THOU SHALL NOT COVET THY NEIGHBOR'S WATER: A LOOK AT THE JOURNEY BOTH TEXAS AND THE MIDDLE EAST MUST EMBARK UPON TO SOLVE THE KINKS IN THEIR WATER REGULATION

I. INTRODUCTION

When you think Texas, you likely picture the current President of the United States of America, George W. Bush. And, when you think President Bush, you likely think of the war in the Middle East. Regardless of political views on the matter, this serves as a connection between Texas and the Middle East. Yet, there is another, less obvious, connection that exists between these two areas: both face the challenge of how to structure their water regulation systems in order to preserve water for future generations.[1] After looking at the insufficient water regulations of Texas and countries in the Middle East, it becomes clear that both areas will need to undergo a massive overhaul in water regulations to ensure they preserve access to water. Each area will present two separate problems with regard to water regulations, but both may benefit from the same proscriptive measures in attempting to solve their water regulation problems.

II. BACKGROUND

A. Texas Background

1. Original Adoption

The English rule of capture[2] was adopted in the 1904 Texas case of *Houston & Texas Central Railway Co. v. East*.[3] In *East*, the plaintiff brought suit against the defendant railroad company for damages caused by digging a well that made the

1. *See* Noah Arre, Safe Water is Safe Life! How Safe Are Somalis in Water? (2001), http://www.watermagazine.com/secure/jc/somali.rtf (paper presented at the Eighth Congress of Somali Studies) ("Tensions over water permeate every region of the world, ranging from clashes between urban and agricultural water users to out right (sic) warfare in the Middle East.").

2. Harry Grant Potter, III, *History and Evolution of the Rule of Capture*, *in* 100 YEARS OF RULE OF CAPTURE: FROM EAST TO GROUNDWATER MANAGEMENT, TEXAS WATER DEVELOPMENT BOARD REPORT 361, 1 (William F. Mullican, III & Suzanne Schwartz eds., 2004), *available at* http://www.twdb.state.tx.us/publications/reports/GroundWaterReports/GWReports/Report%20361/1%20CH%20Potter.pdf.

3. 81 S.W. 279, 280 (Tex. 1904).

plaintiff's well run dry.[4] The Texas Supreme Court relied on the principles set forth in the English case of *Acton v. Bundell* to determine that one had a right to dig a well and, if that digging resulted in the drying of a neighbor's well, it would be deemed unactionable.[5] The *East* court necessitated the rule of capture doctrine by looking toward the principles set forth in *Frazier v. Brown*.[6] In *Frazier*, the Ohio Supreme Court found that no correlative rights with regard to underground percolating waters were recognized by law.[7] In justifying its decision, the Ohio court focused partly on policy considerations:

> 1. Because the existence, origin, movement and course of such waters, and the causes which govern and direct their movements, are so secret, occult and concealed, that an attempt to administer any set of legal rules in respect to them would be involved in hopeless uncertainty, and would be, therefore, practically impossible. 2. Because any such recognition of correlative rights, would interfere, to the material detriment of the common wealth, with drainage and agriculture, mining, the construction of highways and railroads, with sanitary regulations, building and the general progress of improvement in works of embellishment and utility.[8]

During this time, courts treated the rule of capture as a tort doctrine with regard to neighbors and the pumping of water.[9]

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4. *Id.*

5. *Id.* (quoting Acton v. Bundell, 152 Eng. Rep. 1223 (Ex. Ch. 1843)) ("That doctrine is thus stated: 'That the person who owns the surface may dig therein and apply all that is there found to his own purposes, at his free will and pleasure; and that if, in the exercise of such right, he intercepts or drains off the water collected from the underground springs in his neighbor's well, this inconvenience to his neighbor falls within the description of *damnum absque injuria*, which cannot become the ground of an action.'").

6. *Id.* at 280–81; Frazier v. Brown, 12 Ohio St. 294, 311 (Ohio 1861), *overruled by* Cline v. American Aggregates Corp., 474 N.E.2d 324 (Ohio 1984).

7. *East*, 81 S.W. at 280.

8. *Frazier*, 12 Ohio St. at 311.

9. *See East*, 81 S.W. at 280–81.

2. From Tort Doctrine to Vested Property Right

In *Texas Co. v. Burkett*,[10] the Texas Supreme Court fortified the rule of capture by interpreting it to be a vested property right and no longer a tort doctrine. In *Burkett*, the plaintiff sought to enact a contractual agreement with the defendant.[11] The defendant argued that the plaintiff did not own water and that the water actually belonged to the state; therefore, the plaintiff did not have a right to sell.[12] The court disagreed with the defendant and ruled that the plaintiff "plainly had the right to grant access to [streams] and the use of their waters for any purpose . . . ."[13] The court in *Burkett* created a common law rule classifying water ownership as a vested property right.[14] There has been criticism with regard to groundwater falling under the umbrella of property rights.[15] Water ownership cannot satisfy the characteristics of an "efficient property rights system" including universality, exclusivity, transferability, and enforceability.[16]

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10. 296 S.W. 273, 277 (Tex. 1927) ("Again, where there is but one riparian owner, . . . he may grant all of the riparian rights to the use of the waters of such stream, even if by that use it is all consumed by the grantee. This is for the reason that the grantor had dominion and ownership of it. It was his property, and he could dispose of it as he saw fit.").

11. *Id.* at 275–76.

12. *Id.* at 276.

13. *Id.* at 278.

14. Eric Opiela, Commentary, *The Rule of Capture in Texas: An Outdated Principle Beyond its Time*, 6 U. DENV. WATER L. REV. 87, 96 (2002).

15. Todd H. Votteler, *The Little Fish that Roared: The Endangered Species Act, State Groundwater Law, and Private Property Rights Collide Over the Texas Edwards Aquifer*, 28 ENVTL. L. 845, 874–75 (1998) (discussing the fundamental characteristics of property rights serving as part of the bundle of entitlements involving the rights, privileges, and limitations for use of a resource of the owner).

16. *Id.* (noting that an efficient property rights system has the following characteristics: "1) universality—all resources are privately owned, and all entitlements completely specified; 2) exclusivity—all benefits and costs accrued as a result of owning and using the resources should accrue to the owner, and only to the owner, either directly or indirectly by sale to others; 3) transferability—all property rights should be transferable from one owner to another in a voluntary exchange; 4) enforceability—property rights should be secure from involuntary seizure or encroachment by others").

3. Defining Absolute Ownership

After *Burkett*, other Texas courts began following the lead by interpreting *East* as expressing an absolute ownership principle.[17] The Texas Legislature codified this sentiment by enacting the Texas Underground Water Conservation Act of 1949, which recognized ownership and rights in underground water of "the owner of land, his lessees and assigns."[18] The years following the state legislature's adoption of the absolute ownership principle gave preference to protecting the water rights of farmers and ranchers.[19] This can be largely attributed to the rural influence present in that particular legislature.[20] Not until the 1960s—when legislative seats were being redistricted—did the Texas Legislature witness a rise in urban interests.[21] These urban interests viewed water in the agricultural sense until the 1980s.[22]

Notably, a majority of other states do not recognize private ownership of groundwater.[23] It is important to distinguish two types of water when discussing water ownership: surface water and groundwater.[24] Both surface water and groundwater have "different allocation rules, distinct conflict resolution frameworks, and separate administrative agencies."[25] In recognizing the value of water resources, however, the Texas Legislature has expressed a common goal of effective utilization of both groundwater and surface water sources to meet the present and future water needs in Texas.[26]

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17. Opiela, *supra* note 14, at 97.

