

# Still the Fertile Crescent? The Environment and the Tigris- Euphrates River System, 1988-2005

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In January 1990, engineers in southeastern Turkey observed one of the most incredible events ever seen in that region of the world. The Euphrates River, a 1,900-mile unstoppable force of nature, ran up against an immovable object, the towering walls of Atatürk Dam. For an entire month, the dam stopped the flow of the Euphrates in its tracks while its waters filled a 817 square kilometer reservoir. Atatürk Dam formed the centerpiece of Turkey's Güneydogu Anadolu Projesi (also known as the GAP Project or the Southeastern Anatolia Project), which was designed to bring irrigation water and hydroelectric power to its citizens living in the southeast. After spending \$1.25 billion on the dam, the Turkish government was ready to see the returns.<sup>1</sup>

Turkey's downstream neighbors, Syria and Iraq, were less than elated by the impoundment of so much water. The Syrians depended on the Tigris and Euphrates; they are the only major rivers within Syrian borders. While Turkey claimed to have fulfilled its water obligations to Syria (guaranteed unilaterally by Turkey in 1987), this was small consolation to the Syrian farmers already dealing with drought conditions. For Iraq, whose water supply also depended in part on the Euphrates, Syria's own Tabqa Dam compounded the problem. This structure, along with the GAP Project, combined to decrease the volume of water reaching Iraq from the Euphrates by 25 percent.<sup>2</sup>

<sup>1</sup> John Cooley, "Middle East Water: Power and Peace" *Middle East Policy* 1 (no. 2, 1992): 12.

<sup>2</sup> *Ibid.*

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The Tigris and Euphrates flow from the mountains of Turkey through Syria and Iraq to the Persian Gulf.

This modern story of dependence on water is a repeat of a very old story, perhaps the region's oldest story. For millennia, the waters of the Euphrates River, along with its neighbor the Tigris, have been the lifeblood of societies in the Middle East. Many great empires, including the Babylonians, Assyrians, Persians, and Ottomans, rose and fell, but these two rivers continued flowing endlessly into the Persian Gulf. Now, however, there is a new twist to the old story. Today, this river system, which has been a source of life for thousands of years, faces a critical challenge. As the primary water source for much of Turkey, Syria, and Iraq, the Tigris-Euphrates river system faces environmental stresses of a magnitude never seen before.

The population of these three nations totals 124.2 million. Of these people, 49.4 million live in Syria (19.9 million) and Iraq (29.5 million), the two nations most dependent on the Tigris and Euphrates Rivers for their water needs. This population is also rising. The region's relatively high birthrates and increasing life expectancies have contributed to robust natural growth rates—2.4 percent in Iraq,

2.5 percent in Syria, and 1.2 percent in Turkey.<sup>3</sup> These demographics make a study of environmental change in the region significant for several reasons. First, any change affecting such a large group of people is bound to have enormous consequences for both the region and the world. More specifically, however, in a region where water is a precious resource, the quantity of water available is critical and will become more critical in the future as population figures continue to rise. The equally critical issue, however, and the issue receiving much less attention from scholars and media writing about the region, concerns the quality of this water.

Several factors affect the water quality in the Tigris-Euphrates river system. Dams, such as Turkey's Atatürk Dam and Syria's Tabqa, are one. Pollution, in its many forms, is another, and irrigation, sedimentation, and war also play roles. The people, plants, and animals that inhabit the region and depend on the rivers are all affected by these issues daily. Yet very little scholarship has attempted to integrate all these factors and measure their combined impact on the health of the river system. Much of the reason for this omission lies in the way media, scholars, and historians have approached the region. Discussion of the environment often takes a back seat while observers contemplate the religious, geo-political, and economic issues of this oft-troubled region of the world.

Not that the various other issues occupying the media and intellectual spotlights are unimportant. They are very real and most certainly deserve the world's attention. The environmental issues facing the Middle East, though, are no less important. Admittedly, the environmental health of the Tigris-Euphrates river system is not a hot political issue. It does not include violence between opposition groups, like the ongoing conflict between Israelis and the Palestinians. It has little to do with terrorism. Insuring the health of the river system does not directly produce any revenue, unlike insuring the health of the oil industries of Iraq or Saudi Arabia. Nothing about environmental policy raises the hackles of feminists in the same way as conservative traditions such as veiling women. Yet, this is a critical issue because it affects millions of people, every day, on many levels. It is about protecting the health of people in Turkey, Iraq, and Syria, both

