

## THE GLOBAL WATER CRISIS: IMPENDING DISASTER AND THE ROAD TO COLLAPSE

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“Time and tide wait for no man.” - 16<sup>th</sup> Century proverb

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*Cassandra, of the ancient Greek myth, was doomed to see the future, but to have no one believe her.*

*Brett Buchheit and Matthew Mansfield also see the future, and it's not pretty. We, as a global community, are running out of water. The impact is being felt from the shores of Australia to the United States. We are beginning down a path which will eventually result in famine, pestilence, and global unrest. All of it caused by human activity. All of it preventable. And too few people will believe him.*

*It is often noted that, with the advent of nuclear weapons sixty years ago, humanity first gained the power to destroy itself. Little did we know, however, that we had already created a more insidious means of self-destruction: the destruction of our water resources.*

*Scientists have recognised this phenomenon for decades, but few of us listened to them. We didn't want to hear what the scientists had to say. We didn't want to change our ways. And, anyway, how could they be so sure? Our reluctance was encouraged by those with vested interests: like the tobacco companies before them, many pollution-emitting industries and water-hungry municipalities did everything in their power to foment doubt and inaction. Many still do.*

*Now, however, the evidence, as this article proves, is incontrovertible. When the last drop is consumed, where will we turn?*

*Let's hope that Brett Buchheit and Matthew Mansfield have more luck than Cassandra. Let's hope we, the global community, begin to approach the issue. Globally, our survival depends on it.*

*It is prescient that a law review article in Australia begins the global dialogue as often, it is the nation which makes headlines for approaching environmental woes. As Australia leads the charge, let us hope the other nations of the world follow suit.*

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## I INTRODUCTION: COMPLICATED STRUGGLE FOR WATER & THE DIAMOND-WATER PARADOX

Since the dawn of mankind, prospectors, politicians, and authors have marvelled at water; so precious, wars have been fought over its ownership and dominion. Contentious relationships and struggles over water have even impacted languages.

The word ‘rival’ takes its roots in conflicts over water, stemming from the Latin term rivalis, meaning “one taking from the same stream as another.”<sup>1</sup>

Water, of almost unascertainable value, for the most part, remains free. This notion has long been fodder for theologians who have marvelled at the Diamond-Water Paradox. The paradox wrangles with the fact that the price of items is measured by the labour it takes to possess them. Diamonds require massive labour and the physical removal of 250 tonnes of rock.<sup>2</sup> Water, which falls freely from the sky and flows from mountains, would seemingly be of little or no value, yet nothing could be further from the truth.

A quote often attributed to American author Mark Twain is, ‘[w]hiskey is for drinking, and water is for fighting over.’ The author of *Water: The Fate of Our Most Precious Resource*, wrote, “[m]illions have lived without love. No one has lived without water.”<sup>3</sup>

Until recently, water-related issues have not garnered much attention. That has changed, as the result of some sudden events which have caused societies to reassess their appreciation for this priceless resource and its current scarcity. Suddenly, the issue has gained notoriety as people are met with the harsh reality that water, like all other commodities, is finite. And without water, we as a global society are destined for incredible struggles in the near future.

Recent headlines have been awash with this crisis. “Seventy percent of the water used worldwide is used for agriculture. Much more will be needed if we are to feed the world’s growing population - predicted to rise from about six billion today to 8.9 billion by 2050.”<sup>4</sup> Almost immediately after that fact was published came this one: “If current trends continue, two planets would be needed by 2050 to meet humanity’s needs.”<sup>5</sup>

According to recent headlines, food prices have begun to soar due to higher grain prices and water prices, along with an increasing cost associated with the importation of goods. This comes at a time when, according to the United Nations, water scarcity “will affect between 2bn and 7bn people by the middle of next century.”<sup>6</sup>

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<sup>1</sup> Michael Specter, ‘The Last Drop: Confronting the Possibility of a Global Catastrophe’, *The New Yorker* (New York), 23 October 2006, 62.

<sup>2</sup> PBS, *The Diamond Deception* (2001).  
<<http://www.pbs.org/wgbh/nova/transcripts/2703diamond.html>>.

<sup>3</sup> Elizabeth Grossman, *A Review of Water: The Fate of Our Most Precious Resource* (2001) GRIST: Environmental News and Commentary  
<<http://www.grist.org/advice/books/2001/01/09/to/>>.

<sup>4</sup> Alex Kirby, *Water Scarcity: A looming crisis?* (2004) BBC News  
<<http://news.bbc.co.uk/1/hi/sci/tech/3747724.stm>>.

<sup>5</sup> BBC News, *The Living Planet: Facts and Figures* (2006)  
<<http://news.bbc.co.uk/2/hi/science/nature/6080074.stm>>.

<sup>6</sup> Vanessa Houlder, ‘World in Drier Straits’, *The Financial Times* (London) 10 August 2003, 1.

On the eve of the 3rd World Water Forum, the Vice-President of the World Water Council stated, “[t]he minimum consequences will be higher food prices and expensive food imports for water scarce countries that are predominantly poor,” referring to the consequences of droughts.<sup>7</sup> “The populations of the poorest countries will face hunger if they cannot get the resources to import food they cannot grow. It’s intolerable to think that billions of our children and grandchildren will face these deprivations because we fail to act today.”<sup>8</sup>

The United Nations highlighted the costs associated with poor water quality in a UNDP report issued on November 10, 2006.<sup>9</sup> The report states “dirty water is the second-leading cause of death among children globally... It kills 1.8 million children younger than 5 each year – more than HIV/AIDS, malaria, war or car accidents, says the UNDP report.”<sup>10</sup>

Water scarcity has caused ripples from Europe, India, and Australia. In the United States, there has been speculation that one of the causes of the excessive damage during the recent fires in Southern California was the policy-decision made which prevented water from being piped to the sites where it was needed, despite ample water being available to fight the fires.

According to the International Water Management Institute based in Sri Lanka, approximately one-fifth of the world’s population lives in areas without sufficient water supplies. This figure, constituting approximately 1.2 billion people, shows that as the population of the world expands, societies are struggling to meet their needs.<sup>11</sup>

This article is not, in any way, a theory. It demonstrates that, water struggles are nothing new and when water scarcity becomes an issue, the results are often brutal. The connection between unsustainable global environmental practices, the scarcity of water, and how that scarcity has led to the decline and extinction of previous civilizations is also not a recent subject. The facts are clear; if a society cannot adapt, they become extinct. As the article will show, every society failing to protect their most precious resource – water - has perished.

There are historical examples of wars being fought because of water and the rise and fall of dynasties being tied to the resource. An example lies in Ancient China, where “the Chinese character for ‘political order’ is based on the symbol for ‘water,’ and the meaning has always been clear: those who control water control

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<sup>7</sup> Ibid.

<sup>8</sup> Ibid.

<sup>9</sup> Robyn Dixon, *A Global Clean Water Shortage* (2006) Los Angeles Times. <http://www.latimes.com/news/nationworld/world/la-fg-water10nov10.1.6276868.story?coll=la-headlines-world>.

<sup>10</sup> Ibid.

<sup>11</sup> Patrick Barta, ‘Amid Water Shortage, Australia Looks to the Sea’, *The Wall Street Journal* (New York), 11 March 2008, A1-19.

people.”<sup>12</sup> Societies in Ancient China dealt with a scenario eerily similar to that of modern-day United States. “Population growth, economic development, and the increasing need for military preparedness resulted in intense competition for increasingly scarce resources and often erupted in war, creating a series of famines.”<sup>13</sup>

By highlighting the problems associated with unsustainable agricultural and livestock practices, water privatization, and water wars. This article will show that in the past, when societies have been blind to water concerns, they have often disappeared and argues, that if the global community does not reassess its present situation, there is no reason to assume we will not meet the same fate – famine, war, and pestilence.

Ultimately, this article seeks to offer solutions to lessen or eliminate water shortages and their imminent catastrophic impacts. Although the planet appears to be nearing a tipping point, if drastic changes are made, the present crisis could potentially be ameliorated. But global effort will be required, lest we meet the fate of those before us who have ignored the tell-tale signs.

International policy author Eric Dannenmaier describes the paradoxical effect by commenting:

Despite the risk to resources, economies, and populations, the link between environmental policy and regional security is poorly understood and rarely viewed comprehensively. Ironically, if foreign troops or terrorists threatened the same consequences, the response would be more certain.<sup>14</sup>

The authors must make an important note regarding the tabulation of statistics in the article. In our research, we reached the conclusion that the best approach to take was not to cover the globe and find various places struggling with domestic water scarcity. It is safe to say that it would be unnecessary to state that societies across the planet are struggling with the issue. Instead, we decided the best approach would be to focus on the crisis in one area which can best be applied to the struggles almost all nations face. It is for that reason we decided to focus our research on one area: the American Southwest. The majority of our statistics concentrate on this region because it is quite simple to apply what is happening there to what is happening elsewhere. The region finds itself struggling with the ability to provide enough water for its ever increasing citizenry, a situation mirrored in the majority of nations across the globe.

By way of background, the American Southwest includes the U.S. states of Arizona, California, Colorado, Nevada, New Mexico, and Utah, and comprises a

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<sup>12</sup> Specter, above n3, 69.

<sup>13</sup> David A. Francko and Robert G. Wetzel, *To quench our thirst: the present and future status of freshwater resources of the United States* (1983) 62.

<sup>14</sup> *Ibid.*

population of over 66.7 million people, almost 25 percent of all U.S. citizens. The region contains the major metropolises of Los Angeles, San Diego, San Francisco, Phoenix, Denver, and Las Vegas and is one of the most populous areas in the United States, containing some of the world's largest cities.

Although the statistics in the American Southwest may seem regionalised, the parallels to Australia and the rest of the globe's current crisis are clear. We, as a global society, are running out of water. And we, as a global society, must act. The U.S. Southwest is not a microcosm; instead it is a study of one area which lends itself to predictions across the rest of the world. This area was chosen due to its rapidly increasing population, the economic resources in the area, and the inability of United States to solve the region's water problems despite the injection of trillions of dollars to counter the predicament.

As for solving the crisis, if money alone cannot remedy the situation, what can? It would seem the only hope is community activities, conservation efforts, and utilising technology such as Australia's new desalination plants.<sup>15</sup> By allowing ourselves to focus on the issue, by governmental action, and through science, it is possible we can prevent our demise.

