

The Water: Systems, Science and Society Program at Tufts University
Presents the 2nd Annual Interdisciplinary Water Symposium



Water: Systems, Science and Society

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Tufts

Water in 2050

The Infrastructure to Get There

Friday, April 1, 2011
Tufts University
www.tufts.edu/water

Photo by Ian MacLellan, taken during student internship in Kenya
Program design by Ana Rosner



From the Student Organizing Committee

The 2nd Annual
Interdisciplinary Water Symposium

Letter of Welcome

The year is 2050 and a whole new world is in existence. Population, land use, precipitation patterns, and the economies and policies of countries across the world have changed. In this new age, what is the appropriate scaling of water infrastructure? How should we address the aging infrastructure problem in the United States? What role does infrastructure play in addressing the growing needs of developing countries? Today, we will be exploring these critical and emerging infrastructure challenges.

Throughout today's symposium, the term "infrastructure" is used broadly and takes on an interdisciplinary meaning: conveyances for drinking water, stormwater, and sewage; systems for producing and exchanging food; networks of economic, regulatory, and political exchange; processes to monitor and protect human and ecological health; and capacity for communication, forecasting, and knowledge-sharing. Three panels of esteemed water experts from multiple disciplines and perspectives will explore the big issues.

This symposium is a product of the Tufts University Water: Systems, Science and Society (WSSS) Program. The WSSS program is designed to provide unique training to the next generation of water resource leaders. Established in 2004, the program builds on Tufts' existing strengths in science, engineering, health, nutrition, diplomacy, and public policy. WSSS students and faculty from diverse academic disciplines work together and share their research on interdisciplinary projects. By providing a forum for collaboration and information exchange, WSSS participants' understanding grows to incorporate approaches and terminology from outside their own areas of expertise. Students analyze water resource problems drawing on many different perspectives, an increasingly important skill that is essential for addressing today's water problems.

Here today are students from Boston College, Harvard, MIT, Tufts, UMass Boston, and WPI; academic experts; and professionals from private companies, nonprofits, and government agencies. We are excited to have such a diverse gathering of people with water knowledge with us today, and we encourage you to join the conversation during both formal and informal events. Thank you for attending the second annual WSSS Symposium!

Best regards,

The 2011 WSSS Symposium Student Organizing Committee
Lauren Caputo, Peter Kelly-Joseph, Laura Kuhl, John Parker,
Ellen Tyler and Eric Vaughan

Water in 2050: The Infrastructure to Get There

Presented by the Tufts University
Water: Systems, Science and Society Program

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Letter of Welcome	2
Table of Contents	3
Recognition of Sponsors	4
Schedule	6
Keynote Address: Gene Stakhiv	7
Panel Discussion Topics	8
Second Keynote Address: Dan Sheer	10
Panelist Biographical Information	11
Student Poster Titles	17
Exhibitors in Networking Session	20
Symposium Organizers	21
Information about WSSS	22
Acknowledgements	23

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Schedule

8:15 - 9:00 am	Registration and Breakfast <i>Mezzanine, Hall of Flags</i>
9:00 - 9:15 am	Opening Remarks
9:15 - 10:00 am	Keynote Address by Gene Stakhiv
10:00 - 11:00 am	Scaling and Infrastructure: How big is too big?
11:00 - 11:15 am	Break
11:15 - 12:15 pm	Aging Infrastructure in the United States
12:15 - 1:15 pm	Lunch with Poster Session and Networking Session <i>7th Floor, Cabot Hall</i>
1:15 - 2:00 pm	Second Keynote Address by Dan Sheer
2:00 - 2:15 pm	Break
2:15 - 3:30 pm	Meeting the Growing Needs of Developing Countries
3:30 - 3:45 pm	Closing Remarks
3:45 - 5:00 pm	Closing Networking Reception <i>7th Floor, Cabot Hall</i>

Except where noted, all events take place in the ASEAN auditorium, 160 Packard Avenue Fletcher School of Law and Diplomacy

Keynote Address

Gene Stakhiv

“Does National Security Depend on Environmental and Water Security?”