<sup>3</sup> *2008 World Population Data Sheet* (Washington, DC: Population Reference Bureau, 2008), 8-9. The natural growth rate in the United States is 0.6 percent.

for today and tomorrow. It is also about protecting the floral and faunal diversity of the region. Finally, at the heart of this issue is the question of whether people and governments in the Middle East (or any region of the world, for that matter) can balance the wants of their societies against the needs of the planet. The environmental health of the Tigris-Euphrates watershed likely will prove to be as important, if not more important, than any other issue in the everyday lives of those who live in the region.<sup>4</sup>

### ***Chemical Terrors***

On March 16, 1988 the Iraqi government's Anfal campaign against the Kurds reached its climax during an attack on city of Halabja in northeastern Iraq. This town of over 60,000 people, one of 250 mostly Kurdish communities targeted in the campaign, suffered a cruel attack by a government against its own subjects. The Iraqi military, under the leadership of Ali Hassan al-Majid, employed a variety of chemical gas agents during the attack. Tremendous devastation and personal suffering resulted immediately. The attacks killed some Kurds instantly; choking on the poisonous gas, they fell dead on the spot. Others suffered horrible burns and physical deformity, the death toll reaching about 5,000 immediate deaths.<sup>5</sup>

As devastating and as these ruthless attacks were for the Kurdish people at the time, the long term environmental effects may be greater. Halabja and the nearby areas are within the Tigris-Euphrates watershed. The residue of these chemicals has produced many terrifying statistics. In Halabja, deaths from cancer are four times as likely as in a nearby town that escaped chemical attack. Miscarriages are fourteen times as likely, and the level of sterility in the population is equivalent to that in Hiroshima and Nagasaki after those cities suffered atomic attack. Rare and aggressive forms of cancer occur at a rate as high as anywhere in the world. Possibly the worst consequence

<sup>4</sup>This analysis begins in 1988 because that is when the long war between Iraq and Iran ended. While this war is certainly important for understanding environmental changes to the Tigris-Euphrates river system, including such an analysis of it here would have broadened the discussion in unwieldy ways. To keep a concise focus and to keep the article to a manageable length, I have chosen to begin the history after the war's conclusion.

<sup>5</sup>"Experiment in Evil," *Sydney Morning Herald*, December 7, 2002.

is that some of the chemicals used in the attack effect DNA; many abnormalities have been passed from one generation to the next.<sup>6</sup>

The extent of the environmental damage to the watershed as a whole remains uncertain. No one knows exactly what combination of chemicals Ali Hassan al-Majid used in the attacks, and few studies on the soil and water exist. The attacks took place twenty years ago, and conditions have improved to some extent, but there are signs of significant and long-lasting damage to the region's watershed. During the confusion of the gas attack, many Kurds tried to wash off the chemicals in nearby ponds, allowing high levels of toxins to accumulate in the water supply. Mass graves, which hold many of the dead from the gas attacks, allow chemicals to leech into the soil and groundwater. The result is that, two decades later, children are regularly born with physical deformities and abnormalities, demonstrating the ongoing importance of this highly criminal action by the Iraqi government.<sup>7</sup> The fact that dozens of other Kurdish towns met the same fate of chemical destruction indicates that the environmental damage is likely as widespread as the villages destroyed by the Anfal campaign.

### ***The Fate of Iraq's Marshlands***

Most of Iraq's Kurds live in the north of the country, and their way of life is rather different from that of their fellow citizens of the south, the Marsh Arabs. What both groups have in common, however, is that they suffered as part of Saddam Hussein's quest to consolidate his personal power and remove all potential sources of opposition within the nation he ruled for a generation. The environmental impact of this persecution was severe for the Marsh Arabs and the land around them. This group of people shared a unique 5,000-year-old culture living among the reeds of Iraq's southern marshlands. Satellite images indicate that between 1975 and 2000, the area of marshlands has declined by 90 percent, from 20,000 square kilometers to about 2,000 square kilometers. Much of the former marshlands has been turned into salt desert. Of the roughly 500,000 Marsh Arabs formerly living in the area, many have been killed out-

<sup>6</sup>Ibid.

