

also, however, require the West to develop a more profound understanding of the basic religious and philosophical assumptions underlying other civilizations and the ways in which people in those civilizations see their interests. It will require an effort to

identify elements of commonality between Western and other civilizations. For the relevant future, there will be no universal civilization, but instead a world of different civilizations, each of which will have to learn to coexist with the others.

Michael T. Klare

RESOURCE COMPETITION IN THE 21ST CENTURY

It is possible that in focusing on explanations for past wars, we give insufficient attention to the causes of future conflicts. (On the other hand, it seems likely that certain fundamental characteristics—of “human nature,” social systems, and so on—are likely to survive relatively unchanged from one era to the next.) In this selection, we present an effort by a noted peace researcher to look ahead and anticipate “new global schisms” that may characterize violent conflict in the twenty-first century. Note especially the suggestion that *interstate* wars have been and will be replaced by *intrastate* conflicts.

As in all previous epochs, the world of the 21st century faces a variety of political, economic, social, and ecological pressures that threaten stability in many parts of the globe and embody a potential for violent conflict. Many of these pressures are akin to those that have imperiled regional and international stability in the past: ethnic and religious antagonisms; the struggle for dominance between aspiring and established powers; territorial disputes; economic competition; and so forth. It is likely, however, that additional sources of friction and instability will arise in this century, emerging from the distinctive features of the current era. Among the most powerful of these will be global competition for access to and control over key sources of vital non-renewable resources: oil, water, natural gas, arable land, and various industrial minerals.

The significant role played by resource competition in sparking conflict is evident in many of the recent outbreaks of armed violence, such as those in Afghanistan, Chad, Chiapas, Colombia, Congo, Iraq, Liberia, Mali, the Philippines, Sierra Leone, Somalia, Sudan, Zimbabwe, and parts of India. Violence has also arisen in disputes over contested offshore territories, such as the East and South China Seas, the Caspian Sea, and the Persian Gulf. Like all human conflicts, these upheavals have more than one cause; all, however, are driven to a considerable extent by competition over vital or valuable resources: diamonds in the case of Liberia and Sierra Leone; oil in the case of Colombia, Iraq, and Sudan; timber and minerals in the Congo; arable land in Chiapas and Zimbabwe; and so on. Indeed, the United Nations Environment Programme (UNEP) reported in 2009

that 18 recent and ongoing civil conflicts—including many of those cited above—were fueled in large part by competition over resources like these.¹¹

It is true, of course, that competition over scarce and vital materials has long been a source of conflict. Indeed, many of the earliest recorded wars—notably those occurring in ancient Mesopotamia, Egypt, and the Jordan River valley—were driven by struggles over the control of water supplies and arable land. Similarly, many of the wars of the sixteenth through the early twentieth centuries were sparked by competition among the major European powers for control over resource-rich colonies in Africa, Asia, the East Indies, and the New World—struggles that culminated in World War I. The rise of Nazism and the outbreak of the Cold War tended to overshadow (but did not eliminate) the importance of resource competition in the last century, but this factor emerged with its historic vigor at the end of the Cold War, as demonstrated by the conflicts identified above.¹²

One can argue, then, that the re-emergence of resource conflict in the current period is nothing more than a return to the status quo ante: to the long stretch of time during which resource competition was a dominant theme in world affairs. But it is the contention of this chapter that the situation we face today is not just more of the same, but is, in fact, the product of altered circumstances in which resource competition has assumed a more pivotal role in armed conflict than has been the case in the past. To appreciate this, it is necessary to consider both the importance of key resources to contemporary human endeavors and the unique pressures on the world's resource base as we move deeper into the 21st century.

Some resources are, of course, essential for human survival. All humans need a certain amount of food and water, plus access to shelter, clothing—and, in northern climates, heat. At a very primitive

level of existence, human societies can function on relatively modest quantities of these materials, so long as their numbers remain few. As societies grow larger and more complex, however, they require more resources for their own purposes and to produce trade goods to exchange for the things they lack, including luxury items sought by their elites. Modern means of warfare also consume vast quantities of resources, especially petroleum to fuel the tanks, planes, helicopters and ships that have come to dominate the contemporary battlefield. The more developed, urbanized, and prosperous a society, the greater is its requirement for resources of all types.¹³

The dilemma that confronts us as we proceed deeper into the 21st century is the fact that human consumption of almost all types of commodities is growing at an ever-increasing rate, imposing growing and possibly intolerable pressures on the world's existing stockpile of natural resources. Until now, humans have been able to mitigate these pressures by developing new sources of supply—for example, by digging deeper into the earth for metals and oil—and by inventing alternative materials. No doubt human ingenuity and the power of the market will continue to generate solutions of this sort. At some point, however, the demand for certain vital resources will simply overwhelm the available supply, producing widespread shortages and driving up the price of what remains; in some cases, moreover, it may prove impossible to develop viable substitutes. (For example, there is no known substitute for fresh water.) As resource stocks dwindle and prices rise, the divide between those with access to adequate supplies and those without will widen, straining the social fabric and in some cases leading to violent conflict.¹⁴