Senior International Water Advisor, U.S. Army Corps of Engineers Institute for Water Resources; Co-Director, International Joint Commission Upper Great Lakes Study; Technical Director, UNESCO International Center for Integrated Water Resources Management

Dr. Stakhiv has spent his entire professional career with the U.S. Army Corps of Engineers and has served as study manager for several large river basin studies and metropolitan water supply studies in the U.S., including the International Joint Commission's Upper Great Lakes Study and the completion of the five-year Lake Ontario and St. Lawrence River Study Board. Dr. Stakhiv has extensive international experience, primarily with the World Bank, serving as senior advisor to the Water Ministries of Iraq, Bangladesh, Ukraine, Armenia and the Aral Sea Basin countries, and as the acting senior science advisor at the U.S. Mission to UNESCO in Paris, France. He served as Chief of the Planning, Policy and Special Studies Division, Institute for Water Resources (IWR) at the US Army Corps of Engineers from 1990 to 2004, which supported the formulation of practical policies and procedures that the Corps needs to respond to legislation, administration initiatives and scientific advances. He serves on the Board of several UNESCO Centers, leads UN initiatives, and has been very active in international climate change symposia, including serving as co-chair of several IPCC Committees. As lead author of the second and third IPCC reports, and reviewer on the fourth report, he shared in the award of the 2007 Nobel Peace Prize.



Panel Discussions

Scaling and Infrastructure: How big is too big?

10:00 - 11:00 am

This panel will focus on the role of scale in infrastructure development. The benefits and limitations of large-scale versus smaller, modular-style infrastructure development will be discussed. In light of the pressing infrastructure needs in developing countries and their emerging economies, it can be argued that large-scale solutions are advantageous due to economies of scale. However, many large-scale infrastructure projects have failed in the past and are increasingly difficult to implement. Locally-adapted, smaller-scale, community-level solutions may be an effective alternative, but at what cost?

John Briscoe *Professor of the Practice, School of Public Health and School of Engineering and Applied Sciences, Harvard University*

Paul Kirshen *Research Leader, Battelle Memorial Institute*

Susan Murcott *Senior Lecturer, Massachusetts Institute of Technology*

Moderator: William Moomaw *Professor and Director, Center for International Environment and Resource Policy, Fletcher School of Law & Diplomacy, Tufts University*

Aging Infrastructure in the United States

11:15 am - 12:15 pm

A 2009 report by the American Society of Civil Engineers assigned an overall D grade to America's infrastructure. Replacing and repairing aging infrastructure is a daunting challenge for the United States. What strategies should be used to address this issue? What approach can be leveraged from recent advancements and research? This panel will engage the audience in discussion of these issues with the goal of producing key recommendations for further research.

Stephen Estes-Smargiassi *Director of Planning, Massachusetts Water Resources Authority*

Richard Palmer *Professor, University of Massachusetts Amherst*

Marcus Quigley *Principal, Geosyntec Consultants*

Chi Ho Sham *Vice President, The Cadmus Group, Inc*

Moderator: David Gute *Associate Professor, School of Engineering, Tufts University*

Meeting the Growing Needs of Developing Countries

2:15 - 3:30 pm

Developing countries have pressing needs for water infrastructure that will only increase with population growth, urbanization, and climate change. Domestic, industrial, and agricultural sectors will all face increasing demand and potentially less supply. Yet access to water has the potential to improve livelihoods for the bottom billion(s). How can these needs and opportunities be met without compromising ecological integrity in a resource- and finance-constrained world? What role does infrastructure play?

John Ambler *Senior Vice President for Programs, Oxfam America*

Jeffrey Griffiths *Associate Professor, School of Medicine, Tufts University*

Calestous Juma *Professor of the Practice, The Kennedy School, Harvard University*

Kenneth Strzepek *Visiting Professor, Joint Program on Science and Policy of Global Change, Massachusetts Institute of Technology*

Moderator: Annette Huber-Lee *Visiting Scholar and Lecturer, School of Engineering, Tufts University*

Second Keynote Address

Dan Sheer



“Designing and Implementing Water Management Strategies: Understanding Values, Changing Perceptions, Changing Behavior”

Founder and President, HydroLogics, Inc.