<sup>7</sup>"Halabja: 14 Years Later," *60 Minutes*, CBS, May 12, 2002.

right, and about one-fifth are now refugees in neighboring Iran, with most of the rest displaced in various locations within Iraq.<sup>8</sup>

There are two primary causes for the loss of marsh habitat in southern Iraq. The first is increased use of water upstream by Turkey and Syria, a topic for later discussion. But, according to most sources, the most important cause by far is Iraq's water diversion projects. Some scientists place most of the blame on the Third River Project set up by the Iraqi state. The ostensible purpose of the Third River Project was to provide irrigation for other areas in southern Iraq. But the same satellite images indicated that but a limited area has benefited from the diverted water.<sup>9</sup> The larger purpose of this water diversion, it seems, was to force the Marsh Arabs to submit to the Iraqi state. Some Marsh Arabs helped Iran use the marshlands as an infiltration route during the 1980-88 war between the two nations. Saddam Hussein's anger at the Marsh Arabs was so great that in 1991 he retaliated by bombing Marsh Arab villages, sometimes with the same chemical weapons used against the Kurds in the north.<sup>10</sup>

The contraction of the marshlands is difficult enough for the human occupants of the marshlands, but wildlife has suffered severely as well. The drying of the marshes has endangered the habitat of an estimated forty species of waterfowl, some that migrate from as far away as Siberia and southern Africa, and one species of otter may now be extinct.<sup>11</sup> Several of these forty waterfowl species reside on global lists of badly threatened animals, including the Dalmatian pelican, pygmy cormorant, marbled teal, white-tailed eagle, imperial eagle, and white-tailed curlew.<sup>12</sup> In addition, the marshes form the largest freshwater ecosystem in the entire Middle East; as such, they are home to water buffalo, coastal fisheries, and shrimp harvested by Kuwait and worth several million dollars annually. Wildlife experts

<sup>8</sup>Tim Radford, "Marsh Arab Civilization Disappearing as Iraqi Wetland are Drained: Satellite Photos Shows 5,000 Year Old Culture has Lost 90% of its Land," *Guardian* (London), May 19, 2001.

<sup>9</sup>Michael McCarthy, "How Saddam has Drained the Life from his Precious Wetlands and Left a People Damned," *Independent* (London), May 19, 2001.

<sup>10</sup>John Burns, "The Killing of Iraq's Ancient Marsh Culture," *New York Times*, January 26, 2003.

<sup>11</sup>Barry Kent MacKay, "State of Wildlife in Iraqi Wetlands has gone from Very Bad to Worse," *Toronto Star*, March 30, 2003; Radford, "Marsh Arab Civilization Disappearing."

<sup>12</sup>David Bird, "Wetlands are Being Dried Up; Man's Meddling is Depriving Many Rare Birds of Marsh Homes," *Gazette* (Montreal), November 6, 1993.

believe that the marshes host more endemic species than any other area on the Eurasian landmass. Native bird species include the Iraq babbler and Basra reed warbler. Other native animals include the Euphrates soft-shelled turtle, the Mesopotamian spiny-tailed lizard, the Mesopotamian bandicoot rat, and the Mesopotamian gerbil.<sup>13</sup> Wolves and wild boar formerly inhabited the area, but the impact of habitat depletion has extirpated both from the marshlands.<sup>14</sup>

Regardless of where the blame lies for the destruction of the marshes, in ecological terms it is a disaster of major proportions. In addition to the effect on species already mentioned, other species have been forced to disperse to new areas. The purple swamp hen, for example, began to relocate southward into Kuwait as early as 1992.<sup>15</sup> In describing the total extent of the environmental damage, the widely-quoted Klaus Toepfer of the United Nations Environmental Programme stated, "This major ecological disaster, comparable to the drying up of the Aral Sea and the deforestation of large tracts of Amazonia, has gone virtually unreported until now."<sup>16</sup> As the quotation indicates, even as the extent of the damage became widely acknowledged by 2001, media coverage and scholarship concerning this aspect of the Middle East remained a low priority.

Despite the magnitude of this disaster, the overthrow of Saddam Hussein has brought slight hope for the revival of the marshlands. Many plant species in the marsh have adapted to endure several dry seasons in succession, and scientists believe that some plant seeds buried in dried out areas may still be viable.<sup>17</sup> Curtis Richardson of Duke University described the amazing resilience of some marshlands: "The high quality of the water, the existing soil conditions and the presence of stocks of native species in some regions indicate that the restoration potential for a significant portion of the Mesopotamian marshes is high." The re-flooding of the marshes has already begun in the aftermath of the invasion by the United States; about twenty percent of the drained areas are once again marshes thanks to

<sup>13</sup>McCarthy, "How Saddam has Drained the Life."

<sup>14</sup>MacKay, "State of Wildlife in Iraqi Wetlands."