The problem is not insurmountable but it will require concerted action. Like most global communities, Australia itself has felt the impact of drought with the failure of domestic wheat crops in 2006 and the economic effects that were felt due to soaring grain costs and the impact on pig farms in the United Kingdom.<sup>16</sup>

It would seem we are all intertwined in this disaster. If the price of corn in London can increase the cost of a B.L.T. in Perth, it seems we are no longer able to pretend we are not all neighbours in this global community. It would seem we must succeed together or fail together. At this point, there appears to be no middle ground.

According to a 2005 study by the U.S. Climatic Data Centre, which noted 67 percent of the Southwest was in moderate to extreme drought.<sup>17</sup> There can be no doubt that a disaster waits at the doorstep of every nation across the globe and potentially, it will be a disaster of epic proportions if the global community does not find a solution to this impending catastrophe. Current global drought conditions, combined with massive increases in industry and population, have forced nations to literally squeeze water out of the desert, creating a 'tipping point.' If unencumbered, nations will soon no longer have enough water to survive.

To illustrate the swiftness with which this calamity may arise, we turn to a simple illustration. With a scale, when weight is slowly added to the weighing pan, one

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<sup>15</sup> Barta, above n14, 1.

<sup>16</sup> Guy Chazan, 'Swine Song: U.K. Pig Farmers Stuck in Crisis', *Wall Street Journal* (New York), 26 March 2008, A1-12.

<sup>17</sup> MSNBC, *West drought could be worst in 500 years* (2007)  
<<http://www.msnbc.msn.com/id/5239212>>

side gradually and gingerly descends. However, when weight is rapidly added, the lighter side will fall so swiftly, the weighing pan will bounce dangerously. The impending disaster will not be a gradual descent. It will be a forceful, shocking occurrence that will leave regions scrambling for solutions. Note that there is no maybe in this equation. When the Earth reaches this tipping point, the effects will be swift, critical, and brutal.

The concept of “water scarcity” was developed by Malin Falkenmark, Senior Scientist at the Stockholm International Water Institute.<sup>18</sup> “A country is said to experience water stress when annual water supplies drop below 1,700 cubic meters per person. When supplies drop below 1,000 cubic meters per person per year, the country faces water scarcity for all or part of the year.”<sup>19</sup> According to Falkenmark, when this figure is reached, the impacts of water scarcity will become apparent.<sup>20</sup>

It should be noted this article relies heavily on current periodicals and publications, reflecting the most current information available at the time of the article’s submission. Additionally, there are several comments obtained through meetings and emails with scholars, scientists, professionals in the field, and individuals who specialise in environmental concerns. It is for those reasons that it must be mentioned, had it not been for the helpful assistance of those who guided our efforts, our research would not have been as fruitful.

## II CAUSE AND EFFECT: LIVESTOCK, GRAZING, AND A LESSON IN THE U.S. BEEF INDUSTRY

What forces bring people to arid communities and create water scarcity? How does an arid, desert region see a population growth that increased six-fold since the turn of the century and more than doubled since the mid-1960s, such as that in Phoenix, Arizona?<sup>21</sup> To understand the environmental complexities and pitfalls of cattle raising and the devastating effects it has on water resources, it is necessary to examine case studies of agriculture and livestock in the South-western United States. The parallels to other agrarian areas are near-mirror images.

### *Western Beef*

According to the American Meat Institute, the average American consumes between 60 and 75 pounds of beef, and the cattle-industry in the US produces 26,492 million pounds of beef.<sup>22</sup> The fact that there are massive amounts of cattle in

<sup>18</sup> United Nations Millenium Project, *Malin Falkenmark* (2007) <<http://www.unmillenniumproject.org/who/falkenmark.htm>>

<sup>19</sup> Don Hinrichsen, *Freshwater: Lifeblood of the planet* (2007) *People and the Planet* <<http://www.peopleandplanet.net/doc.php?id=671&section=14>>

<sup>20</sup> Ibid.

<sup>21</sup> CP-LUHNA, *Population Growth* <<http://cpluhna.nau.edu/Change/populationgrowth.htm>>.

<sup>22</sup> American Meat Institute, *Overview of U.S. Meat and Poultry Production and Consumption* (2001) <<http://www.amif.org/FactSheetMeatProductionandConsumption.pdf>>.

the American Southwest comes as a surprise to no one who has driven across the arid expanses of Texas, New Mexico, and Arizona, where often the names of the towns are derived from types of cattle, such as Hereford, Clovis, Galloway, and Highland. But how did such water-hungry animals find themselves in the middle of the desert?

The invention of barbed wire in 1873 allowed for livestock to be contained over enormous areas of land.<sup>23</sup> Through large-scale confinement, governmental subsidies and governmentally-supplied water, the United States began its addiction to “Western Beef.” Previous to this phenomenon, beef was a luxury. Afterwards, it became a staple. By pumping money and water into the desert, the United States began to create a problem which, nearly 100 years later, would force the population of the region to wonder: when will we run out of water?

In the US, there are approximately 8,000,000 cattlemen.<sup>24</sup> Cattle are raised either by private farmers or corporations, often by grazing on publicly-owned land until the cattle reach maturity. They are then slaughtered on-site or transported to confined-areas known as ‘feedlots’ to be processed.<sup>25</sup> So what is the impact of millions of cattle in one area? What happens when hundreds of thousands of cows walk on arid soil? What is the environmental impact of their waste?

Noted environmental and water law author David Zwick writes, “With more than 107 million cattle presently residing in the US, the Department of Agriculture boasts that ‘animal wastes in this country [which it estimated at over 1.7 billion tons annually] probably exceeds wastes from any other segment of our agricultural-industrial commercial-domestic complex.”<sup>26</sup> Statistics show that gathering hundreds of thousands of cows in small areas, providing them with water and grain, and dealing with their excrement has dramatic impacts on the environment and specifically, on the area’s water supply.

#### *Free-range and Feedlot Impacts*

In an article titled, *Rivers of Crud*, author Susan Zakin notes free-range cattle has had a disastrous impact on the Southwest.<sup>27</sup> A survey conducted by several scientists found:

Livestock grazing has damaged approximately 80% of stream and riparian ecosystems in the western United States. Although these areas compose only 0.5-

<sup>23</sup> Christopher W. York, *Anthropology of Nostalgia: Primitivism and the Antimodern Vision in the American Southwest, 1880-1930* (Masters Thesis, Massachusetts Institute of Technology, 2001).

<sup>24</sup> Best Food Nation, *Americas Beef Producers* (2006) <<http://www.bestfoodnation.com/beef.asp>> at 19 March 2007.

<sup>25</sup> Ibid.

<sup>26</sup> David Zwick, *Water Wasteland: The Report on Water Pollution*, (2005), p.34.

<sup>27</sup> Susan Zakin, *Rivers of Crud* (1999) <<http://www.grist.org/news/maindish/1999/08/26/zakin-cow>>.

1.0% of the overall landscape, a disproportionately large percentage (~70-80%) of all desert, shrub, and grassland plants and animals depend on them. Recent studies clearly document that livestock continue to degrade Western streams and rivers, and that riparian recovery is contingent upon total rest from grazing.<sup>28</sup>

These scientists also note, “A 1990 EPA report on grazing based on extensive field observations in the late 1980s revealed that riparian areas throughout much of the West were in ‘their worst condition in history.’”<sup>29</sup>

In addressing the issue of feedlots, the United States Department of Agriculture (USDA) cites urine and manure as “[t]he major source of environmental degradation from confined animal production,” noting “[a]nimal waste can be transmitted through runoff of nutrients, organic matter, and pathogens to surface water” and “leaching of nitrogen and pathogens to ground water.”<sup>30</sup> In a separate study, thirteen noted scientists, professors and authors found, “[d]uring the four to five months each animal spends in the lot, it produces 0.5 tons of manure (dry weight). This can lead to high nitrogen concentrations in the groundwater under some conditions.”<sup>31</sup> They also noted, “Of the potential contaminants in manure, nitrate is the most important, as it is soluble in water and its concentration remains unchanged while passing through the soil.”<sup>32</sup> In simple terms, the sheer amount of manure and the fact it contains such high levels of nitrogen effectively deoxygenates water.

#### *Hazards Associated with Collection of Waste on Feedlots*

When cattle are contained in feedlots, their impact does not become harmless. Citing a U.S. Environmental Protection Agency (EPA) statistic where livestock waste has led to the pollution of more than 27,000 miles of river, an environmental organisation named Ask for Change comments:

One of the most dangerous practices of factory farming is the storage and ‘use’ of liquefied animal waste. The massive quantities of manure generated by [feedlot cattle] are stored in sewage pits and then spread onto cropland. These manure pits often leak or overflow, releasing toxic bacteria and excess nutrients into groundwater. Spreading waste on the ground leads to ... water pollution when more manure is applied than the surrounding land can absorb.<sup>33</sup>

<sup>28</sup> A.J. Belsky, A. Matzke and S. Uselman, ‘Survey of Livestock Influences on Stream and Riparian Ecosystems in the Western Unites States’ (1999) 54 *Journal of Soil and Water Conservation* 419-431.

<sup>29</sup> Ibid.

<sup>30</sup> United States Department of Agriculture: Economic Research Service, *Agricultural Resources and Environmental Indicators, 2006 Edition* (2006) <<http://www.ers.usda.gov/publications/arei/eib16/Chapter4/4.5>>.

<sup>31</sup> Bruce J. Peterson et al, ‘Control of Nitrogen Export from Watersheds by Headwater Streams’ (2001) 292 *Science* 86-90.

<sup>32</sup> Ibid.

<sup>33</sup> Meat Matters: Ask For Change!, *Ask for Change! Issues* <<http://www.askforchange.org/issues.htm#waterpol>> at 19 March 2007.

*Tonnes and Tonnes and Tonnes of Manure, Not to Mention Urine*

A single cow releases an average of 95 pounds of urine and faeces daily.

