Global Resources

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VIEWPOINT 5

"Tensions exist over water use, water ownership and water rights—and are likely to increase in the future."

Water Scarcity Is a Global Problem

Steve Lonergan

Steve Lonergan is a divisional director at the United Nations Environment Programme. He is also the co-author, with David Brooks, of Watershed: The Role of Freshwater in the Israeli-Palestinian Conflict. *In this viewpoint, Lonergan asserts that water is a scarce resource in some parts of the world and that access to freshwater reserves is an international concern that has heightened regional tensions. He maintains that water rights and water disputes are issues that will continue to shape international policies, but that these matters are not likely to lead to open hostilities. Lonergan argues that cleaner water supplies and the efficient transport of water must be assured before their lack unnecessarily adds to regional problems.*

As you read, consider the following questions:

1. In what part of the world is water a "strategic" resource, as Lonergan explains?

Steve Lonergan, "Water and War," *Our Planet*, 2005. Reproduced by permission.

2. In what sector of the global economy does Lonergan believe the most improvement in the efficient use of water can be made?
3. In Lonergan's view, what two things will be needed to avert future problems over water rights and supply?

The purposes of the United Nations, as set forth in the UN Charter, are to maintain international peace and security; to develop friendly relations among nations; to cooperate in solving international economic, social, cultural and humanitarian problems and in promoting respect for human rights and fundamental freedoms; and to be a centre for harmonizing the actions of nations in attaining these ends. These purposes were reinforced in the United Nations Millennium Declaration of 2000 and further clarified. Three key areas now define United Nations activities: Peace and Security; Development; and Human Rights and Democracy.

As we enter the 21st century, new challenges to these areas are emerging. We are confronted with both old and new threats to international peace and security; poverty has been recognized by world leaders as the most daunting of all the problems facing the world in the new century; and fundamental values of freedom, equality, solidarity, tolerance, respect for nature and shared responsibility now form common values through which achievements in the former two categories can be realized. In each of these key areas environment and resources play a central role. Threats to common security now include so-called 'soft threats': environmental degradation, resource depletion, contagious diseases and corruption, to name just a few.

It is now recognized that environmental degradation and both scarcity and abundance of natural resources are potential sources of conflict—and cooperation—and need to be more systematically addressed in this context. Access to fresh water

Living Below the Water Requirement Threshold

Hydrologists typically assess scarcity by looking at the population–water equation. . . . the convention is to treat 1,700 cubic metres per person as the national threshold for meeting water requirements for agriculture, industry, energy and the environment. Availability below 1,000 cubic metres is held to represent a state of "water scarcity"—and below 500 cubic metres, "absolute scarcity".

Today, about 700 million people in 43 countries live below the water-stress threshold. With average annual availability of about 1,200 cubic metres per person the Middle East is the world's most water-stressed region: only Iraq, Iran, Lebanon and Turkey are above the threshold. Palestinians, especially in Gaza, experience some of the world's most acute water scarcity—about 320 cubic metres per person. Sub-Saharan Africa has the largest number of water-stressed countries of any region. Almost a quarter of Sub-Saharan Africa's population lives in a water-stressed country today—and that share is rising.

United Nations Development Programme,
Human Development Report 2006.
New York: Palgrave Macmillan, 2006, pp. 135–36.

and sanitation services are a precondition to achieving the other internationally accepted goals in the Millennium Declaration.

Nowhere is this issue more important than in the Middle East, where water is considered a 'strategic' resource and tensions between countries in the region over it are high. There it has become a major political issue, and the various peace agreements that have been proposed or signed in recent years all include water. This has led to claims from various sources—

attributed (but unsubstantiated) to such individuals as [former secretary-general of the UN] Boutros Boutros Ghali and former King Hussein of Jordan—that 'the next war in the Middle East will be over water'. This rhetoric has captured the public imagination and caused much consternation in the intelligence communities of various countries, who worry whether water—or other scarce resources—may be a future flashpoint for international conflict.

Scarce Resource

In many cases, these comments are little more than media hype; in others, statements have been made for political reasons. Yet, regardless of the source, or the reason, water is clearly a scarce resource in some regions. Tensions exist over water use, water ownership and water rights—and are likely to increase in the future. The Middle East and Africa provoke perhaps the greatest concern about water shortage: by 2025, 40 countries in the regions are expected to experience water stress or scarcity.