<sup>15</sup>Christopher Walker, "Birds Forced from Southern Marshes Ravaged by Saddam," *Times*, October 6, 1995.

<sup>16</sup>Radford, "Marsh Arab Civilization Disappearing."

<sup>17</sup>Brendan McWilliams, "Restoring the Garden of Eden in Southern Iraq," *Irish Times*, May 12, 2003.

projects under the supervision of scientists. Some of the displaced wildlife has begun to return. Yet, the future of the marshes of southern Iraq remains uncertain. Dr. Richardson attributes this to apathy on the part of the international community:

One of the great tragedies of this whole area is that looking at the marshes themselves is not of primary importance to the future of Iraq. To an ecologist, they are an ecological disaster, but they are also a human disaster and I think it is really critical that we get the international community to focus on doing more to restore the marshes.<sup>18</sup>

### ***Harnessing the Tigris and Euphrates***

Why is the international community so apathetic? The lack of political star power of restoring wildlife habitat certainly has much to do with the global lack of interest in Iraq's marshlands. On the regional level, however, this problem intertwines with immensely important issues of water usage and economic development. Clearly, the damming of the Tigris and Euphrates Rivers is one cause for the drainage of marshlands in southern Iraq. The effects of damming these two rivers go far beyond that, however. Though Syria and Iraq have dam systems of their own, the most extensive and well-known dam system in the region is Turkey's GAP Project, centered on Atatürk Dam. The purpose of the project is to provide water for irrigation and hydro-power for southeastern Turkey, one of that country's least economically developed regions. The economic benefits of the project in these areas are substantial. The GAP Project involves twenty-two dams and nineteen hydroelectric plants with a generating capacity of 7,500 megawatts. At full development, these hydroelectric plants will be capable of generating 27.3 billion kilowatt hours of electricity annually, and the dams provide irrigation for 1.7 million hectares of land, about 20 percent of the irrigable land in Turkey.<sup>19</sup>

<sup>18</sup>Tim Radford, "Dried-Up Garden of Eden can Flourish Again, say Scientists," *Guardian*, February 21, 2005.

<sup>19</sup>Dogan Altinbilek, "Water and Land Resources Development in Southeastern Turkey," *Water Resources Development* 13 (no. 3, 1997): 311.



Though the economic benefits of the GAP Project are impressive, the environmental impact is substantial. The problems start with the impact of the dams on the local environment. The project has already displaced several thousand Kurds living in the region. One of the primary purposes of the GAP Project is irrigation, but irrigation can lead to excessive salinization of the soil and requires evacuation channels for surface water.<sup>20</sup> Salinization takes place when irrigation water, containing salt and other pollutants, evaporates into the air or when plants absorb it through their root systems. This leaves behind the salt, which does not evaporate and which plants do not use, increasing the salt content of the soil. The possibility also exists that increased agriculture will lead to new crop patterns. Large scale agriculture for commercial purposes (such as growing cotton) may lead to short term exploitation of the soil at the expense of long term sustainability and the continuing health of the region. These new agricultural patterns and increasing salinity influence users downstream in Syria and Iraq as well.<sup>21</sup>

Though significant, salinity is not the only way in which dams change the surrounding environment. The water discharged from dams is not equivalent to the water entering the reservoir behind the dam. Dam discharge can change water temperatures, the amount of sediment contained in the water, the organic content of the water, and the overall volume of water in the river channel. A decrease in the sediment discharged causes rivers to erode their banks, altering the habitat of plants and animals living there, while too great an increase in sediment causes excessive siltation of the riverbed, increasing the chance of destructive flooding as the riverbed rises over time. Insufficient water volume is also a critical issue. If the volume is too small, evaporation will increase the concentration of salt, minerals, and organic chemicals in the water, causing a decline in water quality. Finally, most of the water passing through the dams comes from the deepest portions of the reservoir, depriving it of much of the dissolved oxygen needed to sustain aquatic life.<sup>22</sup> All of these issues af-

<sup>20</sup> Quentin Peel, "Communication Gaps Hinder Dam Project: South-Eastern Anatolian Project." *Financial Times* (London), April 5, 2000.

<sup>21</sup> Feryal Turan, "Drowning the Poor: The Social and Ecological Costs of Water Development in Turkey" (diss. Northeastern University, Boston, 2001), 182.

<sup>22</sup> Frederick Lorenz and Edward Erickson, *The Euphrates Triangle: Security Implications of the Southeastern Anatolia Project* (Washington, DC: National Defense University Press, 1999), 37-38.

fect river habitat throughout the entire river system. Whenever Turkey, Syria, or Iraq installs another dam, it subjects all water users downstream from that dam to each of these negative effects.