Dr. Sheer is the founder and President of HydroLogics, a worldwide water resources management consulting firm. He has devoted his professional career to improving water management. For the past decade, Dr. Sheer has been closely involved in planning and operations for the Everglades, Lake Okeechobee, the Everglades Agricultural Area and the Lower East Coast through contracts with the South Florida Water Management District. He has directed the modeling of the Delaware, Susquehanna, and NYC water supply systems, and is currently engaged in modeling the Appalachian-Chattahoochee-Flint and Alabama-Coosa-Tallapoosa Basins for the Atlanta Regional Commission and the South Saskatchewan River Basin in Alberta. He was also instrumental in the creation of the Southern Nevada Water Authority and the Kansas River Water Assurance District. Dr. Sheer has done pioneering work in the development of water resources modeling technology and the use of Computer Aided Negotiation and Operations Exercises. His work on HydroLogics' OASIS modeling system led to a U.S. Patent. He has received Best Journal Paper citations from both AWWA and ASCE, was a founding member of the National Research Council's Water Science and Technology Board, and serves on the NRC's Committee to review the Florida Keys Carrying Capacity Study.

Panelist Biographical Information



John Briscoe

Gordon McKay Professor of the Practice of Environmental Engineering and Health, School of Engineering and Applied Sciences and the School of Public Health, Harvard University

Dr. Briscoe's career has focused on the issues of water, other natural resources and economic development. He has worked as an engineer in the government water agencies of South Africa and Mozambique; as an epidemiologist at the Cholera Research Center in Bangladesh; and as a professor of water resources at the University of North

Carolina. In his 20-year career at the World Bank, he held high-level technical positions, including Country Director for Brazil. Briscoe has served on the Water Science and Technology Board of the National Academy of Sciences and was a founding member of the major global water partnerships, including the World Water Council, the Global Water Partnership, and the World Commission on Dams. He currently serves on the Global Agenda Council of the World Economic Forum, on the High-Level Advisory Committee for the Murray Darling Basin Authority, as a member of the Council of Distinguished Water Professionals of the International Water Association, and as Senior Water Advisor to McKinsey and Company.



Paul Kirshen

Research Leader, Battelle Memorial Institute and Visiting Scholar, Department of Civil and Environmental Engineering, Tufts University

Dr. Kirshen is a Research Leader at Battelle Memorial Institute in climate change adaptation and co-founder of the Tufts University Water: Systems, Science, and Society (WSSS) graduate education program at Tufts University. Dr. Kirshen does research and consulting at the local, regional and global scales on climate change impacts and adaptation, as well as integrated water resources management.

His current projects include development of a training program in climate change adaptation for local decision makers and guidance tools for planning and management of urban drainage systems under a changing climate. He has recently completed projects on water supply under climate change for the World Bank and the UN Framework Convention on Climate Change. He has also worked on the Infrastructure Systems, Services and Climate Change: Integrated Impacts and Response Strategies for the Boston Metropolitan Area (CLIMB) project for US EPA ORD with the University of Maryland, Boston University and others.



Panelist Biographical Information



Susan Murcott
Senior Lecturer, Department of Civil and Environmental Engineering, MIT

Ms. Murcott's work addresses innovative, low-cost water and wastewater treatment technologies for developing countries. For a decade, her research and professional consulting practice focused on innovations in wastewater treatment for megacities in Mexico, Brazil, Eastern Europe and China. Since 1997, she has been a leader in the emerging field of household water treatment and safe storage. She has led projects in

Nepal, Haiti, Nicaragua, Dominican Republic, Brazil, Peru, Kenya, Ghana, Bangladesh and Rwanda. These initiatives are part of her larger effort, "Safe Water for 1 Billion People", which trains engineering students to work in multi-disciplinary teams while building relations with partners and communities in low-income countries to improve water and sanitation conditions. Murcott and her teams have won many competitions and awards, including the Kyoto Water Prize – Top Ten Finalist (2006), St. Andrews Prize for the Environment – 2nd Prize (2006), the Wall Street Journal Technology Innovation Award (2005) and World Bank Development Marketplace Prize (2003).