Water scarcity is a function of supply and demand. Demand is increasing at an alarming rate in some regions, through population growth and increasing per capita use. In many water-scarce countries, such as Jordan and Israel, there is no obvious and inexpensive way to increase water supply, and tensions among different water users are likely to result. In other countries, such as Egypt, improvements in water efficiency, moving away from water-intensive crops, or importing water from nearby countries may offer reasonable solutions.

The second crisis is deteriorating water quality. Agriculture is the biggest polluter: increased use of fertilizer and pesticides has contaminated both groundwater and surface water supplies. Domestic and industrial pollution is also increasing, and the problem affects both developed and developing countries.

Finally, the use of water has a geopolitical dimension. Water moves from upstream to downstream users, and withdraw-

als and type of use in one place may affect the quantity or quality of supplies downstream. There are also historical, cultural, economic and social aspects of water use. To some, water is a gift from God, and should not be priced, while others, such as the World Bank, have pushed for full marginal cost pricing of water.

The lack of a suitable legal framework for resolving international water resource disputes presents another problem. Sovereignty over international rivers generally invokes one of four doctrines: absolute territorial sovereignty, which implies that riparian states [countries abutting water sources] may use water resources in any way they please, even to the detriment of other nations; absolute territorial integrity, which suggests that riparian use of a river should not negatively affect downstream riparians; limited territorial sovereignty, which invokes a combination of the two within a framework of equitable use by all parties; and community of co-riparian states, which promotes integrated management of river basins.

Global Implications

Problems of water scarcity and water pollution affect human and ecosystem health, and hinder economic and agricultural development. Local and regional problems, in turn, may affect the rest of the world by threatening food supplies and global economic development. The United Nations Commission on Sustainable Development concludes that these problems could result in a series of local and regional water crises, with serious global implications.

Is there likely to be violent conflict over water in the future? Past experience suggests that this is unlikely. However, many claim that the probability of conflict is increasing. The basis for most projections for future conflicts is that with the growth of demand, the decline in freshwater availability (through groundwater mining and pollution), and the adverse health effects from poor water quality, scarcity will result in

violence and water wars. Yet fighting over water makes very little sense economically or politically.

There is little question that water scarcity will be a problem in some regions in the future. Global warming is likely to alter rainfall patterns and evapo-transpiration regimes in many regions, and long-term planning for water supply must take this into consideration. There is also little question that water will cost more, as it becomes increasingly scarce. This will necessitate improvements in water efficiency—and possibly the restructuring of economies away from water-intensive sectors.

The greatest improvements can be made in agriculture, since irrigation here accounts for almost 70 per cent of water use worldwide. As the price of water increases, different distribution systems are coming into operation: water moved by tanker, by long-distance pipeline and even by plastic bags. There may also be greater use of desalination technology, although to date it has been prohibitively expensive and operations are confined primarily to countries with surplus energy supplies. Importing water—as in Singapore—may become more normal.

Two other factors may play a role in water-related tension. First, food imports may be driven by water scarcity. Half the world population will soon depend on the world food market for their food security. How poor, water-scarce countries will finance these food imports may become a major issue. Second, increased competition is expected for water: between urban and rural populations; between the agriculture and domestic sectors; and between countries. This may be exacerbated by rapid urbanization. Nevertheless many of the problems with water supply in the future can be resolved thrugh cooperative agreements and some degree of economic investment. Such agreements and preventative diplomacy over shared water supplies will continue to dominate.

Disputes Over Water

Historically, there is little evidence that water scarcity has caused violent conflict though, in many cases, water has been used as a strategic goal or target, as part of military activities. There have, however, been many disputes over water within nations: it may be that the probability of violent conflict over water varies inversely with the size (and type) of the political bodies involved.

Yet water scarcity will be at the forefront of the international agenda for decades to come. In some cases, water may even be a contributing factor in international conflict. A member of the Israeli negotiating team to the Middle East Peace Process, Hydrology Professor Uri Shamir once noted: "If there is a political will for peace, water will not be a hindrance. If you want reasons to fight, water will give you ample opportunities."

VIEWPOINT 6

"Unlike oil, water is a reusable resource, which can be used and then reused many times."

Water Scarcity Is Not a Global Problem

Asit K. Biswas

In this viewpoint, Asit K. Biswas counters notions that water is becoming a scarce global resource. Biswas states that current predictions of future water requirements (for industry, agriculture, and personal use) are overestimated because they rely on present-day methods of management, which have unfortunately led to widespread waste. As time progresses, Biswas argues, more efficient water management, utilization, and recovery are being incorporated throughout the globe, and these practices will ensure that water remains a reusable resource. In addition, Biswas believes that the amount of water available for use is also underestimated, giving the false impression that water is already a scarce resource. Asit K. Biswas is the president of the Third World Centre for Water Management, a research think tank in Mexico. He is also the author of over 50 books, many of which concern water resources.

