

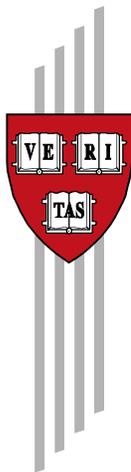
Water and Human Well Being
An Executive Session on Grand Challenges
of the Sustainability Transition

San Servolo Island, Venice – July 20-21, 2009
Sustainability Science Program, Harvard Kennedy
School of Government
Italian Ministry of Environment, Land & Sea
Venice International University

Alix Peterson Zwane, Michael Kremer, and Robyn Meeks

CID Working Paper No. 188
November 2009

© Copyright 2009 Alix Peterson Zwane, Michael Kremer,
Robyn Meeks, and the President and Fellows of Harvard College



Working Papers

Center for International Development
at Harvard University

Water and Human Well Being
An Executive Session on Grand Challenges of the Sustainability Transition
San Servolo Island, Venice – July 20-21, 2009
Sustainability Science Program, Harvard Kennedy School of Government
Italian Ministry of Environment, Land & Sea
Venice International University

Abstract

The Executive Session on Water and Human Well Being was convened by the Harvard Kennedy School of Government and Venice International University on July 20–21, 2009. This high-level gathering was organized to create a unique space for dialog between policymakers, academics, and sector experts to move beyond the truism that “water is life” towards actionable solutions for making water a force for improved human health and well being in the development agenda. Discussion focused on sharing new evidence from applied research on game-changing technologies and human behavior that affect environmental health outcomes. In addition, sessions addressed strategies to move beyond promising pilot projects to scalable programs; public, private, and integrated approaches were considered. The interconnections between sustainability and scale were explored, giving policymakers an explicit opportunity to help shape the research agenda of leading biomedical and social scientists working at the intersection of water and health. The session was one in a series on Grand Challenges of the Sustainability Transition organized by the Sustainability Science Program at Harvard University with the generous support of the Italian Ministry for Environment, Land, and Sea. See <http://www.hks.harvard.edu/centers/cid/programs/sustsci/events/workshops/2009/water>.

Keywords: public goods, project evaluation, public health, sustainable development, water, environment and development

JEL subject codes: H41, H43, I18, Q01, Q25, Q56

This paper may be cited as:

Zwane, Alix Peterson, Michael Kremer, and Robyn Meeks. “Water and Human Well Being: Report of an Executive Session on the Grand Challenges of a Sustainability Transition” San Servolo Island, Venice, Italy: July 20-21, 2009. CID Working Paper No. 188. Center for International Development Working Paper, Cambridge, MA: Harvard University, November 2009.

It is available at <http://www.cid.harvard.edu/cidwp/188.html>. Comments are welcome and may be directed to the authors azwane@gmail.com and mkremer@fas.harvard.edu.

Grand Challenges of the Sustainability Transition:

This report emerges from the third in a series of workshops and study sessions on Grand Challenges of the Sustainability Transition, organized by the Sustainability Science Program at Harvard University, hosted by Venice International University, and supported by the Italian Ministry of Environment, Land and Sea. The first session in the series addressed Grand Challenges in Sustainability Science. It was convened in October 2006 by William Clark, Co-Director, Sustainability Science Program at Harvard University; John Holdren, President, American Association for the Advancement of Science and Professor, Harvard University; and Robert Kates, Co-Chair, Initiative on Science and Technology for Sustainability. Further information is available at the workshop web site:

<http://www.hks.harvard.edu/centers/cid/programs/sustsci/events/workshops/2006/grand-challenges-of-sustainability-science-workshop>.

The second session in the series addressed Biofuels and Sustainable Development. It was convened in May 2008 by Henry Lee, Professor, Kennedy School of Government, Harvard University; Melinda Kimball, Vice-President for Programs, United Nations Foundation; and Corrado Clini, Director General of the Ministry for Environment, Land and Sea of Italy and Chairman of the G8 Global Bioenergy Partnership. Further information is available at the workshop web site:

<http://www.cid.harvard.edu/cidwp/pdf/174.pdf>.