It is apparent, then, that resource competition will play an increasingly significant role in world affairs as time proceeds. Just *how* substantial its impact will be will depend, to a considerable extent, on the evolution of human consumption patterns. The greater the pressure we bring to bear

¹¹ United Nations Environment Programme (UNEP), *From Conflict to Peacebuilding: The Role of Natural Resources and the Environment* (Nairobi, Kenya: UNEP, 2009), Table 1, p. 11.

¹² For background and discussion, see: Steven A. LeBlanc, *Constant Battles* (New York: St. Martin's Press, 2003); and Clive Ponting, *A New Green History of the World* (New York: Penguin Books, 2007).

¹³ The author first advanced this argument in Michael T. Klare, *Resource Wars* (New York: Metropolitan Books, 2001).

¹⁴ For an elaboration of this argument, see Michael T. Klare, *The Race for What's Left* (New York: Metropolitan Books, 2012).

on the world's existing resource base, the higher the risk of major social and environmental trauma. It is essential, then, to consider the implication of five key trends in contemporary human behavior: globalization, population growth, resource depletion, and climate change.

GLOBALIZATION

The growing internationalization of finance, manufacturing, and trade—the phenomenon we know of as globalization—is having a powerful effect on many aspects of human life, including the demand for and consumption of basic resources. Globalization increases the demand for resources in several ways. Most significant is the spread of industrialization to more and more areas of the world, producing a dramatic increase in the demand for energy, minerals, and other basic commodities.

The spurt in demand for energy is especially evident in the newly-industrialized countries of Asia, which are expected to continue growing at a rapid pace in the decades ahead. According to the U.S. Department of Energy, energy consumption in developing Asia (including China, India, South Korea, and Taiwan) will grow by an estimated 2.9 percent per year over the next quarter-century, jumping from 138 quadrillion British thermal units (BTUs) in 2008 to an estimated 299 quadrillion BTUs in 2035.¹⁵ The growth in demand for petroleum will be especially pronounced, with total consumption in developing Asia climbing from 17 million barrels per day in 2008 to a projected 34 million barrels in 2035. A similar pattern is evident with respect to consumption of natural gas and coal—both of which are projected to experience a substantial increase in demand in the coming decades.¹⁶ The rising consumption of energy, along with other materials needed to sustain economic growth in the newly-industrialized countries, will significantly increase the pressures already being placed on the global resource base.

Globalization is further adding to the pressure on resources by contributing to the emergence of a

new middle class in many parts of the world. As families acquire additional income, they tend to acquire more goods and appliances, eat higher-end foods (such as beef, pork, and chicken), and to move into larger living quarters—all of which generates a steep increase in the consumption of basic materials. Most significant in this regard is the growing international demand for private vehicles, a process known as the “motorization” of society. According to one recent estimate from the Energy Forum of the Baker Institute of Rice University, automobile ownership in China will jump from 63 million in 2009 to 210 million in 2020 and an astonishing 770 million by 2040.¹⁷ Just to produce all of these vehicles will entail the consumption of vast amounts of iron, aluminum, and other minerals; once in operation, they will consume millions of gallons of oil per day, year after year.

Finally, globalization affects the global resource equation by extending the worldwide reach of multinational companies (MNCs), generating significant economic benefits for many poor and isolated countries but also providing incentives for cash-starved governments to permit the extraction of raw materials beyond sustainable levels or to cut down forests in order to make way for export-oriented ranching and agriculture. This has resulted, for instance, in the continuing deforestation of the Amazon region and the large-scale deforestation of such countries as Indonesia, Malaysia, and the Philippines.¹⁸

POPULATION GROWTH

Rising population is further adding to the pressures on the world's resource base. According to the latest United Nations projections, total world population will rise from 6.9 billion people in 2010 to an estimated 9.3 billion in 2050, for an increase of

¹⁵ U.S. Department of Energy, Energy Information Administration (DOE/EIA), *International Energy Outlook 2011* (Washington, D.C.: DOE/EIA, 2011), Table A1, p. 157.

¹⁶ Ibid., Tables A5–A7, pp. 162–64.

¹⁷ Energy Forum of the James A. Baker III Institute for Public Policy, Rice University, *The Rise of China and Its Energy Implications: Executive Summary* (Houston: Baker Institute, 2011), pp. 13–15.