One health benefit touted by dam proponents is that impounding behind dams will help insure a supply of safe drinking water to local populations. This helps to decrease episodes of diseases such as cholera, typhoid, and dysentery. The standing water in reservoirs, though, poses a different danger in terms of disease. Diseases linked to water storage projects include schistosomiasis (directly associated with irrigation canals), onchocerciasis (river blindness), trypanosomiasis (sleeping sickness), and filariasis. The reservoirs also are home to insects and parasites that may be disease vectors for humans, including mosquitoes-borne diseases such as malaria and yellow fever.<sup>23</sup>

While the cost of the GAP Project to the humans in the local environment is high, costs to the plants and animals of the region are significant as well. Observers will never know some of the environmental costs, due to inadequate studies in the early stages of the project. Turkish law at the time did not mandate environmental impact statements preceding a project, as is the case in the United States and many other nations.<sup>24</sup> The Turkish government did initiate a study for this purpose for the GAP Project, but apparently the study was never completed due to financial problems. It is unclear how the Turkish government found the funding to create the massive GAP Project but could not find the funding to hire a few scientists to study its environmental impact. It is clear, however, that flooding river valleys for storage reservoirs and clearing fields for crop irrigation has a negative impact on species diversity, including rare species endemic to the area. We do not know the exact number of species affected by the project for certain, due to the limitations described previously. Estimates, however, conclude that the creation of the reservoir for Keban Dam alone resulted in the extinction of twelve plant species.<sup>25</sup>

For fauna native to the region, the GAP Project has not been kind. While dam reservoirs do create habitat for some animals, such as birds, certain fish native to the river do not thrive in lake environments. The Tigris-Euphrates river system contains forty-six species

<sup>23</sup>Turan, *Drowning the Poor*, 199-202.

<sup>24</sup>Lorenz and Erickson, *Euphrates Triangle*, 38.

<sup>25</sup>Turan, *Drowning the Poor*, 172, 176.

and sub-species of fish; some thrive in warm water and migrate up or down stream to find ideal conditions. Dams reduce or eliminate the mobility of these fish. One turtle species, *Rafetus euphraticus daudin*, is in decline because Atatürk Dam flooded its habitat. It can still lay its eggs, but changes in the reservoir level disperse the eggs. Irrigation works destroyed much of the habitat of the antelope species *Gazelle subgutturosa*, now threatened with extinction, and hedgehog (*Hemiech- enus auritus*) and bat populations have declined due to an increasing use of pesticides.<sup>26</sup>

### ***Don't Drop that Bomb on Me***

Issues involving water use and economic development have a rather subtle yet tremendously important impact on the health of the Tigris and Euphrates and will in all likelihood continue to shape life in the region for several generations. The negative influence of warfare on the health of the watershed is both immediate and dramatic. Both the first Gulf War (1990-1991) and the second Gulf War (2003-present) have had negative environmental effects. During war, the goal is to defeat the enemy by whatever means necessary, and environmental consequences are hardly ever considered. In the first Gulf War, both sides took actions with severe environmental repercussions.

Iraq's contribution to environmental devastation included the burning of Kuwait's oil wells as the Iraqi army retreated. The Iraqi soldiers set approximately 500 oil wells ablaze in 1991. The resulting clouds of acidic black smoke rose into the air, causing black, acidic rain to fall all over the region from Turkey to Iran. The burning oil from the wellheads also created significant clouds of smog, drastically reducing air quality. Just as photochemical smog forms in urban areas when fuel emissions combine with sunlight, the same process took place over Kuwait and Iraq as a result of the burning oil wells. This air pollution, which lasted for several months, in turn contributed to reduced crop yields, due to both the pollution in the air and the reduced amount of sunlight that managed to filter through the smog.<sup>27</sup>

<sup>26</sup> Ibid., 177-179.

<sup>27</sup> Fred Pearce, "Flow of Fear in the Desert—Allied Bombing may have Destroyed Bar- rages Vital to Field Irrigation and Flood Control," *Guardian*, March 8, 1991.