Stephen Estes-Smargiassi
Director of Planning, Massachusetts Water Resources Authority

Mr. Estes-Smargiassi is the Director of Planning at the MWRA, the regional wholesale water and wastewater provider for the Boston metro area. As part of his responsibilities he managed the MWRA's successful demand management programs, reducing water demand by over 100 mgd; initiated its GIS system; and coordinated protection planning studies for the 400 square mile Quabbin, Ware River and Wachusett reservoir watersheds, as well as about 40 other smaller supply systems in the metropolitan area. He has overseen MWRA's collaborative efforts to understand and communicate the risks of lead in drinking water since 1993, and has been active in regional and national efforts to review and revise the Lead and Copper Rule. He developed the briefing materials used by MWRA's Board of Directors to make the treatment technology decision for the metropolitan Boston water system and then participated in the successful defense of that decision in federal court. He is active with the AWWA Research Foundation, is a QualServe peer review team leader, and has actively participated in water quality regulatory development activities regionally and nationally.



Richard Palmer
Professor, Department of Civil and Environmental Engineering, University of Massachusetts Amherst

Dr. Palmer is the Head and Professor of Civil and Environmental Engineering at the University of Massachusetts Amherst. From 1979 to 2008, he was a Professor at the University of Washington. His primary areas of interest are in the application of structured planning approaches to water resources. He developed the field of

"shared vision modeling" in water resources planning and pioneered the use of "virtual drought exercises." He has received the "Service to the Profession" (1998) Award from the Water Resources Planning and Management Division of the American Society of Civil Engineers (ASCE) and the "Certificate of Recognition" for his editorial services to the *Journal of Water Resources Planning and Management* of ASCE (1997). He was awarded the Huber Award for Research Excellence by the ASCE (1992) for his innovative application of simulation and optimization techniques to issues in water resource management. In 2006, he received from ASCE the Julian Hinds Award for his contributions to water resources planning and his research related to the impacts of climate change on water resources.



Marcus Quigley
Principal, Water Resources Engineering, Geosyntec Consultants

Mr. Quigley is a principal civil and environmental engineer based in Massachusetts with more than 13 years of experience working on challenging projects related to surface water hydrology, hydraulics, water quality, and stormwater and erosion and sediment control permitting and management. He is recognized as a national technical leader in stormwater best management practice (BMP) design, research and development, modeling, data analysis, and field data acquisition. Mr. Quigley is managing and directing major nationwide NPDES compliance audit programs for private clients. He has been the lead designer for a number of conventional and low impact development (LID) controls systems, and has directed ground-breaking monitoring work to demonstrate the effectiveness of LID. Mr. Quigley is a Diplomate, Water Resources Engineer of the American Academy of Water Resources Engineers.

Panelist Biographical Information



Chi Ho Sham

Vice President, The Cadmus Group, Inc.

Dr. Sham heads the Drinking Water and Water Quality Group at The Cadmus Group, Inc. He is an expert in source water protection, underground injection control, and the use of geographic information systems in environmental protection and natural resource management. He has extensive experience in hydrology, geomorphology, and water quality. Dr. Sham is an active member of the American

Water Works Association (AWWA). He heads its Source Water Protection Committee, is a trustee of AWWA's Water Resources Division, and chaired the planning committee of the 2009 AWWA Water Resources Symposium. In addition to being a research fellow at Clark University's George Perkins Marsh Institute, Dr. Sham also serves on the advisory board of the Worcester Polytechnic Institute's environmental engineering program. He has recently been appointed to the Massachusetts State Advisory Board of the Conservation Law Foundation. Dr. Sham holds a Ph.D. in geography from the State University of New York at Buffalo.



