

THE GLOBAL NEED FOR ACCESS TO SAFE DRINKING WATER

HEARING BEFORE THE COMMITTEE ON COMMERCE HOUSE OF REPRESENTATIVES ONE HUNDRED SIXTH CONGRESS SECOND SESSION

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(II)

CONTENTS

	Page
Testimony of:	
Huq, Anwarul, Research Associate Professor, Center of Marine Biotechnology, University of Maryland Biotechnology Institute	16
Jones, Gerald, Vice President, International Services, American Red Cross	11
Lockery, Peter, Senior Advisor, Water Sanitation and Environmental Health Care	21
Quintero, Adrianna I., Project Attorney for Public Health, Natural Resources Defense Council	29
Sampat, Payal, Research Associate, World Watch Institute	34
Weiner, Hal, Executive Producer, PBS Series Journey to Planet Earth, Screenscope, Inc	4

(III)

THE GLOBAL NEED FOR ACCESS TO SAFE DRINKING WATER

THURSDAY, OCTOBER 12, 2000

HOUSE OF REPRESENTATIVES,
COMMITTEE ON COMMERCE,
Washington, DC.

The committee met, pursuant to notice, at 10:15 a.m., in room 2123, Rayburn House Office Building, Hon. Tom Bliley (chairman) presiding.

Members present: Representatives Bliley, Tauzin, Gillmor, Shimkus, Bryant, Brown, Barrett and Luther.

Staff present: Nandan Kenkeremath, majority counsel; Bob Meyers, majority counsel; Kristi Gillis, legislative clerk; and Dick Frandsen, minority counsel.

Chairman BLILEY. The committee will come to order.

This morning this hearing focuses on the global need for access to safe drinking water. The Chair would recognize himself for a brief opening statement.

The Food Quality Protection Act and the Safe Drinking Water Act amendments of 1996 are among the most substantial laws from the Commerce Committee. These laws modernized programs and gave Americans better access to safe, abundant and affordable food and water. The committee continues a vigilant oversight role in these areas.

The good fortune in this country is not shared by the world, however. UNICEF estimates that over 1 billion people in the developing world do not have access to safe and plentiful drinking water, and almost 3 billion have no adequate sanitation systems.

Polluted water supplies cause the spread of infectious disease. Nearly half of the world's population suffers from water-related disease. Most of those affected are poor and live in developing countries. U.N. Secretary General Kofi Annan has stated that if present consumption patterns continue, within 25 years, 2 out of every 3 people on Earth will live in dangerous conditions with respect to drinking water.

Only a patchwork of international nongovernmental organizations are involved in improving drinking water. Despite the involvement of these organizations, the public health concern from the global lack of access to safe drinking water and sanitation remains very serious. The first thing we need to do is understand the nature and importance of this issue. That is the purpose of this hearing.

The witnesses are experts who can provide an overview, but there is obviously much more to this problem. Increasingly, public

health problems do not have boundaries. Moreover, competition for water can increase as a threat to international stability and peace. Finally, a global strategy for water security takes many years to implement. Tools exist today for local and regional water management and protection. However, current policies are not workable. Addressing this problem will require political understanding and resolve.

This country can create the right atmosphere for solutions. We can contribute expertise in technology and watershed management. We can focus on the public health concerns that do not stop at the border.

My time as chairman of the Commerce Committee is drawing to a close. This hearing, in fact, will probably be the last hearing that I will formally chair. Leaving this committee and all it has done over the last 6 years will be difficult, but I also know that the potential for the committee work is great. Members will explore new public policy challenges and rise to the task of finding solutions. It is with that spirit I wanted to hold today's hearing and challenge the members who will carry on the committee's efforts to reach great goals.

The Chair yields back the balance of his time and recognizes the ranking member of the Health and Environment Subcommittee, the gentleman from Ohio, Mr. Brown.

Ms. BROWN. Thank you, Mr. Chairman. It is a pleasure to sit with you at, as you say, perhaps your last hearing. Thank you for the service and the cooperation over the many years you have been here.

Today's hearing on the global need for access to safe drinking water addresses a huge and growing problem. As a member of the International Relations Committee, I am well aware of the role that access to clean, safe drinking water plays in public health and economic development and even in conflict within and among nations.

It is estimated that 1 billion people still lack safe drinking water, and almost 3 billion do not have adequate sanitation. More than 2 million children die each year from sanitation-related diseases. According to the U.N. Environmental Program, if present consumption patterns continue, two out of every three people on Earth will live in water-stressed conditions by the year 2025.

While some say technology can solve all of the world's problems, we need to be aware of the enormity of this problem. Harper's magazine a couple of months ago pointed out that for every user of the Internet in the country of India, 135 Indians do not have access to safe drinking water. We should be concerned about the welfare of people in developing countries where safe drinking water is also in short supply for their own sakes, but we should also be concerned for more parochial reasons. The world's borders simply can't hold back the spread of water-related disease, the spread of water-related conflicts, or the flight of refugees from poor conditions.

Furthermore, as the world's need for water grows, a demand for water exports from the Great Lakes and other fresh-water bodies in the world and the U.S. will also grow. The International Joint Commission has stated that even small diversions from the Great Lakes could harm the lakes' ecosystem. My district lies along Lake

Erie, and my constituents strongly oppose international sales of water from the Great Lakes. Instead, we should work with other nations to improve water infrastructure and encourage conservation.

Mr. Chairman, as ranking member on the Health and Environment Subcommittee, which is the authorizing committee for the Safe Drinking Water Act, I cannot talk about drinking water today without expressing my concern about the new rider in the VA-HUD, Independent Agencies appropriations bill on arsenic standards and drinking water. Millions of Americans have arsenic in their drinking water at levels that scientists say puts their health at risk. Arsenic is known to cause skin, bladder and lung cancer. Doctors have also identified incidences of heart disease, stroke and diabetes from arsenic in drinking water supplies. A senior EPA official in charge of the drinking water program has called arsenic in drinking water a significant threat to our public health.

The current standard of 50 parts per billion has not been changed in more than 50 years. That is why Congress set a deadline of January 1, 2000, in the 1996 Safe Drinking Water Act amendments for an updated, more protective standard. The purpose of that deadline was to force the EPA to take action to revise this standard.

The prestigious National Research Council, an arm of the National Academy of Sciences, last year reaffirmed that the current standard does not protect the public health and urged a new standard be promulgated as expeditiously as possible. Virtually everyone from World Health Organization to the water supply companies in the U.S. agree that we need a more stringent standard for arsenic in our drinking water. The only debate is whether the standard should be 100 percent more stringent, 500 percent more stringent or, as the EPA has recommended, 1,000 percent more stringent.

The Republicans in Congress have added an environmental rider in the VA-HUD bill that will result in yet another delay before the new, stronger protective standard comes out. It has been reported that the rider was added at the behest of the mining industry. This change to the Safe Drinking Water Act took place in secret negotiations on the VA-HUD bill. No formal conference was held with meetings open to the public. Neither the bill reported by the Senate Appropriations Committee nor the bill that passed the House contains such a provision, but somehow it ended up in the bill, and now we find it in the conference report.

Make no mistake about it. The purpose of this rider is to delay yet again the new protective arsenic standard for our citizens' safe drinking water. This is the wrong way for this body to do its business and will cause further harm to those millions of Americans whose drinking water contains unhealthy levels of arsenic.

Mr. Chairman, I thank you for holding this hearing about problems of global access to safe drinking water. I congratulate you on your service, and I yield back the balance of my time.

Chairman BLILEY. The time of the gentleman has expired.

The gentleman from Illinois Mr. Shimkus.

Mr. SHIMKUS. Thank you, Mr. Chairman. Let me say it is an honor to serve with you up to the 11th hour of this Congress, and we will go down working together. It has just been an honor. I

know you do also want to pause and reflect on the loss of our sailors' lives this morning as we keep everything in perspective and remember that we have great servants throughout the country trying to do the bidding for our country.

I remember as a young cadet down in Panama being warned, don't drink the water. They would give us canteens, and we were supposed to drop two iodine tablets in there, significantly just killing everything in the water. We had a few young, smart cadets who obviously didn't follow instructions, and they became very, very sick because of that. Now, that is also part of the change between societies, but it also highlights the importance of drinking water to me, and a thing we take pretty much for granted.

In rural America we are fighting very diligently, through the USDA and rural water program, to provide safe drinking water out to the areas where it not be cost-effective or efficient. I think this hearing will also address the issue of safe drinking water for Third World countries, which have a very similar problem: costly, probably an inefficient way to attempt to meet a need.

I like coming to hearings, and I like the ability to get a chance to learn things, and that is what we are here to do. I thank the chairman for calling this hearing, and, Mr. Chairman, I yield back the balance of my time.

Chairman BLILEY. The time of the gentleman has expired.

We will now hear testimony from our first witness. We would ask you if you could to summarize your written statement and try to limit it to 5 minutes, and your full statements will appear in the record of the committee.

Our first witness is Mr. Hal Weiner, executive producer of the PBS series, Journey to Planet Earth.

Welcome to the committee, Mr. Weiner.

STATEMENTS OF HAL WEINER, EXECUTIVE PRODUCER, PBS SERIES JOURNEY TO PLANET EARTH, SCREENSCOPE, INC.; GERALD JONES, VICE PRESIDENT, INTERNATIONAL SERVICES, AMERICAN RED CROSS; ANWARUL HUQ, RESEARCH ASSOCIATE PROFESSOR, CENTER OF MARINE BIOTECHNOLOGY, UNIVERSITY OF MARYLAND BIOTECHNOLOGY INSTITUTE; PETER LOCKERY, SENIOR ADVISOR, WATER SANITATION AND ENVIRONMENTAL HEALTH CARE; ADRIANNA I. QUINTERO, PROJECT ATTORNEY FOR PUBLIC HEALTH, NATURAL RESOURCES DEFENSE COUNCIL; AND PAYAL SAMPAT, RESEARCH ASSOCIATE, WORLD WATCH INSTITUTE

Mr. WEINER. Thank you, Mr. Chairman and members of the House Committee on Commerce. As one of the executive producers of the PBS series Journey to Planet Earth, I certainly welcome the opportunity to share some of the thoughts of myself and our crew and our distinguished panel of advisors about why we as a Nation should care about the quality and availability of the world's drinking water.

Let me just very briefly mention that we are guided by a blue ribbon panel of scientists. We are funded in part by the National Science Foundation, and our series is seen by approximately 20 million people throughout the world. It is a responsibility we at PBS do not take lightly.

As a filmmaker and journalist, I have worked in nearly 50 countries, and I have seen clear evidence that the growing shortage of safe drinking water has become a public health and economic emergency of global proportions. I think, equally important, it has become a national security issue. Places like Brittany, Shanghai and Mexico City we have seen intensive agriculture and uncontrolled industrial development seriously contaminate nonrenewable aquifers. We have filmed along the shores of the Amazon, the Mekong and Jordan Rivers and found that the deforestation and population pressures impair the economy of local communities by damaging and depleting watershed resources. We have also documented stories in Zimbabwe, Vietnam and the Middle East which suggest that conflicts over environmental scarcities such as water can lead to increased hostilities that could ultimately threaten our country's national security.

I guess I am sort of part of the show-and-tell part of this hearing, and I would like to do a little showing now. I have brought along a couple of video clips that each run maybe 2 or 3 minutes. Here they are.

[Videotape played.]

Mr. WEINER. The next section coming up is in Jericho.

[Videotape played.]

Mr. WEINER. The final segment is in Zimbabwe.

[Videotape played.]

Mr. WEINER. Mr. Chairman, committee members, I hope that what I have shared with you this morning helps bring an urgency to finding reasonable solutions to a major environmental, economic and, what I have learned recently in my travels around the world, a potentially political crisis. Thank you for your time and courtesies.

[The prepared statement of Hal Weiner follows:]

Mr. Chairman and the members of the House Committee on Commerce, my name is Hal Weiner and as one of the Executive Producers of the PBS environmental series *Journey To Planet Earth* I welcome the opportunity to share some thoughts and images about a very real crisis that exists in the world today.

For nearly thirty years, as an environmental filmmaker and journalist for public television, I have seen first-hand evidence that the growing shortage of safe drinking water is turning into a global health emergency. Equally important, I have seen dramatic indications that conflicts over water can lead to armed hostilities and political crises around the world.

Let me first point out that I am not here to provide you with any of the overwhelming amount of scientific evidence that supports such a statement -- that is better left to the scientists, economists and public health experts. But what I can do is simply show you video clips from what I've seen during my work in nearly fifty countries in both the developed and developing world.

Scientists will tell you that some 1.5 billion people depend on underground aquifers as their sole source of drinking water. In places like Brittany, Shanghai and Mexico City I'll show you dramatic scenes of intensive agriculture and uncontrolled industrial development seriously contaminating their non-renewable underground water resources.

Environmentalists can provide statistics supporting the fact that virtually every major waterway in the world is under attack. I have filmed stories along the Amazon, Mekong and Jordan Rivers that show how deforestation and population pressures are seriously imperiling the lives of the people by damaging vitally needed water resources.

Political scientists and economists will support the theory that severe environmental problems such as the lack of clean and reliable drinking water can lead to political crises and increased hostilities around the world. Our television series -- *Journey To Planet Earth* -- has featured stories in Zimbabwe, Vietnam and the Middle East clearly show how water issues have a profound affect on the national security of these countries as well as that of the United States.

What follows are a few relevant video clips from the series.

FILM CLIPS

Mexico City

Computer-generated models help visualize the city's fundamental problem. Mexico City is located in a valley a mile and half above sea level. Surrounded by a wall of mountains, some as high as 12,000 feet, it's locked into what scientists call a closed ecosystem. Unlike most other mega-cities there is little wind to cleanse the air and no ocean or major river to exchange water and sewage.

When the Aztecs founded the city, it was dotted with lakes and surrounded by a densely forested watershed. Today only a few groves of trees remain. The lakes are also gone -- drained by the Spanish to expand the city. In their place are 1400 square miles of asphalt and concrete -- and the remains of ancient aqueducts that once brought in water from nearby springs. But as the city's population grew, more water was needed.

The brief rainy season offers little help and the nearest river is on the other side of the mountains. Though Mexico City sits on top of a vast aquifer it's in danger of running dry because 70 percent of the city's drinking water is pumped from the underground reservoir.

Angel Statue commemorates Mexico's Independence from Spain. Built in 1910, it's foundation was anchored deep beneath the surface of the street. Yet over the years twenty-three steps had to be added to its base. Incredibly, the land around the statue is sinking -- in fact, almost all of Mexico City is sinking.

As water continues to be consumed the aquifer loses volume -- causing the land that rests on top to slowly collapse. Much of Mexico City's center has sunk more than 30 feet in the last century and is sinking another one to three inches a year.

Compounding the problem are open canals cutting through the heart of the city. Each day, they carry billions of gallons of raw sewage. Spreading foul odors and disease, the waste water is pumped over the mountains -- away from the city.

The canal eventually spills into the Tula River. Along the way the water foams with phosphates and deadly bacteria -- poisoning everything in its path. Before the toxic waste reaches the Gulf of Mexico it makes a brief but lethal stop.

Sixty years ago the Mezquital Valley was an arid wasteland. Today it's a fertile oasis because farmers, desperate for water, use the city's untreated sewage to irrigate their crops.

Jenny Garcia Sanchez knows little about the water her parents use to irrigate their pastures. She is nine -- a good student -- and talks about becoming a doctor. If she gets her wish, business could be very brisk. Every few years the tainted water brings cholera to the valley. It's a deadly trade-off most of these farmers have reluctantly accepted.

A few miles away is the village of Santa Ana Ahuehuetpan. Tainted irrigation water has contaminated the aquifer. Disease has taken its toll. Pablo Garcia Gonsales is the community's leader. Several years ago he petitioned the local government to build a water purification plant. He's still waiting. Most of the younger people have already given up and moved on. There are very few opportunities in a town without clean drinking water.

Istanbul

Istanbul's newest residents are those who flee rural poverty and violence. Many are from Turkey's war-torn Kurdish region. Drawn to the safety and booming economy of

Istanbul, they arrive at the rate of over 1,400 every day, 43,000 every month, more than half a million hungry and impoverished people every year.

As new arrivals pour into the city, its water supply begins to suffer. This is not the first time Istanbul's water fell victim to human pressures.

During the sixth century, Romans built huge underground reservoirs -- for times of drought or enemy attack. These highly decorated cisterns sustained Istanbul for centuries. Then about 400 years ago the city's population rose sharply. These subterranean chambers were no longer adequate -- plunging Istanbul into a serious water crisis.