As bad as this event was for those living in the affected areas, the Allied bombing campaign against Iraq during the first Gulf War produced serious environmental consequences of its own. The campaign destroyed much of Iraq's intricate irrigation system built around the waters of the Tigris and Euphrates Rivers. This caused flooding and inundation in some areas and insufficient water to reach other areas that needed it for cereal and vegetable production.<sup>28</sup> The bombing affected urban areas as well. The damage to and destruction of water treatment facilities resulted in a great volume of untreated sewage going directly into the Tigris River from Baghdad (population 3.8 million), Amara (population 400,000), and other cities. This major threat to drinking water supplies put Iraqis at risk of contracting cholera, typhoid, and other water-borne diseases. In addition, the economic embargo against Iraq that followed the end of the first Gulf War made replacement equipment for water treatment systems difficult or impossible to obtain. Much of Iraq faced the same water quality problems that the Kurds of northern Iraq faced after the Anfal campaign in 1988.<sup>29</sup> Because of the water-borne diseases, child mortality rates rose sixfold between 1991 and the start of the second Gulf War in 2003. In some areas, nine of every ten people admitted to hospitals suffered from problems related to unsafe drinking water.<sup>30</sup>

It is critical not to overlook the importance of the United Nations economic sanctions against Iraq. Because of unsafe drinking water, improper sewage treatment, and lack of certain medical supplies brought on by the sanctions, the health of the Iraqi people suffered immensely, especially children. A United Nations International Children's Emergency Fund (UNICEF) survey in 1999 concluded that mortality among children in Iraq had more than doubled between 1995 and 1999, and 22 percent of children faced chronic malnourishment. A June 2000 report by the United Nations Sub-Commission on the Promotion and Protection of Human Rights declared that the total number of deaths directly attributable to the economic sanctions was at minimum 500,000 and possibly as many as 1.5 million! The

<sup>28</sup>Ibid.

<sup>29</sup>Michael Simmons, "Environment: Flowing Wounds of War," *Guardian*, January 29, 1993.

<sup>30</sup>Katie Ridley, "Thirsty Iraqis Face a Killer in Their Taps: Used to Safe Drinking Water, Many Still Rely on a System Fossilized by War and Sanctions," *Atlanta Journal Constitution*, January 27, 2003.

reasons for this catastrophic increase in mortality include the problems resulting from unsafe drinking water in Iraq, but also include the United States vetoing proposed UN missions to bring humanitarian aid to the people of Iraq. The United States blocked contracts for providing water tankers on the grounds that the tankers could be used to transport chemical weapons. Various contracts to provide medical supplies also received a veto from the United States.<sup>31</sup> Regardless of the perceived military, political, and economic reasons given to justify the vetoes of these humanitarian projects, the end result is not in dispute. The people of Iraq paid a heavy price for the sins of their leaders.

The aftermath of the United States' 2003 invasion of Iraq looked much the same as the first. Again, journalists and scientists noted the pipes spitting raw sewage untreated into the Tigris River in Baghdad and other cities. Even taking water samples from the river to measure levels of bacteria, phosphates, heavy metals, and other pollution became dangerous due to the resistance to the American invasion.<sup>32</sup> Prior to the second war, Iraq had about 140 water treatment facilities in operation; after the fighting, only about 65 percent of them still functioned, due to damage from bombing, the effects of looting, and shortages of the needed chemicals, spare parts, and power. In Spring 2004, only 60 percent of urban Iraqis and 30 percent of rural people could count on safe drinking water, whereas the figure for the country as a whole had been nearly 95 percent prior to the first Gulf War.<sup>33</sup>

Fortunately for the health of the people of Iraq and for the health of the Tigris River, outside companies and Iraqi subcontractors are in place to rebuild the water management infrastructure following the second Gulf War.<sup>34</sup> This will help Iraq rebuild its water management plants to help insure safe drinking water and better health in Iraq's cities. It should also help to change the horrific upward trend in mortality rates, as will the lifting of UN economic

<sup>31</sup>Mahmood Mamdani, *Good Muslim, Bad Muslim: America, the Cold War, and the Roots of Terror* (New York: Pantheon Books, 2004): 188-191.

<sup>32</sup>James Glanz, "Iraq Struggles to Restore its Endangered Tigris River," *New York Times*, July 12, 2004.

<sup>33</sup>Pamela Wolfe, "Reconstruction amidst Violent Upheaval in Iraq," *Business and Industry* 19 (May 2004): 3.