Asit K. Biswas, "An Assessment of Future Global Water Issues," *International Journal of Water Resources Development*, vol. 21, no. 2, June 2005, pp. 229–37.

As you read, consider the following questions:

1. As some scientists estimate, about how many times is each drop of water in the Colorado River used before it reaches the sea?
2. According to Biswas, what will eventually drive nations to explore and tap the currently-neglected groundwater resources of the planet?
3. In Biswas's view, what two factors might induce a global water crisis if they are not promptly addressed?

While predicting the future is an extremely hazardous business, one item can be predicted with complete certainty: the world in the year 2030 will be vastly different from what it is today. The changes that we shall witness during the next 25 years are likely to be far-ranging and far-reaching, and these changes will certainly be several orders of magnitude higher and more complex than what we have witnessed during the past 25 years. Among the main driving forces that are likely to contribute to these changes are rapidly evolving demographic conditions, concurrent urbanization and ruralization in developing countries, rapid technological advances, the speed, extent and impacts of globalization, improvements in human capital, governance and functioning of institutions, implementation of more effective national and intergovernmental policies, and advances in human expectations and knowledge due to accelerating information and the communications revolution.

The water sector is an integral component of the global system, and it will most certainly undergo major changes during the next 25 years. In fact, *water management practices and processes are likely to experience more change during the next 25 years than has occurred during the past 2000 years.* Many of these new developments will be driven by changes stemming

from non-water sectors, on which the water profession will have no, or at best limited, control or say.

Customarily, water professionals have mostly ignored the global forces that are external to the water sector, even though these are likely to shape water use, availability and management practices of the future in some very significant ways. For example, water professionals are continuing to ignore the implications of globalization, even though within the next 5–15 years the various forces unleashed by globalization are likely to make radical changes in water use and requirement patterns in numerous countries, ranging from the United States to Japan, and China to Mexico. These types of global forces are already shaping the future use and availability patterns for water, and yet such issues have been consistently ignored by the water and development professions, and international and national institutions in the recent past. In addition, the water profession continues to ignore major developments in the areas of biotechnology, desalination, information and communication, etc., even though developments in these areas may influence the water futures of the world.

Fears of Scarcity

It is now widely predicted and believed that the world will face a major water crisis in the coming decades because of increasing water scarcities in numerous countries. Many international organizations, ranging from intergovernmental institutions such as the World Bank and the various United Nations agencies, to non-governmental organizations such as the World Water Council, have published world maps in recent years, all somewhat similar, which show more and more countries of the world will become water-stressed by 2050 because of increasing scarcities.

Such a 'bandwagon' effect in global thinking is of course not an exclusive issue for the water sector alone: it is prevalent in other areas. Regrettably, political correctness and bandwag-

ons receive more attention than solid scientific studies and logical analyses. Accordingly, an important question arises as to how reliable are these predictions of an impending water crisis, even though numerous major institutions have produced very similar forecasts, often without any reference to the initial source.

An objective review of the facts on which the original forecast was based will indicate that its reliability is highly likely to be poor for a variety of reasons, only a few of which will be discussed here.

First, the data and the information on which such forecasts and maps are based are highly unreliable. Extensive analyses by the Third World Centre for Water Management indicate that the national estimates on which the current global figures are based are often erroneous (in some cases very significantly, and in others, they are totally wrong). For many major countries, such as India and China, estimates of water availability and use are currently available, but no one has a clear idea about the accuracy, relevance and usefulness of such national statistics, and the purposes for which they can be successfully used. Thus, it is impossible to get any reasonably reliable picture of the global and/or regional water situations, which are based on the aggregation of such incomplete and unreliable national data sets.

Secondly, water abstraction [removal of water from a water source] is at present widely used as a proxy for water use for such forecasts. Methodologically, this, of course, is fundamentally incorrect. Unlike oil, water is a reusable resource, which can be used and then reused many times. For example, some scientists have estimated that each drop of the Colorado River water is currently used six to seven times before it reaches the sea. Also, globally, water is being increasingly reused, both formally and informally, and all the indications are that the extent of reuse in all countries will accelerate further in the coming decades. Accordingly, the current practice of

using water abstraction as a proxy for water available is already significantly erroneous, and so are the forecasts of the future based on such analyses. In about a decade, when water reuse becomes even more extensive, the practice of using water abstraction data in such a fashion will be completely meaningless because of very serious underestimation of the quantity of water that will actually be used. Thus, projecting water availability on this basis to 2050, and then predicting a global crisis, is not a meaningful exercise or good science.