¹⁸ For discussion, see Klare, *The Race for What's Left*. On the dynamics of deforestation, see Michael Williams, *Deforesting the Earth*, abridged ed. (Chicago: University of Chicago Press, 2006). For data on worldwide deforestation, see Food and Agriculture Organization (FAO), *State of the World's Forests* (Rome: FAO, 2011), and earlier editions.

2.4 billion.¹⁹ These additional people will need to be fed, housed, clothed, and otherwise provided with basic necessities—producing a corresponding requirement for food, water, wood, metals, fibers, and other materials. Although the earth can supply these materials—at least in the amounts needed for a relatively modest standard of living—it cannot continue to sustain an ever growing human population and satisfy the rising expectations of the world's middle and upper classes. At some point, significant shortages will occur, intensifying the competition for access to remaining supplies and producing severe hardship for those without the means to pay the higher prices thereby incurred.

Of all basic necessities, the one that is most likely to be affected by population growth is fresh water. Humans must have access to a certain amount of water every day, for drinking, personal hygiene, and food production. Fortunately, the world possesses sufficient renewable supplies of fresh water to satisfy current requirements and to sustain some increase in the human population. As population grows, however, the pressure on many key sources of supply will increase, suggesting that severe shortages will develop in some water-scarce areas over the next few decades.²⁰

This is especially true in the Middle East and North Africa, where fresh water is already in short supply and population growth rates are among the highest in the world. For example, the number of people who will be relying on the Nile River, the Jordan River, and the Tigris-Euphrates system for all or most of their water supply will grow from approximately 325 million in 2000 to 740 million in 2050—without any appreciable increase in the net supply of water in the region. Unless the existing sources of supply are used more efficiently or the desalination of seawater proves more affordable, competition over access to water will become more intense in these areas and could lead to war.²¹

RESOURCE DEPLETION

The three factors described above—globalization, population growth, and urbanization—are combining to create a fourth: the irreversible depletion of many non-renewable resources. While the earth contains large amounts of many key materials, these supplies are not unlimited and can be exhausted through excessive extraction or utilization. And, in the case of some vital resources, humans have reached this point or are likely to do so in the early decades of the 21st century. For example, humans have harvested some species of fish (such as the once-prolific cod) so intensively that they have virtually disappeared from the world's oceans and are not expected to recover. Similarly, some valuable types of hardwood have largely disappeared from the world's forests.²²

Of the resources that are facing depletion in the decades ahead, none is more important to human life and society than petroleum. Oil provides about one-third of the world's basic energy supply—more than any other source—and provides about 97 percent of the energy used for transportation. It is the chemical feedstock for a vast array of valuable products, including plastics, fertilizers, pesticides, asphalt, and many pharmaceuticals. Oil is also essential for the conduct of modern warfare, providing fuel for tanks, planes, missiles, and most warships.

Like many other materials we rely on, petroleum is a non-renewable resource: once we consume the existing world supply (produced by geological processes over many millennia), there will be none left for future generations. We humans have already consumed about half of the earth's conventional petroleum—approximately 1.2 trillion barrels out of the 2.4 trillion barrels that are thought to have existed in 1859, when commercial extraction began—and are exploiting what remains at such a rapid pace that much of the remaining supply could disappear

¹⁹ United Nations, Department of Economic and Social Affairs, Population Division, "World Population Prospects: The 2010 Revision," online edition, retrieved at <http://www.un.org/esa/population> on August 4, 2012.

²⁰ For background and discussion, see Marq de Villiers, *Water* (New York: Houghton Mifflin, 2000).

²¹ For background, see Klare, *Resource Wars*, pp. 138–89.

²² For background, see Klare, *The Race for What's Left*, pp. 19–40. For an inventory of the world's depleted resources, see World Wildlife Fund (WWF), *Living Planet Report 1998* (Gland, Switzerland: WWF, 1998). Substantial information on the depletion of particular resources is available in the annual publications of the Worldwatch Institute of Washington, D.C., notably *The State of the World*, and *Vital Signs*.

in the next 30–40 years.²³ Additional supplies of so-called “unconventional” oil—Canadian tar sands, Venezuelan extra-heavy crude, Rocky Mountain oil shale, Arctic oil, and so on—can replace some of the depleted conventional supply, but extracting these fuels requires vast amounts of water and energy while emitting huge amounts of GHGs, so it is not clear that societies will permit their full-scale exploitation.²⁴

GLOBAL CLIMATE CHANGE

All of these problems are bound to be exacerbated by the effects of global climate change. Although climate scientists cannot be certain about the future effects of climate change on any particular locale, they are increasingly convinced that large parts of the planet will suffer from persistent drought, diminished rainfall, and the invasion of coastal areas by a rise in the sea level. This will, in turn, jeopardize water supplies and food production in many tropical and temperate areas of the world, forcing millions of people—perhaps tens or even hundreds of millions—to abandon their ancestral lands and migrate to other, less-severely affected areas. The result could well be an increase in conflict over access to food, fresh water, and arable land.²⁵