<sup>34</sup>Ibid.

sanctions. However, this will not help to undo the last, and possibly most serious, environmental consequence of the two Gulf Wars. During both these conflicts, weaponry employed by the forces of the United States contained depleted uranium, a radioactive and very toxic waste product left over after the enrichment of natural uranium. Damacio Lopez, executive director of the International Depleted Uranium Study Team, described the effects of depleted uranium on Iraq since 1991:

In Iraq over 1.5 million soldiers and civilians have died of natural causes since the 1991 Gulf War, one third of them children under the age of five. Leukemia, cancer, birth defects and rare diseases have increased at an alarming rate in this country. Studies conducted by Iraqi scientists have found higher levels than permitted by international standards for U-238 and its products in drinking water of various city supplies and in the Tigris River. Vegetables, fish, and meat in southern Iraq are showing levels of radiation contamination as well.

With a half-life of roughly four and a half billion years, depleted uranium will continue to affect the water and soil of Iraq indefinitely, unless entirely eliminated by a specific cleanup effort.<sup>35</sup>

### ***The Shatt al-Arab and the Persian Gulf***

As these various forms of urban pollution flow downstream towards the Persian Gulf, they eventually combine as the two great rivers meet. The Tigris and Euphrates Rivers come together in southern Iraq and join with the Karun and Abadan Rivers flowing west from Iran to form the Shatt al-Arab. As early as 1976, studies done on the Shatt al-Arab indicated that pollution of the waterway was significant. Domestic sewage discharge caused bacterial contamination in its waters, which eventually flow into the Persian Gulf. Excessive concentrations of nutrients and organic matter from sewage runoff increased algae growth, and the algae consumed the dissolved oxygen necessary to aquatic life. Industrial waste played a role here as well. In addition to the polluted water coming downstream via the Tigris

<sup>35</sup>Mamdani, *Good Muslim, Bad Muslim* 195.

and Euphrates, the large number of ships using the port of Basra contributed to the pollution.<sup>36</sup>

More recent water quality studies show that in addition to sewage and industrial waste, fertilizers and pesticides influence the water quality of the Shatt al-Arab. DDT has been a commonly used insecticide in Iraq, by both agricultural and public health authorities. Other chemicals found in this sedimentation study include aldrin, dieldrin, and chlordane.<sup>37</sup> But far and away the single greatest environmentally destructive event of the past twenty years came in the wake of Iraq's retreat from Kuwait early in 1991. As the Iraqi army retreated, it allowed a huge volume of oil to spill into the Persian Gulf.<sup>38</sup> The environmental impacts of this are legion, and include destruction of habitat for fish and other aquatic species, birds, marine mammals, and the ecology of the shores of the Persian Gulf.

### ***Making Sense of it All***

The environmental history of the Tigris-Euphrates river system in the past two decades is a troubled one. Some of the issues faced by Turkey, Syria, and Iraq are typical of nations attempting to industrialize and make use of their natural resources. The GAP Project in Turkey is an example of this. The project has imparted substantial benefits to the Turkish population. Yet the environmental problems of the project loom over everything, like a dark cloud threatening to obscure the sun. The danger of water-borne diseases, the modification of the volume and quality of the water flowing downstream to Syria and Iraq, the potential problems associated with irrigation, and the displacement or destruction of endemic species are real. These issues affect the everyday lives of the people of southeastern Turkey just as the benefits of the GAP Project do. The fact that the Turkish government completed no environmental studies prior to initiating the project is deeply disturbing, because once a plant or animal spe-

<sup>36</sup>Massoud Saad, "Observations on the Problems of Pollution in Shatt al-Arab, Iraq" *Revue Internationale d'Océanographie Médicale* (1976): 6-9.

<sup>37</sup>Ali DouAbul, Hamid Al-Saad, Amina Al-Timari, and Hussain Al-Rekabi, "Tigris-Euphrates Delta: A Major Source of Pesticides to the Shatt al-Arab River (Iraq)," *Environmental Contamination and Toxicology* 17 (1988): 412-413.

<sup>38</sup>Jo Anne Hart, "The Arab State Sub-System in Crisis" in *The Gulf Crisis: Background and Consequences*, ed. Ibrahim Ibrahim (Washington, DC: Center For Contemporary Arab Studies, 1992): 187-188.

cies is lost, the damage is irrevocable and a small piece of the world has been lost forever. Pollution flowing into the Persian Gulf from the Shatt al-Arab also falls into this category. The industrial pollution is the result of the heavy use of the port of Basra, and the various products shipped via this outlet are important to the economy of Iraq. Unfortunately, this pollution not only hurts the ecology of southern Iraq, but pollution flowing into the Persian Gulf also harms the fisheries of the region and the shrimp industry of Kuwait.