18. *Id.*; *see also* Act of June 2, 1949, ch. 306, §§ 1, 3c(D), 1949 Tex. Gen. Laws 559, 562.

19. C. Richard Bath, *A Commentary on Texas Water Law and Policy*, 39 NAT. RESOURCES J. 121, 122 (1999).

20. *Id.*

21. *Id.*

22. *Id.*

23. Cynthia DeLaughter, Comment, *Priming the Water Industry Pump*, 37 HOUS. L. REV. 1465, 1477 (2000).

24. *See* Bath, *supra* note 19, at 122.

25. *Id.*

26. *See* John R. Pitts & Janet L. Hamilton, *Texas Water Law for the New Millennium*, 14 NAT. RESOURCES & ENV'T 35, 35 (1999); *see also* Act of Sept. 1, 1997, ch. 1010, § 1.01, 1997 Tex. Gen. Laws 3610, 3610 (codified as amended at TEX. WATER CODE

4. Now Enter Senate Bill 1

In 1997, the Texas Legislature enacted Senate Bill 1, which demonstrated that groundwater regulation should be "tailored to meet local water supply and population needs."[27] In order to accomplish this goal, the Texas Legislature created Underground Water Conservation Districts (UWCD).[28] Texas regulates its groundwater with UWCDs instead of using a regulatory scheme that creates a uniform set of rules across the state.[29] Subject to regional and state approval, UWCDs give residents who live close to water sources the power to establish rules with regard to water management.[30] This requires that each district analyze both available and anticipated water supply and demand in that particular district.[31] Once this analysis is completed, districts are to develop a plan addressing their management goals and objectives.[32] After this plan is submitted and approved by the Texas Water Development Board (TWDB), it is then integrated into the regional water plan and serves as the basis of action for a district.[33]

5. *Present Day Ownership*

The present day understanding of the rule of capture rests on the idea that a "landowner possesses the water beneath the surface by virtue of control over the surface."[34] Three principles guide the rule of capture in Texas: (1) water under the land belongs to the owner;[35] (2) the owner or assignee may pump as

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ANN. § 16.05).

27. *See* DeLaughter, *supra* note 23, at 1479 (citation omitted).

28. *Id.* at 1478–79.

29. *See* Douglas G. Caroom, Water Law in a Nutshell (Oct. 1997), http://web.archive.org/web/20050924180539/http://www.bickerstaff.com/articles/waternut.htm (discussing how UWCDs in Texas may be created either by the Texas Natural Resource Conservation Committee (TNRCC) or by a special act of the Texas legislature).

30. *See id.*

31. *See* Pitts & Hamilton, *supra* note 26, at 40.

32. *Id.*

33. *See* Caroom, *supra* note 29.

34. *See* DeLaughter, *supra* note 23, at 1477.

35. Houston & Tex. Cent. Ry. Co. v. East, 81 S.W. 279, 280 (Tex. 1904).(tracing the history of the law through the English and American courts).

much water as he likes without being held accountable to others affected;[36] and (3) a party may sell whatever water is pumped to third parties, and such water may be used in other locations.[37]

To better understand the rule of capture, one must examine the limitations in place for owning, pumping, and selling groundwater.[38] One limitation on water ownership is the defining of exactly what water belongs to the state and what water belongs to the surface owner.[39] There are four categories of groundwater sources that determine to whom the water belongs: (1) underflow, (2) underground stream, (3) artesian, or (4) percolating.[40] Underflow of a watercourse and underground streams in defined channels belong to the state.[41] Watercourse underflow is defined as the portion of a surface watercourse that flows through sand and gravel deposits beneath the surface of the stream bed.[42] Courts will treat underground streams in defined channels as surface water—thus, not the sole property of the surface owner—if it has the same characteristics of a surface watercourse.[43] These characteristics include the presence of banks, beds that form a channel, and a current of water.[44] The importance of the artesian water restriction involves statutory provisions that prevent waste of this source and require permits for its withdrawal.[45] Percolating water belongs solely to the surface property owner.[46] Once a landowner has ownership over

36. Sipriano v. Great Spring Waters of Am., 1 S.W.3d 75, 76 (Tex. 1999) (allowing water company to pump average of 90,000 gallons a day without liability for causing neighbor's well to dry).

37. Tex. Co. v. Burkett, 296 S.W. 273, 277 (Tex. 1927).

38. Caroom, *supra* note 29.

39. *Id.*

40. *See* DeLaughter, *supra* note 23, at 1478.

41. Caroom, *supra* note 29.

42. *See Burkett*, 296 S.W. at 277 (explaining the concept of underflow in terms of riparian water).

43. *See* Caroom, *supra* note 29.

44. Denis v. Kickapoo Land Co., 771 S.W.2d 235, 236–37 (Tex. App.—Austin 1989, writ denied) (holding that, absent proof, that the subterranean watercourse possessed all the characteristics of a surface watercourse, a presumption of percolating water stands).

45. *See* TEX. WATER CODE ANN. §§ 11.201, 11.202(d)–(e) (Vernon 2000).

46. *See* Caroom, *supra* note 29.

percolating water, further limitations are set in place to restrict what kind of usage may occur.[47]

There are two common law restrictions on a landowner's right to capture, pump, and sell percolating water.[48] First, a surface owner may not "maliciously take water for the sole purpose of injuring his neighbor . . . or wantonly and willfully waste it."[49] There is, however, criticism of this limitation because some feel that proving the malice intent element is too difficult and, therefore, makes such a limitation ineffectual.[50] Additionally, there is a belief that the Texas Supreme Court created a major escape hatch by stating that "waste" refers only to "waste in use" and not "water lost during transport."[51] This distinction between use and transport was articulated in *City of Corpus Christi v. City of Pleasanton* where the court allowed a city to extract ten million gallons of water a day for transport without classifying it as waste.[52] The Texas Supreme Court, however, later came back in *Bragg v. Edwards Aquifer Authority*[53] with a broader definition of "waste" as it applied to the rule of capture limitation. It has been suggested that *Bragg* "opened the door for future Texas Legislatures to finally empower locally elected groundwater conservation districts with the powers necessary to regulate groundwater withdrawals without running afoul of the rule of capture."[54]

The second limitation stipulates that a landowner may not cause subsidence in neighboring land to occur through use of

47. *See* DeLaughter, *supra* note 23, at 1478.

48. *Id.*

49. City of Corpus Christi v. City of Pleasanton, 276 S.W.2d 798, 801 (Tex. 1955) (citations omitted).

50. *See* Opiela, *supra* note 14, at 101 (stating that "malice intent" is notoriously hard to prove and that it has never come into play in a Texas groundwater case).

51. *Id.* at 102.

52. 276 S.W.2d at 800.

53. 71 S.W.3d 729, 736 (Tex. 2002) (stating that requiring a permit to prevent waste from Edwards Aquifer served as part of the "broader concept of preventing waste by conserving, protecting, and preserving the aquifer through the Legislature's designed permit program").

