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2010 Clarke Prize Lecture Focuses on the Impacts of Human Activities on the Future Availability of Drinking Water

FOUNTAIN VALLEY, Calif. – Challenges facing our ability to provide a sustainable supply of clean drinking water for future generations were highlighted at the Seventeenth Annual NWRI Clarke Prize Lecture and Award Ceremony, held by the National Water Research Institute (NWRI) of Fountain Valley, California, on Thursday, July 15, 2010, in Orange County, California.

The Clarke Prize Lecture was given by environmental engineer Jerald L. Schnoor, Ph.D., the Allen S. Henry Chair of Engineering at the University of Iowa, who was selected as the 2010 NWRI Athalie Richardson Irvine Clarke Prize recipient for outstanding achievement in water science and technology.

The Clarke Prize was established by NWRI in 1993 to recognize outstanding research scientists in water and wastewater. Mrs. Joan Irvine Smith, daughter of the late Athalie Richardson Irvine Clarke, presented Schnoor with a medallion and $50,000 award.

In Schnoor's Lecture, entitled *Water Sustainability in a Changing World*, the term "water sustainability" was defined as "the continual supply of clean water for human uses and for other living things." The problem, according to Schnoor, is that we either have too much water or too little water to meet our needs.

Water allocations and available infrastructure are two examples of factors that affect the availability of water. These various factors change throughout time – changes, said Schnoor, "that are driven by human activities, not nature." Four drivers that cause changes in water availability include:

- **Population growth**. According to the United Nations Environment Program, the average per capita supply of water will decline by one-third by 2025. Yet, in that same amount of time, our global population is expected to grow by over 1 billion people, with much of that growth occurring in coastal regions where freshwater supplies are much more limited or scarce.

- **Climate change**. Sea surface temperatures are rising, which in turn increases precipitation. Increased precipitation results in increased moisture in the atmosphere, meaning that global rainfall rates will likely increase. In general, climate change will cause wet areas to get wetter and arid areas to get drier. Both conditions stress existing water infrastructure. For instance, more rainfall means more runoff, which could result in significant flooding events – affecting communities built on flood plains or that rely upon aging and outdated water infrastructure.

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- **Land use change and energy choices**. As populations grow, land is converted for agricultural, industrial, or municipal purposes, which often requires more water or results in the degradation of water quality. For instance, nitrogen and phosphorous from agricultural practices in the central U.S. run off into the Mississippi River Basin and ultimately discharge into the Gulf of Mexico, causing hypoxia (or "dead zones") that threaten fisheries in the region. Our energy choices also affect our water supplies. Take the production of biofuels, for example. Corn requires considerable amounts of water just to grow the crop – in areas where corn is irrigated, 7,000 gallons of water are needed to produce the feedstock to fuel a car with 10 gallons of corn-ethanol.

- **Global poverty**. One-billion people around the world live on less than $1 a day. Over 900-million people do not have access to safe drinking water, while 2 billion lack basic sanitation. Millions of children below the age of 5 are dying from preventable waterborne diseases. "Poverty," said Schnoor, "renders all other actions to mitigate climate or land use change to be of secondary or low importance."

Schnoor concluded the Clarke Lecture with several possible strategies to meet these challenges and achieve water sustainability. Among his suggestions:

- Incorporate Best Management Practices for agriculture, developing a permitting system similar to wastewater treatment plants to prevent the over-enrichment and impairment of water bodies with nutrients like nitrogen.

- Augment water supplies with recycled wastewater, both indirectly (reusing treated domestic or industrial wastewater by discharging it to a reservoir or aquifer) or directly (introducing recycled water into a potable water distribution system downstream of a water treatment plant). Schnoor cited the example of Singapore, a city-state of 4.6 million people that recycles water for drinking water purposes. "They are now an international hydro-hub," said Schnoor, "having solved most of their own water problems, created new jobs in a high technology industry, and exported their water technology to others."

- Invest in repairing, replacing, and modernizing water infrastructure in the U.S., such as developing water treatment plants that do not succumb to flood waters, that report their own mistakes, and return online automatically after brief interruptions.

- Improve our ability to monitor, model, and forecast water resources. With such an ability, said Schnoor, we could warn fisherman of the levels and locations of hypoxia in Gulf water, alert water treatment plant operators of potential pathogens arriving from downriver, and make informed management decisions in the event of toxic spills or terrorist threats.

- Empower people with the knowledge, capital, or contacts needed to provide proper sanitation and access to safe drinking water in impoverished areas.

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Schnoor is the seventeenth recipient of the NWRI Clarke Prize. He currently teaches courses in groundwater, environmental modeling, water quality, and sustainable systems at the University of Iowa. He also co-founded and co-directs the university's Center for Global and Regional Environmental Research, which is a state-funded institute devoted to studying and bettering our environment. In addition, he serves as Editor-in-Chief of *Environmental Science & Technology*, the leading journal in the world on environmental engineering and science.

Copies of the 2010 Clarke Lecture may be downloaded at NWRI's website at www.nwri-usa.org.

A 501c3 nonprofit, the National Water Research Institute (NWRI) was founded in 1991 by a group of California water and wastewater agencies in partnership with the Joan Irvine Smith and Athalie R. Clarke Foundation to promote the protection, maintenance, and restoration of water supplies and to protect the freshwater and marine environments through the development of cooperative research work. NWRI's member agencies include Inland Empire Utilities Agency, Irvine Ranch Water District, Los Angeles Department of Water and Power, Orange County Sanitation District, Orange County Water District, and West Basin Municipal Water District.

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