The Sustainability Science Program at Harvard University:

Harvard's Sustainability Science Program harnesses the University's strengths to promote the design of institutions, policies, and practices that support sustainable development. The Program addresses the challenge of sustainable development by: advancing scientific understanding of human-environment systems; improving linkages between research and policy communities; and building capacity for linking knowledge with action to promote sustainability. The Program supports major initiatives in policy-relevant research, faculty research, training of students and fellows, teaching, and outreach. Further information is available through the Program web site at www.cid.harvard.edu/sustsci/, or from co-Directors William C. Clark (william_clark@harvard.edu), Michael Kremer (mkremer@fas.harvard.edu) or Nancy Dickson (nancy_dickson@harvard.edu), at the Center for International Development, Harvard Kennedy School, 79 JFK Street, Cambridge, MA 02138 USA.

Venice International University:

Venice International University (VIU) is an association made up of ten universities, the Foundation of Venice, the Province of Venice, the Italian Ministry for the Environment and Territory (IMET) and the Italian National Research Council. The aim of this international center is to manage higher education and research centers on the island of San Servolo in Venice. VIU's work on sustainability is pursued through The Center for Thematic Environmental Networks (TEN). Further information is available through the TEN web site at www.univiu.org/research/ten, or from Professor Ignazio Musu (ten@univiu.org), at VIU, Isola di San Servolo 30100 Venice, Italy.

Author Acknowledgements

A session of this type is made possible by the commitment and hard work of many people. We would like to thank Azzam Alwash, Chief Executive Officer, Nature Iraq, and Corrado Clini, Italian Ministry for the Environment, for being on the Organizing Committee. We are deeply appreciative for the work of Elisa Carlotto and Alessandra Fornetti at Venice International University and to Gloria Visconti for her advice and guidance throughout the process. Mary Anne Baumgartner provided administrative support at Harvard. Finally we are very grateful to Robyn Meeks at Harvard who served as the coordinator for the session, rapporteur, and who helped us in the development of this report. Her assistance was essential to the success of this session.

Water and Human Well Being

The Executive Session on Water and Human Well Being was convened by the Harvard Kennedy School of Government and Venice International University on July 20–21, 2009. This high-level gathering was organized to create a unique space for dialog between policymakers, academics, and sector experts to move beyond the truism that “water is life” towards actionable solutions for making water a force for improved human health and well being in the development agenda. Discussion focused on sharing new evidence from applied research on game-changing technologies and human behavior that affect environmental health outcomes. In addition, sessions addressed strategies to move beyond promising pilot projects to scalable programs; public, private, and integrated approaches were considered. The interconnections between sustainability and scale were explored, giving policymakers an explicit opportunity to help shape the research agenda of leading biomedical and social scientists working at the intersection of water and health. The session was one in a series on Grand Challenges of the Sustainability Transition organized by the Sustainability Science Program at Harvard University with the generous support of the Italian Ministry for Environment, Land, and Sea.

Key reflections arising from the meeting included the following:

The science of water and health

- Piped water and sanitation has tremendous health impact. However this is too expensive to be practical in rural, low density areas of the poorest countries. This is especially when there are dispersed settlement patterns as in much of Africa.
- Investments in source water quality, short of piped water and sanitation, do not have the hoped for health benefits. Simply providing clean water at the source risks recontamination in storage and transport.
- Water treatment can produce significant health benefits at a potentially extremely low cost relative to the associated health benefits. There are a number of technologies for treatment including chlorine that appear ready for scaling-up, and there are a number of groups attempting to do so.
- Some people believe that there is complementarity between clean water, sanitation, and hand washing with soap, but others argue that recent evidence based on rigorous research does not seem supportive of this view and that more research is needed.