Cattle in the U.S. alone produce nearly one billion tons of organic waste per year. The organic waste created by a 10,000 head feedlot is equivalent to the human waste generated by a city of 110,000 people. Most of the organic waste generated by feed lots becomes runoff.<sup>34</sup>

These associated wastes “have important influences on water quality, soil nutrient status, defoliation patterns, and insect and odour concentrations. The severity of the impacts from wastes appeared to be related first to the distribution of animals, second to their concentration”<sup>35</sup>. According to the USDA, having large numbers of cattle in a confined area exacerbates the impact. The animals’ concentrated waste is destructive “because bacteria are carried to water as runoff during precipitation events. For example, increased contamination was more strongly influenced by the cattle use of meadows near streams than the stocking density in the entire pasture.”<sup>36</sup>

The impacts do not arise solely, however, just from excrement. “In addition to the threat to groundwater from the vast quantities of manure thus generated, there is also a threat from the food activities, such as hormones and antibiotics, which the manure may contain.”<sup>37</sup> This poses less of a threat in areas where the groundwater is located in a deep water table, but in areas where the groundwater is shallow, such as in arid areas, the risk of contamination is higher.<sup>38</sup>

The impact of urine on vegetation is also immense;

Urine deposits create patches of high nitrogen concentration in soil and plants, because urine contains the majority of nitrogen in animal wastes, even though the majority of this nitrogen is volatilised. This high concentration of nitrogen is followed by increased intensity of defoliation by grazing animals in the growing season.<sup>39</sup>

The impact of this nitrogen-rich fluid does not end once it hits the ground, however. That is only the beginning of the cycle. According to the USDA,

[m]ost of the feedlots’ liquid waste evaporates. But that is not, unfortunately, the end of it. As much as 90% of the urinary nitrogen excreted on feedyards is volatilized

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<sup>34</sup> Marguerite Hampton, *What Price Beef?* (1997) Turtle Island Institute <<http://www.tiiclics.org/Archive1/Beef.html>>.

<sup>35</sup> Mitchel P. McClaran, ‘Improving Livestock management in Wilderness’ (Paper presented at the Wilderness Science in a time of Change Conference, Missoula, 23-27 May 1999) 53.

<sup>36</sup> Ibid.

<sup>37</sup> Peterson et al, above n 34, 77.

<sup>38</sup> Ibid.

<sup>39</sup> McClaran, above n38.

(passed off in vapor-form) as ammonia. The airborne ammonia is then reabsorbed by nearby water, where it simulates eutrophication (enrichment of a body of water due to chemical nutrients) and increased the danger of nitrate poisoning in drinking water supplies. Most of the remaining 10% percolates down through the pasture to contaminate the groundwater underneath.<sup>40</sup>

It would appear that, given these statistics, putting livestock in an arid environment is perhaps the worst place for them to be, and interestingly, cattle are perhaps the worst animals for these arid areas

[b]ecause [the] drying (of feces) strongly reduces the probability of contamination. [C]ontamination will be more likely in mesic areas [areas adapted to moist environments] than arid areas, and from cattle feces because they are more moist than feces from horses and sheep.<sup>41</sup>

#### *Trampling, Defoliation, Siltation, Soil Health and Groundwater*

The impact of cattle on the land itself deserves some investigation and must be quadrupled when analysing soil trampling (one cow, but four hooves). “Soil compaction ... has adverse effects on plant health.”<sup>42</sup> Trampling destroys photosynthetic tissue and triggers an energy flow rate decrease through the plant.” This results in “fewer flowers in the season following trampling treatments. Continued trampling triggers further breakdown of the system leading to death of the plant.”<sup>43</sup>

The USDA states, “[s]oil that is eroded from disturbances in riparian or upland areas is being deposited into streams. This adversely affects water quality and aquatic habitats in most streams where it does occur.”<sup>44</sup> “Loss of topsoil or contamination by foreign chemicals could significantly degrade forest sustainability”<sup>45</sup> The impact of this sedimentation attracts the staggering comment that “agricultural lands contribute most of the more than 4 billion tons of sediment produced each year in the United States (compared to some 32 million tons of organic waste and suspended or settleable solids produced by all industries and municipalities combined).”<sup>46</sup> As these sediments work their way downstream, they clog aquatic arteries and impair irrigation lines.<sup>47</sup>

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<sup>40</sup> Zwick, above n29, 94.

<sup>41</sup> Paul Rogers et al, *Forest Health Monitoring in the Interior West: A baseline summary of forest issues 1996-1999* (2001).

<sup>42</sup> Ibid 114.

<sup>43</sup> Ibid 142.

<sup>44</sup> Ibid.

<sup>45</sup> Ibid.

<sup>46</sup> Zwick, above n29, 94.

<sup>47</sup> Ibid.

When evaporation and transpiration exceed precipitation, as in the arid Southwest, “the recharge of groundwater takes place only in ‘wet’, or multi-cycle years.”<sup>48</sup> In the arid areas, where evaporation and transpiration can greatly exceed precipitation, the mineralisation of groundwater due to leaching is a significant cause of contamination; evapotranspiration may further concentrate salts.<sup>49</sup>

#### *Water Requirements for Raising Cattle*

“The production of 1 kg of beef requires 16,000 liters of water.”<sup>50</sup> “The water used to produce just 10 pounds of steak equals the household consumption of a family for one year. The water that goes into producing one 1,000 pound steer would float a battleship.”<sup>51</sup> Obviously, in a water-scarce environment, these statistics cause alarm.

#### *Total Impact*

Nearly all of the ecologically impaired 410 million acres of U.S. rangelands, according to an estimate by the Natural Resource Conservation Service, are located in the West.<sup>52</sup> “This is an area four times the size of California, or 21 percent of the continental United States...” where “at least 50 percent of the desirable plant species [are] eliminated, [has] high erosion and weed invasion rates, and [the] riparian areas unable to function normally.”<sup>53</sup>

#### *Governmental Rewards: Water and Beef Subsidies*

Beef subsidies, in the form of monetary governmental grants and tax breaks, are intended to benefit the public by lowering the price of goods. The concept is ‘the ends justify the means’ and these incentives are made to provide for the public good while off-setting the actual cost of the industry. Beef grants are created by the government with the intention of benefiting consumers with lower prices. Ironically, they end up having the opposite effect. According to an article in the San Francisco Chronicle, not only do more than half of the US water supplies go to livestock production, but the actual cost of subsidies is driving up the cost of meat and these increases are borne by the US taxpayers.<sup>54</sup> “If water used by the meat industry were not subsidised by taxpayers, common hamburger meat would cost

<sup>48</sup> Peterson et al, above n 34, 88.

<sup>49</sup> Ibid 89.

<sup>50</sup> University of Twente & UNESCO, *Water Footprint* (2007) Water Footprint <<http://www.waterfootprint.org/>> at 19 March 2007.

<sup>51</sup> Hampton, above n37.

<sup>52</sup> Ibid.

<sup>53</sup> George Wuerthner, *Livestock: Myth and Reality* Western Watershed Project <[http://www.westernwatersheds.org/facts\\_photos/livestck\\_myths/livestck\\_myths.html](http://www.westernwatersheds.org/facts_photos/livestck_myths/livestck_myths.html)> at 19 March 2007.

<sup>54</sup> Simone Spearman, ‘Eating More Veggies Can Help Save Energy’, *San Francisco Chronicle* (San Francisco) 29 June 2001, B4.

\$35 a pound. You need 25 gallons of water to produce a pound of wheat - 2,500 gallons to generate a pound of meat.”<sup>55</sup>

According to author and water-specialist George Wuerthner, the impact of the subsidies is often that the rich get richer while the poor get poorer. Public lands grazing subsidies, like most agricultural subsidies, disproportionately benefit large landholders. According to a recent Government Accounting Office (GAO) profile of nearly 20,000 permittees, the largest 500 control 36 percent of the public lands foraged. Just 16 percent of all permittees control 76.2 percent of the AUMs (animal unit months-a measurement of forage) available on Bureau of Land Management (BLM) lands. Most of these permittees are big corporations. The smallest 2,000 permittees control less than 0.13 percent of BLM forage. This inequality is a result of the process for assigning public lands allotments. Access to permits requires ownership of private base operations. Since wealthy ranchers own more land, and thus more base property, they wind up with more federal lands allotments.<sup>56</sup>

When viewing the issue of subsidies on a global scale, it appears subsidies help the process of cattle-raising, but harm both the land and the water of the area. According to the 30-nation group Organization for Economic Co-operation and Development (OECD), governmental farm subsidies negatively impact water conservation.<sup>57</sup> In an October 31, 2006 report, the OECD announced, “[g]overnment policies to support farm production often discourage the efficient use of water and aggravate pollution.”<sup>58</sup> After the report was released, the OECD stated “subsidizing irrigation systems and lowering water charges paid by farmers ... undermines the efficient use of water. Moreover, providing lower pumping costs to agriculture accelerates the depletion of ground water aquifers and adds to the energy intensification of farming.”<sup>59</sup>

Famed American author and political activist Ralph Nader, when speaking of the troubles with water treatment plant subsidies, commented:

Hundreds of millions of construction grant subsidies flowed from Washington to local government for water treatment plants which industry promptly used to dump more water through. This subsidy to local government turned into a subsidy to factories that increased water pollution – and at the taxpayers’ expense.<sup>60</sup>

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<sup>55</sup>

Ibid.

<sup>56</sup>

Ibid.

<sup>57</sup>

Organisation for Economic Co-operation and Development, *Farm Support Undermining Sustainable Use of Water* (2006).

<[http://www.oecd.org/document/24/0,2340,en\\_2649\\_37465\\_37619288\\_1\\_1\\_1\\_37465.00.html](http://www.oecd.org/document/24/0,2340,en_2649_37465_37619288_1_1_1_37465.00.html)

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<sup>58</sup>

Ibid.

<sup>59</sup>

Ibid.

<sup>60</sup>

David Zwick and Marcy Benstock, *Water Wasteland; Ralph Nader’s Study Group Report on Water Pollution* (1971) xiii.

*Who Profits from Western Beef Subsidies?*

Though seemingly intertwined with the continual livelihood of the West, agriculture and ranching in the South-western United States is slowing. “Since 1980, employment in these natural resource sectors has declined significantly in the Mountain West region.”<sup>61</sup> Additionally, US Courts have commented the BLM is not maintaining the arid areas of the Southwest, writing that “84 percent [of BLM managed areas] are in fair, poor, or bad condition.”<sup>62</sup> Commenting on the Council on Environmental Qualities assessment of BLM lands, the Court in *NRDC v Morton* noted, “[m]uch of this land, particularly the vast public domain, remains in desperate condition.”<sup>63</sup> The Court finished their opinion with the comment, “[u]ncontrolled, unregulated, or unplanned livestock use is occurring in approximately 85 percent of (the area) and damage to wildlife habitat can be expressed only as extreme destruction.”<sup>64</sup> This, the Court surmises, “[makes] it apparent ... that grazing systems do not protect and enhance wildlife values.”<sup>65</sup>

Dr. Jared Diamond, commenting on “perverse subsidies” in his book *Collapse*, notes subsidies are a way for the rich to stay rich while the average taxpayer never sees the bottom-line.<sup>66</sup> “The relatively few... lobby tenaciously for the subsidies that represent their income, while the losers [all the taxpayers] are less vocal because the subsidy is funded by just a small amount of money concealed in each citizen’s tax bill.”<sup>67</sup> Measures benefiting a small minority at the expense of a large majority are especially likely to arise in certain types of democracies that bestow ‘swing power’ on some small groups: e.g., small religious parties often holding the balance of power in Israel to a degree scarcely possible under the Dutch parliamentary system.<sup>68</sup>

*Poor Governance*

According to the United Nations, there is an issue of “good versus bad governance” as noted in the statement “(g)overnance is seen by UNDP as the exercise of economic, political and administrative authority to manage a country’s affairs.”<sup>69</sup> The UN seems to indicate that without a participatory approach, policies enacted are no better than a paper tiger. “Among the factors to achieve good governance are

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<sup>61</sup> Thomas Michael Power, ‘The Changing Economic Role of Natural Landscapes in the West: Moving Beyond an Extractive and Tourist Perspective’ (2001) 31 *Environmental Law Reporter* 10439.