Though some of the region's environmental stresses are attributable to efforts toward development, others are not. Iraq's use of chemical weapons against the Kurds of northern Iraq created an environmental situation completely unjustified from any perspective, other than those with the view of terrorizing civilian populations. The instant suffering that chemical warfare caused to the Kurds in the Anfal campaign was a reprehensible act. Equally reprehensible is the fact that there was no cleanup effort, allowing toxic chemicals to leak into the soil and water supply. The evidence of this continues today with high rates of disease, birth defects, and child mortality. The fact that some of the chemicals used affect human DNA suggests that these terrible problems are likely to continue into the foreseeable future.

The efforts of Saddam Hussein and the Iraqi state to dry out the marshes of southern Iraq have also had disastrous consequences for the natural environment. Many of the Marsh Arabs, inhabitants of the region for millennia, are scattered or dead, and for those who remain life may never be the same again. Also scattered are the populations of many species of wildlife dependent upon the marsh habitat. The marshes served as important habitat for both endemic species and avian populations that used them on long migration routes. Fortunately, there is some hope for the restoration of a portion of the marshlands; the success of the restoration efforts is critical for the biodiversity of the region.

Finally, the two Gulf Wars have hurt the environment of the Tigris-Euphrates river system in multiple ways, and both contestants are guilty. Iraq's igniting of Kuwaiti oil wells and spilling oil into the Persian Gulf has damaged the ecology of the region in ways that are difficult to calculate and quantify but incredibly significant. Likewise, the bombing and destruction of Iraq's water treatment plants and ir-



rigation works by the United States and its allies caused great damage to the river system. Damaged irrigation works disrupted food production while untreated sewage and chemicals spilled freely into the Tigris and Euphrates Rivers. The resulting pollution of Iraq's water supply caused catastrophic problems in terms of public health. The use of depleted uranium in weaponry also had incalculable effects on the health of Iraqi citizens through its release of radioactive materials into the environment.

Some of the issues presented here are typical of places in the world challenged by poverty and an arid environment. Turkey's efforts to increase prosperity in an economically depressed region at least appear laudable. (However, there is always, in such situations, the question of who will actually benefit from these major projects. Will the benefits go to individual citizens or large corporations with money and influence? Unfortunately, the answer to such crucial questions lies outside of this study.) The trade-offs concerning water in Turkey or Iraq are similar to those faced by many areas with growing populations but finite water resources. The Sahel region of northern Africa finds itself in a similar predicament. For that matter, so do many western states within the United States that depend on the water from the Colorado River Storage Project, though their economic plight is certainly less severe overall than most nations situated in arid locations.

What makes this particular story original are the interesting and often tragic twists and turns provided by political decisions. Many nations are dealing with issues of water quality and scarcity, but not many of them have exacerbated the problem by attempting to kill major segments of their own population as Iraq has with the Kurds and Marsh Arabs. Similarly, to do these things while fighting two major wars against the military juggernaut of the United States is unprecedented. As a result, the story of the environmental issues of the Tigris and Euphrates watershed is typical to that of other arid regions in some ways, but certainly not in all. Local decisions taken by individuals, or nations, always influence outcomes, creating a unique story.

This story is largely a story of the importance of these decisions. The critical thread running through each of the environmental problems facing the Tigris-Euphrates river system is the role of humans in creating the problems. None of the problems described here is a

direct result of global climate change or natural disaster. Humans are the primary agent of change in each case. Though humans may be the cause of the problems, they also have the ability to solve them. A society with the ability to create weapons utilizing chemical agents or depleted uranium also has the capacity to clean up the ecological mess caused by using these weapons. Science that is capable of constructing monumental dams on the Tigris and Euphrates Rivers is also capable of finding ways to preserve the flora and fauna threatened by the dams. In short, humans must find a way to adapt to the natural world, instead of always trying to force the natural world to adapt to them.

Ignorance is not the problem. The knowledge exists to deal with most of the issues presented here. The question is whether the will exists to deal with the problems. The fact that so little of the scholarship and media reports on the region focuses on the environment of the Middle East must bear part of the blame, because it diverts public attention into other channels. This is not to demean the work of scholars writing about politics, economics, gender relations, religion, or nationalism in the Middle East. The issues they are concerned with are important and deserve the attention. But the relative lack of attention given the environment and ecology of the region leaves a gaping hole in our knowledge of the Middle East. It leaves a wide gap in public consciousness as well. This tragedy only serves to increase the suffering of the inhabitants of Turkey, Syria, and Iraq. Environmental issues affect the people living in the Tigris-Euphrates watershed every bit as much as politics or nationalism.