To ease the city's thirst nearly 35 miles of aqueducts were built -- connecting Istanbul to rural reservoirs and natural springs. Just outside of Istanbul, Ottoman engineers constructed the Kirazli dam. It's changed very little over time and the surrounding watershed is still productive and unpolluted. But reservoirs within Istanbul are surrounded by illegal settlements. Inadequate sewage facilities threaten Istanbul's drinking water. The impact of mass migration on the city's infrastructure is enormous.

Just ask those who work the waters of the Bosphoros. This is an industry that's always supported generations of families. Today they face a grim future. Like the farmers of Mexico's Mezquital Valley, these fishermen are suffering the consequences of a city that can't handle the sewage it generates.

The Middle East

To enter the gates of the old city is to step back in time. For thousands of years, the holy land has suffered the stings of political fervor. Despite all its problems, Jerusalem continues to beckon the faithful of three great religions. It's still a cradle of hope. If lasting peace is to come to the Middle East -- those who decide its fate know that water must be a shared resource.

Shimon Peres

Water, contrary to land, is undisciplined in political terms. The water moves in the stomach of the land from one place to another place without following the borders, without following man's divisions. Even the rains don't go through the customs. Now, unless politics will attune itself to the demands of nature, namely to use correctly the sources of water, to distribute it as it is needed, to keep the land fertile our children will live in a desert and the desert is the father of poverty and of want.

Just a few miles from Jerusalem, are the rocky slopes of the Jordan River's West Bank.

Occupied by Israel since the '67 War, it is home to three quarters of a million Palestinian refugees. Here, the quantity of water is so small, that it creates not only a struggle between the water and the desert, but a struggle between people. For years, the West Bank has been a battlefield between Palestinians and Israeli soldiers.

This is the ancient city of Jericho. Here, disputes over water are as old as its biblical walls.

Lana Abu Hijaleh

This is a city of 12,000 people, and now the expectations are so many Palestinian returnees will be coming back, a number of the ministries of the Palestinian authority are here, so there are a lot of restraints on the resources in Jericho City. One of that, of course, is water, because Jericho is one of the few cities in the Palestinian Territories where it depends on springs and on the underground water. In the past, it used to have access, of course, to the Jordan River, but after the '67 War this access was denied totally.

This is Ayn Sultan spring, it's one of the most ancient sources in Jericho. Water here is very important for all people. You can read about it repeatedly in the Koran, in the holy book for Muslims. It's mentioned by Prophet Mohammed. "From water comes everything that is alive."

Like the early pioneers of the Kibbutz Ein Gev, those who live in the Arab villages of the West Bank know that without water, there will simply be no economic development.

Lana Abu Hijaleh

Water is considered a common commodity for people, they feel a right to use it, and nobody is allow to restrict their access to it. So people are willing to protect it with their own lives, actually.

Though the Jordan River is little more than a creek compared to the Amazon or Mississippi, in a region so steeped in hostility and mistrust, equitable distribution of its waters may be the key to lasting peace.

Shimon Peres

We have to provide our children with the flow of water as a promise of their future and not to look anymore upon water as upon a gun, or a plane or a tank.

(END OF VIDEO SEGMENTS)

Mr. Chairman and committee members, I hope that what I've shown you brings urgency to a major environmental, economic and political of the 21st century -- the desperate need to shelter and sustain the world's exploding urban population without destroying the delicate balance of our environment.

Thank you for your time and courtesies.

Background Information About
Journey To Planet Earth

Journey To Planet Earth is the first and only continuing prime-time television series that focuses on newly emerging problems associated with changes to our environment. Produced in association with South Carolina ETV, the initiative includes three one-hour documentaries a year and an outreach program developed by the Chicago Academy of Sciences and presented in science museums, schools and neighborhood centers around the country. Also seen on major overseas television networks in China, Japan, Western Europe, Australia, Singapore, and Brazil; the series yields a world-wide audience of 20 to 30 million people per episode.

Our series and outreach programs are supported by strategic partnerships with such organizations as the Smithsonian Institution's National Museum of Natural History, the American Association for the Advancement of Science, the North American Association for Environmental Education, the International Food Policy Research Institute, the National 4-H Clubs and the Girl Scouts of America.

Our major underwriters include National Science Foundation, the Kellogg Foundation, the Rockefeller Foundation, the Arthur Vining Davis Foundations, The World Bank, the National Institutes for Health, NASA, the Department of Agriculture, the Department of Energy, Continental Airlines and the American Honda Foundation.

Each episode in the *Journey To Planet Earth* series features four to five thematically related stories. Though photographed on different continents and focusing on different sets of problems, all of these stories are interconnected and provide audiences with a dramatic mosaic of how the Earth works as an interrelated system.

To achieve this end, *Journey To Planet Earth* cuts across the traditional disciplines that are involved in earth science and answers key questions about interactions that take place between the land, the oceans and the atmosphere. In addition, each episode will deal with the economic, political and historical perspectives of these issues.

A final unifying theme of *Journey To Planet Earth* is hope, as each program in the series explores new ways for individuals around the world to help their countries and

communities cope with serious environmental threats. In a very real sense, people come to understand that they can make an important difference in solving many of our environmental problems.

In developing the series we have considered two other factors.

Public television is an effective medium to reach large audiences:

- An estimated 102 million viewers watch public television shows each week.
- Programs on nature and science issues are among the most popular.

An investment in public television is cost-effective:

- Science shows are excellent investments because they are not one time events -- they have a long "shelf life."
- In addition to numerous repeat broadcasts and overseas distribution, free off-air rights are made available to schools and tapes are generally available for loan or rental in public libraries and video stores throughout the country.

Chairman BLILEY. Thank you, Mr. Weiner.

We will now hear from Mr. Gerald Jones, Vice President of International Services of the American Red Cross. Mr. Jones.

STATEMENT OF GERALD JONES

Mr. JONES. Chairman Bliley, Representative Brown, other distinguished members of the Commerce Committee, I am Jerry Jones, Vice President of International Services of the American Red Cross, and I want to thank you for the opportunity to testify today on the global need for access to safe drinking water, one of our principal health-related activities in assisting vulnerable populations around the world.

Chartered by Congress in 1905, the American Red Cross is mandated to provide a system of international and domestic disaster relief. Our mission is to help people prevent, prepare for, and respond to emergencies. We serve as the recognized representative of the International Red Cross and Red Crescent movement within the United States. That movement is composed of the International Committee of the Red Cross, the guardian of the Geneva Conventions; the 176 individual Red Cross and Red Crescent societies around the world, including the American Red Cross; and our International Federation, which serves as a coordinating body. This unique global network of community-based operations provides an unmatched capacity for immediate humanitarian response anywhere in the world. Further, it allows the American Red Cross to supplement the response of the U.S. Government to international disasters and public health crises, such as that posed by the lack of safe drinking water.

According to The World's Water report in 1998 and 1999, an authoritative source, over 1 billion people in the world are without safe drinking water or adequate sanitation day to day. This year the American Red Cross is assisting more than 380,000 people by

implementing water and sanitation programs in Central America, Africa and the Balkans. The American Red Cross is providing technical and financial assistance to improve water supplies and to promote health education. Our total current funding to improve water sanitation is \$15 million provided by private contributors; however, we have the capacity to expand our response with increased funding.

Over the past decade, the American Red Cross has worked tirelessly to tackle health-related problems associated with water and sanitation in all corners of the globe. While the American Red Cross's entry into this field is usually triggered by a disaster, replacing water and sanitation systems destroyed by natural disasters such as Hurricane Mitch, many of our assistance programs continue for 2 years or so afterwards.

The American Red Cross has helped Rwandans rebuild community water systems following their civil war in 1995. Following the 1995 war in Azerbaijan, people who fled to refugee camps were the beneficiaries of the American Red Cross-designed water and sanitation program, whose water treatment facilities 5 years later still sustain thousands of families, including children and elderly.

In the aftermath of the 1998 tidal wave disaster in Papua, New Guinea, we provided financial assistance and sponsored a water engineer to help affected communities resettle in new villages out of harm's way. Currently major water sanitation programs are under way to assist 75,000 people in Central America still recovering from the devastation caused by Hurricane Mitch.

Lack of access to safe drinking water and adequate sanitation leads to infectious diseases: diarrhea, dysentery, cholera, typhoid, malaria, skin diseases and others. Despite international efforts targeting this health crisis over the past two decades, modest gains often have been outpaced by increased population growth and a lack of local capacities to maintain already built infrastructures. As health education is a critical component to water supply programs, the American Red Cross, through the larger Red Cross movement, has the advantage of an existing base of trained volunteers in local communities throughout its network of Red Cross and Red Crescent societies located in more than 176 countries worldwide.

There are two recommendations that I would like to share with the committee. First, we need to make better use of best industry practices. There are numerous examples of water, sanitation and health education projects over the past decades that achieve their goals as well as many lessons learned from less successful efforts. From those experiences there is a consensus among WHO, among Red Cross organizations, and others involved about what approaches work best. The American Red Cross believes that in order to effectively reduce water-related diseases through improved access to safe drinking water and adequate sanitation, the following program strategies should be adhered to. Please bear in mind that these recommendations focus on ways to make programs in rural areas as sustainable as possible over the longer term.

We believe that we must address sanitation, hygiene and health education needs along with making improvements to water and sanitation facilities. Improved health often depends on how water is utilized and is not simply a matter of supplying more of it. We

feel that you must require the beneficiary population to be involved in health promotion, water system design and operations, and to utilize local water committees to facilitate operation and maintenance.

For example, in Nicaragua, health promoters and the persons responsible for maintaining equipment receive specific training in these areas.

We feel you must use technologies appropriate and affordable in local settings. For example, gravity-fed water systems are appropriate where reliable power systems may not be available, such as in northwest Kenya's Kerio Valley, where we are currently working. We feel you must utilize to the extent possible locally manufactured or procured equipment and construction materials, as well as local expertise and labor. For example, hand pumps used to draw water from wells routinely requires spare parts. It is necessary that these be readily available locally.

We feel you must work in collaboration with local government agencies, being cognizant of local legal frameworks. In Azerbaijan, for example, water rights were secured through local government prior to the drilling of new boreholes.

We feel it important that you account for local gender and local cultural practices. For example, better access to safe drinking water in Papua, New Guinea, meant installing a pipe system to bring water into the village. This drastically reduced the distance that women had to carry water and allowed them to spend more time in preventive health measures for their own children.

Second, just as this committee is doing today by holding this oversight hearing, we need a renewed commitment to address global water sanitation and health education programming. Over the past decades, international organizations and their local partners have developed their various capacities to implement assistance programs in the areas of water and sanitation. It is crucial that governments and the general public alike renew their commitment to funding health education and safe drinking water programs around the world, with the aim of saving lives and improving health.

Mr. Chairman, I want to thank you for the opportunity to share the American Red Cross experiences and efforts to address the issue of global safe drinking water supplies. We look forward to working with Congress and the new administration to expand our efforts in this vital area of global public health. Thank you.

[The prepared statement of Gerald Jones follows:]

PREPARED STATEMENT OF GERALD JONES, VICE PRESIDENT, INTERNATIONAL SERVICES, AMERICAN RED CROSS

INTRODUCTION

Chairman Bliley, Representative Dingell, and other distinguished members of the Commerce Committee, I am Gerald Jones, Vice President, International Services of the American Red Cross. Thank you for the opportunity to testify today on the global need for access to safe drinking water—one of our principal health related activities in assisting vulnerable populations around the world.

Chartered by Congress in 1905, the American Red Cross is mandated to provide a system of international and domestic disaster relief. Our mission is to help people prevent, prepare for and respond to emergencies. The American Red Cross is an independent, nonprofit organization, dedicated to providing critical people-focused services. We serve as the recognized representative of the International Red Cross

and Red Crescent Movement within the United States. The Movement is composed of the International Committee of the Red Cross, guardian of the Geneva Conventions; the 176 individual Red Cross and Red Crescent Societies around the world, including the American Red Cross; and the International Federation, which serves as a coordinating body. This unique global network of community based operations provides an unmatched capacity for immediate humanitarian response anywhere in the world. Further, it allows the American Red Cross to supplement the response of the United States government to international disasters and public health crises, such as that posed by the lack of safe drinking water.

According to *The World's Water 1998-1999*, an authoritative source, over a billion people in the world are without safe drinking water or adequate sanitation day to day. This year the American Red Cross is assisting more than 380,000 people by implementing water and sanitation programs in Central America, Africa and the Balkans. In numerous communities throughout El Salvador, Guatemala, Honduras, Nicaragua, Kosovo, Kenya, and Mozambique the American Red Cross is providing technical and financial assistance to improve water supplies and promote health education. Our total current funding to improve water sanitation is \$15 million provided by private contributors; however, we have the capacity to expand our response with increased funding.

RED CROSS AND RED CRESCENT MOVEMENT INVOLVEMENT

Over the past decade, the American Red Cross and our Red Cross and Red Crescent Movement partners, including the International Committee of the Red Cross (ICRC), International Federation of Red Cross and Red Crescent Societies, and National Societies, have been working tirelessly to tackle the health related problems associated with water and sanitation in all corners of the globe.

Role of the American Red Cross

While the American Red Cross' entry into the field is usually triggered by a disaster, replacing water and sanitation systems destroyed by natural disasters such as Hurricane Mitch, many of our assistance programs continue for a year or more afterwards. The American Red Cross has helped Rwandans rebuild community water systems following the civil war in 1995. Following the 1995 war in Azerbaijan, people who fled to refugee camps were the beneficiaries of an American Red Cross designed water and sanitation program whose water treatment facilities, five years later, still sustain thousands of families, including children and elderly. In the aftermath of a 1998 tidal wave disaster in Papua New Guinea, the American Red Cross provided financial assistance and sponsored a water engineer to help affected communities resettle new villages out of harms way. Currently, major water and sanitation programs are underway to assist over 75,000 people in Honduras, Nicaragua, El Salvador and Guatemala still recovering from the devastation caused by Hurricane Mitch.

Lack of access to safe drinking water and adequate sanitation leads to infectious diseases like diarrhea, dysentery, cholera, typhoid, malaria, skin diseases and others. Despite international efforts targeting this health crisis over the past two decades, modest gains often have been outpaced by increased population growth and a lack of local capacities to maintain built infrastructures. So the situation persists and coverage levels are eroding, according to the World Health Organization which will soon release results of a ten-year survey of this trend. As health education is a critical component to water supply programs, the American Red Cross, through the Red Cross Movement, has the advantage of an existing base of trained volunteers in local communities throughout its network of Red Cross and Red Crescent sister Societies located in more than 176 countries worldwide.

Role of the International Committee of the Red Cross

The International Committee of the Red Cross (ICRC) leads the Movement's response in conflict situations. In 1999, the ICRC conducted operations with a water supply component in 31 different countries. While the historical record indicates that nations seldom go to war over water, the present day reality is that the vision for improved health requires increasing access to fresh water when nearly two-thirds of the world's population live in river basins that demand sharing arrangements between countries (*Forum: War and Water*, ICRC, 1998). For example, the potential for conflict increases as the pressure for water becomes greater between countries along rivers, such as along the Nile, the Amazon. It should be noted that through appropriations to the Department of State Department, Congress provides a sizeable portion of the financial support for ICRC operations worldwide.

International Federation

Donor Red Cross and Red Crescent Societies, either bilaterally or through a coordinating body known as the International Federation, approach the need for safe water on two levels. Emergency Response Units of trained individuals with specialized equipment stand ready to be deployed anywhere in the world to purify and distribute water until regular supplies are restored. Over the longer term, we support local Red Cross Red Crescent National Societies in rebuilding permanent water and sanitation infrastructure, conducting health education campaigns, and implementing plans for disaster preparedness and mitigation.

RECOMMENDATIONS FOR IMPROVING ACCESS TO SAFE WATER GLOBALLY

There are two recommendations that I would like to share with the committee. First, we need to make use of best industry practices. There are numerous examples of water, sanitation, and health education projects over the past decades that achieved their goals, as well as many lessons learned from less successful efforts. From those experiences, there is consensus among major organizations involved about what approaches work best. These agencies include the World Health Organization, the American Red Cross and its partners in the Red Cross and Red Crescent Movement, government donors like USAID, national governments that receive donor assistance, and various international and local NGOs.

The American Red Cross believes that in order to effectively reduce water-related disease through improved access to safe drinking water and adequate sanitation, the following programming strategies should be adhered to. Please bear in mind that these recommendations focus on ways to make programs in rural areas as sustainable as possible over the longer term.