Currently, no reasonable estimates exist on the extent of reuse of water, even at the national levels, let alone for the world as a whole. Some data on water reuse do exist for a very few developed countries such as Japan. In addition, the water profession, regrettably, has not considered reuse as an important factor in global water availability and use considerations, as a result of which the existing forecasts of the magnitudes of future water scarcities are highly suspect, and often somewhat meaningless.

The Impact of Economy and Technology on Recovering Water Resources

Thirdly, water pricing is likely to play an increasingly important role as the 21st century progresses. The net result of this development is likely to be significant advances in demand management, which currently plays a minor role in most countries of the world, especially for agricultural water use. This would mean that within a short period of about a decade or so, present projections of future water requirements would have to be revised downwards, most likely quite significantly because of increasing emphasis on demand management and cost recovery. Implementation of the European Framework Directive on water within the next decade is likely to further accelerate the global trend to use water pricing as an important instrument for water management.

Fourthly, as water pricing becomes more widespread, and as technology advances further, it is highly likely that the estimates of groundwater availability may have to be revised significantly upwards. At present, since water for agriculture, which is the major user of water, in most countries is virtually free and municipal water use is often highly subsidized, no economic incentive exists to explore groundwater on a comprehensive basis. Accordingly, the current global and national estimates of usable groundwater are likely to prove to be very serious underestimates. Under these conditions, the global estimates of economically usable groundwater are likely to increase significantly in the future. Due to technological advances, currently unusable sources of groundwater are likely to be used in the coming years.

Better Water Management

Furthermore, all the current estimates of the future global water requirements are likely to prove far too high, especially as demand management comes to widespread use, and reuse of water receives priority attention. These estimates will have to be revised significantly downwards during the next decade. This, of course, has also been the historical pattern. For example, all forecasts of future global water use made during the past 50 years have proved to be very serious overestimates. This trend of overestimating future water requirements is still continuing.

Simultaneously, the amount of water that is available for use at present is seriously underestimated because reuse and recycling are ignored; estimates of groundwater availability will have to be revised upwards; and technological advances are making costs of desalination and other non-conventional sources of water more and more attractive. For example, within the past five years, the cost of desalination of sea water has come down to about US$0.45 per cubic metre due to technological advances and improved management practices.

Coca-Cola Proclaims a Commitment to Better Water Management

Along with the communities where [Coca-Cola facilities] operate, we have a shared interest in finding effective solutions to water management. And that is at the heart of our approach to partnerships. Let me briefly share some examples.

In India, we've installed rainwater harvesting systems in twenty of our plants and in eight communities. The collected water is used for plant functions, as well as for recharging aquifers. Today, much of the total water that we use in our operations is renewed and returned to groundwater systems. And we believe we can do better. As responsible partners we will continue to increase the amount of water we return to local groundwater systems. We'll do this by supporting rainwater harvesting, drip irrigation and other local initiatives, such as helping restore traditional water storage systems that local communities use.

In Africa, many of our bottling partners are in the process of improving wastewater treatment at their facilities. Rather than just building a plant that serves the Coca-Coca bottler alone, we're collaborating with the Africa Development Bank, with USAID, and with local community stakeholders, to explore ways that—as partners—we can extend the scope of the bottler's efforts to benefit the community, to effectively leverage the human and physical capacity of our system for shared benefits.

Jeff Seabright, "Framing Solutions: Building Partnerships," speech, Center for Strategic & International Studies and Sandia National Laboratory, Washington, D.C., February 9, 2005. www.csis.org.

Hence, given the upward adjustments in water availability and downward revisions in requirements, and the expected im-

provements in the management practices and the institutions that manage this resource, one can now be cautiously optimistic about the global water future.

This, of course, does not mean that it would be an easy process for all countries to adjust to the new realities of a rapidly changing global water scene. Most certainly, many countries are likely to find it difficult to manage the expected transformation without discontinuities because of socio-political constraints, institutional inertia, increasing management complexities, vested interests and current and past inefficient water management practices. However, since 'business as usual' will not be a feasible option for the future in all countries, policy makers, water professionals and water institutions, whether they like it or not, will be forced to react to the new conditions, most probably within the next 10–15 years. All these and other associated developments are likely to make the present 'gloom and doom' forecasts of a global crisis due to water scarcities somewhat unlikely in the coming decades.