54. Opiela, *supra* note 14, at 103–04.

water on his land.[55] This limitation was created in *Friendswood Development Co. v. Smith-Southwest Industries* where the Texas Supreme Court ruled that a negligent subsidence exception allows for deterrence of excessive underground water withdrawals and resulting land subsidence.[56] The basic policy behind the court's ruling rested on the idea that "ownership and rights of all landowners will be better protected against subsidence if each [landowner] has a duty to produce water from his land in a manner that will not negligently damage or destroy the lands of others."[57]

With these restrictions in place, however effective they may or may not be, the rule of capture still allows a landowner to appropriate waters while on his land and make whatever use of that water he chooses.[58] All of this is without regard to the fact that his use may cut off the flow of water toward neighboring land, thus depriving that neighboring landowner of water use.[59]

As one might imagine, the rule of capture has led to controversy,[60] but more importantly, it has also led to a massive depletion of water supplies.[61] A major part of this depletion can be accredited to the large growth of urban areas in Texas, which has put a strain on groundwater resources.[62]

6. Persistence of the Rule of Capture

With all of its negative effects and the inundation of criticism with regard to the rule of capture, why do courts still adhere to it? Two justifications have been posed to help answer this question: reliance on the rule and legislative deference.

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55. Friendswood Dev. Co. v. Smith-Southwest Indus., 576 S.W.2d 21, 30 (Tex. 1978).

56. *Id.*

57. *Id.*

58. City of Corpus Christi v. City of Pleasanton, 276 S.W.2d 798, 800 (Tex. 1955) (explaining the origins of this rule in common law).

59. *Id.*

60. *See* Sipriano v. Great Spring Waters of Am., 1 S.W.3d 75, 76 (Tex. 1999) (allowing water company to pump average of 90,000 gallons a day without liability for causing neighbors well to dry).

61. Opiela, *supra* note 14, at 88 ("Texans have taken water for granted as a resource . . . that, while in reality finite, most thought to be infinitely abundant.").

62. *Id.*

For courts adhering to the rule of capture, reliance is an ever-weakening argument as time progresses and water management problems increase.[63] One rationale that has been offered to explain why reliance is a diluted basis for following the rule of capture is that although a landowner can rely on this rule to release him from liability for pumping his neighbor's well, this same landowner, in turn, realizes that the rule does not protect his well from his neighbor.[64] In fact, rural parties, such as farmers and ranchers—once the most devoted of supporters for the rule of capture and antiregulation[65]—now stand as parties calling for regulation in order to create "firm water rights."[66]

This leads to the next justification for sticking with the rule of capture: legislative deference. Texas courts point to the Texas constitution, which states that "the preservation and conservation of all such natural resources of the State are each and all hereby declared public rights and duties[,] and the Legislature shall pass all such laws as may appropriate thereto."[67] An example of such application is *Sipriano v. Great Spring Waters of America*, in which the court stated that "[i]t would be improper for courts to intercede at this time by changing the common law framework within which the Legislature has attempted to craft regulations to meet this state's groundwater-conservation needs."[68] This decision was due to the then-recent passing of Senate Bill 1 and the legislature's creation of a water district system to address water concerns for individual areas.[69]

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63. *Id.* at 106; *see also* Friendswood Dev. Co. v. Smith-Southwest Indus., 576 S.W.2d 21, 29 (Tex. 1978) ("The rule has been relied upon by thousands of farmers, industries, and municipalities in purchasing and developing vast tracts of land overlying aquifers of underground water.").

64. Opiela, *supra* note 14, at 106; *see also* Votteler, *supra* note 15, at 876.

65. Ralph K.M. Haurwitz, *Maurice Rimkus: Coming Around on Water Reform*, AUSTIN AM.-STATESMAN, Dec. 28, 1997, at A15.

66. *See* Votteler, *supra* note 15, at 876.

67. TEX. CONST. art. 16, § 59(a); *Sipriano*, 1 S.W.3d at 77.

68. 1 S.W.3d 75, 80 (Tex. 1999) ("[W]e cannot say at this time that the Legislature has ignored its constitutional charge to regulate this natural resource.").

69. *Id.* ("Senate Bill 1 also included various provisions calling for more comprehensive and coordinated water planning.").

Although the Texas Supreme Court has yielded to the legislature, lower Texas courts have not given such deference to Senate Bill 1.[70] In *South Plains Lamesa Railroad v. High Plains Underground Water Conservation Dist. No. 1*, plaintiff landowner brought action against the water district for revoking a water well permit and denying another.[71] The court held that the water district lacked the authority to deny and revoke water well permits for "disproportionate taking" in relation to track size and, by doing so, exceeded their authority.[72] Discussing the Texas Supreme Court's prior decisions,[73] the court in *South Plains* determined it was in a position to define aspects of the water district's power rather than deferring to the legislature.[74] This discrepancy between the more activist lower courts and the Texas Supreme Court has led some to conclude that although courts defer to the legislature, they are also the ones who are impeding the legislature from changing water regulation.[75]

B. Middle East Background

The Middle East, as a whole rather than a single country, offers a beneficial comparison to the Texas water regulation system.[76] This is due to the water problem in the Middle East, as in Texas, being a growing problem among neighbors.[77] Water

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70. 52 S.W.3d 770, 773 (Tex. App.—Amarillo 2001, no pet.).

71. *Id.*

72. *Id.* at 781.

73. *Id.* at 776–77 (citing Acker v. Tex. Water Comm., 790 S.W.2d 299, 301 (Tex. 1990); City of Corpus Christi v. City of Pleasanton, 276 S.W.2d 798 (Tex. 1955); Houston & Tex. Cont. Ry. Co. v. East, 81 S.W. 279, 280 (Tex. 1904)).

74. *Id.* at 777–80 ("[T]he decision of the District on discretion vested 'in a groundwater District by the Legislature to regulate a natural resource' does not support the action of the District.").

75. Opiela, *supra* note 14, at 107 ("Texas courts have made it clear that the legislature is the preferred choice for any modification of the rule of capture. Yet, at the same time they have impeded efforts at legislative change.").

76. Paul Simon, *In an Empty Cup, A Threat to Peace*, N.Y. TIMES, Aug. 14, 2001, at A17 ("In other parts of the world, the situation is much more urgent. Nowhere is this truer than in the Middle East. Even in the unlikely event that the current conflict between Israelis and Arabs is resolved tomorrow, in 10 years or less the area is likely to explode over water—unless regional and long-range planning begins soon.").

77. *Id.*

has always been scarce in the Middle East,[78] but the growing need from increased populations and agricultural sectors is elevating this scarcity toward the level of crisis.[79] A major part of this problem arises from the fact that most countries in the Middle East share the same aquifers.[80] This problem is exacerbated by the number of countries that do not take into account their impact on a neighboring country's water resources.[81] It has been argued that the conflict over water rights serves as a major barrier to reaching a peaceful relationship among the countries in the Middle East.[82]

1. Setting the Stage for Conflict

Use, share, control, and management of water creates high levels of tension among Middle Eastern neighbors.[83] The Middle East, along with North Africa, represents five percent of the global population, but only .09% of global water resources.[84] A problem arises for the Middle East due to the Tigris, Euphrates, and Jordan River systems serving as the only main waterways

78. *Id.* ("Middle East leaders understand that they need to agree to regional and long-range planning for conserving and sharing water and for constructing desalination plants. But they must begin soon. A drought is making the water situation worse now, but even if rainfall were normal, water shortages would be growing desperate for most of the Middle East countries.").