Climate change will affect many aspects of the global resource equation, but its greatest impact—at least initially—will be on the supply of food and water. “Climate change will alter rainfall patterns and further reduce available freshwater by as much as 20 to 30% in certain regions,” a paper prepared by the European Union secretariat noted in 2008. This, in turn, will result in diminished food production

in these areas, accompanied by rising food prices—a likely trigger for social unrest and conflict. “Water shortage in particular has the potential to cause civil unrest and to lead to significant economic losses, even in robust economies,” the EU study noted. The consequences will be even more intense in areas under strong demographic pressure. The overall effect is that climate change will fuel existing conflicts over depleting resources. . . .”²⁶

Along with global food supplies, climate change will affect the planet’s energy supply. An increase in severe storm activity, for example, will endanger oil and natural gas production in such key producing areas as the Gulf of Mexico, the North Sea, and the western Pacific. Because such a large share of America’s energy production and refining capacity is concentrated in the Gulf of Mexico, intense hurricanes will have a devastating effect on the nation’s oil output. Hence Hurricane Katrina, which swept through the Gulf in August 2005, destroyed 45 drilling platforms and crippled about one-fourth of America’s production capacity; Hurricane Rita, coming one month later, destroyed another 66 platforms.²⁷ The reduced levels of rainfall expected from global warming in many parts of the world will also reduce the flow of water into many rivers that have been dammed for the purpose of generating electricity; with less rainfall, these hydro-electricity plants could sit idle for long stretches of time.

THE PROSPECTS FOR CONFLICT

Together, these factors are producing increasing pressures on the world’s resource base—pressures that can only increase as we proceed deeper into the 21st century. The resulting shortages are likely to produce or magnify antagonisms between and within societies as governments and factions compete for access to or control over major sources of vital materials. In the extreme case, such antagonisms can lead to the outbreak of armed violence.

²³ For background, see Klare, *The Race for What’s Left*, pp. 29–32. This assessment is largely based on data and analysis in International Energy Agency (IEA), *World Energy Outlook 2008* (Paris: IEA, 2008), pp. 221–48.

²⁴ For background and discussion, see Michael Klare, *The Race for What’s Left* (New York: Metropolitan Books, 2012), pp. 41–127.

²⁵ The most comprehensive study of the impact of climate change on human societies is Martin Parry, et al., *Climate Change 2007: Impacts, Adaptation and Vulnerability*, Contribution of Working Group II to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change (Cambridge: Cambridge University Press, 2007).

²⁶ European Commission (EC) and High Commissioner, *Climate Change and International Security: Paper to the European Council* (Brussels: EC, 2008), p. 3.

²⁷ National Commission on the BP Deepwater Horizon Oil Spill and Offshore Drilling, *Deep Water* (Washington: National Commission, 2011), p. 50.

In general, violent struggle over resources can take one of four forms: territorial disputes, access conflicts, allocation disputes, and revenue disputes. Most of the armed conflicts of the post-Cold War era embody aspects of one or another of these types.

Territorial Disputes

Conflicts arising from disputed claims to contested lands have been a source of friction and warfare throughout human history, and still occasionally provoke armed violence—the 1998–2000 war between Eritrea and Ethiopia is a conspicuous example—but have become less frequent in recent years as nations have slowly but surely resolved outstanding boundary disputes. However, conflicts over *offshore* territories appear to be growing more frequent as governments fight over contested maritime areas with valuable fisheries and undersea resources, such as oil and natural gas deposits. Typically, the parties to these disputes cite differing interpretations of the United Nations Convention on the Law of the Sea (UNCLOS) to justify their claims to substantial (but often overlapping) offshore territories. As resource deposits on land become progressively depleted, disputes over offshore resources are likely to become more pronounced.²⁸

Two such areas exhibiting a particularly high risk of conflict are the East China Sea and the South China Sea. Both of these areas are claimed in total or in part by the surrounding countries—China, Japan, and Taiwan in the case of the former; Brunei, China, Malaysia, the Philippines, Taiwan, and Vietnam in the latter—and both are thought to harbor substantial undersea reserves of oil and gas. Efforts to resolve these territorial disputes through peaceful negotiations have, until now, met with failure, and most of the claimants have employed military force to demonstrate their resolve to protect their interests—on some occasions, producing armed violence. The growing tensions in these areas have triggered a naval buildup among the countries involved,

provoking international concern over the risk of future clashes at sea.²⁹

Tensions of this sort have also arisen in the waters surrounding the Falkland Islands (called the Malvinas by the Argentineans) and in the Arctic region. As in the East and South China Seas, both of these areas are thought to possess large reserves of oil and natural gas, and both have been the subject of competing claims to vast offshore territories. Argentina and the United Kingdom fought a war over the Falklands/Malvinas in 1982, but have remained peaceful since then; now, however, efforts by UK-based oil firms to drill for oil in waters off the islands has led to renewed tensions, resulting in the deployment of additional British military units and various punitive measures by the Argentineans. Similar disputes have arisen in the Arctic, where the boundaries between the surrounding countries have yet to be determined and ownership of vast areas remains in dispute. Here, too, tensions have been raised by the deployment of additional military units and talk of military action to protect vital interests.³⁰