John Ambler

Senior Vice President for Programs, Oxfam America

Dr. Ambler is the Senior Vice President for Programs at Oxfam America. He guides all of Oxfam's humanitarian preparedness and response work worldwide, as well as its long-term development programs. The latter includes programs in agriculture, water management, extractive industries, gender-based violence, community finance, education, worker rights, and other rural livelihoods activities. Prior to this role, Ambler was the regional director for Asia

at CARE USA, based in Bangkok. He supervised and set strategic direction for CARE's relief and development operations for Afghanistan, Bangladesh, India, Nepal, Pakistan, the Philippines, Sri Lanka, and Tajikistan. Dr. Ambler provided strategic and conceptual direction for CARE's programs in rural development, development finance, urban poverty, HIV/AIDS, health, education, and nutrition. He also played a central role in that organization's efforts to adopt a rights-based approach to development.



Jeffrey Griffiths

Associate Professor, Department of Public Health and Community Medicine, Tufts University

Dr. Griffiths has a long interest in waterborne diseases, ranging from research on the biology of the pathogens to their epidemiology and to public policy and regulation. He has testified to the U.S. Senate on the Oversight Hearing on Federal Drinking Water Programs (December 2009) and provision of clean water to US troops in Iraq

(April 2006). His other research interests include the human, animal, and environmental epidemiology of the emerging pathogen *Cryptosporidium*. He serves on the Science Advisory Board of the US EPA as the Chair of the Drinking Water Committee. He has over 20 years of professional experience working in developing countries, including Bangladesh, Haiti, Ecuador, Kenya and Uganda and is intimately familiar with the health effects of water contamination and the treatment of these conditions.



Calestous Juma

Professor of the Practice of International Development, The Kennedy School, Harvard University

Dr. Juma is Professor of the Practice of International Development and Director of the Science, Technology and Globalization Project at Harvard's Kennedy School. He also directs the Agricultural Innovation in Africa Project funded by the Bill and Melinda Gates Foundation. He is a former Executive Secretary of the UN Convention on Biological Diversity and Founding Director of the African Centre

for Technology Studies in Nairobi, and he also served as Chancellor of the University of Guyana. He has been elected to several scientific academies including the Royal Society of London, the U.S. National Academy of Sciences, the Academy of Sciences for the Developing World, the UK Royal Academy of Engineering, and the African Academy of Sciences. Among others, he serves on the boards of WWF International and the One Laptop per Child (OLPC) Foundation. He is lead author of *Innovation: Applying Knowledge in Development* and co-editor of *Engineering Change: Towards a Sustainable Future in the Developing World*. He is editor of the peer-reviewed *International Journal of Technology and Globalisation* and *International Journal of Biotechnology*.

Panelist Biographical Information



Kenneth Strzepek
Visiting Professor, Joint Program on Science and Policy of Global Change, MIT

Dr. Strzepek has spent 30 years as a researcher and practitioner at the nexus of engineering, environmental and economic systems. His work includes applications of operations research, engineering economics, micro-economics and environmental economics to a broad range of applications. He has worked for a range of national governments, as well as the United Nations, the World Bank, and the U.S. Agency for International Development. He has been a contributing author to the Second IPCC Assessment, the Millennium Ecosystem Assessment, the World Water Vision, and the UN World Water Development Report. He is currently the USAID Scientific Liaison Office on Water and Climate Change to the CGIAR and the Arthur Maass-Gilbert White Fellow at the Institute for Water Resources of the US Army Corps of Engineers. He has received the Department of the Interior Citizen's Award for Innovation, and is a co-recipient of both the Zayed International Prize for the Environment and the 2007 Noble Peace Prize (IPCC lead author).