79. Bülent Topkaya, Water Resources in the Middle East: Forthcoming Problems and Solutions for Sustainable Development of the Region (July 1998), http://www.akdeniz.edu.tr/muhfak/publications/gap.html ("The greatest single pressure has been caused by the very rapid growth of population.").

80. Population Action Int'l, *Water and Conflict*, *in* SUSTAINING WATER: POPULATION AND THE FUTURE OF RENEWABLE WATER SUPPLIES (1998), http://web.archive.org/web/19981205100447/ www.cnie.org/pop/pai/water-25.html (last visited Feb. 4, 2007) [hereinafter *Water and Conflict*].

81. *Id.*

82. Peter W. Zimmerman, Water and Peace in the Middle East (Sept. 7, 1999), http://www.muhajabah.com/docstorage/zimmerman.htm.

83. Hilal Elver, Emerging Water Conflict in the Middle East? The Case of the Euphrates and the Tigris Rivers Basin, http://www.american.edu/maksoud/water98/present8.htm (last visited Feb. 4, 2007).

84. World Bank Group, From Scarcity to Security: Averting a Water Crisis in the Middle East and North Africa, http://lnweb18.worldbank.org/mna/mena.nsf/All/F2953DF0DB1100F685256AFE0072EEE5?OpenDocument (last visited Feb. 4, 2007) [hereinafter From Scarcity to Security].

for the region.[85] By 1990, there were eleven water-scarce countries in the Middle East and North Africa.[86] By 2025, it is predicted that an additional seven countries in this region will be added to the list.[87]

A number of factors have contributed to the increasing scarcity of water in the region. First, population rates in the Middle East are growing rapidly, and water is being consumed at such a rate that it is impossible for the water to replenish itself naturally.[88] This growth has also caused increased pressure for economic development and irresponsible patterns of urbanization and industrialization.[89] Second, domestic pollution has contributed to the deterioration in the quality of available water.[90] This can partly be attributed to the lack of environmentally conscious technology that has accompanied the industrialization of the Middle East.[91] Finally, the expansion of agriculture and industry has also eroded available water resources in the region.[92] These three factors combined have caused the per capita water availability in the Middle East to become one of the worst in the world.[93] Because water resources are continually shrinking, a number of Middle Eastern countries have turned to using treated wastewater for industry,

85. Ilan Berman and Paul Michael Whibey, *The New Water Politics of the Middle East*, STRATEGIC REVIEW, Summer 1999, *available at* http://www.israeleconomy.org/strategic/water.htm; *see also* Elver, *supra* note 83 ("Despite the size of the Middle East, there are only three rivers that can be classified as large by the world standards: the Nile, the Euphrates and the Tigris rivers.").

86. Berman & Whibey, *supra* note 85. The eleven countries are Bahrain, Jordan, Kuwait, Algeria, Israel and the Occupied Territories, Qatar, Saudi Arabia, Somalia, Tunisia, the United Arab Emirates, and Yemen. *Id.*

87. *Id.* (predicting Egypt, Ethiopia, Iran, Libya, Morocco, Oman and Syria as the next seven countries to be included in the list).

88. *See* Pamela Leroy, *Troubled Waters: Population and Water Scarcity*, 6 COLO. J. INT'L ENVTL. L. & POL'Y 299, 311–12 (1995).

89. *See* Elver, *supra* note 83.

90. *See* Berman & Whibey, *supra* note 85.

91. *See* Elver, *supra* note 83.

92. *See* Berman & Whibey, *supra* note 85.

93. *Id.* (citing From Scarcity to Security, *supra* note 84).

agriculture, and the recharging of aquifers.[94] This, of course, gives rise to health risks due to the bacteria, viruses, and organisms present in the water.[95]

One of the factors contributing to tension over water in the Middle East is the fact that upwards of fifty percent of the population has to rely on water coming from another sovereign state.[96] This transboundary aspect, along with the scarcity of water in the Middle East, has been the spark of a number of conflicts.[97] Such conflicts include ones among Turkey, Iraq, and Syria over the Tigris and Euphrates River; among Israel, the Palestine Authority, and Jordan over the Jordan River Basin; and within Saudi Arabia itself.[98]

2. Turkey —Syria —Iraq

Since the 1970s, there has been a growing tension between Turkey, Syria, and Iraq over water.[99] This is due to the Tigris-Euphrates River system being the only real source of water in the region.[100] For six thousand years, the basins formed by both the Tigris and Euphrates Rivers have been part of a number of struggles for domination.[101] Turkey sits toward the north of both Syria and Iraq. For Syria, the main water source is the Euphrates River,[102] which flows down from Turkey and then

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94. Middle East Wastewater Clearinghouse (MEWUC), Middle East Water Shortage, http://weather.nmsu.edu/hydrology/wastewater/wastewater.htm (last visited Feb. 4, 2007).

95. *Id.*

96. John Kolars, *Hydro-geographic Background to the Utilization of International Water in the Middle East*, 80 AM. SOC'Y INT'L L. PROC. 250, 250 (1986); Topkaya, *supra* note 79.

97. *See* Topkaya, *supra* note 79 (The basic principle being that as available water resources become "less and less, then water for one user means lack of water for the other," which "leads to competition over these resources and in certain cases to conflicts and even to mobilisation [sic] of armed forces.").

98. *Id.*; *see also* Kolars, *supra* note 96, at 254.

99. Kolars, *supra* note 96, at 254.

100. *See* Topkaya, *supra* note 79 ("The location of the Tigris and Euphrates rivers offers little sympathy to national boundaries or strategic political concerns.").

101. *Id.*

102. *Syria*, ENCYCLOPEDIA BRITANNICA (2007), *available at* http://www.britannica.com/eb/article-29936/Syria.

into Iraq.[103] Iraq, on the other hand, relies both on the Euphrates River water supply as well as water from the Tigris River that flows from Turkey into Iraq, thus giving them an additional source of water.[104] Notably, Iraq is the country with the highest consumption of water from the Euphrates River among the other countries in the region.[105] In 1987, a protocol was signed, which allowed for Syrian access to the Euphrates River Basin.[106] However, "Turkish development efforts have increasingly threatened to marginalize and even eliminate Syrian access to water."[107] One such development effort is the Southeast Anotolia Project (GAP).[108] The goal of this project was the development of the area consisting of nine provinces in the Euphrates-Tigris basins known as the "GAP Region".[109] Originally, the GAP started as an energy production and irrigation project but has since been expanded to cover urban, rural, and agricultural infrastructures.[110]

It has been argued that this development has essentially given Turkey control of the only upstream water source for

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103. *See* Topkaya, *supra* note 79.

104. *Euphrates River*, ENCYCLOPEDIA BRITANNICA (2007), *available at* http://www.britannica.com/ebc/article-9363999.

105. *See* Topkaya, *supra* note 79.

106. *See* Joseph W. Dellapenna, *The Two Rivers and the Lands Between: Mesopotamia and the International Law of Transboundary Waters,* 10 BYU J. PUB. L. 213, 251 (1996) (citing *Protocol on Matters Pertaining to Economic Cooperation,* signed July 26, 1987, Syria-Turkey, art. 6 (unpublished)).