Access Conflicts

Conflicts arising from efforts by a resource-importing nation to safeguard its ability to procure needed resources from a distant source and to transport them safely to its own territory. Many of the colonial wars of past centuries were sparked by such efforts, as was Germany's 1941 invasion of the Soviet Union (intended in part to seize control of the oil fields of the Caucasus region) and Japan's subsequent invasion of the Dutch East Indies (also sparked by the pursuit of oil). Great Britain's determined efforts to retain a presence in Iraq after World War II and to retain control of its refinery at Abadan in Iran after its nationalization by Prime Minister Mohammed Mossadegh in 1951 also fit this pattern.³¹

²⁹ See *ibid.*, pp. 224–27. On the risk of conflict in the South China Sea, see International Crisis Group (ICG), *Stirring Up the South China Sea (I)*, Asia Report no. 223 (Brussels: ICG, 2012).

³⁰ For background on these disputes, see Klare, *The Race for What's Left*, pp. 63–65, 70–99.

³¹ For background on these events, see Daniel Yergin, *The Prize* (New York: Simon and Schuster, 1991), pp. 305–42, 450–78.

²⁸ For background on this point, see Klare, *The Race for What's Left*, pp. 41–69.

For the United States, ensuring access to the oil supplies of the Persian Gulf has long been a major military objective. This was made an explicit strategic objective in the so-called "Carter Doctrine" of January 23, 1980. Asserting that "[a]n attempt by any outside force to gain control of the Persian Gulf region"—and thereby impede the flow of oil—"will be regarded as an assault on the vital interests of the United States of America," President Jimmy Carter warned that this country would repel such an assault "by any means necessary, including military force."³² This basic principle was then cited by President George H. W. Bush as the justification for going to war against Iraq when it invaded Kuwait in 1990 (and, it was said, posed a threat to Saudi Arabia) as well as for the subsequent economic blockade of Iraq by Presidents George H. W. Bush and Bill Clinton; it can also be viewed as the impetus for the 2003 U.S. invasion of Iraq.³³

Access conflicts of this sort are also likely to arise in the future as the competition for vital resources intensifies and the major consuming nations become increasingly reliant on supplies acquired from distant and unstable regions. To better ensure its access to the oil supplies of Africa, for example, the United States has beefed up its naval presence in the Gulf of Guinea, the source of substantial U.S. oil imports.³⁴ The Chinese are also expanding their naval capabilities so as to better ensure their access to overseas resource supplies. "With the expansion of the country's economic interests, the navy wants to better protect the country's transportation routes and the safety of our major sea lanes," declared Rear Admiral Zhang Huachen, deputy commander of the East Sea Fleet, in 2010. "In order to achieve this, the Chinese Navy needs to develop along the lines of bigger vessels and with more comprehensive capabilities."³⁵ While it is impossible to predict the

outcome of these efforts, it is not hard to imagine a situation in which U.S. and Chinese naval forces clash with one another as a result of efforts to gain or protect access to an embattled supplier in Africa or the Middle East—a scenario envisioned by the National Intelligence Council in its 2008 study of the future strategic environment, *Global Trends 2025*.³⁶

Allocation Disputes

Conflicts that arise when neighboring states jointly occupy or rely on a shared resource source—a river system, an underground aquifer, an oil field, or so on. In such cases, conflict can erupt from disagreements over the distribution of materials taken from the shared resource. For example, Iraq, Syria, and Turkey have been squabbling over the allocation of water from the Tigris-Euphrates river system, which originates in Turkey but travels for much of its length through Iraq and Syria. The Jordan and Nile Rivers have also provoked allocation disputes of this sort, both in ancient times and in the present. The extraction of petroleum from a shared underground reservoir can also be a source of conflict, as demonstrated by Iraq's dispute with Kuwait over the prolific Rumaila field.³⁷

Allocation disputes of this sort—especially those over shared sources of water—are likely to grow more heated in the years ahead as a result of population growth and climate change. The countries that depend on the three river systems noted above—the Nile, the Jordan, and the Tigris-Euphrates—are experiencing very rapid population growth, and in some cases (Ethiopia, Sudan) are expected to see a two- or three-fold increase in population between now and 2050. At the same time, these rivers lie in areas of the world that are expected to see a significant decline in rainfall as a result of climate change, meaning that less water will be available for use by these growing populations. Given the history of animosity between the countries involved (including Israel and its neighbors), the possibility of friction

³² Jimmy Carter, State of the Union Address, Washington, D.C., February 23, 1980, retrieved at www.jimmycarterlibrary.org on March 31, 2007. For background on these events, see Michael A. Palmer, *Guardians of the Gulf* (New York: Free Press, 1992), pp. 101–11.