- Address sanitation, hygiene and health education needs along with making improvements to water and sanitation facilities. Improved health often depends on how water is utilized and is not simply a matter of supplying more of it.
- Require the beneficiary population be involved in health promotion, water system design and operation, and utilize local water committees to facilitate operation and maintenance. For example, in Nicaragua, health promoters and persons responsible for maintaining equipment receive specific training.
- Use technologies appropriate and affordable in the local setting. For example, gravity fed water systems are appropriate where reliable power systems may not be available, such as in northwest Kenya's Kerio Valley where the American Red Cross is currently working.
- Utilize to the extent possible locally manufactured or procured equipment and construction materials as well as local expertise and labor. For example, handpumps used to draw water from wells routinely require spare parts and it is necessary that these be readily available locally.
- Work in collaboration with local government agencies, being cognizant of local legal frameworks. In Azerbaijan for instance, water rights were secured through the local government prior to drilling new boreholes.
- Account for local gender and local cultural practices. For example, better access to safe drinking water in Papua New Guinea meant installing a piped system to bring water into the village. This drastically reduced the distance women had to carry water, allowing them greater time to spend toward preventive health measures for children.

Second, just as the Committee is doing today by holding this oversight hearing, we need a renewed commitment to address global water, sanitation and health education programming. Over the past decades, international organizations and their local partners have developed their various capacities to implement assistance programs in the area of water and sanitation. More recently, improved evaluation methods are being developed to measure the actual impact of such programs. It is crucial that governments and the general public alike renew their commitment to funding health education and safe drinking water programs around the world with the aim of saving lives and improving health.

An independent organization, the American Red Cross relies on the generosity of the American public to support our international disaster response, including water supply programs. As the recognized representative of the International Red Cross and Red Crescent Movement in the United States, the American Red Cross stands ready to work with the Commerce Committee, State Department and others, to address the needs of those around the world in gaining access to safe drinking water through our unique global network.

CONCLUSION

Mr. Chairman, I thank you for the opportunity to share the American Red Cross experiences and efforts to address the issue of global safe drinking water supplies. We look forward to working with Congress and the new Administration to expand our efforts in this vital area of global public health.

Chairman BLILEY. Thank you, Mr. Jones.

We will now hear from Dr. Anwarul Huq, I hope I got that right, Research Associate Professor, Center of Marine Biotechnology, University of Maryland Biotechnology Institute. Dr. Huq.

STATEMENT OF ANWARUL HUQ

Mr. HUQ. Mr. Chairman and members of the committee, my name is Anwarul Huq, and I am an associate professor at the University of Maryland Biotech Institute.

Chairman BLILEY. Would you pull the microphone as close to you as you can. We have a very antiquated sound system in here.

Mr. HUQ. Is it better now?

Chairman BLILEY. That is better.

Mr. HUQ. Let me commend you on holding a hearing on the important topic of safe drinking water, a concern for millions of people throughout the world. About 25 years ago, at the beginning of my career, when I was working as a research officer at the International Center for Biodisease Research in Bangladesh, 1 day a middle-aged man arrived at the hospital with a young girl in his arms. The girl was nearly dead from drinking contaminated water, and I could read from the face of the doctor attending the patient that there was very little hope that the girl was going to survive. After 12 hours, she was able to drink fluid and all the hydration solution developed at that center to treat cholera patients. After 24 hours, the girl, that little girl, although extremely weak, was released from the hospital, and she was allowed to go home. Had there been no help, instead of walking out of the hospital, someone would have carried her into the graveyard. That day I vowed that if I could save even one life, I would consider my own life well spent.

Unlike smallpox, water-borne diseases cannot be eradicated because many of the pathogens are naturally occurring in aquatic environments, notably *Vibrio cholerae*, the causative agent of cholera. Intervention is, however, possible by changing the way water is used through general education and increased public awareness and, most importantly, widespread initiatives to protect water from undesired contamination.

According to a report published by the World Health Organization, many developed countries have water sources that are continuing to deteriorate in quality. For example, cholera has appeared in the former Soviet Union. After a century without cholera epidemics in South America, Peru and other neighboring countries, several other neighboring countries saw an outbreak of cholera in 1992, believed to have been caused by unboiled or untreated drinking water. In Bangladesh, the majority of the population in villages still depend on untreated surface water for household consumption for reasons of taste and convenience. In a country like Bangladesh where fuel wood is very short in supply, boiling water, effective as it is, is not done because of the lack of fuel wood.

In my own research, we found that four layers of sari cloth of the commonest type used by Bangladeshi villagers, 99 percent of cholera-causing cells attached to zooplankton can be filtered from drinking water. The sari material used to filter contaminated water can be washed and air dried for reuse.

Effective, low-cost and culturally acceptable measures to improve clean water are having a dramatic impact: The project under way in Bangladesh involving over 60,000 people funded by the National Institutes of Nursing Research of the National Institutes of Health to treat workers, educate the villagers on the importance of simple filtration, a method that we developed at the University of Maryland, demonstrate how to use the filter effectively and how to decontaminate the filter after each use. This training is accomplished by one-on-one family visits, as well as the use of colorful posters, community discussions, and town hall meetings.

Increasingly people are using bottled water here and in other countries. Sadly, there are not that many fortunate people in the world who have access to or can afford to buy bottled water in their daily lives.

In conclusion, safe drinking water is a global necessity. In the years ahead, both developed and developing countries will consider their supply of drinking water as valuable and vital as we view petroleum resources on a global scale today.

Thank you again for inviting me to testify before this committee, and I would be happy to respond to any questions you might have. [The prepared statement of Anwarul Huq follows:]

PREPARED STATEMENT OF ANWARUL HUQ, RESEARCH ASSOCIATE PROFESSOR, CENTER OF MARINE BIOTECHNOLOGY, UNIVERSITY OF MARYLAND BIOTECHNOLOGY INSTITUTE

At a time when man has stepped foot on the moon and our country is considering sending landing craft to Mars and other planets, it is tragic that thousands of people die each day here on earth from waterborne diseases like cholera, that are preventable. About 25 years ago at the beginning of my career when I was working as research officer at the International Center for Diarrhoeal Disease Research, Bangladesh (ICDDR,B), one evening after spending 18 hours doing field work in the ICDDR,B Field Hospital, I was relaxing over coffee when a middle aged man arrived at the hospital with a young girl in his arms. The girl, 9 or 10 years old, was nearly dead with sunken eyes and hardly breathing. The doctors attended the patient immediately. I could read from the face of the doctor that there was very little hope that the girl would survive, but the doctor worked desperately hard. After about 4 hours the vital signs of the little girl showed that she was responding. After 12 hours, she was able to drink fluids, an oral rehydration solution developed at the ICDDR,B for cholera patients. After 24 hours she was released from the hospital. The little girl was extremely weak as she walked out of the hospital. Had there been no help, such as that available at the ICDDR,B field hospital, instead of walking out of the hospital, some one would have carried this little girl to a grave yard. That day, I vowed that if I could save even one life, I would consider my own life well spent.

The impact of population growth worldwide has resulted in an increased incidence of waterborne disease and diseases such as cholera pose a real threat to public health, unless appropriate intervention measures are initiated locally, regionally, and globally. It is estimated that the volume of available renewable freshwater will decrease by $\frac{1}{3}$ for each human being in the year 2025, compared to what the world population had available per person in 1955. Unlike smallpox, waterborne diseases cannot be eradicated, because many of the pathogens are naturally occurring in aquatic environments, notably, *Vibrio cholerae*, the causative agents of cholera. However, intervention is possible by changing the way water is used, through general education, and increased public awareness and, most importantly, widespread initiatives to protect water from undesired contamination. Because of industrialization, most developed countries tend to have problems of chemical pollution, whereas most of the developing countries suffer from pollution with domestic wastes because

of the lack of resources for waste management. In addition, the emergence of pathogens resistant to chemicals used in water treatment and disinfectant is a concern for those responsible for management of clean, safe drinking water supplies.

Waterborne disease outbreaks are on the rise globally, both in frequency and severity. Reports published by the United Nations Children's Fund in 1993 demonstrated a direct correlation between safe drinking water and death of children under 5 years of age. Another report by the World Health Organization (WHO), published in 1992, estimated that diarrheal disease traceable to water contamination kill two million children each year. Although mortality from many of the waterborne infections is generally low, the socio-economic impact in both developed and developing countries is severe. In 1995, a colloquium was held on "A Global Decline in the Microbiological Safety of Water: A call for Action", organized by the American Academy of Microbiology. Five years later, the Academy sponsored another colloquium to re-evaluate the microbiological quality of drinking water. It found that there is a need for improved and more powerful molecular biology-based methods for detection of human pathogens in water supplies and for a public health risk assessment, including bacteria, viruses, and other organisms, such as toxic algae.

Rapid population growth, on one hand, is considered to have contributed to the increase of bacterial contamination and deteriorating public health conditions, but urbanization, on the other hand, has provided treated, safe drinking water for millions of people. At the beginning of the 20th century, typhoid fever was an emerging disease in Europe and the United States. Fortunately, the disease was controlled successfully in those communities that were provided with filtered and chlorine-treated water. Nonetheless, when the infrastructure deteriorates or is stressed to meet the demand of increased population growth, outbreaks of waterborne diseases are still likely to occur. According to a report published by the World Health Organization in 1992, many developing countries have water sources that are continuing to deteriorate in quality. For example, cholera has reappeared in the former Soviet Union and the reappearance and transmission of cholera, after a century without cholera epidemics, in Lima, Peru, and several other neighboring cities and countries during 1992 is believed to have been caused by unboiled or untreated water serving as drinking water. In fact, in both developed and developing countries, ground water increasingly is becoming contaminated and, in many cases is being depleted, since the renewal rate is declining directly, or indirectly with population growth.

Although the microbiological quality of water is usually measured by monitoring for the presence of certain pathogenic bacterial species, the problem is not limited to bacteria but includes parasites and viruses. Major bacterial problems in the United States in recent years are *E. coli* 0157:H7 and *Enterococcus*. Both are intestinal bacteria that can cause flu-like symptoms, as well as enteric infections. Earlier this year, over 1,000 people were infected with *E. coli* 0157:H7 in Walkerton, Ontario, Canada, and 90 individuals were hospitalized. At least 10 died and an additional nine deaths were investigated. In the summer of 1998, an outbreak caused by the same organism took place in a theme park, traced to water, in suburban Atlanta, killing two. In June, 1998, 367 people became ill with nausea, diarrhea, and vomiting and stomach pain, after consuming raw oysters. Although hardly anybody in the United States will drink untreated water, nevertheless, if natural water is contaminated, people may become infected indirectly, as in the case of raw oysters taken from contaminated waters. *Cryptosporidium* has caused massive waterborne epidemics worldwide and is also recognized as the most important drinking water parasitic contaminant in the United States. The largest outbreak of cryptosporidiosis occurred in 1993, when 400,000 people in Milwaukee, Wisconsin, were infected with *Cryptosporidium*. Because of this and other outbreaks of waterborne diseases, confidence in the purity and safety of our public drinking water supply has gone down in the United States.

Numerous epidemics of cholera occurred in Europe and in the United States in the 1800s. Tens of thousands of people died, until safe drinking water became available. Between 1832 and 1875, cholera spread rapidly and caused catastrophic epidemics in the United States. Although no longer an epidemic threat in the United States, cholera and other diarrheal diseases remain major killers of children globally, especially in developing countries. According to a World Health Organization report, there were over 293,000 cases of cholera, reported worldwide in 1998. One must remember that these are only the reported cases. More than 14,000 deaths, many of them children were reported to have occurred in Rwandan refugee camps in 1994. It has long been known that cholera is a waterborne disease, and the infectious agent, a bacterium called *Vibrio cholerae*, is transmitted via water. Until 1992, both North and South America were free of cholera epidemics for almost a century. Unfortunately, after that massive epidemic in Peru and involving almost all the countries of Latin America, cholera has become pandemic in several coun-

tries in South America, killing over 8,000 people since 1992. It should be noted that this bacterium occurs naturally in the aquatic environment. In an ongoing study in our laboratory at the University of Maryland, cholera bacteria can be easily detected in Chesapeake Bay. Although toxigenic strains have been detected in the water of the Gulf Coast sporadically since 1978, so far, nearly all of the Chesapeake Bay isolates have been proven to be nontoxigenic. Those sporadic cases of cholera that have occurred in the United States since 1973, except for a few, were related to travel to cholera-endemic countries or consumption of local or imported seafood. In addition, we have demonstrated that professional divers often have elevated antibody to *Vibrio cholerae* bacteria, most probably a result of exposure to cholera bacteria in the fresh and estuarine water where they dive, including a fresh water reservoir in Maryland, where they also have worked. The point is that there is always a risk, although very small, for cholera to occur in the United States.

One very important aspect of determining bacteriologically safe drinking water is to take into account the viable but nonculturable (VBNC) phenomenon in bacteria, first reported from our laboratory at the University of Maryland. In this state, bacteria remain viable, maintaining virulence, but not growing on conventional bacteriological culture media. They are essentially dormant or in a survival stage, when environmental conditions do not lend themselves to active growth of the bacteria, such as cold weather or less nutrient being available. Therefore, these bacteria can easily be missed if appropriate methods are not used for detection, namely molecular biology or biotechnology methods for detection. It has been demonstrated that chlorine in the form of sodium hypochlorite (Clorox), up to 2.5%, has very little effect in killing *V. cholerae* when the bacteria are attached to plankton. In fact, in pure culture, i.e., without plankton present, large numbers of free living cells of *V. cholerae* can enter the VBNC, or dormant state, when exposed to disinfectant. Thus, re-evaluation of disinfectants, including chlorine, for treating drinking water supplies, particularly when filtration systems are not effective at the highest level, such as after very heavy storms and before chemical treatment.

Surface water has been implicated in the transmission of cholera and other waterborne diseases. The association of vibrios, particularly *V. cholerae* with plankton, specifically zooplankton has been established from extensive studies carried out in our laboratory during the past 25 years. Recently, the presence of the *V. cholerae* bacteria in cargo ship ballast water has been reported, suggesting international dissemination of *V. cholerae* via aquatic organisms, namely plankton, in the ballast water that is discharged in harbors remote from the original source of the ballast water. Our work on ballast water suggests that *V. cholerae* is present in, and on copepods (plankton) in the ballast water of ships entering Chesapeake Bay from ports of origin elsewhere in the world. Copepods, a dominant group of the zooplankton community in riverine and brackish water, have a characteristic seasonal distribution in size and species and can carry a large number of *V. cholerae*, enough to cause cholera even if only 1-10 copepods are ingested via drinking water.

Filtration water at the time of collection, and just before drinking, has been successful in removing cyclopes, a planktonic stage of the guinea worm, which causes dracunculiasis, a serious a life-threatening and common disease in many countries of Africa. The worm is removed using a nylon net to filter out the plankton which carry the intermediate stage of the worm. Filtration is so successful that it is now recommended as an effective method for preventing dracunculiasis. By drinking water with cyclopes (plankton) in the water, a person serves as the active host in whom the intermediate stage develops to the adult migrating worm. Although boiling water prior to drinking will kill the plankton, cyclopes, and, therefore, the guinea worm larvae, it is a time-consuming procedure and expensive as well. In a country like Bangladesh, where fuel wood is in very short supply, boiling water, an effective practice as it is, is not done because of the lack of fuel wood. Furthermore, boiling water is not socially acceptable in most rural villages of Africa, a situation that also prevails in Bangladesh.

In Bangladesh, a majority of the population in the villages still depends on untreated surface water for household consumption. Surface water taken from ponds and rivers is a preferred source of drinking water, for reasons of taste, convenience, or a local belief that "quality" water is "natural," i.e., not chemically treated. A family and neighborhood study of cholera transmission demonstrated that those who used water from sources known to contain cholera bacteria, for cooking, bathing, or washing, but used water for drinking that did not show the presence of bacteria by standard culture methods, had the same rate of infection as those who used *V. cholerae* O1 culture positive water for drinking. Once the index case is reported, it is most likely that further spread in the family takes place via water or other means, such as direct contact, which may not be prevented even if the water brought into the house is free of *V. cholerae* O1. Moreover, during severe flooding,

which occurs almost every year, there are some areas of Bangladesh that experience reduction to conditions of mere survival, i.e., even the barest necessities become difficult to obtain and building fires to boil water is simply not possible.