<sup>62</sup> *NRDC v. Morton*, 388 F. Supp. 829 (D.C. 1974).

<sup>63</sup> *Ibid.*

<sup>64</sup> *Ibid.*

<sup>65</sup> *Ibid.*

<sup>66</sup> Jared Diamond, *Collapse: How Societies Choose to Fail or Succeed* (2004) 427.

<sup>67</sup> *Ibid.*

<sup>68</sup> *Ibid.*

<sup>69</sup> United Nations Development Programme, *A Global Report: Reducing Disaster Risk A Challenge for Development* (2004) <[http://www.undp.org/cpr/whats\\_new/rdr\\_english.pdf](http://www.undp.org/cpr/whats_new/rdr_english.pdf)> 75.

participation, efficiency, and strategic vision. At the heart of good governance is a commitment to sharing decision-making power between the stakeholders in a process.” The UN states, “[t]his contrasts with the conception of the government as the dominant actor shaping development and disaster risk management.”<sup>70</sup> The UN comments, “urban planning, building regulations, environmental control and regional development ... can all be describes as failures.”<sup>71</sup>

There exist a morass of complex domestic and international laws. In the struggle over such a critical resource, these competing interests prevent a cohesive plan. It has become an issue of the ‘haves’ and the ‘have nots’, and those with political clout are usually the ones who prevail. “We as a society still retain faith in the technological approach to solving environmental problems and in the adequacy of present laws and conventions governing the use of natural resources.”<sup>72</sup> This perception has led to a general ignorance as to where our water comes from and whether or not it will run out.

### III ADDITIONAL FORCES ENGENDERING WATER SCARCITY

#### *Virtually Free Water and the Diamond/Water Paradox*

The current attitude about water, generally, is that is free. Indeed, water is cheap. It falls from the sky, flows naturally through rivers and streams, surrounds continents, and in most developed countries, is a faucet-turn away. Theologians from Copernicus to Locke wrestled with the “water-diamond paradox”. Adam Smith, in *The Wealth of Nations*, noted, “[n]othing is more useful than water; but it will purchase scarce anything; scarce anything can be had in exchange for it. A diamond, on the contrary, has scarce any value in use; but a very great quantity of other goods may frequently be had in exchange for it.”<sup>73</sup>

Ralph Nader comments, “[w]ater is the most precious, limited natural resource we have .... The technology that ruins this water can also save it. But because water belongs to no one – except the people – special interests, including government polluters, use it as their private sewers.”<sup>74</sup> Without recognising that current attitudes towards water are one of the causes of the water crisis, the problem increases. “[T]echnological expansion was one of the prime causes of water shortfalls, rather than the potential cure.”<sup>75</sup> The current perception of water is that if there is a crisis, technology will solve the problem.

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<sup>70</sup>

Ibid.

<sup>71</sup>

Ibid 76.

<sup>72</sup>

Francko and Wetzel, above n16, 93.

<sup>73</sup>

Adam Smith, *An Inquiry into the Nature and Causes of the Wealth of Nations*, (first published 1776, 1877 ed) 37.

<sup>74</sup>

Zwick and Benstock, above n63.

<sup>75</sup>

Francko and Wetzel, above n16, 83.

It is because of this ignorance that people move to arid, water-scarce areas, fully expecting their water-needs to already have been addressed. An abundance or scarcity of water does not seem to affect the mass entry to the American Southwest, and with this entry the strain on water resources increases. Perhaps this is due to the fact that water in the American Southwest has not been deemed a “critical element”.<sup>76</sup> Nikolai Ramsey of the Grand Canyon Trust, states, “[s]tudies have shown that water scarcity or availability doesn’t affect growth patterns at all. It seems that people go where they want and water is found to accommodate them”.<sup>77</sup>.

### *Agricultural Impacts*

The impact of farming in the US Southwest has increased the severity of the water-scarcity issue.<sup>78</sup> Farming in an arid, desert environment, rather than fertile, water-rich areas requires more water from a resource when there is little to spare.<sup>79</sup> Regardless of the location of the agriculture, its impact is severe. Farming, by its very nature, necessitates a massive amount of water. Water conservationist and author of *Keepers of the Spring* Fred Pearce states, “[i]n the United States, farmers used roughly 50 trillion gallons of water in 2000, about one-third of the country’s total water use”.<sup>80</sup> The problem is only compounded in the Southwest.

A comment from noted-professor N. William Hines, a scholar on the issue of water quality, is that the explosion of agriculture is one of the reasons why its impact is so severely felt.<sup>81</sup> When farming was done on a subsistence-level, the impacts were not as grave.<sup>82</sup> The implementation of agribusiness techniques has led to the current environmental impact.<sup>83</sup> “Agricultural wastes have always contributed to water pollution, but until recent development of large scale commercial farming based extensively on modern technology, these wastes were sufficiently diffuse to escape attention”.<sup>84</sup>

#### IV DISPELLING THE MYTH & RISKS ASSOCIATED WITH INACTION

What are the risks of not taking action? Who will suffer from water scarcity crisis globally and where will those people turn?

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<sup>76</sup>

Ibid.

<sup>77</sup>

Ibid.

<sup>78</sup>

United States Department of Agriculture: Economic Research Service, *Agricultural Resources and Environmental Indicators, 2006 Edition* (2006)  
<<http://www.ers.usda.gov/publications/arei/eib16/Chapter2/2.2/>>

<sup>79</sup>

Ibid.

<sup>80</sup>

Fred Pearce, *Keepers of the Spring: Reclaiming Our Water in an Age of Globalization* (2000) 20.

<sup>81</sup>

N.W. Hines, ‘Nor Any Drop to Drink: Public Regulation of Water Quality’ (1966) 52 *Iowa Law Review* 186-193.

<sup>82</sup>

Ibid.

<sup>83</sup>

Ibid.

<sup>84</sup>

Ibid.

First, we must dispel the myth that there is no looming catastrophe. Without sufficient quantities of clean water, society would crumble. Potable water and water for irrigation are essential to a balanced society. Scientists using tree-ring studies noted the current water drought in the Southwest is even more severe than that of the Dust Bowl Era in the U.S.<sup>85</sup> The U.S. Geological Survey reports “[t]hese comparisons suggest that the current drought may be comparable to, or more severe than, the largest-known drought in 500 years.”<sup>86</sup> “Clean water has not only healed humanity but nourished it. Irrigation for agriculture accounts for more than two-thirds of all water use, and sophisticated water-distribution projects have helped increase crop yields to feed the earth’s surging population.”<sup>87</sup> A lack of water would create a crisis.

Second, we must assess who is most vulnerable when water resources fail to provide for the burgeoning world population. Interestingly, individuals in water-scarce areas may not be the first to feel its shortage. “[T]he most vulnerable people many not be in the most vulnerable places – poor people can live in productive biophysical environments and be vulnerable, and wealthy people can live in fragile physical environments and live relatively well.”<sup>88</sup> As seen in the example cited earlier, higher corn costs in the U.K. caused ripples in markets thousands of miles away in Australia.

That having been said however, where an individual lives is certain to increase his/her susceptibility to the crisis “having been increasingly recognized as one among many processes that influence vulnerability”.<sup>89</sup> The impact will most certainly be borne by those whose livelihoods are associated with agriculture. “The problems will be most acute for farmers, the biggest consumers, accounting for 75 percent of all water withdrawn from rivers, reservoirs, and aquifers.”<sup>90</sup>

The interconnectivity is plain to see. If production prices in one area increase, those increases are reflected in the cost to the consumer. If suddenly a head of lettuce were to increase by 500%, consumers located far from the lettuce-producing farms would either be forced to bear the cost or alter their purchases. With the dietary and purchasing decisions in developing-nations being changed, the economic impact will be felt by both the producer and by the consumer. The interconnectivity of the economy impacts all participants, both those on the farm and those far away.

When addressing the issue of environmental security and governance, comparative environmental law and international sustainable development policy specialist Eric

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<sup>85</sup> Ibid.

<sup>86</sup> Ibid.

<sup>87</sup> Spector, above n3, 63.

<sup>88</sup> K.L. O’Brien and R.M. Leichenko, ‘Double Exposure: Assessing the Impacts of Climate Change Within the Context of Economic Globalization’ (2000) 10 *Global Environmental Change* 224.

<sup>89</sup> D.M. Liverman, and K.L. O’Brien, ‘Global Warming and Climate Change in Mexico’ (1992) 1 *Global Environmental Change* 332.

<sup>90</sup> Houlder, above n9.

Dannenmaier states, “[t]he challenges come from development patterns that place communities at heightened risk of natural disaster, the long-term impact of population growth and land use decisions, poorly managed resource exploitation, and the lack of strategic energy policies”.<sup>91</sup> As shown, the massive changes in population distributions, poor governmental policies and unchecked subsidies allows one to believe that the environmental security of the area is in jeopardy, which Dannenmaier explains “is a real, immediate and potentially costly concern...in both human and economic terms.”<sup>92</sup>

Dannenmaier describes the paradoxical effect by commenting:

Despite the risk to resources, economies, and populations, the link between environmental policy and regional security is poorly understood and rarely viewed comprehensively. Ironically, if foreign troops or terrorists threatened the same consequences, the response would be more certain.<sup>93</sup>

Additionally, should there be a crisis, where will the inhabitants of that region of the world turn? Should we expect a mass exodus, as has been the case in nations where water has suddenly not been able to support the populous? According to data from Dannenmaier and the UN World Food Programme, “environmental refugees represent 58 percent of the total refugee population worldwide”.<sup>94</sup>

Author Rutherford H. Platt addressed the issue of where victims of disaster turn. He commented that as evacuees flee a catastrophe, they are rarely welcomed in the areas where they seek refuge. Platt cites the NIMBY (‘not-in-my-backyard’) concept.<sup>95</sup> If and when the crisis reaches the area, where will those displaced go?