107. *See* Berman & Whibey, *supra* note 85.

108. Southeastern Anatolia Project (GAP), http://www.fas.usda.gov/remote/mideast_pecad/gap/introduction.htm (last visited Feb. 4, 2007). *See generally* Berman & Whibey, *supra* note 85 (detailing briefly the GAP Project and the roles of Turkey and Syria).

109. Southeastern Anatolia Project (GAP), *supra* note 108. The "GAP Region" basically includes nine provinces in the Euphrates-Tigris basins and Upper Mesopotamia plains. *Id.*

110. *Id.*; *see also* Ayseygul Kibaroglu, Sustainable Development of Irrigation Systems in the Southeaster Anatolia Project (GAP) Region, http://www.gap.metu.edu.tr/html/yayinlar/sustainabledevforgapAKibaroglu.pdf (last visited Feb. 4, 2007).

Syria.[111] In fact, the GAP will have a great impact on the water supply of Syria and Iraq flowing from the Euphrates River.[112]

3. Jordan —Palestine — Israel

Turning toward another water conflict in the Middle East, the Jordan, Palestine, and Israel region demonstrates the problems of overuse due to population growth and pollution.[113] Their water source originates in Lebanon and has a total average flow of around 1,200 cubic meters a year.[114] This water system is made up of both the Jordan and Yarmouk Rivers.[115] The Jordan River basin is viewed as the most controversial in the region due to it being the most developed and politically intricate.[116] Because a number of states that rely on the Jordan River for water are not able to harvest enough water to meet their needs, they must also rely on groundwater aquifers as a main source of water.[117] This reliance is due to Jordan's per capita water consumption, which, although one of the lowest among countries in the Middle East, is still more than the amount of water it can harvest from rainfall and from the Yarmuk River.[118] In 1994, the Israeli-Jordanian Treaty was signed, creating guidelines regarding the distribution, preservation, and availability of water from the Yarmouk and

111. *See* Southeastern Anatolia Project (GAP), *supra* note 108 ("The water resources component of the GAP Master Plan envisages to construct 22 dams, 19 power plants, and numerous networks of irrigation canals to deliver water to over nearly 1.7 million hectares of land.").

112. *See* KURDISH HUMAN RIGHTS PROJECT ET AL., DOWNSTREAM IMPACTS OF TURKISH DAM CONSTRUCTIONS ON SYRIA AND IRAQ (2002), http://www.thecorner house.org.uk/pdf/document/ IraqSyri.pdf.

113. *See* Berman & Whibey, *supra* note 85 ("The Jordan River Basin has also emerged as a flashpoint for conflict over water. Resources in the area, suffering serious overuse as a result of pollution and population growth, have increasingly impacted interstate relations.").

114. Abigail Ofori-Amoah, Water Wars and International Conflict (Spring 2004), http://academic.evergreen.edu/g/grossmaz/oforiaa/.

115. *Id.*

116. Aaron T. Wolf, 2020 Vision Brief 31: Middle East Conflicts and Directions for Conflict Resolution (Apr. 1996), http://www.ifpri.org/2020/briefs/number31.htm.

117. *See* Ofori-Amoah, *supra* note 114.

118. *Water and Conflict*, *supra* note 80.

Jordan Rivers.[119] However, despite this agreement, conflict is continually rising.[120] In 1999, the climate of the region and harsh droughts caused Israel to be unable to adhere to the stipulations of the 1994 treaty and cut the annual allocation of water to Jordan by half.[121] This caused Jordan to be unable to sustain its current levels of water consumption and move toward a water rationing system.[122] Because of Jordan's limited access to water resources, its escalating water deficit is expected to reach 250 cubic meters by the year 2010.[123] With Jordan placing a high value on the "hydraulic imperative" and Israel's decreasing internal water sources, fears of a grab-for-resources is increasing among the two countries.[124]

Israel, on the other hand, has relied almost entirely on its National Water System, which is made up of the West Bank Mountain Aquifer, the Coastal Aquifer, and the Lake Kinneret Basin.[125] Because of this reliance, the "Mountain Aquifer underneath the West Bank is a point of contention between Israelis and Palestinians."[126] More specifically, one of the major issues between Israel and Palestine is Israel's blocking of Palestinian access to water supplies.[127] This has caused Israel to overexploit available resources in order to expand agricultural and industrial ventures.[128]

4. Saudi Arabia

Saudi Arabia serves as another demonstration of a country quickly approaching a water crisis. The difference between

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119. Treaty of Peace Between The State of Israel and The Hashemite Kingdom of Jordan, Isr.-Jordan, art. 6, Oct. 26, 1994, KA 1060, 7–8, *available at* http://www.jewish virtuallibrary.org/jsource/Peace/isrjor.html.

120. *See Middle East Drought "Forces Israel to Break Treaty,"* BBC NEWS, Mar. 15, 1999, http://news.bbc.co.uk/2/hi/world/middle_east/296797.stm.

121. *Id.*

122. *See* Berman & Whibey, *supra* note 85.

123. *Id.*

124. MARTIN SHERMAN, THE POLITICS OF WATER IN THE MIDDLE EAST 16, 51–53 (1999).

125. *Id.* at 7.

126. *See* Ofori-Amoah, *supra* note 114.

127. *Id.*

128. Berman & Whibey, *supra* note 85.

Saudi Arabia and the countries discussed above is that this particular country's problem arises from a lack of permanent bodies of waters and rivers.[129] Because of this, Saudi Arabia is forced to rely heavily on underground sources of water.[130]

A number of these underwater resources have been contaminated in various ways as a result of the Gulf War.[131] This contamination was caused, in part, by agricultural-related seepage and Iraq's burning of oil wells during the conflict.[132] Additionally, the Gulf War brought increased strain on water resources due to the bombing of water treatment facilities by U.S. troops.[133] Further straining water resources, multiple oil spills in the Persian Gulf damaged Saudi Arabian desalination facilities.[134]

As can be seen, water serves as a catalyst for conflict among various Middle Eastern countries. As with neighbors in Texas, neighbors in the Middle East recognize the importance of protecting water rights in order to ensure continued access to this valuable resource. And, as might be imagined, conflict soon follows this recognition.

III. PROSCRIPTIVE MEASURES FOR BOTH TEXAS AND THE MIDDLE EAST

Both Texas and the Middle East have severe problems with their water regulation systems. If poor management and conflict over water continues, then it will not be an available resource for future generations.[135] The issue of water security is of

129. Central Intelligence Agency, The World Factbook: Saudi Arabia, http://www.cia.gov/cia/publications/factbook/print/sa.html (last visited Feb. 4, 2007).

130. *See* Berman & Whibey, *supra* note 85.

131. *See Water and Conflict*, *supra* note 80 ("Although it was global concerns about oil supplies that helped internationalize the 1991 Gulf War, water resources were not spared in the conflict.").

132. *See* Berman & Whibey, *supra* note 85.

133. *See* Ofori-Amoah, *supra* note 114.

134. *See Water and Conflict*, *supra* note 80 ("Using every tactic at his limited disposal, Saddam Hussein ordered his troops to dismantle the desalination plants of Kuwait, and the oil spills that fouled the Persian Gulf also damaged desalination sites in Saudi Arabia—demonstrating both the importance and the vulnerability of these facilities.").