The threat of a global water crisis because of physical scarcities only, as expected at present, is overstated. If there is to be a crisis in the water sector, it will probably occur due to two reasons, neither of which is receiving adequate attention at present.

The Problem of Deterioration

The first cause that could contribute to a crisis is continuous water quality deterioration. Globally, water quality is receiving inadequate attention, even though it has already become a critical issue. While global data on water quantity are poor, they are virtually non-existent for water quality. Even for major developed countries such as the United States or Japan, a clear picture of the national water quality situation currently does not exist. For developing countries and for countries in transition, ranging from Indonesia to Nigeria, and Russia to

Mexico, existing legal and institutional frameworks and networks for water quality monitoring are highly deficient, adequate expertise on water quality management simply does not exist and water quality laboratories suffer very seriously from poor quality control and quality assurance practices. Furthermore, senior policy makers in most developing countries become interested in water quality aspects primarily when there are major local crises due to political considerations, and/or media interventions. Sadly, for all practical purposes, water quality is still receiving only lip service from most senior bureaucrats and politicians in developing countries, countries in transition and the international institutions.

Not surprisingly, because of the above deficiencies, water quality problems are becoming increasingly serious in all developing countries. Accordingly, nearly all surface water bodies within and near urban-industrial centres are now highly polluted. While data on the existing groundwater quality are extremely poor, it is equally likely that groundwater is also becoming increasingly contaminated near centres of population.

In spite of poor water quality management practices, national data available in developing countries and countries in transition mostly give an erroneous picture of the existing water quality conditions. As a general rule, in these countries, the official pictures of water quality situations are mostly rosier than the current conditions warrant. These estimates are accepted at face value by international institutions, and are repeated in their reports without any comments and qualifications. This practice has given these erroneous estimates legitimacy, which is unwarranted. This, in turn, has given the world a false sense of security, which is likely to prove highly counterproductive in the future.

Recent estimates made by the Third World Centre for Water Management indicate that in spite of the official rhetoric and figures published by several international organizations, less than 10% of wastewater generated in Latin America is

properly treated and disposed of in an environmentally acceptable fashion. The situation is likely to be very similar in Asia, and probably worse in Africa. Furthermore, most universities in the developing world do not provide appropriate education and training on water quality management. Accordingly, rapid capacity building in this area would be a Herculean task under the best of circumstances. In addition, currently no reasonable estimates exist as to what would be the investment needed in Latin America or Africa to improve wastewater treatment from paltry levels of less than 10% to a reasonably tolerable level of 50–70%. All that can be stated at present with complete confidence is that the total investment costs necessary for proper wastewater treatment, disposal and management are likely to be astronomical, and most developing countries would find it extremely difficult to meet these very high resource requirements in a timely manner.

Lack of Investment in Water Rehabilitation Projects

The second possible crisis is likely to come from lack of investments for both water quantity and quality considerations. Investment requirements for wastewater treatment have already been mentioned. These are for point sources only; investment needs for controlling non-point sources of pollution such as agricultural run-off are simply unknown at present, even for the Organization for Economic Co-operation and Development countries, let alone for developing countries. In addition, most existing water development projects in developing countries need massive investments for rehabilitation and modernization, and then for their efficient and sustainable operation. Equally, new projects are becoming increasingly expensive to develop because more efficient project sites have already been developed, or are in the process of development, and because of the social and environmental countermeasures necessary to reduce, or even eliminate, the anticipated adverse impacts. Analyses of current cost estimates for the next generation of water supply projects in developing countries indicate that these are likely to be 1.75–3 times the cost of the present generation of projects, in real terms and per cubic metre of water delivered. These high costs are still not adequately reflected in the current budget estimates of nearly all water agencies of the developing world, which is further distorting the levels of investments that will be required.

Globally, the total investment costs for modernizing and efficiently managing existing water development projects and wastewater treatment plants and to construct new ones are likely to be astronomical. Currently, not even 'ballpark' estimates of such costs are available. Thus, an important question is from what source would such financial investments be available? Governments all over the world now have high national debts and the resource-generating capacities of most developing countries and countries in transition, where most of the water projects have to be rehabilitated and the new ones are to be constructed, are limited. Moreover, the World Bank and the regional development banks have steadily reduced their financial support to water development projects as a percentage of their total loan portfolios in recent years. Furthermore, because of strong pressures from social and environmental activists, international financial institutions have become increasingly reluctant to finance new water development projects, irrespective of their overall societal benefits. In fact, a historian in the 21st century might very well conclude in a retrospective analysis that the Sardar Sarovar Project (Narmada Dam) in India became the World Bank's 'Viet Nam' in terms of its support to water projects during the 1990s. The regional development banks, which for all practical purposes follow the World Bank's leadership in most areas, have taken, at least unofficially, a very similar stance. There seems to be some rethinking going on in these institutions in terms of changing

these politically expedient policies, but what is likely to be the actual policy during the next 10–20 years is anybody's guess. Thus, it is likely that unless the current situation improves very significantly, the lack of investments available may precipitate a water crisis as the 21st century progresses, from both water quantity and quality considerations.