In a recent New York Times article,<sup>96</sup> Platt’s NIMBY concept dealing with refugees recently gained notoriety in the U.S. state of Idaho, where the city council in the city of Greenleaf asked all residents to purchase firearms.<sup>97</sup> This request was made in anticipation of a possible influx of refugees, modelled after Idaho saw the evacuees of New Orleans from Hurricane Katrina attempting to escape the storm’s wrath.<sup>98</sup> The ordinance, which passed the city council recently, was aimed at preventing refugees from entering the town.<sup>99</sup> It would seem individuals fleeing an environmental disaster would be met with hostile opposition as they attempt to escape a crisis.

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<sup>91</sup> E. Dannenmaier, *Environmental Security and Governance in the Americas* (2001) 1.

<sup>92</sup> Ibid 5.

<sup>93</sup> Ibid.

<sup>94</sup> Ibid.

<sup>95</sup> Rutherford H. Platt, *Disaster and Democracy*, (1999) 237.

<sup>96</sup> Glenn Reynolds, ‘A Rifle in Every Pot’, *The New York Times* (New York), 16 January 2007, 16.

<sup>97</sup> Ibid.

<sup>98</sup> Ibid.

<sup>99</sup> Ibid.

## IV HISTORICAL IMPACTS DUE TO ENVIRONMENTAL FACTORS

Tulane University School of Law's Oliver Houck, when considering the massive history of societal shifts due to environmental crises, remembers a quote from Plato. After Plato's observation of Roman-occupied lands along the Mediterranean, he commented, "[w]hat now remains, compared with what then existed, is like the skeleton of a sick man, all the fat and soft earth having wasted away, and only the bare framework of the land being left".<sup>100</sup>

Throughout the history of civilisation, the struggle over water has been a key factor in the development of societies, and in their demise. Why the global community thinks it will avoid the certainty of its fate, if unabated, is completely incomprehensible. One needs only to look at history to be certain our time will come and we will be forced to deal with the crisis.

How do once thriving societies disappear from the face of the planet? There is a wealth of historical data to prove that in areas rooted to the lands, crises have occurred which have forced the inhabitants to either leave the area or die. Professor Houck thinks perhaps it is due to the "adolescence" of civilisation that we are unable to understand this phenomenon.<sup>101</sup>

Professor Bamforth comments the world has seen its fair share of societies pushed to extinction because of water scarcity.<sup>102</sup> He notes, "[d]eserts are the footprints of civilization" and follows that with "[t]he 'cedars of Lebanon' - the country is now a desert," the "[l]and of milk and honey" conquered by Joshua is now Israeli desert," and finally, "parts of Syria and upper Iraq were once woodlands (now desert)".<sup>103</sup>

Water conservationist and author Fred Pearce comments, "There is a common pattern here. The world has been consistently blind to the importance to great empires of traditional communally managed water systems".<sup>104</sup>

*Mesopotamia*

In the area encompassing present-day Egypt, Israel, Jordan, Syria, Iraq, and parts of Turkey, flow the Euphrates, the Nile, the Jordan, and the Tigris rivers. It is an area known to be the 'Cradle of Civilization' and is one of the first places where irrigation was used to sustain crops. If, at one time, it was the world's breadbasket, how did its civilisations collapse?

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<sup>100</sup> Oliver Houck, *Natural Resources Law Volume II* (2006) 29.

<sup>101</sup> Ibid.

<sup>102</sup> E-mail from Prof. Stuart Bamforth, to Brett Buchheit, 19 March 2007. (author has copy).

<sup>103</sup> Ibid.

<sup>104</sup> Pearce, above n83, 145.

The European Union's Water Initiative states scientists have concluded the Mesopotamian Sumerian civilisation collapsed, in a large part, due to irrigation techniques which were unsustainable.<sup>105</sup> "Over time, the combined effects of rising water tables and rising concentration of mineral salts spoiled the soils. By about 2,300 BC the fields supported only a fraction of their former production. The tale of salt-damaged crops is told on Mesopotamian cuneiform tablets. Food scarcity eventually undermined this great civilization."<sup>106</sup>

### *Egypt and the Nile*

Fred Pearce notes that without a constant supply of water for irrigation, a society cannot continue and the power-struggle over water has changed history. "Egypt is virtually rainless and utterly dependent of the Nile waters. Yet, on rare occasions, floods racing out of eastern and central Africa have failed. The result? In ancient times, dynasties failed."<sup>107</sup> In Cadillac Desert, famed American author Marc Reisner comments, "[f]or thousands of years, Egyptian farmers irrigated by simple diversions from the Nile and nothing went badly wrong".<sup>108</sup> Without being able to rely of the floods of the Nile, civilisations in the area crumbled.

### *Cambodia and Angkor Temples*

Extending some 500 square miles, the city of Angkor, like "Los Angeles, ... relied on a highly sophisticated system of hydraulic management..."<sup>109</sup> Angkor has been called "the biggest city in the preindustrial era".<sup>110</sup> Now it is a tourist-attraction, its former inhabitants driven from the area when the water they relied on was no longer available.<sup>111</sup>

### *Ancient Israel*

Pearce notes that inhabitants of modern day Israel and Palestine lived in the Negev Desert, one of the planet's least hospitable environments, known for scorching desert heat that routinely reaches above 120 Fahrenheit. How did they manage a thriving culture in the middle of such a place? Because of their ability to harness water. "[m]ore than 1,500 years ago, the Negev Desert was inhabited by the Nabataeans, caravan traders who built six imposing desert cities".<sup>112</sup> He notes that now, "[e]ach of these hilltop cities in now in ruins".<sup>113</sup>

<sup>105</sup> European Commission, *Water Management Played a Critical Role in the Rise – and Collapse – of Several Earlier Civilizations* (available at <[http://ec.europa.eu/research/water-initiative/years\\_en.html](http://ec.europa.eu/research/water-initiative/years_en.html)> (March 19, 2007).

<sup>106</sup> Ibid.

<sup>107</sup> Ibid.

<sup>108</sup> Marc Reisner, *Cadillac Desert* (1986) 481.

<sup>109</sup> Pearce, above n83, 144.

<sup>110</sup> Ibid 143-144.

<sup>111</sup> Ibid 144.

<sup>112</sup> Ibid.

<sup>113</sup> Ibid.

*Medieval Europe and the Black Plague*

Science has proven that without clean water in significant amounts, civilisations have perished. In fact, “in mid-fourteenth-century Europe, one out of every four persons perished within a span of three years and the total number of dead may have surpassed twice the number killed in Europe during World War II”.<sup>114</sup>

Driven by forest clearing to accommodate the burgeoning population, which “[e]xperts agree doubled and perhaps tripled during (the) era,” pressures on the environment increased and “[w]ater resources, degraded by human wastes in the cities and by erosion in the countryside, could sustain no further growth”.<sup>115</sup> Pearce notes, “[d]isease, spread by contaminated water, swept through urban areas. Famine resulted when degraded farmlands ceased to produce surpluses needed to feed the urban masses”.<sup>116</sup> Due to environmental impacts, Europe was brought to its knees.

*The Mill Creek People*

In the area now referred to as the American Southwest rests another example of an entire civilisation which disappeared due to its inability to find balance with environmental stresses. Archeologists and U.S. historians found evidence of numerous Native American societies who simply vanished. “Stretching across the U.S. Great Plains from Iowa to Colorado, covered by the dust of centuries, lie the remnants of a thousand small villages. In the sixteenth century, when Coronado traversed the plains in search of gold, he found no cities and very few agricultural villages.” Pearce questions, “[w]here had all the farmers gone and why had they abandoned their villages?”<sup>117</sup> The dependence on rain to supply water for corn harvests meant that in 1200 AD, when a great drought occurred, “this drought devastated the Plains agricultural societies”.<sup>118</sup>

*Mayan Civilisation*

The Mayan civilisation became a flourishing culture due to their agricultural abilities, and the collapse of that system led to their downfall. The people, ultimately, began to starve and were forced to leave the area. One of the greatest civilisations known to man was suddenly lost to time.

Archaeological evidence shows anaemia[sic] symptoms from skulls and bones of the later period as well as progressive depopulation. No stone building was constructed after 822 AD. Over-farming, deforestation with subsequent soil erosion

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<sup>114</sup> Francko and Wetzel, above n16, 64.

<sup>115</sup> Ibid 65.

<sup>116</sup> Ibid.

<sup>117</sup> Ibid 61.

<sup>118</sup> Ibid

and loss of productivity were instrumental in spelling the complete demise of this society by 900 AD.<sup>119</sup>

### *Anasazi Indians*

Anasazi Indians occupied the areas of present-day Arizona and New Mexico. Evidence suggests that their highly-complex irrigation systems, constructed in the 10<sup>th</sup> Century, eventually degraded the area's soils.

The high evaporation rate and alkaline nature of the soils of the arid San Juan Basin eventually caused salinization and nutrient depletion as a result of prolonged irrigation. Because of the degradation of the canyon's soils, irrigation was largely abandoned toward the end of Anasazi occupation of Chaco Canyon, during the twelfth century, in favour of floodwater farming in outlying reaches of the canyons.<sup>120</sup>

### *Why Do Societies Allow This Conduct to Continue?*

Why is it that societies are driven from the face of the planet? How do once thriving populations seemingly disappear? Perhaps the best answers to these questions lie in Jared Diamond's *Collapse*, where Diamond writes about the concept of "ecocide," describing it as "[t]he process through which past societies have undermined themselves by damaging their environments..."<sup>121</sup>

Diamond writes of the three reasons why societies collapse.<sup>122</sup> First, he notes, a group may fail to anticipate the outcome of their actions.<sup>123</sup> Second, there may be a perception that the problem is not, in fact, a problem.<sup>124</sup> Third, often societies won't even try to solve a problem once they've recognised it for what it is. Diamond theorises societies may not fully understand the impact of their actions. "Groups may do disastrous things because they failed to anticipate a problem before it arrives, for any of several reasons."<sup>125</sup> With the situation in the world today, it is possible that the nations somehow do not see the water-shortages and current battles as problem. He remarks, that this has happened in the past, where it seemed incredibly obvious that there was a problem. "With the gift of hindsight, we now view (their actions) as incredibly stupid."<sup>126</sup>

Diamond also notes how short the memory is of societies. "When the city of Tucson in Arizona went through a severe drought in the 1950s, its alarmed citizens

<sup>119</sup> European Union Water Initiative, *Five Thousand Years of Water Works Supporting Diverse Human Societies* European Commission <[http://ec.europa.eu/research/water-initiative/years\\_en.html](http://ec.europa.eu/research/water-initiative/years_en.html)>.