Poster Titles and Authors

Student Poster Session

Stormwater Management Under Climate Change: Site-specific and Robust Strategies for Three Case Studies
Lauren Caputo and Ana Rosner, School of Engineering, Tufts University, and Thomas Renaud, Worcester Polytechnic Institute

Relationship Between Land Use and Road Salt Contamination
Josh Coefer, Boston College

Strengthening Agroforestry Projects & Impact Assessment in Guatemala
Sarah Coleman, Friedman School of Nutrition Science and Policy, Tufts University

Oil, Water, and Urbanism in the Post-Soviet Caspian: the Future of Neft Dashlari
Shelby Elizabeth Doyle, Harvard University



Karen C Kosinski and collaborators collecting urine samples for schistosomiasis screening in Adasawase, Ghana.

Student Poster Session

Fiber-Optic Microarray for Detection of Cyanobacteria
Shonda T. Gaylord, Cummings School of Veterinary Medicine, Tufts University

Barriers to Use and Sustainability of Water and Sanitation Facilities in Ethiopian Schools
Gogi Grewal, Friedman School of Nutrition Science and Policy and School of Medicine, Tufts University

Well, Dam: The Great Failure of La Laguna, Mexico
Amos Irwin, Fletcher School of Law and Diplomacy, Tufts University



Water Quality and Sustainability Gains in Small Drinking Water Supply Systems: Assessing the Impacts of a Post-Construction Support Model in El Salvador
Georgia Kayser, Fletcher School of Law and Diplomacy, Tufts University

Schistosoma haematobium Infection in the Presence of Infrastructure Designed to Reduce Recreational Water Contact: a Case Study in Rural Ghana
Karen C. Kosinski, David M. Gute, School of Engineering, Tufts University

Farm field in floodplain of First Creek, Colorado. Photo by Lauren Caputo.

From a Culture of Disaster Response to a Culture of Adaptation: Climate Change and Flooding in Honduras
Laura Kuhl, Fletcher School of Law and Diplomacy, Tufts University



Laura Kuhl interviewing Honduran residents about climate change.

The Battir Spring – the Road to a Safe Water Resource
Simcha Levental, Graduate School of Arts and Sciences, Tufts University

Systems Approaches to Urban Stormwater Management
Jack Melcher, Graduate School of Arts and Sciences and School of Engineering, Tufts University

Applying Human-specific 16S rRNA *Bacteroides* Marker to Identify Sources of Human Fecal Contamination in Kranji Reservoir Catchment, Singapore
Jean Pierre Nshimiyimana, Janelle Thompson, Peter Shanahan, Massachusetts Institute of Technology

NPDES Permitting at Thermoelectric Facilities
Seth Sheldon and Anamarija Frankic, University of Massachusetts Boston

Egypt, Sudan, and Ethiopia: the Nile River Disputes Case Study
Yuan Wang, Graduate School of Arts and Sciences, Tufts University



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Eric Vaughan at the Palestinian Water Authority
Headquarters at an infrastructure planning meeting



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Heron in degraded salt marsh on Cape Cod. Photo by Ana Rosner

The WSSS Program

An Interdisciplinary Research and Education Program
for Graduate Students at Tufts University

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The Fletcher School of Law & Diplomacy
The School of Medicine
The Friedman School of Nutrition Science & Policy
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About the Program

"In the 21st century we have to develop an integrated approach across the disciplines to understand the complexity of water issues worldwide." -Rita R. Colwell

To meet this challenge, Tufts University established the Water: Systems, Science and Society (WSSS) Ph.D. and MA/MS Program. The purpose of the WSSS program is to provide the interdisciplinary perspectives and tools to manage water related problems around the world.



Gogi Grewal examining school water points in Tigray region, Ethiopia.

WSSS students take courses in four core areas and participate in cross-cutting seminars. They undertake a significant interdisciplinary water resources research project, or an Interdisciplinary Professional Experience. They participate in weekly meetings with fellow students and participate in cross-cutting seminars. For more information about the program, courses, and research areas, visit www.tufts.edu/water/about.html.

Acknowledgements

The 2011 WSSS Symposium Student Organizing Committee would like to make the following acknowledgements to those whose support and participation has been essential:

All speakers and panel participants

WSSS students and participating faculty

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