Therefore, we proposed an intervention at the index case level, which would help prevent the release of large numbers of bacteria into the environment when sanitary latrines are not available. The importance of safe water for all household purposes, i.e., cooking, bathing, washing, and drinking cannot be over emphasized. When consumption of surface water cannot be avoided, particularly during flooding or other natural disasters which occur every year in Bangladesh, a simple method that is effective in reducing the number of *V. cholerae* will be very useful. In addition, the recently recognized problem of very high concentrations of arsenic present in Bangladesh ground water, i.e., in shallow tube well water, forced large numbers of people to avoid ground water, and switch back to drinking water from rivers and ponds, i.e., surface water. Thus, a simple filtration method that we devised, using cloth filters, may become even more important in protecting economically destitute villagers from becoming ill from contaminated water.

Based on our accumulated work on cholera over twenty-five years, we hypothesized that a simple and inexpensive filtration method to sieve out plankton colonized with *V. cholerae* should curb, or at least reduce, cholera epidemics. This presumes filtration will reduce the numbers of *V. cholerae* per volume of drinking water, whether from ponds, rivers or other natural water supplies, to numbers below a potentially infectious dose. Extensive experiments were conducted in our laboratory at the University of Maryland and the results showed that *V. cholerae* attached to copepods can be filtered out of the water using sari material of a type that is readily available in nearly every household in villages of Bangladesh. Different kinds of sari material were tested, in addition to a nylon net of maximum pore size of 200 μ m (the same nylon net as used to control dracunculiasis in Africa). The emphasis in our study focussed on sari material, because it was our aim to develop a method of filtration that bore no additional cost to villagers for household water filtration. It was not intended to eliminate cholera by our method, but to reduce the number of cholera cases to a minimum.

Results of experiments showed that either four layers of sari cloth of the commonest type used by Bangladeshi villagers, or one layer of nylon net, retained 99% of *V. cholerae* since the cells are attached to zooplankton. The sari material used to filter contaminated water, i.e., to separate out suspended particles, including copepods, can be washed and air-dried each time after use for repeated use. Complete drying of the filtering material is desirable, with four hours, or more than 24 hours, required for drying, depending on the humidity, i.e., monsoon vs. non-monsoon season. From results obtained in our preliminary studies in Bangladesh, four hours of sun exposure or 24 hours of air drying in a shaded environment was most effective. The decontamination procedure was even more effective if the sari cloth was thoroughly rinsed with water before drying. However, during the monsoon in Bangladesh, when the humidity is ca. 100%, fully complete drying is not usually achieved. Considering such situations, thorough washing of each filter after every use is recommended, using the same river or pond water to remove concentrated plankton from the filter, followed by rinsing with filtered water and drying when possible. There is no hazard or risk associated with application of this method, either to participants or to workers carrying out the study.

A concept of filtration acceptable to villagers is the basis of this project. So after demonstrating that simple filtration using Bangladeshi household material can reduce the number of cells of *V. cholerae* 01 (reduction of 2 logs or more in number of *V. cholerae* cells) in surface water. We are now carrying out a community-based study targeted toward undeserved rural populations and aimed at cholera intervention involving direct community participation. We have undertaken this project in collaboration with the International Centre for Diarrhoeal Disease Research, Bangladesh (ICDDR, B) and funded by the National Institute of Nursing Research, National Institutes of Health. The field trials began a year and half ago in Bangladesh. Most importantly, mothers of households are responsible for implementation, thereby, ensuring ultimate success.

Field workers, who explain and educate the villagers and the importance of filtration, demonstrate how to use the filter effectively and how to decontaminate the filter after each use. This training is accomplished by one-on-one family visits, as well as through the use of colorful posters, community discussions, and "town hall meetings." Those villagers using the filtration devices for six months are included in a follow-up survey, conducted to evaluate efficacy of the devices, as well as compliance in the use of the devices. The second phase study began last month, involving 12,000 families and approximately 60,000 individuals. Questionnaires, data recording, methods for education about filtration, and related matters from the first phase

were carefully reviewed, with special focus on effective education and distribution of the filtering devices, to ensure successful completion of the full field trials.

Preliminary results from the first phase of the study indicate that filtration reduces the number of cases of cholera significantly, when sari or nylon net is used to filter household water, compared to the number of cholera cases in the control villages. From September to December, 1999, the number of cholera cases was $<0.5/1000$ in both the sari and nylon net filtration groups and $>1.5/1000$ in the control group, where filtration was not done, a three-fold reduction of cholera cases among filter users. An important finding from the first phase of the study was the acceptability of filtration of household water by the villagers. It was found that 90% of the villagers were in compliance with the instructions for using the filters. Only 0.6% of the population were non-compliant, i.e., didn't use the filters. Of the remaining population, a few families switched to tube well water and some had migrated to other villages.

Clearly, there is willingness among the villagers to use filtration as an intervention method to prevent cholera. Finally, we are excited and delighted by the promising results from the first phase of the project. Filtration, using sari cloth and/or nylon net, is effective in reducing the number of cholera cases, the villagers in Bangladesh are in excellent compliance (far better than expected), and the number of cholera cases for those who filter their water is significantly less than for those who do not filter.

I take this opportunity to mention here that during the past couple of years I have been asked whether the sari filtration method can be useful in any other countries, employing the local material of that country. It is a very simple method and if a locally available material can fulfill the requirement, it should work. Increasingly, people are using bottled water. Sadly, there are not that many fortunate people in the world who have access to, or can afford to buy bottled water for their daily drinking water needs. A rural villager in Bangladesh earns about \$2.00 per day. A day's wages may buy only one or two bottles of water!

In conclusion, safe drinking water is a global necessity. In the years ahead, both developed and developing countries will consider the supply of drinking water as valuable and vital as we view petroleum resources on a global scale today.

Chairman BLILEY. Thank you, Dr. Huq.

We will now hear from Mr. Peter Lockery, senior advisor of water sanitation, environmental health, with CARE.

STATEMENT OF PETER LOCKERY

Mr. LOCKERY. Mr. Chairman and members of the committee, I am Peter Lockery. I am senior advisor on water sanitation and environmental health. Thank you for the opportunity to present testimony this morning on behalf of CARE.

What I will try to do in our testimony is to give a flavor of the international debate that is going on about water sanitation and environmental health. I have in my testimony tried to respond to what I expect are the most frequently asked questions.

The first question is why is water critical to poverty reduction? Well, closer and more secure access to water and sanitation save large amounts of time and energy in collecting water and in finding a place to defecate. Just so my colleague over there does not have a monopoly on the show and tell, I brought along this morning a gagro from Nepal. This is a vessel commonly used in Nepal for collecting water, and women walk quite often several miles to collect all the water they need. Just imagine carrying that up and down hills several times a day.

The other issue I mentioned in my comment was finding a place to defecate. Remember that 3 billion people in the world don't have an adequate place to defecate. They do not have adequate sanitation. That means for a lot of women in the world, they are limited to defecating at dusk or at dawn. Those are the only times when they feel secure and can find the privacy necessary.

The second reason why water is critical to poverty reduction is water can be used for horticulture, household livestock production, and in supporting microenterprise, such as brickmaking and pottery. Going back to Nepal, if you go into the hills there, you will find water buffalo in many hill villages. They are not native of hill villages, they live on the plains, but if you can get water, people can keep them in the hills.

The third reason why water is critical is in urban areas particularly, improved water supplies can be much cheaper than water vendors. Recent studies show that water vendor supplies cost 4 to 10 times what a pipe water supply would cost.

Finally, improved water and sanitation reduces the burden of water and excreta-related diseases. Remember that 1 child every 10 seconds, 2 to 3 million children per year, dies from diarrhea.

The second question is why are hygiene and sanitation important? Well, studies show that sanitation, hygiene promotion and water quantity have a greater impact on the incidence of diarrhea than water quality. In our sanitation and family education project in Bangladesh, we didn't provide any water and sanitation hardware; we simply focused on hygiene promotion. The results in the incidence of diarrhea, a reduction in the incidence of diarrhea, were dramatic.

Finally, I make the point on this point of hygiene and sanitation that people want toilets for other reasons than health. They want them for privacy, convenience, safety, and dignity, rather than health, in many cases.

The next question is how should water be managed? I think what is coming out now in the international consensus is at the lowest appropriate level, possibly by the users themselves, and the most important lesson that has been learned over the last 25 years is putting people at the center and recognizing their right to affordable access to safe water and sanitation, and their right to participate in decisionmaking.

Imagine yourself in the desert north of Timbuktu. You are standing next to a deep well with a group of pastoralists, nomadic Arabs dressed in indigo-dyed cloth. They are complaining because the concrete lining of the well is beginning to collapse. Why? Because following tradition, they tried to deepen the well when it dried and undermined the lining. The project manager has explained to the pastoralists what happens when they deepen the well without putting in additional lining, but it is too late, the damage has been done. You realize that the project needs to meet and discuss with the pastoralists before the wells are constructed so that issues such as location and well maintenance can be decided. But there is a problem here. Which pastoralists use which wells?

In this society, only men and boys go to the wells. You ask to speak to some women, some families. You are taken to a typical tented camp some miles from the well. You crawl into a tent and spend an hour talking to a family. The man's wife does most of the talking. She is probably illiterate, but nevertheless wise and thoughtful in her responses. You learn a great deal about their culture and society, about their hopes and aspirations. You also learn that they only move camp about twice per year. They go north in the fall and south in the spring, following the grass for their ani-

mals. They use one group of wells in the winter and one group in the summer. So, yes, if they were asked, groups of families would try to manage the wells and prevent damage.

My final point concerns payment. Two years ago, I was visiting a project in Mozambique. We were in a village, and the village maintenance team had removed their hand pump from the borehole and were carrying out repairs. There seemed to be a rather large number of people present for just one village maintenance team. I asked who these people were. My colleague inquired and was told there were maintenance teams from two adjacent villages. When the hand pump was installed, these two adjacent villages had contributed parts of the cost so that should their own hand pump fail, they would have the right to use the hand pump in the village we were visiting.

These are poor subsistence farmers, and they value boreholes very highly, being the only source of water in the dry season. They were ready to invest, if given the opportunity, and have taken full responsibility for all normal operation and maintenance costs. What they needed was some initial assistance with the capital investment. In fact, the capital investment was provided by USA, because this was a U.S.-funded project. They needed that initial leg up, but the rest they were prepared to do for themselves.

Mr. Chairman, thank you once again for the opportunity to appear at this hearing.

[The prepared statement of Peter Lockery follows:]

PREPARED STATEMENT OF PETER LOCKERY, SENIOR ADVISER ON WATER, SANITATION AND ENVIRONMENTAL HEALTH CARE, CARE

Mr. Chairman and Members of the Committee, my name is Peter Lockery. I am CARE's Senior Adviser on Water, Sanitation and Environmental Health. Thank you for the opportunity to present testimony this morning on behalf of CARE.

My testimony will briefly describe CARE's history and involvement with the provision of drinking water and sanitation. It then reviews the current situation and trends in water resources and in access to safe drinking water and sanitation that inform CARE's programming. The final section examines lessons learned by responding to a series of key questions:

- Why is water critical to poverty reduction?
- Why are hygiene and sanitation important?
- How should water be managed?
- Who should pay for water?
- Why is gender important?

Incorporated in the final section are brief descriptions of two CARE projects that serve to illustrate the points made on hygiene and integrated water resources management respectively.

CARE

CARE was founded in 1945 to assist in the post-war reconstruction of Europe. Today CARE is one of the world's largest relief and development organizations, with programs spanning the relief to development continuum of humanitarian assistance in the areas of agriculture and natural resources, basic and girls' education, health (including reproductive health, children's health, and water, sanitation and environmental health), and small economic activity development. Since 1945, CARE has helped more than one billion needy people in 125 countries worldwide.

CARE has carried out water and sanitation activities for forty-three years, reaching an estimated 10 million people in 20,000 communities in more than 30 countries, through an investment of over U.S. \$250 million. CARE's current portfolio includes 63 projects with significant water and sanitation activities. The projects are located in a total of 29 countries in Africa, Asia and Latin America. In FY99, program expenses on water and sanitation exceeded \$29m, including \$17m on emergency and rehabilitation and \$12m on development. Funding comes from multi and

bi-lateral agencies, host governments, private corporations and individuals, and the communities served.

CARE's approach to water and sanitation activities reflects the organization's breadth of experience and expertise. During the 1960s, CARE focused on the provision of water supply hardware to poor rural communities in the developing world. As CARE experience grew over the next thirty years, other components such as toilet construction, watershed protection, and health and hygiene education were gradually introduced. Most recently, the emphasis has been on those elements that ensure sustainability and impact. Although most CARE projects are rural, in the 1990s CARE has undertaken an increasing number of urban projects. These include water supply, drainage, on-site sanitation and sewer construction, and solid waste management.

CURRENT SITUATION AND TRENDS

"The world faces severe and growing challenges to maintaining water quality and meeting the rapidly growing demand for water resources. New sources of water are increasingly expensive to exploit, limiting the potential for expansion of new water supplies. Water used for irrigation, the most important use of water in developing countries, will have to be diverted to meet the needs of urban areas and industry but must remain a prime engine for agricultural growth. Waterlogging, salinization, groundwater mining, and water pollution are putting increased pressure on land and water quality. Pollution of water from industrial waste, poorly treated sewage, and runoff of agricultural chemicals, combined with poor household sanitary conditions, is a major contributor to disease and malnutrition."¹

Caught between growing demand for freshwater on one hand and limited and increasingly polluted water supplies on the other, many developing countries face difficult choices. Rising demands for water for irrigated agriculture, domestic consumption, and industry are forcing stiff competition over the allocation of scarce water resources.

Water Resources

Although water appears to be abundant, less than 3 percent of the world's water is freshwater, and most of this is either in the ground or in the form of ice. Lakes and rivers account for only 0.014 percent of all water. Enough precipitation falls each year on the land surface of the earth to cover the United States to a depth of 15 feet or to fill all lakes, rivers and reservoirs fifty times over, but about two-thirds is lost to evaporation and more than half of the remainder flows unused to the sea.² Rainfall is also highly variable; the same area can experience droughts one year and floods the next.

With continuing growth in global population coupled with the demand for rising levels of consumption associated with expanding economic activity, freshwater is becoming an increasingly scarce resource. In many countries, particularly developing countries with high levels of population growth and low or variable rainfall, the situation is fast reaching crisis proportions. The increasing effects of climate change are now starting to exacerbate the situation. Table 1 illustrates the decline in per capita availability of freshwater by region and in selected countries.

A country or region will experience periodic water stress when the annual supply of renewable freshwater supplies fall below 1,700 m³ per person. The global average is about 7,400 m³ but withdrawal only amounts to about 9 percent or 680 m³ per person. This low level of withdrawal reflects the losses to evaporation and floods.

Table 1

Decline in per capita availability by region and in selected countries, 2000-2025 predicted

Region Example country	Per capita water availability (m ³ per person per year)	
	2000	2025
Africa	4,500	2,500
Ethiopia	2,400	1,000
Kenya	600	200
Morocco	900	500
South Africa	1,100	800

¹ Rosegrant, Mark W., *Water Resources in the Twenty-First Century: Challenges and Implications for Action: Food, Agriculture, and the Environment*, Discussion Paper 20; IFPRI 1997

² Seregedin, I., *Towards Sustainable Management of Water Resources*. The World Bank. 1995

Table 1—Continued

Decline in per capita availability by region and in selected countries, 2000-2025 predicted

Region Example country	Per capita water availability (m ³ per person per year)	
	2000	2025
Asia	3,400	2,300
India	1,400	800
Pakistan	600	200
China	1,900	1,500
Jordan	100	100
Uzbekistan	2,300	1,600
Australia & Oceania	75,900	61,400
Europe	3,900	3,900
Russia	29,000	30,600
Poland	1,200	1,100
N. America	15,400	12,500
Jamaica	3,000	2,200
S. America	33,400	24,100
Guyana	291,000	230,000

Source: Comprehensive Assessment of the Freshwater Resources of the World, Stockholm Environmental Institute 1997

Countries are often dependent on international agreements with neighboring countries for water since approximately 15 percent of all countries receive more than 50 percent of their available water from countries situated upstream. The potential for tension and conflict between nations is clear.

Where planning and management of water resources are ineffective and uncoordinated, it places a major constraint on the reduction of poverty. Poor institutions at all levels from the state to the household have the greatest difficulty in establishing their claims to water. This exclusion needs to be addressed in the management and allocation of water, but political patronage frequently results in decisions driven more by expediency than efficiency or equity.

Drinking Water and Sanitation Coverage

One billion poor people are excluded from their right to basic water services. Almost two and a half billion do not have access to sanitation and are forced to live in degrading and unhealthy environments. Three million children die each year from diarrhea related disease, and yet the Convention on the Rights of the Child (1989) is clear on a child's right to clean drinking water and freedom from the dangers of environmental pollution. Water is central to the lives of women, and yet they are almost invariably excluded from decisions regarding its management and allocation.