³³ For discussion, see Michael T. Klare, *Blood and Oil* (New York: Metropolitan Books, 2004), pp. 96–101.

³⁴ For background, see *ibid.*, pp. 142–45.

³⁵ Edward Wong, "Chinese Military Seeks to Extend Its Naval Power," *New York Times*, April 23, 2010.

³⁶ U.S. National Intelligence Council (NIC), *Global Trends 2025* (Washington, D.C.: NIC, 2008), pp. 77–79.

³⁷ For background on these disputes, see Klare, *Resource Wars*, pp. 52, 138–89.

and conflict over the distribution of these rivers' diminishing supply is bound to grow.³⁸

Revenue Disputes

Conflicts arising in divided or failing states when the national government has lost control of part or most of its territory and competing factions—warlords, ethnic militias, separatist groups, and other such formations—fight for control over oilfields, copper mines, diamond fields, or other resource sites that represent a significant source of revenue. Conflicts of this sort may first arise as a means to an end—to secure the funds needed to pay for arms and ammunition—but often become an end in themselves, as a way of enriching the commanders of these factions. This is evident, for example, in the protracted wars in Angola and Sierra Leone, where rebel commanders reportedly accumulated substantial fortunes from the sales of diamonds.³⁹ Such conflicts often prove difficult to resolve, as the leaders involved see no incentive to end the fighting—and the accompanying accumulation of private resource wealth.⁴⁰

Conflicts over the possession of valuable materials can also figure in attempts by minority groups in a multinational society to separate from the larger nation and create their own state based on the exploitation of a particular resource located in the sub-region where they form a majority—and the corresponding efforts of the central government to prevent such a move. This is evident, for example, in the Biafran War of 1967–70, in which the people of southeastern Nigeria sought to establish a separate state financed by oil revenues, and in a similar separatist drive by the inhabitants of Angola's oil-rich Cabinda province. In these, and other such cases, the central government invariably seeks to crush such

attempts as it is typically very dependent on the revenues from oil (or other resource) exports.⁴¹

Violence is not, of course, the only possible response to resource competition: as will be argued below, there are other plausible responses to scarcity. But the risk of violence is always latent when countries perceive the possession of certain materials as a matter of *national security*—that is, as something so vital to the survival and well-being of the state that it is prepared to employ military force when deemed necessary to ensure access to that resource. For some countries—notably those in very arid areas—water has long been portrayed as a national security matter. For example, Israel has declared that access to the waters of the Jordan River is vital to its survival, just as Egypt has long viewed the Nile River in this fashion. For other nations, especially the United States and China, oil has been viewed as a matter of national security—as exemplified, for example, in the “Carter Doctrine” of 1980. So long as resources are viewed through the lens of national security, governments periodically will respond with military force when possession of or access to critical sources of supply is deemed to be at risk. Only by posing an alternative perspective—one that posits the advantages of cooperative, non-violent outcomes to such disputes—will it be possible to avert recurring conflict over scarce and valuable resources. Devising such outcomes and promoting their benefits, therefore, is an essential precondition for lasting peace and stability in the 21st century.

AVERTING CONFLICT OVER SCARCE RESOURCES

Assuming that the necessary political will can be generated, friction arising from resource scarcity can be channeled into constructive, non-violent outcomes through four general forms of action: mediation, adjudication, and consultation; joint development

³⁸ See UNEP, *From Conflict to Peacebuilding*, Case Study 8, p. 18. See also Ref: Dyer: Climate Wars.

³⁹ For background on this problem, see UNEP, *From Conflict to Peacebuilding*, pp. 10–14. See also William Reno, *Warlord Politics and African States* (Boulder: Lynne Rienner, 1998).

⁴⁰ For discussion of this phenomenon, see David Keen, *The Economic Functions of Violence in Civil Wars*, Adelphi Papers no. 320, International Institute of Strategic Studies (IISS) (Oxford: Oxford University Press and IISS, 1998).

⁴¹ For discussion of this phenomenon, see Terry Lynn Karl, *The Paradox of Plenty* (Berkeley: University of California Press, 1997).

of contested resources; technological innovation; and conservation and efficiency.