Periodical Bibliography

The following articles have been selected to supplement the diverse views presented in this chapter.

Ronald Bailey	"Peak Oil Panic," *Reason*, May 2006.
Economist	"Empty Bowls, Heads, and Pockets," July 31, 2004.
Geographical	"Water Crisis Hitting World's Richest Nations," November 2006.
Chris Jozefowicz	"Water Boys," *Current Science*, January 19, 2007.
Shaena Montanari	"Global Climate Change Linked to Increasing World Hunger," *World Watch*, September/October 2005.
Mark Morrison, Stanley Reed, and Chris Palmeri	"Plenty of Oil—Just Drill Deeper," *Business Week*, September 18, 2006.
New Scientist	"Africa's Water Crisis Deepens," March 11, 2006.
Professional Engineering	"Oil Reserves Will Last for 41 Years, Says BP," June 23, 2004.
Jeffrey D. Sachs	"The Challenge of Sustainable Water," *Scientific American*, December 2006.
Stephen L. Sass	"Scarcity, Mother of Invention," *New York Times*, August 10, 2006.
Anita Inder Singh	"Governing Water Wisely," *UN Chronicle*, December/February 2006–2007.
David Strahan	"Who's Afraid of Peak Oil?" *Ecologist*, April 2007.
Alexandra Witze	"Energy: That's Oil, Folks . . ." *Nature*, January 4, 2007.

Explain how Poliquin would view the methods advocated by the World Bank. Then, decide if you think sustainable development is a worthwhile goal for the international community or whether it is a practice that could do more harm than good. Explain your answer.

2. After reading all the viewpoints in this chapter, formulate a possible course that the world could take to preserve and distribute resources (such as food, water, and oil). In framing your answer, address the concerns of Deborah James, Maude Barlow, and Tony Clarke that multinational corporations are currently dictating how resources are used. Do you see a way to overcome their concerns, or is the current practice of globalization an equitable way to distribute resources? Perhaps, like Rajesh Makwana, you believe that the sum of the world's resources should be equitably shared. How could this be accomplished? Whatever plan you put forth for preserving and distributing global resources, explain its operation and advantages thoroughly.

Organizations to Contact

The editors have compiled the following list of organizations concerned with the issues debated in this book. The descriptions are derived from materials provided by the organizations. All have publications or information available for interested readers. The list was compiled on the date of publication of the present volume; the information provided here may change. Be aware that many organizations may take several weeks or longer to respond to inquiries, so allow as much time as possible.

Center for Global Food Issues
P.O. Box 202, Churchville, VA 24421-0202
(540) 337-6354 • fax: (540) 337-8593
e-mail: cgfi@rica.net
Web site: wwwcgfi.org

The Center for Global Food Issues (CGFI) employs a global perspective in researching and analyzing the agricultural and environmental issues associated with farming. The center promotes free trade and innovative farming technologies in addition to raising awareness about the effect of different farming methods on the environment. CGFI works to ensure sustainability of the global agriculture industry while keeping environmental conservation a central focus. Back issues of the center's publication, *Global Food Quarterly*, are available on its Web site, as are current reports on topics such as organic farming.

Competitive Enterprise Institute
1001 Connecticut Ave. NW, Suite 1250
Washington, DC 20036
(202) 331-1010 • fax: (202) 331-0640
e-mail: info@cei.org
Web site: www.cei.org

The Competitive Enterprise Institute (CEI) is a public policy

and limited government involvement in addressing national regulatory issues such as environmental policy. The institute promotes the idea that the private sector can provide appropriate and applicable policies to protect the environment. Subscriptions to e-newsletters such as the weekly *EnviroWire* and the *Monthly Planet* are available on CEI's Web site. Past articles, op-eds, and other reports can be found there as well.