Statistics on water and sanitation are produced by the Joint Monitoring Programme of the World Health Organization (WHO) and the United Nations Children Fund (UNICEF) based on data reported by 152 countries. Table 2 combines the results for the 40 most populous countries in Africa, Asia and Latin America, and compares the preliminary 1999 results with the results in 1970, 1980, and 1990. Table 3 shows the preliminary 1999 results subdivided by region.

Table 2.

Drinking water and sanitation coverage (%) for Africa, Asia and Latin America combined, subdivided into urban and rural (1970-1999)

Year	1970	1980	1990	1999
Urban water	65	74	82	92
Rural water	13	33	50	71
Urban sanitation	54	50	67	81
Rural sanitation	9	13	20	31

Table 3.
Drinking water and sanitation coverage subdivided by region, 1999

Region	Population (millions)	Percentage with access		Number unserved (millions)	
		Safe water	Sanitation	Safe water	Sanitation
Africa	784	62	63	302	289
Latin America & Caribbean	519	83	74	87	137
Asia	3,683	83	46	627	2,003
Total	4,986	80	52	1,016	2,429

Table 2 shows a pattern of steady progress over the last three decades, but there is still a huge task ahead because many people remain without services. Good progress has been made in water. In Asia, the percentage of the population with access to safe water has doubled over the last 20 years to 83 percent. In Africa, by contrast, over one third of the population remains without access to safe water, coverage rising from 45 to 62 percent since 1980.

The figures for sanitation are worse than those for water in almost all regions. Sanitation coverage has increased more slowly, and the numbers unserved are much larger. 2 billion of the 2.4 billion people lacking adequate sanitation live in Asia. In India, for example, where major improvements have been achieved in water supply, less than 31 percent of the population have adequate sanitation.

Although the figures for urban areas are higher than those for rural areas, almost all the world's population growth in the coming years will be in poor urban areas in developing countries. The demand for urban water and sanitation will reflect the population growth and will be increasingly difficult to satisfy.

Many poor urban dwellers live in informal settlements around major cities. They are particularly vulnerable because they normally lack legal title to the land they live on and have little in the way of community organization or political voice to demand an adequate service level. Existing services are often poorly maintained or inoperable: losses of water in excess of 50 percent are common and water may not reach the extremities of the piped system due to lack of pressure. Sewers may be blocked, damaged or non-existent and will typically discharge to a water course without treatment. This is the situation for millions of people. Ironically, they often have to pay private water vendors much higher prices than the price of water from the piped city supply.

Coverage figures in some countries are also affected by contamination of drinking water with natural or man-made substances that can threaten health. An example attracting global attention is the high concentration of arsenic in groundwater in Bangladesh. This affects large areas of the country, with between 10 and 60 million estimated to be at risk.³

LESSONS LEARNED

Why is water critical to poverty reduction?

Poor people themselves consistently place lack of water as one of their main poverty indicators and give it top priority in their own visions of the future. The poor are the most vulnerable to changes in the availability of water resources and are the least able to cope with change. If there is a failure to find solutions to water resources management and environmental sanitation, their capacity to achieve long-term livelihood security, including a healthy and secure living environment, is substantially reduced.

Water and sanitation services attack poverty at the household level in four main ways:

- Closer and more secure access to water and sanitation save large amounts of time in collecting water, and in finding a place to defecate.
- Water can be used for horticulture, household livestock production, and in supporting micro-enterprise such as brick making and pottery.
- Particularly in urban areas, improved water supplies can be much cheaper than water vendors.
- Improved water and sanitation reduce the burden of water and excreta-related diseases.

Good water resources management can often provide advance warning of floods and promote flood preparedness to mitigate the effects of flooding. The poor that are forced by circumstances to live in marginal areas within flood plains are the direct

³ British Geological Survey, Arsenic Study Bangladesh, 1999.

beneficiaries. Floods are the most common natural disaster and cause the greatest number of deaths and the most damage. Flood related deaths are not simply caused by drowning and direct injury but also by associated diseases and famine. Assets including land and livestock are degraded or lost.

Poor people also rely on the natural environment to a far greater extent than richer people do, so they benefit from the sustained availability of natural resources of all sorts, such as fish stocks.

Why are hygiene and sanitation important?

Water-related diseases including diarrhea are the single largest cause of human sickness and death. Deaths from diarrheal disease have decreased over the last decade, but it is estimated that one child dies every ten seconds from this cause.⁴ The water-related diseases that afflict the poor are mainly infectious and parasitic diseases. There are four main types:

- Fecal-oral infections, which mainly cause diarrhea and include cholera, typhoid and dysentery. They can be spread by contaminated water or, more often, by poor hygiene. More than 90 percent of the health benefit of water supply stems from its impact on this group.
- Skin and eye infections, including trachoma, an important cause of blindness, are also associated with poor hygiene.
- Various worm infections, particularly bilharzia that is caught by wading in water contaminated with excreta and infested with snails.
- Diseases spread by insects such as mosquitoes that breed in water.

Improvements in water supply, sanitation and hygiene are important barriers to the water-related infectious and parasitic diseases. Research carried out by Esrey and Habicht⁵, and Esrey et al⁶ in a range of development contexts showed that safe excreta disposal led to a reduction of childhood diarrhea of up to 36 percent. Handwashing, food protection and improvements in domestic hygiene, brought a reduction in infant diarrhea of 33 percent. In contrast, *improving water quality alone produced limited reductions in childhood diarrhea of 15-20 percent*. Reductions in other diseases, such as bilharzia (77 percent), ascariasis (29 percent) and trachoma (27-50 percent) are also related to better sanitation and hygiene practices. Only reduction in guinea worm can be totally ascribed to the quality of water.⁷

Studies of the effects of water, sanitation, and hygiene interventions show that the greatest improvements are achieved when the interventions occur together. Besides reductions in diarrhea, there are improvements in nutritional status, including the reduction in the prevalence of stunting and wasting of children, as well as savings in time and energy expenditure.⁸

Better sanitation not only reduces the risk of disease transmission but also provides privacy, convenience, safety and dignity. Many people, particularly women, are willing to pay for improvements in sanitation for these reasons rather than health. Access to a toilet at home reduces women's and girls' vulnerability, while the availability of toilets at school can be a strong factor in encouraging girls to attend.

How should water be managed?

"As populations grow and water use per person rises, demand for freshwater is soaring. Yet the supply of freshwater is finite and threatened by pollution. To avoid a crisis, many countries must conserve water, pollute less, manage supply and demand, and slow population growth."⁹

Conservation and management of freshwater supplies in the face of growing demand from population growth, irrigated agriculture, industries and cities will require coordinated responses to problems at local, national, and international levels.

Local initiatives show that water can be used more efficiently. When communities and municipalities manage their freshwater resources, they also manage other nat-

⁴Esrey, S. et al. Health Benefits from Improvements in Water Supply and Sanitation. Technical Report No.66, Water and Sanitation For Health Project, Arlington, VA.

⁵Esrey, S., and Habicht, J., Epidemiological Evidence for Health Benefits from Improved Water and Sanitation in Developing Countries, Epidemiological Reviews, 1, 117-128, 1986.

⁶Esrey, S.A., Potash, J.B., and Schiff, C. Effects of Improved Water Supply on Ascariasis, Diarrhea, Dracunculiasis, Hookworm Infection, Schistosomiasis and Trachoma, Bulletin of the World Health Organization 69(5): 609-621. 1991.

⁷Van Wijk, C., Murre, T., revised Esrey, S. Motivating better hygiene behavior: Importance for public health mechanisms of change. UNICEF, New York. 1995.

⁸Esrey, S.A. Sustaining Health from Water and Sanitation Systems, Proceedings of 21st WEDC Conference, Kampala, Uganda. 1995.

⁹Hinrichsen, D., Robey, B., and Upadhyay, U.D. Solutions for a Water-Short World, Population Reports, Series M, No. 14. John Hopkins University School of Public Health, Population Information Program, September 1998.

ural resources better and improve sanitation. This is because freshwater resource management requires soil conservation, forestry management, and control of pollution from excreta, agricultural runoff, industrial effluent and solid waste. At the national and international levels, especially in water-short regions with dense populations, adopting a watershed or river basin management perspective is a needed alternative to uncoordinated water-management policies by separate jurisdictions.

This approach, known as integrated water resources management (IWRM) has been advocated widely as a means to incorporate the multiple competing and conflicting uses of water resources.

AGUA demonstrates another aspect of water management and the most important lesson learned over the last 25 years. The importance of putting people at the center and recognizing their right to affordable access to safe water and sanitation and to participate in decision-making. The rights, responsibilities and roles of individual households and communities need to be defined within an institutional framework for participatory planning and management. There need to be strategies for increasing awareness and technical, managerial and administrative capacity at community and local government levels. Particular attention should be paid to the needs, roles and skills of women and indigenous communities as critical actors in safeguarding and monitoring water resources.

Who should pay for water?

How to finance water and sanitation services has been the subject of much debate over the last decade. Many governments have provided these basic services, bearing both the capital and the operating costs and charging little or nothing to the users. We have learned from world wide experience that services provided freely or at very low cost are not respected or conserved. Resources for proper operation and maintenance are often lacking, and there is insufficient funding for further capital investment. This approach can be summed up as “free service means no service”¹⁰. These concerns, together with concerns over efficient allocation, have led to the recognition of water as an economic good.

Putting people at the center implies that a dialogue must be started with users and communities at the initial stages of projects, on levels of service, tariffs, revenue collection and administration of services. Services with their associated costs are developed to meet local conditions and user demand. Increasingly the evidence is that the demand-responsive approach leads to better recovery of services and more sustainable services. Consultations vary in complexity from small villages to large cities but follow the same principle of responding to demand.

Tariff structures are designed to ensure equity and to avoid the rich benefiting at the expense of the poor. In the case of a regular service, experience shows that recovering full operating costs and part of the capital costs from poor people is often possible (because piped water is normally cheaper and more convenient than water purchased from a private vendor). In some cases a stepped tariff system may need to be applied, so that subsidies can be generated for those who cannot afford regular tariffs.

At the current level of investment in drinking water supply and sanitation, universal coverage would be possible in 25 years but given rich people's power and ability to attract funds to satisfy their higher water demands, some experts predict that it may take up to 50 years¹¹. Economic and legislative instruments can focus funds on the unserved and underserved, but efficient and effective regulation, cost recovery, and monitoring are required to ensure optimal application of these instruments.

Why is gender important ?

Women have not been adequately involved in the decision-making and planning of water and sanitation programs. This has undermined the success of many programs. Women are frequently the main water carriers and users. They are usually responsible for and influential over the health of their children and families although they are not usually expected to perform the role of decision-making at community level. It should also be realized that the women in a community are not a homogeneous group. For example, single women may have different priorities to women with dependants or partners. The consideration about gender is not just about discrimination against women. It refers to the fact that men and women have different roles in society, and that this frequently gives rise to different needs and priorities. Without understanding the roles played by these different groups, or the

¹⁰ Water Supply and Sanitation Collaborative Council. Vision 21: A Shared Vision for Hygiene, Sanitation and Water Supply and A Framework for Action. Geneva. 2000

¹¹ Department for International Development, UK. Addressing the Water Crisis—Healthier and More Productive Lives for Poor People, Consultation Document, March 2000.

barriers to their participation in certain activities, incorrect assumptions will be made by project planners.

Chairman BLILEY. Thank you.

We will now hear from Ms. Adrianna Quintero, project attorney for public health, Natural Resources Defense Council. Ms. Quintero.

STATEMENT OF ADRIANNA I. QUINTERO

Ms. QUINTERO. Thank you, Mr. Chairman. Good morning. My name is Adrianna Quintero, and I do represent the Natural Resources Defense Council. We appreciate your calling this meeting. We are a nonprofit, public interest organization working on environmental issues and public health issues across the country and beginning to work around the world. With over 400,000 members nationwide, we look forward to the opportunity of adding and contributing to the solutions to the need for safe drinking water.

For humans everywhere, water means life. Water gives life, and too often, through droughts, floods and disease, takes it away. Inadequate sanitation, lack of access to clean sources, and poor or no water treatment in rural and urban-perimeter areas have resulted in a worldwide public health crisis. I need not repeat some of the figures that we are all familiar with, but they are, in fact, staggering and startling. Something must be done before this does become a political crisis.

Most unfortunate are the children in the developing world and those who have no voice here in Washington, or even in their own nations' capitals. It is them who we have to think of in making our decisions. The problem, however, affects us all. In urban and surrounding areas worldwide, millions are forced to subsist on drinking water contaminated with sewage, arsenic, pesticides, or chemicals released from industrial plants. Large cities in many nations regularly ration their water due to the limited access to potable drinking water sources and an aging infrastructure. Even here in the United States, where thankfully our problems are nowhere near those in the developing world, much of our Nation's drinking water infrastructure is also aging and outdated, and many of our drinking water sources are contaminated. In fact, daily, many of our surface water and groundwater sources are being contaminated by the inappropriate use of pesticides and chemicals which have not been adequately tested, despite this committee's, Mr. Chairman, great efforts on the Food Quality Protection Act and the Safe Drinking Water Act.

The Safe Drinking Water Act of 1996, which, Mr. Chairman, was instrumental, brought the need for safe drinking water to the forefront. The problem is this issue is still not in one of the top rungs of the international and political agendas. It needs to be an integral part of our political dialog.

There are solutions. Through increased coordination through government and nongovernmental organizations, the U.S. leadership, and through providing additional congressional support and guidance and funding for agencies who work to improve this problem, the need for global drinking water can soon begin to improve. Over time we will save millions of children's lives.

Additionally, ironically, as we talk about the need for safe drinking water around the world, as Mr. Brown mentioned, Congress is currently voting to extend the statutory deadline set by the Safe Drinking Water Act for updating the U.S. arsenic standard. The National Academy of Sciences does continue to say that this is a public health need and that we need to update the standards set back in 1942 when we had no knowledge that arsenic could cause cancer. The EPA, however, has repeatedly failed to meet imposed deadlines to update the standard and continues to seek delays, despite the fact that our standard is five times higher than the World Health Organization's and the standard in many developing nations worldwide. Further delay will only continue to put our population at risk.

At the current 50-parts-per-billion standard, the National Academy estimates that 1 out of 100 people are at risk of getting cancer. This is an unacceptable risk and well over the 1 in 10,000 factor for cancer that EPA normally assigns to toxins and contaminants.

The world looks to us as a role model, yet here we have fallen far behind the curve in protecting our citizens from the risks of arsenic. Any further delay sends the wrong message to our citizens and the world and poses a significant health risk to tens of millions of Americans.

The problem, of course, is much worse globally. With millions of people in the midst of what has been termed the largest mass chemical poisoning by drinking arsenic-laced well water, primarily concentrated in Bangladesh, China, India, Taiwan, and parts of South America, this extreme arsenic poisoning is due to the use of well water that contains what is apparently naturally occurring arsenic. This has caused an epidemic of skin lesions, vascular and cardiac problems, and widespread bladder, lung and skin cancer. We cannot wait for further evidence. The problem is there, and something must be done. There are solutions even to this tremendous problem. Tapping new, clean wells can often lead to great successes.

Microbial contamination, of course, is one of the greatest problems worldwide, and as we have discussed, any type of improvement on treating water for microbial contaminants can save millions of lives.

Problems, nevertheless, are there and must be addressed. We are all familiar with the image of the child suffering the painful effects of dehydration due to drinking contaminated drinking water. Dehydration, which is generally the result of diarrhea and dysentery due to *Giardia*, *Cryptosporidium*, cholera and typhoid, often leads to death for too many children. We must begin also by realizing that this type of contamination is not a problem exclusive to foreign shores. Developed nations like the United States also experience periodic outbreaks, such as the *Cryptosporidium* outbreak in Milwaukee, Wisconsin, and several scares that we have had here in the DC area. Most recently in Canada as well, the Walkerton, Ontario, tragedy also provided a wakeup call to many for the risk of contamination.

Even here, only recently have we imposed stricter standards through the Safe Drinking Water Act to address the risk of *Cryptosporidium* and other microbes in tap water. Nine out of ten

large U.S. water systems, including New York and San Francisco, are still using water treatment technologies that date from World War I and are not filtering their water.

In addition, we must consider the fact that while chlorine has saved many lives, it is also ineffective against many parasites and many types of infectious disease. Additionally, recent toxicological studies have found evidence of potential adverse reproductive effects from chlorination by-products. Studies of pregnant women drinking chlorinated water and animal studies have shown that this may cause certain birth defects, spontaneous abortion, low birth weight and other effects. We must consider this a real risk and look to alternatives such as ozonation combined with granular activated carbon, membrane filtration, or disinfection through ultraviolet light.