Mediation, Adjudication, and Consultation

Given the risky and costly nature of modern warfare, states and other parties often conclude that it is preferable to resolve resource disputes through mediation, adjudication, and cooperation. Boundary disputes are particularly well-suited to international mediation and adjudication, as it is often possible to identify the historical and geographic factors that lend weight to one outcome or another. In recent years, the International Court of Justice (ICJ) in The Hague has adjudicated boundary disputes between Bahrain and Qatar over Hawar Island and between Cameroon and Nigeria over the Bakassi Peninsula—both of which are thought to harbor valuable resource deposits—with minimum rancor on the part of the disputants. Mediation by trusted international actors can also help in the resolution of resources disputes. The World Bank, for example, played a key role in negotiating the Indus Waters Treaty of 1960, governing the allocation of shared river and canal systems in the Indus River basin between India and Pakistan—a treaty that has largely been honored by both sides despite their squabbling over Kashmir and other issues.⁴²

The creation of consultative bodies to oversee the exploitation of shared resources is another approach that can help to forestall the outbreak of conflict. This can be particularly effective in the case of shared river systems, where the acts of upstream countries—such as the construction of dams or irrigation works—can jeopardize the watersupplies of downstream countries. To minimize these effects, countries in a common river basin can participate in a consultative body aimed at promoting dialogue on proposed projects and, in an ideal situation, giving all members of the system some say over their nature and scope. Two endeavors of this sort are the Nile Basin Initiative and the Mekong River Commission; while neither enterprise gives member countries full veto power over the actions of their neighbors, they do allow for dialogue on proposed projects and conduct “confidence-building” activities aimed at gathering information and building trust,

thereby setting the stage for more inclusive decision-making in the future.⁴³

Joint Development of Shared Resources

In cases where the rival claimants to a resource that spans their territories cannot reach agreement on its division or ownership, it is possible to conceive of schemes for joint development of the resource pending a final outcome—thus providing an incentive to settle the matter peacefully. In such cases, the parties involved can establish a joint development authority based on some mutually-acceptable formula to manage the exploitation of the resource and distribute any profits. In addition to producing good will, this creates the breathing room in which diplomats from the various sides can negotiate a final outcome to the dispute.

One such initiative is the Malaysia-Thailand Joint Development Area (JDA) established by the two countries in 1979 to manage the exploitation of oil and natural gas reserves in a contested area of the Gulf of Thailand claimed by both of them. The 1979 agreement allowed for mutual development of the JDA without prejudice regarding each side's claims to the disputed territory, and established the Malaysia-Thailand Joint Authority to oversee extraction of hydrocarbons from the JDA.⁴⁴ This approach was also used as a model by Nigeria and the island nation of São Tomé and Príncipe in addressing their offshore boundary dispute in the Gulf of Guinea. Joint efforts of this sort could help reduce the risk of friction in other contested offshore areas where two or more countries are fighting for control over under-sea resources, such as the East and South China Seas.

Technological Innovation

Technology can go a long way toward reducing the threat of conflict over scarce resources by providing

⁴¹ Information on the activities of the Nile Basin Initiative can be viewed at www.nilebasin.org. Activities of the Mekong River Commission can be viewed at www.mrcmekong.org.

⁴⁴ See Nguyen Hong Thao, “Joint Development in the Gulf of Thailand,” *IBRU Boundary and Security Bulletin*, International Boundaries Research Unit, University of Durham, Autumn 1999, pp. 79–88.

⁴² For background, see Klare, *Resource Wars*, pp. 182–89.

alternative materials and less resource-depleting industrial processes. So long as our economies depend so heavily on non-renewable resources such as oil, natural gas, uranium, and copper, the risk of conflict is bound to rise as the demand for these products grows and supplies contract. By switching to reliance on renewable materials, or substances that are relatively plentiful like silicon, economies can reduce their vulnerability to resource-related friction and conflict.

The greatest imperative here is to reduce the world's reliance on petroleum. At present, oil provides the single largest share of global energy and is expected to do so for the foreseeable future. But because oil is an especially vital resource and is not likely to be available in sufficient quantities to satisfy rising world demand in the years ahead, it is among the resources most likely to provoke conflict. It follows from this that finding substitutes for oil (or for oil-powered contrivances) could help reduce the risk of war. This could mean, for example, developing alternative fuels that are renewable or highly abundant, such as biofuels made from algae, or embracing new modes of personal transportation using electric batteries or hydrogen-powered fuel cells.⁴⁵

Water is another resource that is not likely to be available in sufficient quantities to meet anticipated demand in many parts of the world in the years ahead, with an attendant risk of friction and conflict. Here, too, technology can play a helpful role. Improvements in desalination technology, for example, could make it possible to convert sea water into fresh water at an affordable cost—existing methods of desalination consume large amounts of energy and so are very costly, putting them out of reach for many poor countries. Improved methods of crop irrigation, such as drip irrigation, would minimize waste and reduce water demand in areas where irrigation is essential for food production.

