support of giving each State "full freedom of intrastate administration of her share of the water. . . ." and "internal administration for each of the States."<sup>111</sup>

The mandatory duties of the Commission are monitoring the actions of the Parties under the agreement and issuing biennial reports. Basic to the monitoring process of the Commission is the continuing acquisition

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111. 325 U.S. 589, 599 (1945).



of information obtained from the metering of wells. "There must be a system of measurement of withdrawals from wells. . . . Records must be kept of withdrawals over a period of time,"<sup>112</sup> and the Commission must be able to ensure that withdrawals do not exceed allocated amounts in the Transboundary Groundwater Conservation Areas which are based on calculated mining programs or a determined sustained yield in terms of water quality and water quantity.<sup>113</sup>

The annual report would establish, among other things, whether a Party is meeting its responsibilities under this Agreement. These mandatory duties would seek to ensure that each Party lives within the total water budget allocated to it, whether allocated by uses or volume. Paragraph IV gives the Commission the necessary power to promulgate rules after investigation, notice, and hearing. The idea of notice and hearing at the international level is somewhat uncommon, but does allow the input of interested parties which can be useful in formulating policy. This follows the example of the Delaware River Basin Compact which provides in Section 5.2:

After such investigation, notice and hearing the commission may adopt and from time to time amend and repeal rules, regulations and standards to control such future pollution and abate existing pollution, and to require such treatment of sewage, industrial or other waste within a time reasonable for the construction of the necessary works, as may be required to protect the public health or to preserve the waters of the basin for uses in accordance with the comprehensive plan.

Paragraph IV provides that the rules and regulations of the Commission shall become effective and binding on the Parties if not disapproved by one Party within 180 days of issuance. If a nation has left regulation up to its political subdivisions, this type of consent might not be sufficient and difficult to achieve. Some commentators felt that "180 days is inadequate."

Other sections of this Article which would spell out procedures to be used in the event of irreconcilable differences between the members of the Commission might also be desirable. Perhaps other powers of the Commission pertaining more explicitly to groundwater. e.g., power to sue, should be enumerated (see Susquehanna River Basin Compact, Sec. 5.3.(b)). As we have seen in the comments to Article X, *supra*, the Delaware River Basin Compact gives the Commission itself extensive enforcement power in Section 5.4.

The challenges to enforcement should not be underestimated. Cummings illustrates two difficulties in limiting groundwater use with an

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112. Clark, *supra* note 42, at 159.

113. *Id.*

example from the Costa de Hermosillo, located in the northern state of Sonora, Mexico. The Costa de Hermosillo is one of Mexico's most productive irrigation districts, and its sole source of water for irrigation in groundwater is a coastal aquifer. Years of groundwater mining resulted in falling water tables, which, in turn, resulted in the intrusion of seawater into the aquifer.

In an effort to limit the destructive effects of seawater intrusion, the Water Resources Ministry (Secretaría de Recursos Hidraulicos, SRH) limited each farmer's pumping rate and, to enforce this limit, required the installation of meters on all pumps. A few years passed, water tables continued to fall, and seawater intrusion continued despite apparent "compliance" with SRH limits on groundwater use: innovative farmers had discovered myriad of ways of bypassing meters. By the mid-1970 the seawater intrusion problem had worsened considerably, thereby forcing the SRH to adopt relatively dramatic management/enforcement policies. Exorbitant fines were imposed on pumping in excess of limits. For enforcement, *three* measures of water use were devised: the amount recorded on the meter; the amount implied by electricity use (each meter was put on a separate electric meter); and the amount implied by the number of acres irrigated by the farmer. Pump limits were then compared with that amount of water implied by the higher of those three measures.<sup>114</sup>

Cummings concludes that this example illustrates two aspects of trans-boundary groundwaters. First, users in an unregulated environment have no incentives for conserving the common property resource stock—private incentives are to pump water so long as the value created by water exceeds pumping costs. He suggests this can be corrected through economic incentives such as pumping charges under a scarcity or corrective tax concept. He concludes secondly, that the Commission must have regulatory/enforcement powers that apply to all of the numerous individual pumps, and it must monitor water use of all users.<sup>115</sup>

#### ARTICLE XIII—EXISTING RIGHTS AND OBLIGATIONS

Nothing in this Agreement shall be deemed to diminish the rights and obligations of the Parties as set forth in existing agreements between the Parties.

#### ARTICLE XIV—AMENDMENT

This Agreement may be amended by agreement of the Parties.

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114. Muys, Cummings & Burke, *supra* note 18, at 151.

115. *Id.*

## ARTICLE XV—ENTRY INTO FORCE

This Agreement shall enter into force upon signature by the duly authorized representatives of the Parties.

## ARTICLE XVI—RESOLUTION OF DISPUTES

## COMMENT ON ARTICLE XVI

I. The question of dispute resolution is of particular importance and is one that has to be tailored to the specific needs of the particular parties.