What is more, in working in the developing nations, we must not limit ourselves to simply providing chlorination as a solution. We must look to small-scale UV light systems and other types of simple filtration that acknowledge the need for chlorine removal.

NRDC commends the committee for focusing on this crucial issue. The United States must assume a leadership role in addressing the need for global safe drinking water so that we may take these plans out of the meeting room and put them in action. The solutions are available and workable. However, the global community must recognize that this is a problem and must make a concerted effort toward solving this problem.

Awareness of the global need and implications of failing to act must also be brought to the forefront. As the chairman mentioned earlier, there is the risk of having many of these crops, which are grown with contaminated water and with pesticides that are no longer allowed to be used here in the United States, are being brought into our shores. This is an era of globalization, and we must realize that these risks are, in fact, very, very real.

Congressional leadership can also help bypass the traditional and somewhat inefficient aid mechanisms.

In conclusion, NRDC thanks the committee for opening the dialog on the need for safe global drinking water. We must begin at home, educate our people on this need, and educate others worldwide on the need to protect our existing sources and to provide clean drinking water for all.

We look forward to working with Congress and the new administration. Thank you for your time.

[The prepared statement of Adrianna I. Quintero follows:]

PREPARED STATEMENT OF ADRIANNA I. QUINTERO, PROJECT ATTORNEY, NATURAL
RESOURCES DEFENSE COUNCIL

INTRODUCTION

Good morning, my name is Adrianna Quintero, project attorney for the Natural Resources Defense Council (NRDC), a national non-profit public interest organization dedicated to protecting public health and the environment with over 400,000 members nationwide. We appreciate the opportunity to testify today on the global need for safe drinking water.

For humans everywhere water means life. Water gives life and often, through droughts and floods, takes it away. For many people in the world today, however, it is water they drink that too often brings death and disease. Inadequate sanitation, lack of access to clean water sources and poor or no water treatment in rural and urban-perimeter communities has resulted in a worldwide public health crisis.

One out of every four people on earth (1.2 billion) cannot drink water without risk of disease or death. Every year approximately 4.6 to 6 million people or more will die from diarrhea and dysentery, generally from waterborne disease-carrying organisms. Approximately 12,600 or more children will die each day. According to the United Nations, "given current trends, as much as two-thirds of the world population in 2025 may be subject to high water stress." The devastation most heavily affects children in the developing world who often have no voice in Washington or world capitals.

The problem affects us all. In urban and surrounding areas worldwide, millions are forced to subsist on drinking water contaminated with sewage, arsenic, pesticides, or chemicals released from industrial plants. Large cities in many nations must regularly ration their water due to the limited access to potable sources and aging distribution systems. Even here in the United States, while thankfully our water generally is safer than that in many developing nations, much of the nation's drinking water infrastructure is also aging and outdated and many of our drinking water sources are contaminated.

The Safe Drinking Water Act of 1996 brought the need for safe drinking water to the forefront and many in this Committee were instrumental in its passing. The issue, however, has not made it to the top rung on the national or international political agenda. We must make global drinking water an issue in the international political dialogue.

The problem is huge, but there are solutions. The increased coordination of governments and non-governmental organizations, US leadership and additional congressional support and funding for agencies working to improve global water quality and availability can, over time, save millions of children's lives.

The Problems Affect Us on our Shores and Around the World

Ironically, as we talk about the tragic state of safe water around the world, Congress is voting to extend the statutory deadline set by the Safe Drinking Water Act Amendments of 1996 for updating the U.S. arsenic standard. A 1999 report by the National Academy of Sciences (NAS) determined that arsenic in drinking water causes bladder, lung and skin cancer, and may cause kidney and liver cancer. The study also found that arsenic harms the central and peripheral nervous systems, heart and blood vessels, and causes serious skin problems, including pre-cancerous lesions and pigmentation changes. In addition, the NAS report and peer-reviewed animal studies have found that arsenic also may cause birth defects and reproductive problems.

The need for updating the standard, however, is long overdue. As it stands, the U.S. standard for arsenic has not been updated since 1942, before health officials knew that arsenic causes cancer. EPA has repeatedly failed to meet court-imposed deadlines to update the standard. This 58 year-old standard is currently five times higher than the standard set by the World Health Organization and the standard in many other countries. It must be reduced now. Further delay will only continue to put the US population at risk. At the current level of 50 parts per billion, the NAS estimates that one out of 100 people are risk getting cancer, an unacceptable risk, well over the one-in-10,000 risk factor for cancer that EPA normally assigns for toxins and contaminants. The World looks to the U.S. for guidance. Here we have fallen well behind the curve in protecting our citizens from the risks of arsenic. Any further delay sends the wrong message to our citizens and the world, and poses significant health risks to tens of millions of Americans.

The problem is much worse globally with millions of people in the midst of what has been termed the largest mass chemical poisoning by drinking arsenic-laced well water. Primarily concentrated in Bangladesh, India, China, Taiwan, and parts of South America, this extreme arsenic poisoning is due to the use of well water that contains what is apparently naturally-occurring arsenic. The arsenic has caused an epidemic of skin lesions, vascular and cardiac problems, and widespread bladder, lung, and skin cancer in the affected regions. While the problem of arsenic contamination can be somewhat more difficult to solve than microbial contamination, problems can be avoided by tapping different cleaner water sources, or the use of well-demonstrated on-site treatment.

Microbial Contamination

More than any other medical or public health advancement, public health experts attribute more lives saved over the past 150 years in the United States and other developed nations to the provision of potable, treated water, bar none. Problems nevertheless persist. We are all familiar with the image of the child suffering the painful effects of dehydration due to drinking contaminated water. This microbial contamination from parasites like *E. Coli*, *Giardia*, *Cryptosporidium*, *Shigella*, *V.*

Cholera, Typhoid, and other disease-carrying organisms lead to an early death for too many children worldwide. The United Kingdom Institute of Child Health estimates that in developing countries the average child may suffer from diarrhea ten times per year and one in ten will die before the age of five from diarrhea and dehydration.

We must begin by realizing that microbial contamination is not a problem exclusive to foreign shores. Developed nations themselves experience periodic outbreaks of microbial disease, such as the *Cryptosporidium* outbreak in Milwaukee, Wisconsin, USA in 1993 that sickened over 400,000 citizens and killed over 100, or the more recent New York State county fair where numerous children were sickened. An unofficial estimate by the Centers for Disease Control (CDC) estimates that waterborne disease causes 940,000 illnesses and 900 deaths per year in the U.S. In Canada, the Walkerton, Ontario tragedy earlier this year has provided Canadians with a new awareness of the vital role treatment facilities have for public health.

Even here in the US where the legislative and regulatory structure provides us with a set of enforceable standards, only recently have stricter measures to address *Cryptosporidium* and other microbes in tap water been proposed. Nine out of ten big US water systems is still using water treatment technologies that date from World War I. In addition, while we have saved many lives through basic disinfection, research now shows that our traditional methods of simple chlorination, can pose substantial risks, including cancer risks. Chlorine is ineffective against many parasites, and infectious disease caused by long-understood microbial contaminants. Recent epidemiological and toxicological studies have found evidence of potential adverse reproductive effects from chlorination byproducts. Studies of pregnant women drinking chlorinated water, and of animals have found that some chlorination byproducts may cause certain birth defects spontaneous abortions, low birth weight, and other effects. We must consider this risk real as long as we continue to rely on chlorination as our primary method of water purification, we must also explore treatment options such as ozonation combined with granular activated carbon, membrane filtration, or disinfection through ultraviolet light. Some filtration systems available on a small scale in developing nations, however, can provide rural communities with a filtration and purification system that is simple to use and usually meets US drinking water standards. One group, Industry for the Poor, produces and provides low-cost, easy-to-use filters that provide (1) filtration, (2) chlorination, and (3) chlorine removal. Other technologies, such as small scale UV light disinfection, also are available for use in developing countries.

Where Do We Go From Here

NRDC commends the Committee for focusing on this crucial issue. The United States must assume a leadership role in addressing the need for global safe drinking water so that we may take these plans out of the meeting room and put them into action. The solutions are available and workable. For poorer countries the failure to enforce environmental laws and address potable water needs stems from a need to commit limited resources to more pressing problems. Through careful funding initiatives this need not be true. For pennies per life improved or saved, the global community could rescue millions of children from misery or death from waterborne parasites with simple sanitation improvements and existing, off-the-shelf water treatment and delivery technologies.

Awareness of the global need and the implications of failing to act, however, must be brought to the forefront through awareness-building initiatives, funding programs, and executive actions. The US must lead the world's awareness and public understanding in developed nations and build an effective international coalition of religious, health, environmental, medical, international relief, and work with coalition non-governmental organization (NGO) partners and others to resolve drinking water problems—now.

Even if such leadership were not our moral obligation—which we believe it is—we must recognize that in this day of globalization and international trade waterborne disease plaguing developing nations can spread to developed nations. Imported foods can be grown or washed with contaminated water, and waterborne disease that may reach developed nations via travelers, ship ballast water, or by other means. As citizens of developed nations travel to these regions of our world, they can all bring the misery felt in less-developed nations to the doorstep of the developed world.

Heads of state and other senior government officials from nations in which drinking water problems are most severe should be called upon to publicly discuss and assess the state of their water. An ongoing monitoring system must be in place to encourage our progress towards safe water for all.

Congressional leadership can also help bypass the traditional and sometimes inefficient aid. The US must recognize that solutions likely will vary with the community, but clearly will rely heavily upon participation of the local population to encourage a sense of “buy in” among local people in order to succeed. Awareness, however, must begin at home. We must educate the US public about the need to take action at home and encourage action abroad.

CONCLUSION

In conclusion, NRDC thanks the Committee for opening the dialogue on the need for safe global drinking water. Here in the US we must continue to obligate EPA to comply with the requirements of the 1996 Amendments to the Safe Drinking Water Act. With its implementation, the U.S. will begin to achieve substantial public health gains and set an example for less-developed nations worldwide.

Mr. TAUZIN [presiding]. Thank you, Ms. Quintero.

Finally, Ms. Payal Sampat representing the Worldwatch Institute here in Washington, DC.

STATEMENT OF PAYAL SAMPAT

Ms. SAMPAT. Thank you.

Good morning to the remaining members of the committee. My name is Payal Sampat, and I am a research associate at the Worldwatch Institute. Worldwatch is an independent, nonprofit organization based here in Washington, DC, and we conduct research on global, environmental and development issues. Many thanks for this opportunity to testify on the global need for access to safe drinking water.

My research has focused on persistent forms of water pollution, in particular the chemical contamination of underground sources of water, or groundwater. Groundwater is the primary source of drinking water for some 1.5 billion people worldwide.

As my colleagues have pointed out, in much of the developing world, microbial contamination of drinking water is still the most urgent water quality concern. Over 1 billion people on this planet do not have access to water that is uncontaminated by pathogens. But developing nations and the world as a whole are even less prepared to deal with a more persistent and insidious threat to drinking water, which is the contamination of water supplies by industrial and agricultural chemicals. Consequently, some of the poorest nations in the world now face a double burden. As they struggle to provide their citizens with microbe-free water, they must also grapple with the growing threat of toxic chemicals in their drinking water supplies. My presentation will focus on this latter threat; namely, the chemical contamination of drinking water.

There are four main points I would like to make. First, the chemical contamination of water has increased as chemical use and disposal has grown in both develop and industrial countries. Second, there may be long lag times between the time the chemical is consumed and the appearance of any health effects. Third, chemicals are often found in combination, and the health effects of consuming these mixtures are still not well understood. Finally, an effective policy response will require preventing chemical pollution in the first place, rather than trying to depend on costly, end-of-pipe water treatment.

Several studies indicate that the concentrations of certain chemicals in our water supplies have increased as the use of the chemical has grown. One example comes from nitrogen fertilizer. In

northern China, for example, where fertilizer use has been rising, more than half of the wells tested in 1994 had nitrate concentrations that exceeded World Health Organization drinking water guidelines. Reports from regions as diverse as Sri Lanka, Romania, Mexico and the United States as well show similar nitrate pollution of groundwater. When consumed at unsafe levels by infants, nitrate can block the oxygen-carrying capacity of their blood, and this can cause suffocation and even death. In adults, nitrate has been linked to miscarriages in women and to an increased risk of certain kinds of cancers.

Some of the greatest shocks are beginning to be felt in places where chemical use and disposal has climbed in recent decades, but where the most basic measures to shield water have not been taken. In India, for example, 22 major industrial zones were surveyed in the mid-1990's, and groundwater in every one of them was found to be unfit for drinking and contaminated by a toxic brew of chemicals. Because many of the chemicals now commonly found in our water supplies do not degrade easily, their levels may, in fact, accumulate over time.

After half a century of spraying DDT in the eastern Indian States of West Bengal and Bihar, this chemical was detected in groundwater at levels several thousands times higher than what is considered an acceptable dose. And these persistent chemicals may remain in water even after their original use has been terminated. In the United States the soil fumigant DBCP was banned in 1977, but it still turns up in our water supplies. In the San Joaquin Valley in California, a third of the wells sampled between 1971 and 1988 had levels at least 10 times higher than the maximum allowed for drinking water.

My second point is that there may be long lag times between consuming a chemical and the appearance of any health effects, and an example of this comes from Bangladesh, which Ms. Quintero just talked about. Concerned about the risks of water-borne disease, international aid agencies launched a massive well-drilling program in the 1970's to tap groundwater instead of polluted surface water supplies. At this point, 95 percent of the country uses groundwater for drinking. However, the sediments of the Ganges aquifers are naturally rich in arsenic, thus exposing the population to the heavy metal.

Because the effects of chronic arsenic poisoning can take up to 15 years to appear, the epidemic was not recognized until it was well under way. The first signs were skin sores and lesions, and later stages of arsenic poisoning can lead to gangrene, skin and bladder cancer, damage to vital organs, and eventually death. Experts estimate that arsenic in drinking water could threaten the health of between 20 and 70 million Bangladeshis and between 6- and 30 million people in West Bengal in India.

My third point is that chemicals are often found in combination, and the health effects of consuming these mixtures are not well understood. Most countries do not have water quality standards for all of the hundreds of individual pesticides in use. The U.S. EPA, for instance, has drinking water standards for just 33 of these compounds, to say nothing of the infinite variety of toxic blends now trickling into our water supplies. The USGS detected multiple pes-

ticides in groundwater at nearly a quarter of the sites sampled across the United States between 1993 and 1995. In some States such as Washington State, more than two-thirds of water samples contained multiple pesticides.

Similarly, the USGS found that 29 percent of wells near urban areas in the United States contained multiple volatile organic compounds. The lead researcher in the USGS study notes that because current health criteria are based on exposure to a single contaminant, the health implications of these mixtures are not known. Exposure to a single VOC, volatile organic compound, can be dangerous to human health when consumed even in small concentrations. Another unpredictable element is the interaction between these compounds and the chemicals commonly used by utilities to disinfect water, such as chlorine.

This brings me to my final point, which is that prevention of chemical pollution of water is key. Given how much damage chemical pollution can inflict on public health, the environment, and the economy once it gets into water, it is critical that the emphasis be shifted from end-of-pipe responses to preventing the damage in the first place. This is done by protecting water sources and by using less chemicals in the first place.

For example, the National Research Council estimates that in the United States, between one-third and half of nitrogen fertilizer applied to crops cannot be utilized by the plants, and some of this leaches into groundwater. Experts at the United Nations Food and Agricultural Organization say that in many countries, pesticides could be applied at one-tenth current amounts and still be effective. Research into and support of less chemical-intensive agricultural and industrial practices is an important step toward protecting the health of the planet's people and the water they consume.

I will be happy to answer any questions, and, once again, I thank you for this opportunity to testify.

[The prepared statement of Payal Sampat follows:]

PREPARED STATEMENT OF PAYAL SAMPAT, RESEARCH ASSOCIATE, WORLDWATCH
INSTITUTE

Good morning, Mr. Chairman and members of the Committee. My name is Payal Sampat, and I am a research associate at the Worldwatch Institute. Worldwatch is an independent, nonprofit environmental research organization based here in Washington, DC. Our mission is to foster a sustainable society in which human needs are met in ways that do not threaten the health of the natural environment or future generations. To this end, Worldwatch conducts interdisciplinary research on global issues, the results of which are published and distributed to decision-makers and the media.