Aside from the contributions of the technology itself, the prospects for peace would be further enhanced if nations cooperate in the development of new materials and devices that would benefit all simultaneously. The cooperative development of alternative

energy supplies, for example, could help temper the intense competition among the major oil-importing countries for control over contested oil fields. This was, in fact, one of the hoped-for outcomes of the energy cooperation agreements signed by Presidents Barack Obama of the United States and Hu Jintao of China in Beijing on November 17, 2009. These included a U.S.-China Renewable Energy Partnership and a U.S.-China Electric Vehicles Initiative—agreements that were incorporated into a U.S.-China Joint Statement in which the two sides pledged to work together to “promote world peace, security, and prosperity.”⁴⁶

Conservation and Efficiency

Adjudication, joint development, and technology can help address some resource problems, but ultimately the best way to avert significant shortages of scarce or limited supplies is to consume less of what we now possess of these materials. Indeed, efficiency and conservation is often the most practical and least costly method of expanding the long-term supply of a resource, thereby reducing the risk of dangerous competition. The more efficient our cars, appliances, manufacturing systems, and so on, the less energy and other raw materials we will need to consume, and so the less pressure will be imposed on the world's contracting and contested resource stocks.

The pressure on global energy stocks, for example, would be greatly reduced if trucks and automobiles required far less fuel to travel the same distance as they do today. Some progress in this direction was achieved in 2009, when the Obama administration and Congress agreed to increase the required average fuel efficiency of American automobiles and light trucks, from 27.5 miles per gallon then to 35.5 mpg in 2016⁴⁷—a move that will result in substantially reduced U.S. petroleum consumption. Many scientists agree, however, that is possible to improve automotive fuel efficiency by a far greater amount, with the right combination of mandates and incentives. By

⁴⁵ For an assessment of the alternatives to oil, see Scott L. Montgomery, *The Powers that Be* (Chicago: University of Chicago Press, 2010).

⁴⁶ The White House, Office of the Press Secretary, “U.S.-China Joint Statement,” Beijing, November 17, 2009, retrieved at <http://www.whitehouse.gov/the-press-office/us-china-joint-statement> on August 25, 2012.

⁴⁷ See Juliet Eilperin, “Emissions Limits, Greater Fuel Efficiency for Cars, Light Trucks Made Official,” *Washington Post*, April 2, 2010.

increasing the efficiency of electrical devices, moreover, it is possible to reduce electricity demand, thereby reducing the need for coal, natural gas, uranium, and other primary fuels. Likewise, improved kitchen and bathroom fixtures, and limits on water use, can significantly diminish the consumption of water.

These, and other such techniques can be employed to slow the consumption of vital resources and to channel conflict into productive, non-violent outcomes. Many scientists, economists, environmentalists, and government leaders perceive the urgent need for such efforts, and have advocated them in every possible setting. As a result, progress is being made in some critical areas.⁴⁸ But strong resistance to such efforts has been mounted by some companies

that benefit from existing modes of consumption and from politicians who view vital resources from a traditional national security perspective, with its zero-sum, all-for-us-and-nothing-for-them outlook. For example, the major U.S. oil companies have fought against any effort to limit their ability to drill in offshore areas or the Arctic. By the same token, many consumers, especially in the wealthier countries, are reluctant to reduce their consumption of water, petroleum, rare timber (like teak and mahogany), and other scarce or limited materials.

It is evident, therefore, that efforts to reduce the depletion of vital resources and to avert conflict over critical sources of supply will require a substantial change in attitude toward the utilization of these precious materials. Only by recognizing a shared human obligation to serve as stewards of the earth's precious bounty and to work in concert to preserve vital materials for future generations will we be able to take the necessary steps to avert resource shortages and the very real risk of rising bloodshed over diminishing sources of supply.

⁴⁸ For discussion, see UNEP, *From Conflict to Peacebuilding*, pp. 19–27, 34–37.

Peter W. Singer

BATTLEFIELDS OF THE FUTURE

In addition to well-founded concerns about the causes of wars, we must keep track of the physical locations in which organized armed conflicts occur and where they are liable to take place in the future. Increasingly, these areas involve not only traditional regions on the global map but also the deep oceans, outer space, and cyberspace. Moreover, modern weaponry has also been changing rapidly, with implications not only for who is likely to “win” and “lose,” but also for the economic, social, and political structure of the participants, including the fundamental question of who decides when a country goes to war. In the next two linked selections, Peter W. Singer, director of the 21st Century Defense Initiative at the Brookings Institute, explores some of the issues raised by these new considerations, specifically as these factors apply to the United States.



“Battlefields of the Future”, Peter W. Singer, *Sueddeutsche Zeitung* February 4, 2011.

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