Environmental Defense
257 Park Ave. South, New York, NY 10010
(212) 505-2100 • fax: (212) 505-2375
Web site: www.environmentaldefense.org

Founded in 1967, Environmental Defense is a nonpartisan, nonprofit organization that works in cooperation with major corporations to provide solutions to environmental problems. Environmental Defense's campaigns include efforts to fight global warming, protect the oceans, and ensure that U.S. farm policy is beneficial to farmers, consumers, and the environment in the United States and worldwide. Publications such as the *2006 Annual Report* and fact sheets on topics such as farming projects and global warming are available on the Web site.

Greenpeace USA
702 H Street, NW, Washington, DC 20001
(202) 462-1177
e-mail: info@wdc.greenpeace.org
Web site: www.greenpeace.org

Greenpeace is a global organization that employs controversial techniques to raise awareness about environmental issues such as the destruction of ancient forests and the devastation of the world's oceans. Greenpeace opposes the use of nuclear power and the genetic engineering of food crops. Press releases and reports organized by campaign can be found on the organization's Web site.

Hudson Institute
1015 15th St. NW, 6th Floor, Washington, DC 20005
(202) 974-2400 • fax: (202) 974-2410
e-mail: info@hundson.org
Web site: www.hudson.org

The Hudson Institute is a research organization focusing on issues relating to global security, prosperity, and freedom. The institute works to influence and aid global policy makers and business leaders in areas such as human rights and agricultural and biotechnology policy. Publications of the Hudson Institute include the book *Saving the Planet with Pesticides and Plastic* as well as numerous articles, reports, and white papers available on the organization's Web site.

International Food Policy Research Institute
2033 K St. NW, Washington, DC 20006-1002
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e-mail: ifpri@cgiar.org
Web site: www.ifpri.org

The International Food Policy Research Institute (IFPRI) works in cooperation with fifteen organizations worldwide, all supported by the Consultative Group on International Agricultural Research, to research and establish policies that ensure a sustainable food supply and alleviate hunger for the global population. The institute supports the use of genetically modified crops to alleviate hunger and malnutrition, but also supports risk-assessment programs and regulations that ensure the crops are safe for people and the environment. IFPRI publishes books, newsletters, and reports assessing current policies and technologies relating to food availability worldwide.

National Center for Appropriate Technology
3040 Continental Dr., Butte, MT 59701
(406) 494-4572 • fax: (406) 494-2905
e-mail: information@ncat.org
Web site: www.ncat.org

Founded in 1976, the National Center for Appropriate Technology (NCAT) addresses the needs of the poor by providing affordable, innovative technologies to create sustainable agriculture, communities, and energy in the United States. NCAT uses outreach and educational publications to help the public become more aware of possible solutions to today's energy problems. *ACTION* is the quarterly newsletter of NCAT, and the Center manages the National Sustainable Agriculture Information Service, which provides information about water and pest management as well as organic farming.

National Resource Defense Council
40 West 20th St., New York, NY 10011
(212) 727-2700 • fax: (212) 727-1773
e-mail: nrdcinfo@nrdc.org
Web site: www.nrdc.org

The National Resource Defense Council (NRDC) is an environmental action organization dedicated to preserving the environment and its resources for the current generation and those to come. NRDC campaigns include promotion of alternatives to oil such as sustainable biofuels, slowing the effects of global warming, and aiding China in reducing its output of pollutants. Reports, papers, fact sheets, and current legislation concerning these issues and others are available on the organization's Web site.

Organic Farming Research Foundation
PO Box 440, Santa Cruz, CA 95061
(831) 426-6606 • fax: (831) 426-6670
e-mail: info@ofrf.org
Web site: www.ofrf.org

The Organic Farming Research Foundation (OFRF) has been working since 1992 to promote the use of organic farming practices nationwide. By awarding grants for research to improve organic farming and providing accessible research results to the public and policy makers, OFRF has increased awareness of the benefits of these farming methods. Surveys

conducted by the foundation, such as the *National Organic Farmers' Surveys* and reports such as *State of the States: Organic Farming Systems Research at Land Grant Institutions 2001–2003*, provide new information about organic farming. In addition, the OFRF newsletter, *Information Bulletin*, offers information about current projects.

Organization of Petroleum Exporting Countries
Obere Donaustrasse 93, Vienna A-1020
Austria
Web site: www.opec.org

Headquartered in Austria, the Organization of the Petroleum Exporting Countries (OPEC) is a membership organization representing twelve of the top oil producing countries in the world. Its mission is that of stabilizing prices of oil for producers and ensuring that consumer countries are guaranteed a stable supply of petroleum. Publications containing current information about the state of the oil industry can be found on OPEC's Web site, including the *Monthly Oil Market Report*, the *World Oil Outlook*, and the *OPEC Bulletin*.