Therefore, this article flags the need to address the question, but leaves open the design of specific procedures since they need to be considered in the context of specific settings. Dispute resolution is "particularly urgent" because the lack of effective procedures may contribute to "delay of important projects, suspension of expensive works under construction . . . and inability to deal with very real hazards."<sup>116</sup>

Due to the elemental nature of water to the well-being of all human beings, disputes over water use should be settled in a quick and efficient manner. This point is emphasized in the Third Report to the International Law Commission on the Law of the Non-navigational Uses of International Watercourses.<sup>117</sup> Numerous examples of specific methods are provided in the report.

II. Some agreements provide a special procedure to negotiate a settlement to a dispute.

The Danube Navigation Convention of 1948 provides for the creation of a special body composed of one representative of each party and one additional member chosen by the President of the Commission.<sup>118</sup>

B. Another alternative is the appointment of an umpire on either a permanent or ad hoc basis. One agreement provides for a permanent umpire and a deputy, with special arbitrators who are appointed to handle specific disputes.<sup>119</sup>

C. The Helsinki Rules contain a model for a conciliation commission.<sup>120</sup>

116. Third Report on the Law of Non-Navigational Uses of International Watercourses. Int'l L. Comm'n, 34 U.N. GAOR; UN Doc. A/CN.4/348, at paras. 468-94 (1981).

117. *Id.*

118. Art. 45, 33 U.N.T.S. 196; TEXTS & TREATY PROVISIONS, *supra* note 28, at 420, 422.

119. Art. 70-72, Frontier Treaty between the Kingdom of the Netherlands and the Federal Republic of Germany of 8 April 1960. TEXT & TREATY PROVISIONS, *supra* note 28, at 757, 761-62.

120. Report of the Committee on the Uses of the Waters of International Rivers (London, Int'l Law Association, 1967).

MODEL RULES FOR THE CONSTITUTION OF THE  
CONCILIATION COMMISSION FOR THE SETTLEMENT OF A DISPUTE

*Article I*

The members of the Commission, including the President, shall be appointed by the States concerned.

### III. The Third Report to the International Commission succinctly surveys international practice:

When an accommodation is not achieved at the operating level, higher review must take place. This review can still be by water resources professionals, such as the members, or deputies, of the system States' international watercourse commission. Such arrangements are not uncommon in current system State practice.

An additional "professional" review may be obtained by reference of the question to a technical commission of inquiry. . . . As a further device to forestall the matter's hardening into a formal dispute between the parties, one or more additional "echelons" of review may be built into the system States' arrangements, such as a diplomatic commission specially constituted for the purpose. System States have, in particular agreements, employed a variety of accommodation mechanisms. Belgium and Germany combined diplomatic and technical representation in one joint administrative commission for the purpose of accommodating differences. Such a separate forum could be designated to function prior to the traditional "referral to the Governments," which may mean that the matter will then become a formal dispute.

After "referral to the Governments" of any difference that has not been resolved by the institutional machinery set up by the system

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#### *Article II*

If the States concerned cannot agree on these appointments, each State shall appoint two members. The members thus appointed shall choose one more member who shall be the President of the Commission. If the appointed members do not agree, the member-president shall be appointed, at the request of any State concerned, by the President of the International Court of Justice, or, if he does not make the appointment, by the Secretary-General of the United Nations.

#### *Article III*

The membership of the Commission should include persons who, by reason of their special competence, are qualified to deal with disputes concerning international drainage basins.

#### *Article IV*

If a member of the Commission abstains from performing his office or is unable to discharge his responsibilities, he shall be replaced by the procedure set out in article I or article II of this annex, according to the manner in which he was originally appointed. If, in the case of:

- (1) A member originally appointed under article I, the States fail to agree as to a replacement, or
  - (2) A member originally appointed under article II, the State involved fails to replace the member,
- a replacement shall be chosen, at the request of any State concerned, by the President of the International Court of Justice or, if he does not choose the replacement, by the Secretary-General of the United Nations.

#### *Article V*

In the absence of agreement to the contrary between the parties, the conciliation Commission shall determine the place of its meetings and shall lay down its own procedure.

States for the handling of their shared water resources affairs, the usual next step is direct negotiation between the parties at the political level. The project or programme at issue may be of such importance that even at this stage it may be prudent for the system States to arrange for some or all operations to continue, pending final resolution of the matter.

Failing settlement by high-level negotiation, the parties are, of course, free to take the dispute to the International Court of Justice. The International Court of Justice may in appropriate circumstances indicate provisional measures, which could serve the parties' interests in avoiding delay or disruption of critical water-related activities, or preclude irreversible harm. The parties are also free to refer the matter for adjudication to any other appropriate tribunal.

The fundamental requirement, in accordance with the Charter and the rules of contemporary international law, is settlement by peaceful means. In addition to resolution by means of negotiation, enquiry and adjudication, the parties may choose, among other peaceful means, conciliation, arbitration or the assistance of regional agencies or arrangements.<sup>121</sup>

IN WITNESS WHEREOF, the undersigned Plenipotentiaries, being duly authorized, have signed this Agreement.

DONE AT \_\_\_\_\_, this \_\_\_\_ day of \_\_\_\_\_, one thousand nine hundred and \_\_\_\_\_.

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121. *Third Report, supra* note 117, at 324.