<sup>120</sup> Ibid.

<sup>121</sup> Diamond, above n69, 6.

<sup>122</sup> Ibid.

<sup>123</sup> Ibid.

<sup>124</sup> Ibid.

<sup>125</sup> Ibid.

<sup>126</sup> Ibid.

swore that they would manage better, but soon returned to their water-guzzling ways of building golf courses and watering gardens.”<sup>127</sup>

When dealing with this prong of Diamond’s argument, the perception that the problem at hand is far from a crisis, he notes, the inability to perceive there is a problem often comes in the way of its solution. Diamond uses the term “creeping normalcy” referring “to such slow trends concealed within noisy fluctuations”.<sup>128</sup> Also known as “landscape amnesia” the phenomenon occurs due to “forgetting how different the surroundings looked 50 years ago, because the change from year to year has been so gradual”.<sup>129</sup> Diamond explains this occurs because of readily observable factors. “First, the origins of some problems are literally imperceptible.” Diamond stated often poor governance plays a role, a concept reflected in the UNDP’s studies, blaming what he terms “distant managers”.<sup>130</sup> This is analogous to when a nation’s government oversees water management in a city thousands of miles away, the issues are not in front of their faces, so their assessments are not borne by first-hand experience. Finally, “perhaps the commonest circumstances under which societies fail to perceive a problem is when it takes the form of a slow trend concealed by wide up-and-down fluctuations”.<sup>131</sup> To further explain this final thought, Diamond’s assessment of the situation is that “societies often fail to attempt to solve a problem once it has been perceived”.<sup>132</sup>

As noted by Diamond and others, across the board of civilisation, societies large and small have dealt with issues associated with resource-scarcity. Some have adapted and found alternative methods to support their needs. Others, as numerous noted above, have either failed to see there was a problem or have chosen to avoid action, usually to their demise. These societies reflect the current situation in the world, where a catastrophe is looming. We know it is currently causing severe problems both on a societal and on an environmental scale, yet we fail to address the problem. By sticking our heads in the proverbial sand, it seems obvious our outcome will mirror that of the aforementioned civilisations.

## VII POTENTIAL WARS AND PRIVATISATION

Is the notion that a water crisis could cause actual wars over water a bizarre concept? Not according to an executive at one of the world’s largest private water industries who comments, “There’s huge growth potential. There will be world wars fought over water in the future. It’s a limited, precious resource, so the growth market is always going to be there.”<sup>133</sup>

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<sup>127</sup> Ibid 423.

<sup>128</sup> Ibid.

<sup>129</sup> Ibid.

<sup>130</sup> Ibid.

<sup>131</sup> Ibid 425.

<sup>132</sup> Ibid 427.

<sup>133</sup> Bob Carty, *The Water Barons: A look at the world's top water companies* (2003) CBC Radio <<http://www.cbc.ca/news/features/water/business.html>>.

According to a report issued by the British government in November of this year, “Unless the nations of the world come together to [address the issues]... we face the risk of ‘major disruptions to economic and social activity, later in this century and in the next, on a scale similar to those associated with the great wars and the economic depression of the first half of the 20<sup>th</sup> century’.”<sup>134</sup>

The concept of wars being fought over precious natural resources is not a new one. But is it possible to envision these issues affecting a prosperous country like the United States? Yes, according to Tim Holt, an environmental writer and contributor to High Country News’s “Writers on the Range”.<sup>135</sup> Holt, an author on water scarcity, opines there is no doubt the looming shortage of water means there is potential for conflict between the ‘haves’ and the ‘have nots’. And increasingly those who control domestic water supplies are foreign-corporations based far away from the people whom they serve.<sup>136</sup>

“Eighty-five percent of U.S. consumers still receive their water from public systems,” according to Holt.<sup>137</sup> If this balance was upset and Americans needed to find water elsewhere, something which was once free would suddenly be worth quite a lot, considering it is absolutely essential for life.<sup>138</sup>

Holt writes, “[e]ven in the United States, long a bastion of publicly owned water systems, water is increasingly viewed as something to be bought and sold. Private companies have started taking over municipal and suburban water systems, which gives them monopoly control over water rates. Water ‘privatization,’... threatens local control over this precious resource”.<sup>139</sup>

Who stands to control water resources? European conglomerates.<sup>140</sup> According to Holt, the “Big Three” (the three largest, European-based private water companies of RWE/Thames, Vivendi, and Suez of France) have recently been purchasing assets in the United States, including U.S. Filter, United Water, and American Water Works. Holt notes these “are the three leading U.S. water companies”.<sup>141</sup> “Paris-based Vivendi has already purchased 45,000 acres in California’s Imperial Valley, giving it highly coveted rights to Colorado River water, and an amount equal to 8 percent of the water used in San Diego County,” writes Holt.<sup>142</sup>

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<sup>134</sup> John Cassidy, *High Costs* (2006) The New Yorker  
<[http://www.newyorker.com/talk/content/articles/061113ta\\_talk\\_cassidy](http://www.newyorker.com/talk/content/articles/061113ta_talk_cassidy)>.

<sup>135</sup> Ibid.

<sup>136</sup> Ibid.

<sup>137</sup> Ibid.

<sup>138</sup> Ibid.

<sup>139</sup> Ibid.

<sup>140</sup> Ibid.

<sup>141</sup> Ibid.

<sup>142</sup> Ibid.

As water-systems are purchased by private companies, citizens across the world have reacted out of fear of “increased rates and anonymous service” with efforts to prevent municipal water systems from being privatised.<sup>143</sup> “A suit brought by a citizens’ coalition in Stockton, California resulted in the termination, last fall, of the most lucrative water transfer agreement in the country. It was a 20-year, \$600 million contract between the city and a joint private operation consisting of RWE/Thames...”<sup>144</sup> Citing numerous breakdowns of the city water-system, California’s Public Utilities Commission ordered the transfer of a Montara, California private water system to be returned to the public after the private system proved unable to deal with the task of providing reliable water to the community for a reasonable fee.<sup>145</sup> After selling the water-system to a private company, rates increased.<sup>146</sup> According to Scott Boyd, the system is “uniquely decrepit.” Boyd, President of Montara Water and Sanitary District, commented “every time it changed hands, rates went up”.<sup>147</sup> Montara’s citizens spoke at the polls, “with 80 percent voting for the bonds needed to purchase the water system”.<sup>148</sup>

Holt notes:

The huge size of the companies now moving into [foreign markets] only exacerbates the disconnection between water provider and water consumer. Governments or public water districts are typically involved in the delivery of water because we literally can’t live without water. Letting it fall under the control of companies based in Germany or France may be a boon to their shareholders, but not to those who depend on their water.<sup>149</sup>

#### VIII THE NOT-SO-FAR FUTURE: 2050

Demographers often cite the year 2050 as a benchmark to determine future events.<sup>150</sup> The statistics below are taken from recent articles and focus on the fact that the Earth’s population is expanding exponentially and its resources are increasingly becoming strained.

- “Within the next fifty years, demographers expect the population to grow again by as much as fifty percent.”<sup>151</sup>
- “By 2050, there will be at least nine billion people on the planet...”<sup>152</sup>

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<sup>143</sup>

Ibid.

<sup>144</sup>

Ibid.

<sup>145</sup>

Ibid.

<sup>146</sup>

Ibid.

<sup>147</sup>

Ibid.

<sup>148</sup>

Ibid.

<sup>149</sup>

Ibid.

<sup>150</sup>

Specter, above n3, 64.

<sup>151</sup>

Ibid.

<sup>152</sup>

Ibid 62.

- “If current trends continue, two planets would be needed by 2050 to meet humanities needs.”<sup>153</sup>
- “Seventy percent of the water used worldwide is used for agriculture. Much more will be needed if we are to feed the world's growing population - predicted to rise from about six billion today to 8.9 billion by 2050.”<sup>154</sup>
- “By 2050 ... at least sixty percent of global power capacity will have to come from non-carbon sources, such as wind farms, solar cells, and nuclear reactors; at the moment, the proportion is less than twenty-five percent.”<sup>155</sup>

Regardless of which figures are used, the point is clear: the population of the planet is not getting smaller, and our use of natural resources not decreasing. Action is required immediately, yet there is hesitation to do so.

## IX SOLUTIONS

Author Wallace Stegner commented, “[t]oo often, when they have been prosperous, the western states have been prosperous at the expense of their fragile environment, and their civilization has too often ...degraded the natural scene while drawing most of its quality from it”.<sup>156</sup>

### *Recognising there is a Problem*

As mentioned previously, the first step to solving the problem is to recognise there is one. As Diamond wrote, most societies which collapsed did so because of their inability to perceive there was a problem.<sup>157</sup> With the mountain of information above, it is clear that the calamitous tipping point among desert civilizations is rapidly approaching. As we have witnessed throughout history, when societies encounter environmental crises, the impact is brutal.

According to Editors of the High Country News,<sup>158</sup> “As history has repeatedly shown, reform will come only incrementally. But the challenges ... give cause for hope: In seeking solutions, we may yet be able to forge a collective commitment to finding a way of living in the West that works.”<sup>159</sup>

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<sup>153</sup> BBC News , above n8.

<sup>154</sup> Kirby, above n7.

<sup>155</sup> Cassidy, above n137.

<sup>156</sup> Wallace Stegner, *Where the Bluebird Sings to the Lemonade Springs* (2002) 43.

<sup>157</sup> Ibid.

<sup>158</sup> High Country News, *Where Do We Go From Here? Taking the West Forward* (2004) <[http://www.hcn.org/servlets/hcn.Article?article\\_id=15153](http://www.hcn.org/servlets/hcn.Article?article_id=15153)>.

<sup>159</sup> Ibid.