135. Allan R. Hoffman, *The Connection: Water and Energy Security*, ENERGY

increasing importance due to the already existing water shortage, which will only become more prevalent in the coming years.[136] The question arises: What can be done in these two areas to ensure the water lasts? A brief examination of various theories of water rights provides guidance to answering this question.

One theory is that of absolute territorial sovereignty over water within the state's boundaries.[137] This theory is demonstrated in the 1895 Harmon Doctrine that addressed a dispute between the United States and Mexico regarding pollution in the Rio Grande River.[138] Under this doctrine, "an upstream State can freely deplete or utilize a river's flow within its boundaries without considering the effect of its actions on a downstream State."[139] However, this theory has become increasingly disfavored due to its inability to accord differences between areas sharing the common resource.[140]

The next theory to examine is the principle of prior appropriation. This theory does not give preference to either the upstream or downstream state, but rather to the state that used the water first.[141] However, as with the previous theory, this theory has not received wide international support.[142]

Another theory known as absolute territorial integrity rests on the idea that a downstream state should not have its flow of

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SECURITY, Aug. 13, 2004, http://www.iags.org/n0813043.htm.

136. *Id.* ("Water security can be defined as the ability to access sufficient quantities of clean water to maintain adequate standards of food and goods production, sanitation and health.").

137. *See* Topkaya, *supra* note 79 ("States have historically exercised absolute sovereignty over the use of rivers and other natural resources located within the State's territory, no matter what the effects of the resource use on neighboring States.").

138. *Id.*

139. David J. Lazerwitz, Comment, *The Flow of International Water Law: The International Law Commission's Law of the Non-Navigational Uses of International Watercourses*, 1 IND. J. GLOBAL LEGAL STUD. 247, 250 (1993–1994).

140. *Id.*

141. *See* Topkaya, *supra* note 79 ("A distinct but similarly restrictive theory of water allocation is the principle of prior appropriation, which favors neither the upstream nor the downstream State, but rather the State that puts the water to use first, thereby protecting those uses which existed prior in time.").

142. *See* Lazerwitz, *supra* note 139, at 250.

water interrupted regardless of priority.[143] Again, this is a theory that has received little international support.[144] This is due to the view that this theory places a burden on an upstream state without placing a similar burden on the downstream state.[145] Under a more general umbrella of theories, including *sic utere*,[146] "restricted territorial sovereignty,"[147] and "restricted territorial integrity"[148] theories, a state may use water within its territorial boundaries so long as it does not prejudice the rights of access to water for other states.[149] This more general group of theories view whether a state has prejudiced another state by looking toward the degree of harm to the state allegedly prejudiced.[150] The final, more contemporary theory, known as the community of interests theory, "treats the entire river as one hydrological unit that should be managed as an integrated whole."[151] A problem arises with this theory in that it does not account for the lack of political cooperation between the various states.[152] With a basic knowledge of these above theories, the solutions discussed below may offer some guidance as to what both Texas and Middle Eastern countries can do to improve their water regulation systems.

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143. *See* Topkaya, *supra* note 79 ("This theory, known as 'absolute territorial integrity,' posits that a riparian State may not develop a portion of a shared rivercourse if it will cause harm to another riparian State.").

144. *Id.*

145. *Id.* ("It is viewed as inequitably placing a burden on upper riparians without exacting a similar duty on lower riparians.").

146. *Id.* The term *sic utere* comes from a longer Latin phrase meaning use for yourself as long as you do not spoil it for others. *Id.*

147. *Id.*

148. *Id.*

149. *Id.* ("Under these principles, every state is free to use its territorial water, provided that it in no way prejudices the rights and uses of other riparian States.").

150. *Id.*

151. *See* Lazerwitz, *supra* note 139, at 252.

152. *See* Topkaya, *supra* note 79 ("While this concept of managing a resource based upon its hydrological features as opposed to its political boundaries would be a positive step forward in protecting natural resources, relations among states have not yet evolved to a similar level.").

A. Reasonable Use Standard

One solution for each area's water problems rests in what is known as reasonable use.[153] In 1997, the International Law Commission established the Convention on the Law of the Non-Navigational Uses of International Water Courses (the Convention).[154] Although the Convention deals with international watercourses applicable to neighboring Middle Eastern countries, it may also serve as a guide for neighbors in Texas. In determining the level of reasonable utilization, the Convention sets forth seven factors to consider.[155] These factors include:

> (a) [g]eographic, hydrographic, hydrological, climatic, ecological and other factors of a natural character; (b) [t]he social and economic needs of the watercourse States concerned; (c) [t]he population dependent on the watercourse in each watercourse State; (d) [t]he effects of the use or uses of the watercourses in one watercourse State on other watercourse states; (e) [e]xisting and potential uses of the watercourse; (f) [c]onservation, protection, development, and economy of use of the water resources of the watercourse and the costs of measures taken to that effect; (g) [t]he availability of alternatives, of comparable value, to a particular planned or existing use.[156]

Considering these factors when evaluating a water issue in Texas or the Middle East will allow for a thorough analysis to take place before a neighbors use crosses the unreasonable threshold.[157] Notably, those areas in the Middle East

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153. Opiela, *supra* note 14, at 113 ("The most drastic change Texas could make would be to abandon the rule of capture altogether and follow the lead of Arizona in establishing [a] reasonable use doctrine for groundwater management.").

154. Convention on the Law of the Non-Navigational Uses of International Watercourses, G.A. Res. 51/229, Annex, U.N. Doc. A/Res/51/229/Annex (May 21, 1997), *available at* http://www.un.org.

155. *Id.* art. 6.

156. *Id.*

157. *See generally* Sipriano v. Great Spring Waters of Am., 1 S.W.3d 75 (Tex. 1999) (allowing a water company to pump an average of 90,000 gallons of water a day without liability for causing neighbors well to dry). Applying reasonable utilization principles would likely classify use in *Sipriano* as unreasonable and therefore not allowed.

categorized as "upstream states"[158] have declined to sign the Convention because of the belief it would be a loss for their country.[159] This idea of refusing to give part of one's benefit to another demonstrates an issue regarding the lack of cooperation among neighbors. These neighbors have constructed their livelihoods based on the assumption that fresh water would be available.[160] As seen in the Middle East, settlements were developed near permanent wells and in fertile valleys.[161] Because this resource has been so heavily relied upon, the shortage of water has had the effect of creating fragile relationships between nations, economic sectors, and individuals.[162]

A regional development plan would allow for the fortification of relationships among countries in the Middle East and between neighbors in Texas.[163] In a regional development plan, the area in issue is divided into different sectors, and each sector creates and enacts a water plan for that particular sector.[164] One step in enacting such a plan is the creation of separate control of water resources in a way that will suffocate past grievances.[165] Arguably, this could be accomplished by taking the control of water away from Texas and Middle Eastern governments and essentially turning water over to the private sector.[166] Some have argued that for such a transition to occur,

158. *See* Topkaya, *supra* note 79.

159. *Id.* ("Countries which [abstained] or voted against this convention are all 'upstream' countries.").

160. *See* Wolf, *supra* note 116 ("And the people who have built their lives and livelihoods on a reliable source of fresh water are seeing the shortage of this vital resource impinge on all aspects of the tenuous relations that have developed over the years between nations, between economic sectors, and between individuals and their environment.").