People for the Ethical Treatment of Animals
501 Front St., Norfolk, VA 23510
(757) 662-PETA (7382) • fax: (757) 662-0457
Web site: www.peta.org

People for the Ethical Treatment of Animals (PETA), the largest animal rights organization in the world, works to ensure that the rights of animals are observed worldwide. The organization addresses the rights of all animals, and has addressed numerous issues associated with fish farming, including the environmental impact as well as the associated health issues. Details and reports regarding fish farming can be found at the PETA sponsored Web site www.fishinghurts.com/FishFarms.asp.

Political Economy Research Center
2048 Analysis Dr., Suite A, Bozeman, MT 59718

(406) 587-9591
e-mail: perc@perc.org
Web site: www.perc.org

The Political Economy Research Center (PERC) pioneered the principles of free market environmentalism and continues to advocate for this approach to conservation today. Through research, outreach, and education initiatives, PERC promotes the ideas that, with the use of market incentives and accountability regulations, the private sector will serve as a more successful protector of the environment than the government. *PERC Reports* is the organization's quarterly publication. Articles from this journal and other guides, op-eds, and educational materials are on PERC's Web site.

Reason Foundation
3415 S. Sepulveda Blvd., Suite 400, Los Angeles, CA 90034
(310) 391-2245 • fax: (310) 391-4395
Web site: www.reason.org

The Reason Foundation, a libertarian organization, advocates the use of principles such as individual liberty, free markets, and the rule of law in addressing matters of U.S. and global policy. Reason encourages limited government regulation on issues such as air quality, environmental protection, and energy production. The organization instead favors the will of private corporations to solve the environmental, resource related problems facing the world today. The foundation publishes the monthly magazine *Reason* and has many newsletters and commentaries available on its Web site.

Stockholm Environment Institute
11 Curtis Ave., Somerville, MA 02144
(617) 627-3786 • fax: (617) 449-9603
Web site: www.sei.se

The Stockholm Environment Institute (SEI) is an international research institute dedicated to developing and promoting sustainable development strategies worldwide. Established

by the Swedish government, the organization has offices worldwide to address issues specific to certain countries and to propose innovative solutions for the rest of the globe. Programs of the institute include focuses on climate and energy, future sustainability, and water resources and sanitation. SEI publishes books such as *Environmental Policy Integration in Practice* and reports such as *Biomass, Livelihoods and International Trade*. Links to specific information about water resource and energy planning projects are on the institute's Web site.

Sustainable Energy Coalition
6930 Carroll Ave., Suite 340, Takoma Park, MD 20912
Web site: www.sustainableenergycoalition.org

The Sustainable Energy Coalition (SEC) was founded in 1992 to provide a central advocacy network for individuals and organizations concerned about the use of unsafe energy resources that pollute the environment. SEC has since worked to promote the use of energy-efficient, renewable energy sources, and advocates for policies that support electric utility restructuring, pollution prevention, and control of climate change. "Factoids" detailing studies on renewable energy sources, such as biomass and wind power, are available on SEC's Web site.

World Bank
1818 H St. NW, Washington, DC 20433
(202) 473-1000 • fax: (202) 477-6391
e-mail: pic@worldbank.org
Web site: www.worldbank.org

The World Bank is comprised of two institutions, the International Bank for Reconstruction and Development (IBRD) and the International Development Association (IDA). The IBRD provides financial assistance to middle-income countries or poor countries who qualify for credit, while the IDA works with the countries suffering the greatest amount of poverty. Using these two institutions, the World Bank strives to reduce poverty and improve living standards worldwide. Research

how to achieve these goals focuses on topics such as sustainable rural and urban development, and reports such as *Toxic Agriculture Pollution: An Emerging Story* highlight the importance of resource availability in driving development. The World Bank Web site makes this and other reports available online.

Worldwatch Institute
1776 Massachusetts Ave. NW, Washington, DC 20036-1904
(202) 452-1999 • fax: (202) 296-7365
e-mail: worldwatch@worldwatch.org
Web site: www.worldwatch.org

The Worldwatch Institute is a research organization dedicated to providing accessible information on environmental, social, and economic issues to the public. With publications such as the annual *State of the World* and *Vital Signs*, the bi-monthly magazine *Worm Watch*, and other print resources, the organization funds one-third of its initiatives and educates individuals worldwide. The main goal of the institute is to achieve "an environmentally stable and socially just society."

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