Alex Kirby, the BBC's News Online environmental correspondent, puts the issue in straightforward terms.<sup>160</sup> "The world's water crisis is simple to understand, if not to solve. The amount of water in the world is finite. The number of us is growing fast and our water use is growing even faster."<sup>161</sup>

### *1 Small Steps*

Even seemingly miniscule steps, such as adoption of 1.6 gallon instead of six gallon toilets, have made positive impacts, considering the massive drain on water resource South-western toilets create. "The United States ... has made big progress in cutting domestic water use by adopting low-flush toilets. The amount of water used to flush the nation's toilets has been cut by three-quarters in the past two decades."<sup>162</sup>

Boris Worm, professor at Dalhousie University in Nova Scotia, commented recently in the New York Times,<sup>163</sup> "When humans get into trouble they are quick to change their ways. We still have rhinos and tigers and elephants because we saw a clear trend that was going down and we changed it"<sup>164</sup>

#### *(a) Salinisation-Prevention Irrigation Schemes*

Salt, even far away from any sea or ocean, can clog the riparian arteries of arid lands.<sup>165</sup> Rivers normally wash salts into the ocean.<sup>166</sup> When the flow is impeded by irrigation, however, evapotranspiration concentrates the salt in the soil, creating problems for agriculture.<sup>167</sup>

All soils contain salt. That salt is the result of what geologists call 'weathering' - the natural chemical, biological and physical processes which lead to the gradual breakdown of rocks and other geological formations. As those rocks are gradually worn down, so they release their natural salts into the soil, generally to be dissolved in rain water.<sup>168</sup>

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<sup>160</sup> Kirby, above n7.

<sup>161</sup> Ibid.

<sup>162</sup> Pearce, above n83, 237.

<sup>163</sup> Cornelia Dean, *Study Sees 'Global Collapse' of Fish Species* (2007) The New York Times <[http://www.nytimes.com/2006/11/03/science/03fish.html?\\_r=1&adxnnl=1&oref=slogin&adxnnlx=1163006665-2xhM7MqpiP91YVJF2yJ7yQ](http://www.nytimes.com/2006/11/03/science/03fish.html?_r=1&adxnnl=1&oref=slogin&adxnnlx=1163006665-2xhM7MqpiP91YVJF2yJ7yQ)>.

<sup>164</sup> Ibid.

<sup>165</sup> A.F. Pillsbury, "The Salinity of Rivers" (1981) 245(1) *Scientific American* 54-65.

<sup>166</sup> Ibid.

<sup>167</sup> Ibid.

<sup>168</sup> Edward Goldsmith 'Salting the earth: the problem of salinisation' in Edward Goldsmith and Nicholas Hildyard (ed) *The Social and Environmental Effects of Large Dams: Volume 1* (1984) 134.

Concentrations reaching 0.5-1.0 percent make land toxic.<sup>169</sup> In arid environments, where there is a lack of rainwater, the problem is compounded.<sup>170</sup> “Soils in [arid areas] can thus have a natural salt content as high as twelve percent.”<sup>171</sup> The fact that arid soils are initially high in salt makes them particularly vulnerable to salinisation.<sup>172</sup>

If the water table is permitted to rise to within 2.5 meters of the surface, then the groundwaters are drawn upwards through capillary action - adding still further to their own salt burden on the way, by dissolving the salts in the soils near the surface.’ In effect, the land becomes waterlogged with increasingly saline water. ... Under such conditions, it is not long before the whole area becomes covered with a white saline crust.<sup>173</sup>

Costs of desalinisation can be prohibitive. According to Dr. Edward Rister, Associate Department Head for Agricultural Economics at Texas A&M University, “The major question that remains, however, is which alternative is the most cost-effective over the long run to add water to the regional water supply?”<sup>174</sup> Dr. Rister and faculty members at Texas A&M, as part of a detailed analysis of costs associated with desalinisation, have looked into the feasibility of building a desalinisation plant known as The Southmost Facility, along the Rio Grande in the Southwestern U.S.<sup>175</sup> Their research has led to the conclusion that while it is scientifically possible to desalinate brackish water, it is phenomenally expensive.<sup>176</sup> “While desalination is capable of increasing the available local water supply, high costs and volume have discouraged its use to date.”<sup>177</sup> According to Dr. Rister, “Initial construction costs were \$26.6 million for the Southmost Facility; continued costs are \$80,000 per year for administrative costs and \$1.6 million per year for plant operation and maintenance.”<sup>178</sup>

Even once treated, the water is not drinkable.<sup>179</sup>

Incoming source water salinity levels are typically about 3,500 parts per million (ppm). Once processed, the finished water has outgoing salinity levels of 300 to

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<sup>169</sup> Ibid. citing V. A. Kovda ‘Arid Land Irrigation and soil fertility: Problems of Salinity, Alkalinity, Compaction’ in E. Barton Worthington (ed) *Arid Land Irrigation in Developing countries* (1977) 216.

<sup>170</sup> Ibid.

<sup>171</sup> Ibid.

<sup>172</sup> Ibid.

<sup>173</sup> Ibid 218.

<sup>174</sup> Rio Grande, *Basin Initiative* (2006) < <http://riogrande.tamu.edu/news/2006-08-02/>>.

<sup>175</sup> Ibid.

<sup>176</sup> Ibid.

<sup>177</sup> Ibid.

<sup>178</sup> Ibid.

<sup>179</sup> Ibid.

400 ppm, which is below the 500 ppm maximum level established by the U.S. Environmental Protection Agency for drinking water standards.<sup>180</sup>

In Perth, Australia, desalination has taken hold, supplying the city with one-fourth of its water, and a second plant will eventually raise that total one-third of the city's consumption. However, from the plant's operation arise other environmental issues, such as the air pollution it causes—a plant of that size requires the same amount of electricity generated by 35,000 homes each year.<sup>181</sup>

Maintaining the “water-salt” balance is essential to keep arid soil irrigable.<sup>182</sup> “The amount of water leaving the soil must be at least equal to the amount entering it. Irrigation schemes throw that delicate water-salt balance dangerously out of kilter.”<sup>183</sup> Professor Gilbert White of the University of Colorado at Boulder, cites “numerous cases” across the globe where, in irrigated lands, the water table “has risen within ten years from about 25-30 meters below the soil surface up to 1-2 meters depth”.<sup>184</sup> As explained, when water tables rise, salinity rises and forced more salt into aquifers.<sup>185</sup> This has led to a staggering increase in the salinity-levels.<sup>186</sup> The higher the salt content, the less fertile the soil, the less hospitable it is for crops, and the increase in salinity affects the surrounding water severely by degrading its quality.<sup>187</sup>

One of the major impetuses to salinity control is cost. The expense of salinisation prevention is staggering, costing about \$300 per acre-foot.<sup>188</sup> And the cost of fresh water is the production of 2,000 tons of brine waste.<sup>189</sup> Salinisation plants are an example of what Nobel Laureate Amartya Sen refers to as “unaimed opulence” where economic growth and sustainability measures are implemented “without paying direct attention to converting greater opulence into better human living conditions”.<sup>190</sup>

Unless desalination techniques become exponentially less expensive, they are not suitable for implementation at this time. Perhaps as technology provides more suitable solutions and these costs become reasonable, desalination will become a viable alternative. At present, however, it is not.

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<sup>180</sup>

Ibid.

<sup>181</sup>

Barta, above n14.

<sup>182</sup>

Goldsmith, above n171, 158.

<sup>183</sup>

Ibid.

<sup>184</sup>

Ibid citing Gilbert F. White, "The main effects and problems of Irrigation" in E. Barton Worthington (ed) *Arid Land Irrigation in Developing countries* (1977) .30.

<sup>185</sup>

Ibid.

<sup>186</sup>

Ibid.

<sup>187</sup>

Ibid.

<sup>188</sup>

Ibid.

<sup>189</sup>

Ibid.

<sup>190</sup>

University of Oslo, *Development Ethics Study*

[www.sum.uio.no/dev\\_ethics/developmentethicsstudy.pdf](http://www.sum.uio.no/dev_ethics/developmentethicsstudy.pdf).

*(b) Need for Specific Indicators*

Addressing the issue of global environmental security, Dannenmaier offers a solution applicable to the rest of the world.<sup>191</sup> “Ensure concrete progress by calling for the development of specific indicators to measure the nature and degree of environmental security challenges in the region and the ability of governance frameworks to respond to these challenges.”<sup>192</sup>

*(c) Reassessment of Agriculture and Implementation of Hardier Strains*

Researchers are at work focusing on less water-intensive crops and water-saving techniques by developing “hardy breeds of tropical corn [which] could increase harvests by up to 40 percent...”<sup>193</sup> Also, some arid countries - such as Morocco, Jordan, Israel and Egypt – are deliberately reducing their water needs by increasing food imports and growing less water-intensive crops such as dates, grapes and olives.<sup>194</sup> Certainly the agricultural practices in the rest of the world are unsustainable and overly use the precious water in the area.

*(d) ‘Virtual Water’ and the Importation of Water-intensive Crops*

Another solution may be based in a concept known as ‘virtual water’:

With the trade of food crops or any commodity, there is a virtual flow of water from the producing and exporting countries to countries that consume and import those commodities. A water-scarce country can import products that require a lot of water for their production rather than producing them domestically. By doing so, it allows real water savings, relieving the pressure on their water resources or making water available for other purposes.<sup>195</sup>

It has been said that ‘virtual water’ may be a solution, “but the amounts involved would be immense, and the energy needed to transport them, gargantuan. And affordable, useable energy will probably soon be a bigger problem than water itself.”<sup>196</sup>

*(e) Technology and Management*

By turning an eye toward conservation friendly technology and design schemes, the use of water in the Southwest could be decreased, as seen with the implementation of low-flush toilets. “Similar savings can be made in a similar manner by

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<sup>191</sup> Dannenmaier, above n94.

<sup>192</sup> Ibid.

<sup>193</sup> Ibid.

<sup>194</sup> Ibid.

<sup>195</sup> World Water Council, *Virtual Water* (2005)

<<http://www.worldwatercouncil.org/index.php?id=866>>

<sup>196</sup> Kirby, above n7.

redesigning everything from shower units to public urinals to industrial processes.”<sup>197</sup>

Humanity now uses more than a quarter of the water that falls to the ground in rain. We are reaching the practical limit of supply; solutions lie in better management. Even modest efforts at using water more efficiently would end the world water crisis. In most places, we can fill the taps without emptying the rivers.<sup>198</sup>

It should be noted, however, that the assumption technology will save us is usually incorrect. In fact, allowing private industry to drive water management policy has led to a ‘chicken guarding the henhouse’ problem:

The private market, which has been our main instrument for developing and allocating natural resources, provides little or no incentive to conserve or enhance these resources, to develop new technology for using them more efficiently, or even to gather information about them.<sup>199</sup>

(f) *Creation of a ‘Water Ethic’ and the Need for Education*

It has been noted previously that the concept of ‘free water’ has been an impediment to its conservation. Our current attitudes towards water have, in large part, been the cause of the problem. Without financial or moral repercussions, our current view of water is that it is free now and will always be. There is a need to change this thought-process.