Thank you for this opportunity to testify on "The Global Need for Access to Safe Drinking Water." At the Institute, I work primarily on issues related to water quality. My research has focused on persistent forms of water pollution, in particular, the chemical contamination of underground sources of water, or groundwater. Groundwater is the primary source of drinking water for some 1.5 billion people worldwide.

In much of the developing world, microbial contamination of drinking water is still the most urgent water quality concern. By latest estimates, some 1.3 billion people on this planet do not have access to water that is uncontaminated by pathogens; not surprisingly, polluted water is a leading cause of infectious disease in many countries. But developing nations, and the world as a whole, are even less prepared to deal with a more persistent and insidious threat to drinking water, which is the contamination of water supplies by industrial and agricultural chemicals. Consequently, some of the poorest nations in the world now face a double bur-

den: as they struggle to provide their citizens with microbe-free water, they must also grapple with the threat of toxic chemicals in their drinking water supplies.

My presentation will focus on this latter threat, namely, chemical contamination of drinking water.

There are four points I'd like to make in my presentation. First, chemical contamination of water has increased as chemical use and disposal have grown in both developing and industrial countries. Second, there may be long lag times between consuming a chemical and the appearance of any health effects. Third, chemicals are often found in combination, and the health effects of consuming these mixtures are not well understood. And fourth, an effective policy response will require preventing water pollution in the first place, rather than trying to depend on costly end-of-pipe water treatment, which is not only costly, but in some cases, ineffective.

Some of the principal groups of chemicals detected in drinking water include fertilizers, pesticides, volatile organic compounds (such as chlorinated solvents and petrochemicals), and heavy metals. Most of my examples refer to groundwater, since that is my primary area of research, but surface water contamination by chemicals is equally serious in many regions.

1. *The incidence of chemical contamination of water has increased as chemical use and disposal have grown.* Several studies indicate that the concentrations of certain chemicals in water supplies have increased as their use has grown. One example is nitrogen fertilizer use. In California's Central Valley, for example, nitrate levels in groundwater increased 2.5 times between the 1950s and 1980s—a period in which the region's fertilizer use grew 6-fold. In Northern China, where fertilizer use has also been rising, more than half the wells tested in 1994 had nitrate concentrations that exceeded the World Health Organization (WHO) drinking water guideline. Reports from regions as diverse as Sri Lanka, Romania, and Mexico, show similar results. When nitrate is consumed at unsafe levels by infants, it can block the oxygen-carrying capacity of their blood, causing suffocation and death. In adults, nitrate has been linked to miscarriages in women, and to an increased risk of certain kinds of cancers.

Some of the greatest shocks are beginning to be felt in places where chemical use and disposal has climbed in the last few decades, and where the most basic measures to shield groundwater have not been taken. In India, for example, the Central Pollution Control Board surveyed 22 major industrial zones in the mid-1990s and found that groundwater in every one of them was unfit for drinking.

And because many of the chemicals now commonly found in our water supplies do not degrade easily, their levels may accumulate over time. After half a century of spraying in the eastern Indian states of West Bengal and Bihar, for example, the Central Pollution Control Board found DDT in groundwater at levels as high as 4,500 micrograms per liter—several thousand times higher than what is considered an acceptable dose. And persistent chemicals may remain in water long after their original use. The soil fumigant DBCP (dibromochloropropane) was banned in the United States in 1977, but it still lurks in the country's water supplies. In the San Joaquin Valley of California where DBCP was used intensively in fruit orchards, a third of the wells sampled between 1971 and 1988 had levels that were at least 10 times higher than the maximum allowed for drinking water.

2. *There may be long lag times between consuming the chemical and the appearance of any health effects.* Until the early 1970s, rivers and ponds supplied most of Bangladesh's drinking water. Concerned about the risks of water-borne disease, international aid agencies launched a well-drilling program to tap groundwater instead. By the early 1990s, nearly 95 percent of Bangladesh's people got their drinking water from tubewells.

However, the agencies, not aware that soils of the Ganges aquifers are naturally rich in arsenic, did not test the sediment before drilling tubewells. Because the effects of chronic arsenic poisoning can take up to 15 years to appear, the epidemic was not recognized until it was well under way. The first signs of arsenic poisoning include skin sores and lesions; in later stages, the disease can lead to gangrene, skin and bladder cancer, damage to vital organs, and eventually, death.

Experts estimate that arsenic in drinking water could threaten the health of between 20 to 70 million Bangladeshis and another 6 to 30 million people in West Bengal, India. As many as 1 million wells in the region may be contaminated with the heavy metal at levels between 5 and 100 times the WHO drinking water guideline of 0.01 mg/liter.

3. *Chemicals are often found in combination, and the health effects of consuming these mixtures are not well understood.* Most countries do not have water quality standards for the many hundred individual pesticides in use—the U.S. Environmental Protection Agency (EPA) has drinking water standards for just 33 of these compounds—to say nothing of the infinite variety of toxic blends now trickling into

the groundwater. For instance, the U.S. Geological Survey (USGS) detected two or more pesticides in groundwater at nearly a quarter of the sites sampled across the United States between 1993 and 1995. In the Central Columbia Plateau aquifer, which lies under the states of Washington and Idaho, more than two-thirds of water samples contained multiple pesticides.

But there is some indication of possible additive or synergistic surprises we can expect. When researchers at the University of Wisconsin examined the effects of aldicarb, atrazine and nitrate blends in groundwater—a mixture typically found beneath U.S. farms—they found that “more biological responses occur in the presence of mixtures of common groundwater contaminants than if contaminants occur singly.” Fluctuation in concentrations of the thyroid hormone, for example, is a typical response to mixtures, but not usually to individual chemicals. Other research found that combinations of pesticides increased the incidence of fetal abnormalities in the children of pesticide sprayers.

Industrial compounds such as petrochemicals and solvents are also typically found in combination. In tests conducted between 1985 and 1995, the USGS found 29 percent of wells near urban areas in the United States contained multiple Volatile Organic Compounds (VOCs); overall, a total of 46 different kinds of these compounds turned up in groundwater. But the lead researcher in the USGS study notes that “because current health criteria are based on exposure to a single contaminant, the health implications of these mixtures are not known.” Exposure to a single VOC can be dangerous to human health when consumed even in small concentrations. Women exposed to chlorinated solvents were found to have a two-to four-fold higher incidence of miscarriages. These compounds have also been linked to kidney and liver damage and childhood cancers.

Another unpredictable element is the interaction between these compounds and the chemicals commonly used by utilities to disinfect water, such as chlorine.

4. *Prevention is key.* When chemicals are found in unpredictable mixtures, rather than discretely, utilities will have to resort to increasingly elaborate water treatment set-ups to make the water safe for drinking. But given how much damage chemical pollution can inflict on public health, the environment, and the economy, once it gets into the water, it's critical that emphasis be shifted from end-of-pipe responses to preventing the damage in the first place. This is done by protecting water sources, and by using less chemicals in the first place. For example, the National Research Council estimates that in the United States, between a third and half of nitrogen fertilizer applied to crops cannot be utilized by the plants. Experts at the United Nations Food and Agricultural Organization say that in many countries, pesticides could be applied at one-tenth current amounts and still be effective. Research into less chemical-intensive agricultural and industrial practices is an important step toward protecting the health of the planet's people and the water they consume.

Mr. Chairman, I respectfully request that an article I authored on the subject of global groundwater quality be submitted as part of the hearing record to complement my own brief statements.

I would be happy to answer any questions. Thank you again for this opportunity to testify.

Mr. TAUZIN. Thank you, Ms. Sampat.

The Chair recognizes himself and then members in order.

Let me, first of all, thank you all for coming. This is, I think, the final hearing of our committee scheduled for this Congress, and it is fitting that we conclude it on an issue of not only importance here in this country, but of global significance, such as safe water for drinking and the problems associated with sanitary conditions of contaminated water.

I wanted to put something in context, first of all, Ms. Quintero, because you raised the issue of congressional action to extend the deadline on the arsenic standard. I understand Mr. Brown has made similar comments. You correctly identify a problem at EPA, that EPA has missed most of its deadlines; is that not correct?

Ms. QUINTERO. That is correct.

Mr. TAUZIN. In fact, EPA was as much as a year late in drafting its research plan; is that not right?

Ms. QUINTERO. That is correct.

Mr. TAUZIN. And they were 6 months late on the schedule in proposing the standard in the first place; is that not right?

Ms. QUINTERO. That is right.

Mr. TAUZIN. Are you aware of when the comment period finally closed on the rule?

Ms. QUINTERO. I believe it closed, I don't know the exact date, but sometime in August.

Mr. TAUZIN. No. September 20. Yes. That is our problem, and in your statement you mention the irony of us having to extend the deadline. The comment period just closed, September 20. Do you know how many comments EPA received?

Ms. QUINTERO. Yes.

Mr. TAUZIN. They received 883 comments. We are stuck with the problem of the EPA having literally missed their deadlines and finally get the comment period completed, we got 883 comments, and we may not have a choice but to extend the deadline on completing this work, simply because EPA has unfortunately put us in that position. That is where we are. I just wanted you to know that.

Let me turn to the general questions that you posed for us. In the context of world health and safety issues, we all know that there are certain essentials in our lives, and water clearly is one of them. The irony is that in America, when people are polled as to what the essentials are in their lives, they list things such as VCRs, mobile phones and computers, as though those are essentials. I grew up in a rural part of Louisiana where we understood water and air and things like food, shelter were the critical essentials, but in a great country with so many blessings like ours, we sometimes forget how critical those essentials are, not only here in this country, but where we take safe water literally for granted.

But in so many areas of the world, and I visited Tegucigalpa back in the 1980's and learned tragically that the life expectancy of life in Honduras and many other countries that are neighbors of ours are 49 years of age, primarily because of bad drinking water and unsanitary conditions, all of the conditions that you have outlined for us in your film and in your testimonies today.

I wonder if you would rank this for us. I know that obviously global warming and clean air and preservation of habitat and species, there are a lot of environmental concerns that still plague us here in this country and around the world. Where would you rank this issue that you have testified on today? Any one of you want to put it—is it at the top? Is the most serious thing affecting world health and safety and populations and children, as you pointed out very adequately in your testimony, is it the top one, Mr. Weiner?

Mr. WEINER. Let me respond very briefly by—I am not a scientist, I am sort of a—I work for PBS. I am sort of your ears and your eyes, and then we try to gather material and present it in a nonefficacy way. We have a group of scientists that advise us at Journey to Planet Earth, and I sent them an e-mail and I said, I am going to be testifying, I am going to talk on this issue. What do you think are the most important issues of water? These are pretty high people. It includes Jessica Tuckman Matthews over at the Carnegie Institute for Peace; Morris Strong, who is the Assistant Secretary General at the U.N. in terms of the Rio Conference, et cetera. And what they asked me to express to the committee was

an overwhelming concern of national security. We do recognize disease is terribly important; the economics of the situation is terribly important, but perhaps to answer the question why should we care, why should Americans care about this, on—

Mr. TAUZIN. Other than humanitarian concerns.

Mr. WEINER [continuing]. Is the issue of national security.

Mr. TAUZIN. How do you tie that; how does that fit?

Mr. WEINER. Well, let me give you an example. The Middle East is a tinderbox, and much of it is over water. There is an aquifer that is shared inequitably.

Mr. TAUZIN. I visited the River Jordan.

Mr. WEINER. Pretty tiny, isn't it?

Mr. TAUZIN. Yes. I sat on top the Golan Heights and realized how critical—it is just a little tiny river, and yet how critical it is to people who are fighting over water there.

Mr. WEINER. More critical is the shared aquifer, which is non-renewable.

We are doing a show now in Mexico dealing with the problems in Chiapas. Chiapas is an environmental story. It is inequitable sharing of resources.

We are doing a story on the Nile River Valley, which is—

Mr. TAUZIN. What you are basically saying is that it has national security implications because people will go to war, they will die, they will fight over the access to water supplies, to irrigate, drink, to live, to raise their families, right?

Mr. WEINER. Right.

Mr. TAUZIN. And the contamination, one country, one people contaminating water supplies that are critical for other people obviously will have some of the similar effects, right?

We are going to go from 5.7 billion people on this planet to 9.4 billion by the year 2050. Your film depicts what happens when populations expand dramatically without consideration for water supplies, and drinking water supplies, and sanitation disposal, and chemical treatment before it contaminates our underground water supplies. We can expect a lot more of this, I suppose, with a 9.4 billion population in just 50 years; is that right? This gets worse, not better, unless we take it and make it a huge national and international priority, right?

Mr. Jones.

Mr. JONES. Ranking, though, the catalog of the world's ills and trying to find one is tough, but, I mean, certainly water would permeate so many things, and as we were talking, I was thinking—just jotting down some points here, and you think about the things we talk about here today that are important, you can see how water impacts on—my colleagues here at the table mentioned a conflict in the macro sense. We have seen how water, if it is handled well, can smooth over conflict at local community levels. We have a project in the northwestern part of Kenya, the Kerio Valley, where two ethnic groups are constantly—nomadic ethnic groups are constantly fighting over the scarce water resources.

But doing water well in a place like that really allows you to smooth over conflict, so it has positive potential at the grassroots level too.

Another thing that we talk a lot about today is the democratization. You wonder how does water fit into that. But we have seen that in our projects that it is not enough just to build a water system or sanitation system. You need community involvement to sustain it, and we can often pull on networks of volunteers at a grassroots level. This is one step in the whole democratization process, of getting people at the grassroots level to take responsibility for their lives. That is probably one of the most gratifying things we have seen in water projects at the community level.

Mr. TAUZIN. We are getting called on a vote. Is that a warning for two votes? Let me recognize Mr. Brown.

Mr. BROWN. I thank the chairman.

Several of you mentioned the arsenic issue. I want to come back to that. Mrs. Sampat, you mentioned arsenic in the Ganges. Miss Quintero, you mentioned it in wells. Mr. Lockery, you mentioned it also in your written testimony.

We know what we need to do in this country with arsenic. We need to follow the recommendations of the EPA. We need to follow the recommendations of the National Research Council, which is an arm of the National Academy of Sciences and make the standards perhaps as much as 1,000 percent, 10 times more strict, more stringent.

I am a little troubled by the sort of let's—while not letting EPA off the hook—let's beat up EPA. Just like in this institution, this committee, we decided to beat up on the Highway Safety, and give the government—the regulators on the Firestone/Ford problem, when this same institution has done all it can in weakening those agencies that protect the public—weakening the EPA, cutting their funding, cutting a number of OSHA inspectors, cutting here, cutting there, beating up on these agencies; and then, when they do not protect the public, we wonder why don't they protect the public.

Well, it is because in the case of arsenic, the pressure from the mining industry on OMB, the pressure—in other cases you can make a whole litany of that, and it is unfortunate that we do not, when it comes time to protect the public, especially in something that the public absolutely understands like arsenic, that EPA, that Congress should not interfere.

Certainly EPA should have moved more quickly. EPA, unfortunately, succumbed too much with OMB to pressures from outside, mostly the mining industry. But EPA should have done its job better. But that doesn't mean that Congress should say, well, let's delay it even longer. Instead of January 1, this year, let's get it in next year. We will have a new administration, a new EPA administrator. And then it will get delayed even further when every scientist knows that arsenic levels are absolutely too high. So I think we know what to do in this country.

My question is for the three of you that I mentioned—Mr. Lockery, Ms. Quintero, Ms. Sampat—what do we do in the places you mentioned about arsenic? What do we do? What do they do? Briefly, each of the three of you, if you would.

Ms. QUINTERO. I will gladly begin.

First of all, you are absolutely right. Why let EPA off the hook? And our whole idea here is we have to set an example. I mean, beginning with the U.S., if we can't get things done here, we are not

going to be able to set a proper example on how things ought to be done there.

We know what needs to be done. Having Congress say the word on extending this deadline goes far beyond what is necessary to give EPA time to respond to its comments and time to actually promulgate the rule. While they may not meet the January 1 deadline and it may be tight, that is what the law says and we should respect it as it is, rather than weakening our position in front of the world forum.

As for Bangladesh, it is really the only country where I have spoken to people there. They need assistance in tapping new sources, tapping new wells, putting to use the monitoring systems that are available at low cost and the new and other treatment systems that are available to prevent this type of contamination. But the main thing is tapping new wells. And while that is not a perfect solution, it is a solution and one that, due to their economic state, has been difficult. But I believe that, as far as Bangladesh goes, that is one of the many things that can be done to assist them.

Mr. TAUZIN. Let me ask you, please, to expedite your answers. I will try to get Mr. Gillmor's questions in before we have to leave, too, so if you can expedite, please.