161. *Id.*

162. *Id.*

163. *See id.*

164. *See, e.g.*, TexasWaterMatters.org, What is Water Planning?, http://www.texaswatermatters.org/water_planning.htm (last visited Feb. 4, 2007) ("As part of this process, the state was divided into 16 different planning regions, and a Regional Water Planning Group was appointed for each region.").

165. *See* Wolf, *supra* note 116.

166. *See* DeLaughter, *supra* note 23, at 1472 (finding that private investment in the water industry could help ensure an adequate water supply for the future).

it must be shown that profits can be made from the privatization of water.[167] Because of the increasing scarcity and continual dependence on water resources, it is highly unlikely that the profit aspect of water privatization would be a problem.[168] This privatization of water could also extend beyond mere property rights of water to the "water storage, treatment, and distribution stages."[169] All of this would involve negotiating property rights for the existing resources and any new resources that may come into play.[170] If the private sector were to control the distribution of water, then economic principles, such as competition, would "[breed] efficiency and innovation while protecting consumers from exploitation."[171] Because both Texas and Middle Eastern governments control water resources, there is no competition, and therefore, the protection for consumers against exploitation is replaced by regulation.[172] Even if the privatization of water does not take place, the need for regulation over the quality and amount of water use will continue to be required in the water resource arena.[173] Although this idea of privatization seems drastic, one can look to other countries that have enacted such a system to see that such a transition is possible. For example, in 1988, the British government sold its state-owned utilities to private investors who then sold one hundred percent of its stock to the public.[174] Additionally, the French government designed another model for privatization of water resources. Basically, the French municipalities have the responsibility of running water and

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167. *Id.* at 1486 (citing LEONARD S. HYMAN ET AL., THE WATER BUSINESS: UNDERSTANDING WATER SUPPLY AND WASTEWATER INDUSTRY 283 (1998)).

168. *Id.* (noting, for example, that "in 1998, a private party sold water rights to LCRA for a staggering $75 million").

169. *Id.*

170. *See* Wolf, *supra* note 116.

171. *See* DeLaughter, *supra* note 23, at 1486.

172. *Id.* ("Regulation is a government's substitute for the protection that would otherwise be provided by competition that allows consumers a choice of providers.").

173. *Id.* ("Thus the need for rate and quality regulation will continue whether or not privatization occurs in the water industry.").

174. *Id.* at 1488 (citing LEONARD S. HYMAN ET AL., THE WATER BUSINESS: UNDERSTANDING WATER SUPPLY AND WASTEWATER INDUSTRY 283, 399 (1998)).

sewage programs.[175] In doing this, the municipality has "the option of running their own operations or contracting them via public service concessions."[176] At the very least, some consideration must be given to the idea that the public may benefit from a partnership between governments, which would regulate health standards and water subsidies, and the private sector, which would regulate distribution.[177]

Regardless of whether the water regulation systems are governmental or privatized, it is important that there be more clearly defined lines for neighbors in both the Middle East and Texas. Each neighbor will need to be aware of what areas to harvest and what quantities of water they are entitled to use. More strongly defined boundaries of water resources would also allow for a water source to be controlled more efficiently and, therefore, produce a higher chance of water for future generations.[178] Additionally, defining property rights with regard to water and usage would allow for more equity among neighbors. This equity element will help to steer the view away from a "win-lose" situation toward more of a "win-win" integrated system of cooperation.[179] In order to ensure a smooth transition to a new regulation system, a minimal set of rules should be implemented so both Texas and Middle Eastern neighbors may adjust to the new system. Once people have adjusted to following a more integrated system, then additional regulations may be added as needed to correct problems that may arise. In order to accomplish such a system, there are a number of tools to consider when discussing the enactment of this type of demand management program.[180]

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175. *Id.*

176. *Id.*

177. *See* DeLaughter, *supra* note 23, at 1486 ("Although the government will always play a uniquely important role in the water industry by setting health standards and subsidizing water projects, the public may be better served by the joint efforts of the government and private investors.").

178. *See* Wolf, *supra* note 116 ("Guaranteeing control of a water source adequate to meet future needs . . . . ").

179. *Id.*

180. David B. Brooks, *Water Demand Management: Conceptual Framework and Policy Implementation*, *in* MANAGEMENT OF WATER DEMAND IN AFRICA AND THE MIDDLE EAST (David B. Brooks et al. eds., 1997), *available at* http://www.idrc.ca/en/ev-31795-201-

First, one can turn to the area made up of institutions and laws.[181] Supply and demand for water resources falls within the areas of land and water rights, which both fit within the legal arena.[182] Using the traditional institution of the law will help create *and* monitor water rights throughout time. However, for this legal tool to work effectively, a couple of areas will need to be addressed.[183] For example, both the Middle East and Texas will need to place controls on their current systems by defining "ownership of water" and implementing and enforcing effective remedies for disputes that may arise.[184] More specifically, Texas's government must place stricter regulations and boundaries on the current practice of the rule of capture.[185]

Second, market-based measures such as water subsidies, tariffs, and prices serve as one of the necessary components of a supply and demand system.[186] "Although pricing is currently touted widely, careful analysts see it as a necessary *but insufficient* incentive for achieving efficiency, equity, and sustainability."[187] As for the use of water tariffs, "[m]ost would argue that subsidies should be explicitly justified; that water tariffs should be designed to encourage conservation, not just to recover costs . . . ."[188] As it currently stands, water is supplied inexpensively to the public.[189] A problem arises with the continuing public growth.[190] Water suppliers have not been required to focus on new technologies that would increase water supply or improve water treatment and distribution.[191] Texas

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1-DO_TOPIC.html.

181. *Id.*

182. *Id.*

183. *See* DeLaughter, *supra* note 23, at 1489.

184. *Id.* at 1489–90.

185. *Id.*

186. Brooks, *supra* note 180.

187. *Id.* (emphasis in original).

188. *Id.*

189. *See* DeLaughter, *supra* note 23, at 1491 ("Water is supplied inexpensively such that most consumers do not even notice their water bills . . . . ").

190. *Id.*

191. DeLaughter, *supra* note 23, at 1491 (citing LEONARD S. HYMAN ET AL., THE WATER BUSINESS: UNDERSTANDING WATER SUPPLY AND WASTEWATER INDUSTRY 45–46 (1998) (predicting that water prices will increase if new technologies are not developed)).

and the Middle East would both benefit from their governments creating incentives for the development of system technologies that would advance conservation and lower water resource costs.[192] Regardless of which specific market-based subsidy is used, one must realize that when enacting any program, there is a crucial need to implement a system that monitors results.

A third tool that can be used in establishing a demand management system is known as nonmarket based measures.[193] These nonmarket based measures include the use of information and consulting services, the application of pressure to act in a certain manner, and the enactment of regulations that can limit the time or quantity of use.[194] With regard to information, it would be beneficial to develop education programs for the public regarding water resources.[195] It is ideal to have these nonmarket resources used in a way that fortifies the use of the above mentioned market-based sources.[196]

The final tool that may be used to create a demand management system is the use of direct intervention.[197] Basically, this area of direct intervention recognizes the involvement of governments in providing services and sewage management programs.[198] This involvement can be used to control decisions as to the location and quality of water.[199] For example, if Texas and the Middle East were to privatize their water regulation systems, both would need to establish programs of intervention that will allow for the private water market to function while at the same time allowing for the government to intervene should the private market step outside an established boundary—for example, health standards.