The MacArthur Fellow winner, Peter Gleick who is one of the world’s leading experts on water management, originated the concept of a “water ethic”.<sup>200</sup> Gleick is an elected-member of the Oslo-based Academician of the International Water Academy and an elected-member to the DC-based National Academy of Sciences. He is considered a “visionary on the environment” by the BBC.<sup>201</sup>

Many believe with Gleick that we require a ‘new water ethic’ – “one based not on meeting water shortage with supply-side solutions and confronting nature with our inflated demands for water, but on saving and respect for the environmental services provided by the natural water cycle”.<sup>202</sup> “The theory is that we will one day save water in the way we are learning to save energy and recycle waste – for the good of our planet as well as our pocket.”<sup>203</sup>

In the same vein, the authors of *The Outlook for Water* comment that:

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<sup>197</sup> Pearce, above n83, 237.

<sup>198</sup> Ibid 21.

<sup>199</sup> N. Wollman, *The Outlook for Water: Quality, Quantity, and National Growth* (1971) v.

<sup>200</sup> Pearce, above n83.

<sup>201</sup> Pacific Institute, *About Us: Dr. Peter H. Gleick*.

<[http://www.pacinst.org/about\\_us/staff\\_board/gleick](http://www.pacinst.org/about_us/staff_board/gleick)> at 20 March 2007.

<sup>202</sup> Pearce, above n83, 21.

<sup>203</sup> Ibid.

globally people are fast coming to realize the role some major resources have played in our growth and development and how disasterously we have come to overuse and misuse them. These are what the economist calls 'common property resources' – resources which in a sense are owned by everyone and therefore, not owned by anyone.<sup>204</sup>

By seeing the inter-connectivity between our actions and their impacts, by creating a "water ethic," we will be forced into action.

Education is where the future lies, according to Professor Bamforth. Perhaps continual education measure will bring about a "new generation" of conservationists in the area, focusing the talents of South-western youth and bringing about conservation tactics at home and in the community.<sup>205</sup>

## *2 Extreme Measures - When Small Steps Are Not Enough*

It has been said that 'desperate times call for desperate measures'. When nations begin to realise a catastrophe is imminent, they will need to find extreme measures to redress the issue. Some of those extreme measures are discussed below.

### *(a) Population Restriction*

Bamforth notes that soon, governments might be forced to prevent individuals from immigrating arid areas. By creating a "population versus water resources-available" balance, stresses on an already-stressed area could be controlled.<sup>206</sup> "The American Southwest has to estimate what water resources are available (the Colorado River and underground aquifers) and regulate its population that can live comfortably within them," Bamforth states.<sup>207</sup>

### *(b) Dietary Alterations*

Sunita Narain, winner of the 2005 Stockholm Water Prize, in comparing the situation globally to that of her native India, says dietary changes may also be a solution. Turning away from beef and towards native grains has shown to be a solution in India.<sup>208</sup> As noted, 1 kilogram, or 2.2 pounds, of beef requires 16,000 litres, or 432 gallons, of water.<sup>209</sup> When these heads of cattle are raised in arid environments, this supply of water comes from an already-scarce source. By switching to a diet mindful of water-resources, India has begun to battle its water shortage.

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<sup>204</sup> Wollman, above n203.

<sup>205</sup> Bamforth, above n105.

<sup>206</sup> Wollman, above n203.

<sup>207</sup> Ibid.

<sup>208</sup> Specter, above n3, 64.

<sup>209</sup> University of Twente & UNESCO, above n53.

*(c) Privatisation*

Although the idea, as shown, is increasing unpopular, perhaps the most effective way to battle the crisis is by putting water in the hands of companies who have a vested (albeit financial) interest in the conservation of water. Often the debate takes precedent over the benefits and detractions.

A report from the Pacific Institute, entitled, *Beyond Privatization: Restructuring Water Systems to Improve Performance*, tackles the public versus private issue.<sup>210</sup> Some privatisation schemes have proven to be profitable, given the ‘cost/benefit analysis.’ Their study targeted the need for specific improvement and implementations to be identified and found

performance depends on effective staffing, consistent public support for sufficient funding, better asset management systems, performance measurements and rewards, and more stakeholder involvement and transparency. When increased private involvement or changes in public operations create significant cost savings, as they have in some cases.<sup>211</sup>

According to the British Governmental report issued in 2006, measures which force companies to bear the brunt of their impact can prove successful. “Mitigation... must be viewed as an investment. If these investments are made wisely, the costs will be manageable, and there will be a wide range of opportunities for growth and development along the way.”<sup>212</sup>

*(d) Taxes, Regulation, and Sanctions*

Nader comments that sanctions could be useful, but they “must be enforced (to) reach beyond the institution to the personal irresponsibility of those presently in charge”.<sup>213</sup>

According to Oxford, Cambridge, and London School of Economics – educated Sir Nicholas Stern who currently serves as the head of Britain’s Government Economic Service, “There are a number of ways to deal with market failures, including taxes, regulation, and compulsory voucher schemes that force corporations and other organizations to pay for the negative side effects of their activities, such as environmental pollution”.<sup>214</sup>

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<sup>210</sup> Gary Wolff and Eric Hallstein, *Beyond Privatization: Restructuring water systems to improve performance* (2005).

<sup>211</sup> Pacific Institute, *Water Managers Must Look 'Beyond Privatization,'* <[http://www.pacinst.org/reports/beyond\\_privatization/](http://www.pacinst.org/reports/beyond_privatization/)> at 20 March 2007.

<sup>212</sup> Cassidy, above n36.

<sup>213</sup> Zwick and Benstock, above n63, xiii.

<sup>214</sup> Cassidy, above n36, 35.

*(e) Public Action*

According to Nobel Laureate Amartya Sen, the answer to global and local issues lies largely in public action. This “includes not only what is done for the public by the state, but also what is done by the public for itself. It includes, for example, what people can do by demanding remedial action and through making governments accountable”.<sup>215</sup> Sen warns, however, a democracy alone is not enough. Entrusting the outcome of a crisis in the government, even a democratic one, will not solve the problem. “A democratic form of government is not in itself a guarantee,” Sen comments, adding, “[t]he political incentives to deal with these major failures would enormously increase if these issues were to be brought into political and journalistic focus, making greater use of the democratic framework”.<sup>216</sup>

Dovetailing with Sen’s comments, Nader notes the best method is transparency and publication, commenting “the threat of exposure” should keep municipalities and companies in check.<sup>217</sup> “To implement the scheme, (an) environmental board should be given authority to subpoena company financial records, analyze them, and publicize the data.”<sup>218</sup>

Although currently these extreme options are unlikely to receive support among governments due to their inability, at present, to address the issue and the fact that powerful forces are at work to ensure the status quo. These measures may be the only solution to the crisis, especially when it reaches a calamitous level and people are forced to decide between change and catastrophe.

## XI CONCLUSION

As noted U.S. politician Daniel Patrick Moynihan commented, “[e]xpect little of government, especially national government”.<sup>219</sup> Such pessimism, according to Sen, is unnecessary. “Pessimism is not new, and has a major role over the centuries in dampening the hearts and in forestalling preventive public action.”<sup>220</sup>

Perhaps the problem lies in our inability to see our moral connection both with the land and with each other. “Whether it comes from Navajo culture, African culture, or a middle-class ethic of care, the idea of moral interdependence and share-blaming is worth exploring.”<sup>221</sup> Without recognising our modern-day impacts are having far-reaching impacts, and those impacts tie us all together, we are unable to

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<sup>215</sup> Amartya Sen, ‘Public Action to Remedy Hunger’ (Tanco Memorial Lecture, London, 2 August 1990).

<sup>216</sup> Ibid, 14.

<sup>217</sup> Zwick and Benstock, above n217.

<sup>218</sup> Zwick, above n29, 401.

<sup>219</sup> D.P. Moynihan, *Miles to Go: A Personal History of Social Policy* (1996) 229.

<sup>220</sup> Sen, above n219, 2.

<sup>221</sup> N. Noddings, *Starting at Home: Caring and Social Policy* (2002) 241.

see that with each toilet flush and each headline story ignored, we are sliding further away from a solution and deeper towards the brink of collapse.

Aldous Huxley commented, “Good is that which makes for unity; Evil is that which makes for separateness”.<sup>222</sup> Though one would hardly characterise our inaction and apathy as evil, once the facts are presented and the outcome made clear, it is difficult to find another way to view the situation. By failing to address the water crisis in the Southwest, and by failing to unify, perhaps Huxley would state our actions are, for lack of a better word, evil.

Finally, and perhaps morbidly, the risks associated with inaction will eventually be solved, either by direct action by governments, or simply, by inaction. As Diamond comments, whether a civilization acts or does not act, eventually time will right all wrongs. One of two scenarios will unfold. Either the problems will be addressed in a proactive way with solutions implemented to stop the catastrophe, or the inhabitants of the area will meet their fate through wars or such advanced environmental degradation the populous is forced to leave the area which can no longer sustain them. Given merely a second to ponder the alternatives, one cringes at the thought of the latter.

It has been said ‘time heals all wounds’. The planet has shown a remarkable ability to heal and cleanse itself, removing cancers through environmental disasters such as famine and drought. In *Where have all the Flowers, Fishes, Birds, Trees, Water, and Air Gone?*, Osborn Segerberg, asserts that, barring action to prevent collapse, the situation will remedy itself with dire and fatal results.<sup>223</sup> Segerberg quotes Thomas Malthus, a 19<sup>th</sup> Century author on cultural evolution, who wrote, “the vices of mankind are active and able ministers of depopulation”.<sup>224</sup> Segerberg summarises the situation with the comment, “[i]f humanity falters, it may be overtaken by four phantom horsemen still riding at its heels. Only their names now are Population, Pollution, War, and Consumption – not the invisible White Plague of the 19<sup>th</sup> Century, but the conspicuous consumption of the 20<sup>th</sup>”.<sup>225</sup>

Either way, if the governments of the world decide not to act, there is no logical reason to expect our fates will be different from those who, in the past, were literally wiped off the face of the planet. As history and scientists have proven, a balance will be found, either through our own affirmative actions, or through famine, pestilence, and drought which will drive the area to a tipping point, ending in the same outcomes seen during the Black Plague, the Nile Valley, and previous developments across the world.

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<sup>222</sup> Aldous Huxley, *Ends and Means* (1937) 351.

<sup>223</sup> O. Segerberg, Jr., *Where have all the Flowers, Fishes, Birds, Trees, Water, and Air Gone?* (1971) 241.

<sup>224</sup> Ibid.

<sup>225</sup> Ibid 268.