Mr. LOCKERY. On Bangladesh, the problem is there are something like a million tube wells in Bangladesh; and so, first of all, defining what the extent of the problem is is very difficult. Just imagine carrying out tests on a million tube wells.

The first problem is you have to agree on the test you will carry out. What test procedure are you going to use?

Then when you have defined the problem, what solutions can you use? What are the appropriate solutions? You could tap deeper aquifers. But where are the resources going to come from for doing that?

So now it is a case of finding what are appropriate technology solutions. What can you use at village level? What is affordable? What solutions are available and how well do they work?

Then, finally, when you have figured out what the problem is, what the appropriate technology is, we then have got to make people aware, got to give them access to the new technology; and we are talking about 100 million people.

And, finally, it is not as though the problem is located in one particular area of the country. It is spread across the whole country in pockets. One well can be fine, and you go a hundred meters down the road and another well may be contaminated. So I think it is a problem of huge proportions. So I think the Bangladeshis in many ways have made good efforts to deal with the problem but don't underestimate the problem.

Mr. TAUZIN. Thank you.

The Chair recognizes Mr. Gillmor for a round of questions.

Mr. GILLMOR. Thank you, Mr. Chairman.

I just want to make a comment on the comments by Mr. Brown blaming Congress for problems with arsenic. The truth of the matter is the Clinton-Gore administration proposed to delete targeted funding for arsenic research, and actually Congress has provided millions more for this research than the EPA requested. It was

\$4.8 million more in fiscal year 1997, \$500,000 more in fiscal year 1998 and \$1.6 million more in fiscal year 1991.

But I want to ask a question to Mr. Lockery and Mr. Jones because we legislate here, or at least we try to. Are there specific legislative measures that you would recommend to help in the cause? Are there legal or statutory impediments to delivering the service that do not make sense or make the job more difficult?

Mr. TAUZIN. I am going to announce for the record we will come back following the vote so we will have time to examine more issues.

Mr. BROWN. If the gentleman would yield, Ms. Sampat did not have a chance to answer.

Mr. TAUZIN. We will come back to her when we have a chance.

Mr. Gillmor has the floor.

Mr. GILLMOR. I think you heard my question. If there is something we can do or some impediments which that you have to deal with of a legal nature.

Mr. LOCKERY. As far as I am concerned, sir, I don't think I am competent to answer that question.

Mr. JONES. Also, we are not seeking a legislative remedy. I think something that is helpful, that Congress is aware of the movements toward the industry of policing itself and things such as the Sphere Standards, which are a body of commitments that the non-governmental organizations, the relief and development community have come together to assure that they deliver a quality product. I think that is a step in the right direction, and it is not something we are seeking legislative remedy for but just something that you should be aware of, that there are standards and it is important to conform to standards.

Mr. GILLMOR. Thank you.

Mr. TAUZIN. Thank you, Mr. Gillmor.

While my friend is still here, before we break, the chairman wants to take the privilege to comment that we have not beat up NHTSA for failure to do a job that it was funded to do. NHTSA, with a five cent phone call, could have returned a phone call to State Farm Insurance in July 1998 and learned that it had a recall problem. They just filed that information away in a wastebasket instead. For five cents, that is all it had to do.

NHTSA saved a lots of lives. I have congratulated and commended them. They are one of my favorite agencies. But when they fail to protect Americans on the highway I will jump on them. Absolutely.

I don't appreciate people trying to blame their problems on Ronald Reagan or anybody else—or Herbert Hoover, for that matter. Five cents was all it took to make a phone call to State Farm, and they would have known they had a recall problem. I don't beat up on EPA unless they deserve it. In this case, they deserved it. They missed their deadlines. They had money appropriated to meet their deadlines. Now we are stuck with a comment period that just ended on September 20.

But I will let my friend respond, if he would like to.

Then the committee stands in recess for about 15 minutes, I think.

[Brief recess.]

Chairman BLILEY. The committee will come to order.

Will the gentleman in the rear close the door, please? Thank you.

I believe you have a follow-up question to Ms. Sampat.

Mr. BROWN. Actually, she did not get an opportunity to answer the question that Mr. Lockery and Ms. Quintero answered on what to do with the Ganges in terms of arsenic. Thank you, Mr. Chairman.

Ms. SAMPAT. As I pointed out earlier, there are about a million wells that are affected with arsenic levels between 5 and 100 times the WHO guideline, and there are a number of international agencies in place. Basically, the situation right now is something of a triage, really, trying to make sure that the population is not exposed to increased levels of arsenic.

But I think the two lessons that come out of this, you know, the first one is the precautionary principal. What happened was in the 1970's these wells were dug because surface water was really polluted. However, there was no testing done to see if there were naturally occurring levels of arsenic in the sediment. So I think sort of applying the precautionary principal to the way we look at water and protection of water sources and prevention of chemical pollution of water is important not just for naturally occurring substances but as far as agricultural run-off and industrial effluent and so on are concerned.

Then, specifically with the Bangladesh situation, I think U.S. Assistance of the current health care and water protection efforts that are going on in Bangladesh are going to be key.

Finally, I support Mrs. Quintero's comments on the arsenic guideline in this country, although it is slightly unrelated, given the natural occurrence in Bangladesh.

Chairman BLILEY. The gentleman from Wisconsin, Mr. Barrett.

Mr. BARRETT. Thank you, Mr. Chairman. I am honored to be at what I think might be your last hearing.

Mr. Lockery, we have heard today that there is over a billion people in the world, in the developed world, that do not have access to safe drinking water. Obviously, this is a grave situation and one where the United States can and should play a leadership role.

I am curious as to how this demand in clean water affects the supply, and I asked that question to someone who represents a community that borders the Great Lakes. As you may or may not know, in 1998 a Canadian company was about to sell 150 million gallons of water from the Great Lakes to Asia before widespread concern forced the plan to be dropped. So as the need for clean drinking water to Asia and other countries around the world grows, what do you see the likelihood that calls to divert from places like the Great Lakes or other freshwater sources in the U.S. Will grow?

Mr. LOCKERY. First of all, I think there are two problems here. One is around water quality, and the other is around the quantity of water. The billion people—it is more than a billion people, of course, that do not have safe water. In a number of cases, they have water supply. Everybody has a water supply. So it is quality issue. They do not have access to safe water. They have access to some water.

With regard to the quantity, if you look at the sort of water resource figures for the world, my sense is that in many places there

are existing resources that can be used for drinking. In other words, the water is there. But it may be not possible for people to use it. It is just too far away from them.

I don't see the large shipments of water from the Great Lakes to Asia or to Africa. I think the water resources are there. It is a question of bringing them closer to people. It is a question of managing the water resources better so that you cut down pollution, you cut down agricultural run-off, soil erosion, et cetera. You make a better use of the existing resources.

Mr. BARRETT. Thank you.

Dr. Huq—is that how you pronounce it?

Mr. HUQ. Huq.

Mr. BARRETT. Huq. I understand from your testimony that sources of water contamination in the industrialized world may differ from problems in the developing countries; and I also understand that simple interventions, like filtering water through a sari cloth in Bangladesh, can reduce the spread of waterborne disease.

The community that I represent, Milwaukee, was the community that was hit hard in 1993 by cryptosporidium; and obviously many of us who work in Washington have read about the physteria which has plagued the Eastern Shore in recent years. Are there public health lessons learned or technologies implemented in the U.S. In response to these that you see as important or are we going to see more of these types of outbreaks? What is your feel there?

Mr. HUQ. Well, as I think Ms. Sampat mentioned, that nine out of ten water filtration systems in this country exist which is using the system which is 50, 100 years old. So you have to improve and introduce newer technology. That is one important thing.

Chlorination has been widely used, but there are some findings—like we published a paper that underchlorination sometimes introduce some of the organisms in a non-culturable state. It means the organisms are still alive, viable, they maintain their virulence, but they do not appear on the conventional culture method by which usually people determine whether the organisms are there or not.

So that is something we have to do in this country to improve the system of purification and also the age old pipeline where this taking place. Those kinds of research I think is very important in this country.

Mr. BARRETT. Is it easy to get those developing countries to do that type of research?

Mr. HUQ. It is easy?

Mr. BARRETT. Is it something that is being done? Are we imparting some of the knowledge that we have learned from some of these outbreaks to the developing countries at a fast enough speed, do you think?

Mr. HUQ. It is easy to some extent when we really know how much it is—how much the bigger problem is. Then probably we need to know a little more before we can really implement it.

Mr. BARRETT. Thank you, Mr. Chairman.

Mr. TAUZIN. The time of the gentleman has expired.

The gentleman from Tennessee, Mr. Bryant.

Mr. BRYANT. Thank you, Mr. Chairman, for holding this—apparently your last hearing, and it is certainly a very appropriate one.

I thank the panel for being here. As you can see from the members and our moving in and out, there are many other things going on on the Hill today; and I will be leaving very shortly to go to the floor to speak on the subject of bankruptcy reform, which is one of the issues that will be before this Congress before we adjourn. But, again, thank you for being here with us.

I have just some general questions. Perhaps if one or two of you could volunteer answers, I don't think I have enough time for each of you to respond.

But I am wondering if one of you or two of you could respond quickly on how investments in the international assistance should be prioritized and what are the most important areas, who should receive first funding and how can initial investments in safe drinking water and waste water facilities be sustained over time.

Anyone want to jump into that one? Miss Quintero.

Ms. QUINTERO. Yes. Well, very briefly.

What we need to do is, first of all, make it, as I have stated several times, a priority. If the funding is more targeted and if we are able to share our knowledge—for example, the American Waterworks Association has a non-profit branch that works internationally called Water for People. Their expertise, as we know from their work here nationally, is probably the best that you can find internationally short of some of the knowledge that we have coming from France. But they have not had the same backing and the same funding to be able to actually get into these countries and truly to do the work that we are doing here there.

There are many smaller non-governmental organizations that do that same type of work. And the importance is to recognize that it is two-fold. We need smaller groups that can go into the small rural villages and people with more urban expertise to go into these urban perimeter areas which are more and more becoming the subject of controversy today because—by virtue of the fact that access to water in rural communities is so limited that people—and access to all conveniences is so limited that people are moving to the cities, and these cities do not have infrastructures to provide water to all the people who are living around their areas.

So by providing more funding and support to our own NGO's and to our own experts, either through tax credits or I don't exactly know how, but I think we can do more and export our knowledge, because we still are respected as knowledgeable and capable of embarking on these projects. So I would suggest that is one good way to start at the beginning.

Mr. JONES. I would like to say that I think we have to be careful that, while in this day and age I would never want to downplay the importance of technology, but I think the distinction that was just made between the urban systems and the rural systems is a very important one to keep in mind. I think we have to ask why in the past have rural systems so often failed when you go back after 3 years, 5 years, 6 years and find that systems have broken down. And I think we have to emphasize the importance of sustainability, which gets you into the importance of grassroots networks that are able to mobilize populations to take ownership of these projects. You need communities that will produce volunteers and networks of people who have an ownership in these things.

So that is not to downgrade the importance of technology, certainly in the big urban situations, but in these rural situations technology might not be the silver bullet. But what you need is that very hard community-building process of drawing on human resources and community networks that allow you to sustain a system.

Mr. BRYANT. I thank you for your answers. Certainly that specifically deals with the issue of sustainability that I asked.

Again, to the entire panel, sort of shifting gears a little bit. There is apparently some dispute, at least in the academic communities, over the potential for future conflict worldwide with respect to water resources. Does anyone have an opinion on that they would like to share with this committee?

Mr. WEINER. Well, I did share it a little bit earlier. A good deal of our work in upcoming episodes in *Journey to Planet Earth*, a PBS series, is going to deal specifically with environmental security. We showed some examples of the problems in the Middle East which are quite obvious, shared aquifers and shared water resources which is exploding right now in the Middle East. I just think that, unless we recognize the issues of environmental security, things could conceivably get out of hand.

I suppose one way to bring it home to the American public is that—we are investigating the story right now that started in the Bay of Bengal in Bangladesh. A freighter took on bilge water, contaminated water and released it off the coast of Peru, and I believe, and the panel probably knows it better than I do, and started the biggest cholera epidemic in South American history. Can you imagine that if that was released in the Gulf of Mexico or the port of New Orleans? All of a sudden there would be a wake-up call in terms of why we have care about what is happening in the rest of the world.

We are also doing a story about Haiti and the collapse of Haiti. The political collapse of Haiti is directly associated with the environmental collapse of that island and hence refugees coming into the United States and the problems associated with that.

So I can cite many, many examples of things that we are exploring right now.

Mr. BRYANT. Thank you. I thank the Chair.

Chairman BLILEY. The time of the gentleman has expired.

The Chair recognizes himself for a round.

Mr. Weiner, do you have a sense or any knowledge of how the governments of Mexico or Turkey are responding to the problems presented in your films?

Mr. WEINER. No. All I can tell you is what I have seen. And I have seen in Mexico major demonstrations that have not enlisted from the government proper response. In that opening sequence in Mexico City, you saw a demonstration. That demonstration was the Sandinistas coming into Mexico City. Our cameras happened to be there. It was the first time they entered Mexico City and demonstrated for their cause. The equitable cause in Chiapas and the response from the Mexican government I think has been less than positive.

In Istanbul, when we were there a couple of years ago, the local authorities refused to accept the fact that they had a problem. We

wanted to do a story about the Kurds coming into Istanbul, and we suggested we go to the bus station where they are all coming in. And they said, why do you want to do that? Why don't you go to the airport? And we said, I don't think refugees come into the airport.

These issues are very hard for governments to recognize.

Also, Zimbabwe is another example of the government refusing to accept an environmental problem; and they turned it into a political problem to maintain their power, basically.

Chairman BLILEY. Thank you.

Mr. Lockery, what is CARE's strategy for increasing carriage in rural and urban areas?

Mr. LOCKERY. I think it is one of empowerment, Mr. Chairman. I mentioned in my testimony the need to put people at the center, and I think what we have learned through both our rural and urban programming is the need to empower communities, to build their capacity both at the individual level and the community level so they are able to make decisions for themselves on the type of service they want, the level of service; and, of course, the better the service the higher the contribution that is required. But the kernel of the strategy is this issue of empowering communities.

Chairman BLILEY. Thank you.

Mr. Jones, if Congress were to appropriate more funds in support of this issue, how would you use the funds?

Mr. JONES. Our emphasis has traditionally been on rural projects, and there would be an expansion of existing programming which I think is good programming as it exists now.

It also emphasizes, as I think as my colleague from CARE just said, the importance of empowering communities. More resources would allow us to meet more communities. We are fortunate in that we have a preexisting partner on the ground in all of the countries we work. Every country has a Red Cross or a Red Crescent Society. That Red Cross or Red Crescent has a community network. We have got to strengthen that network.

As I said earlier, it is not just the technology of digging a well, which is pretty straightforward. The challenge is sustaining that well, mobilizing the community to take ownership of it. More resources would allow an expansion of existing projects and would take a lot of pressures off movement into urban areas and movements of things like this.

Chairman BLILEY. Thank you.

Dr. Huq, you describe a simple filtration method involving saris, the local cloth of India and Bangladesh, as a way of decontaminating water from the threat of cholera. Your study finds this method has a very useful impact. How much of our arsenal must be education of developing populations about these simple techniques and about hygiene?

Mr. HUQ. This is a very important issue, education, motivation and massive public awareness. Like there is a finding, we know just hand washing reduces shigellosis tremendously. In our study at the present time, one to one villagers are now being educated how to use this filter when there is no cost involved. All they need to know is how to use the filter and filter their water when they bring it in their home. That has reduced threefold cholera cases—

I mean, threefold reduction in cholera cases in our first 3 months of study. So this is important, how to educate these people, and it takes time. All these illiterate people, they really don't understand when it is told the first time, maybe repeatedly when they are told. Once it goes in their mind and they understand, then they use it. So for education, massive amount of effort is needed.

Chairman BLILEY. Thank you.

Are there additional questions from the members?

If not, the Chair certainly wants to thank the witnesses for your testimony.

The Chair notes that some members are detained in other meetings and may have additional questions or written materials for you which they may wish to submit for the record. So, without objection, the hearing record will remain open for 30 days for the members to submit such materials or submit written questions to the witnesses and to place their responses in the recorded. It is so ordered.

Mr. BARRETT. Mr. Chairman, since this is your last hearing, if I am not mistaken, you began your career as a Democrat and as you are ending here in the committee, just remember it was the Democrats who were with you here until the very end.

Chairman BLILEY. The Chair duly notes that. Thank you. Thank you very much.

[Whereupon, at 12:04 p.m., the committee was adjourned.]