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192. *See id.* ("Government-subsidized municipalities have little incentive or funds to develop technologies that would lead to less expensive ways to increase supply and revolutionize conservation measure to prevent high rates of evaporation and leakage." (citations omitted)).

193. *See* Brooks, *supra* note 180.

194. *Id.*

195. *See* DeLaughter, *supra* note 23, at 1490 (discussing the benefits of public education on water issues).

196. *See* Brooks, *supra* note 180.

197. *Id.*

198. *Id.*

199. *Id.*

Outside direct privatization of the water regulation system and the use of demand management tools, one may also look to the establishment of technology that will allow for the increase of water supplies.

B. Desalination

Desalination is the process of removing dissolved salts from water.[200] This process is able to produce drinking water from seawater and brackish groundwater.[201] Two fundamental processes make desalination possible: thermal and membrane.[202] The thermal process involves heating salt water in order to produce a vapor that can then be distilled to produce fresh water.[203] The membrane process, on the other hand, uses actual membranes to separate the salts from freshwater.[204] This membrane involves using one of two methods: electrodialysis or reverse osmosis.[205] One argument proffers that desalination is one of the very few options available for areas like the Middle East.[206] Over time, "[d]esalination technologies have advanced rapidly in the last decades, bringing down costs and mitigating environmental consequences."[207] In fact, "[p]ublic private partnerships have evolved as a means to harvest the creativity and entrepreneurship of the private sector in partnership with public owners to integrate finance, planning, design, construction, operations and maintenance, and ownership in the delivery of complex projects."[208] In order to effectively combat

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200. Rebecca Maxon, *Is Desalination the Answer?*, FDU MAGAZINE ONLINE, Summer, 2003, http://www.fdu.edu/newspubs/magazine/03su/desalination.html ("Desalination . . . has truly come of age in the last decade.").

201. JAMES C. SMITH, TEX. PUB. POLICY FOUND., HOLD THE SALT: THE PROMISE OF DESALINATION FOR TEXAS 3 (2004).

202. *Id.* at 5.

203. *Id.*

204. *Id.*

205. *Id.* ("*Electrodialysis* uses an electrical potential to move salts through a membrane, leaving behind the freshwater. *Reverse osmosis* uses pressure to drive fresh water through a membrane leaving the salts behind for disposal." (emphasis in original)).

206. *See* Maxon, *supra* note 200.

207. SMITH, *supra* note 201, at 3.

208. *Id.*

water shortages in both areas, Texas and the Middle East should both expand their desalination efforts. When discussing the expansion of the desalination effort as a possible solution to the water shortage problem, one must consider costs and the environmental ramifications.[209]

Often, consideration of the cost of a desalination facility focuses on the amount of fresh water the facility produces.[210] Typically, the measure of cost is put in terms of dollars per thousand gallons.[211] The range of costs "[depend] not only on the costs of desalination facilities, but on the cost of conveyance facilities and environmental mitigation."[212] With improvements in technology, newer desalination facilities as well as the more expensive reverse osmosis facilities have been able to lower costs.[213]

Turning now toward the issue of environmental ramifications, the biggest existing concern is the disposal of the briny residue that remains after the desalination process.[214] For facilities in coastal areas that use sea water as the material source for desalination, the disposing of this briny residue back into the sea is a generally accepted method of disposal.[215] The same, however, is not true for inland desalination facilities.[216] In these situations, the inland facilities have the burden of transporting briny residue to the nearest seawater point or injection well.[217] In both instances, "[b]rine disposal issues often add substantial cost to desalination facilities . . . ."[218] When

209. *See id.* at 5.

210. *Id.*

211. *Id.*

212. *Id.*

213. *See* SMITH, *supra* note 201, at 5 ("Cost data provided on desalination plants, recently completed or in planning stages, show a cost range of $1.89–$2.76 per 1000 gallons. For seawater, reverse osmosis plants, costs have fallen from almost $6.00 per 1000 gallons . . . to less than $2.00 per 1000 gallons . . . . " (citations omitted)).

214. *See id.* at 6.

215. *Id.*

216. *Id.*

217. *Id.*

218. *Id.* (proposing that brine disposal costs "should be considered early in any feasibility study").

compared to the high demand and need for water, this cost is arguably nominal in comparison.

As the issues surrounding the longevity of water supplies increase, water rights will need to be more clearly defined. According to the World Water Council, the implicit right to water has not been put into practice due to the lack of political will and the confusion over a concrete definition of water rights.[219] An argument has been raised "that even with major improvements in water collection and distribution (that would provide 70 percent efficiency instead of the current average of 45 percent worldwide), there would still be a need for 20 percent more water, a prediction that has been termed the 'world water gap.'"[220] Unfortunately, because a number of the available sources have already been appropriated, there are limitations on how much additional water can be extracted from the environment.[221]

IV. CONCLUSION

The problem is simply stated: Water resources are limited while demand is ever growing. In order to battle this harsh truth, both Texas and the Middle East must shift gears into a new mindset when addressing their water regulation systems. This would include clearly defining rights to water, increasing cooperation among neighbors, and looking to new ways of regulating water, such as setting a reasonable use standard, privatizing the water sector, and focusing on the development of technologies such as desalination.[222] By formulating a clear definition of water rights, countries will be better able to understand the boundaries within which they are to act.

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219. *See* Right to Water, http://www.worldwatercouncil.org (last visited Feb. 4, 2007).

220. Robert Svadlenka, The Emerging Water Crisis and its Implications for Global Food Security, http://www.worldhungeryear.org/why_speaks/ws_load.asp?file=13&style=ws_table (last visited Feb. 4, 2007).

221. *Id.*

222. *Id.* ("New water storage projects, optimal water management methods, and design innovations will be important components of the solution to the water crisis. But just as important will be the fostering of a more respectful attitude toward water and the ecosystems that provide it.").

Increasing cooperation among neighbors will be the most challenging aspect of reform for both the Texas and Middle Eastern water regulation systems. For both areas, there is a long history that contributes to the current views of rights to water held among neighbors.

Finally, by looking to new ways of increasing the water supply, both Texas and the Middle East will allow for a greater likelihood of sustaining the maximum availability of water. This will, however, require that both areas contribute time, energy, and resources to the continual development of access to fresh water. After looking at the background of both Texas and Middle Eastern water regulation and the conflicts that exist internally in both areas, it is clear that both can benefit from the above mentioned solutions.

Although no one solution alone will suffice, in the aggregate, they will lead to a more constant supply of water. As with any solution or plan, the true benefit is not realized until it is implemented and given time to take effect. The only thing that is definite is the current systems in both Texas and the Middle East is not sufficient to sustain the needed level of water.

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* J.D., University of Houston Law Center, expected 2007; B.A. in Government, The University of Texas at Austin, 2003. The Author would like thank his family for their constant love and support. He dedicates this article to his mother, who taught him the value of education and the importance of being a good person. This Comment was the recipient of the 2006 Meyer Orlando Writing Award for an Outstanding Comment in the field of International Law.