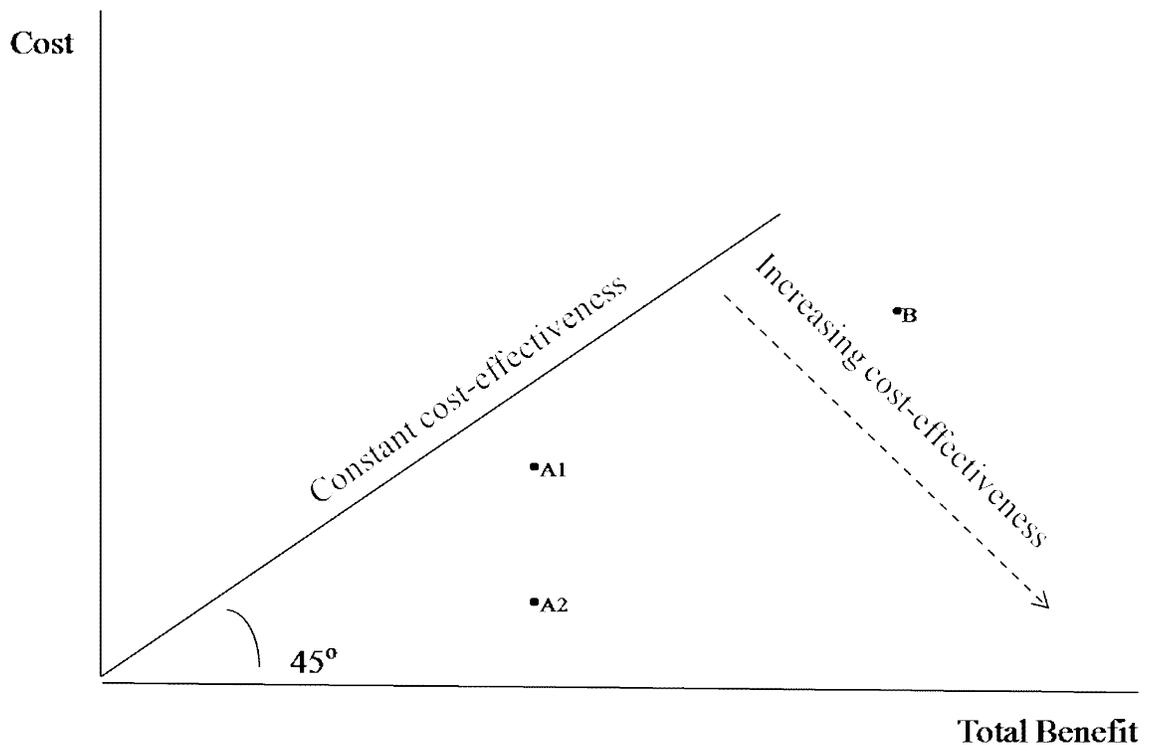
Economics and behavior at the water and health nexus

- There is no “correct” level of investment in water and sanitation. The choice depends on context and resource constraints.
- Some people are willing to pay for water quantity and for convenience, but in low-income countries many households will not pay for quality.
- It is possible to achieve increased take up by reducing price, and there is a fair amount of evidence that simplicity and convenience is important in the adoption decision as well.
- Social norms matter. However, less is known about how to affect these in a lasting way.
- More products that deliver solutions cheaply and easily in ways that can become habits are needed. Some examples were discussed at the conference, but these may only begin to address the needs of people in different settings and contexts.

The participants in the conference developed Figure 1 as an innovative and useful analytic tool for assessing the value of alternative interventions and cost-effectiveness estimation exercises. Figure 1 presents a space in which the alternative water interventions can be mapped; the y axis measures the (social) cost of alternative services and the x axis reports a common measure of benefits (e.g., Disability Adjusted Life Years, or DALYs). Ideally, policymakers choose interventions that are of the highest level of effectiveness, but low cost. When evaluations identify interventions that allow investments further below the 45 degree line, for example a move from point A1 to A2, they are increasingly relevant and useful.

The correct policy choice for locating a water investment strategy in this graph depends on local circumstances. For the most resource-constrained settings, an investment that provides the cost-effectiveness ratio implied by the point A2 may be appropriate. The chlorine dispenser might be thought of as an example of such an investment. As budgets grow and countries develop, it will be more appropriate to choose investment levels that maximize benefits (e.g., high-quality piped water to homes), even with larger costs (and potentially lower cost-effectiveness ratios). Point B is an example of such a choice. The decision about the appropriate timing and path of transition from point A2 to point B will depend on local context and priorities.

Figure 1: Mapping alternative water and health interventions



The policy relevant research agenda identified in the meeting centered on the challenge of taking solutions to scale for well being, mindful of context and setting

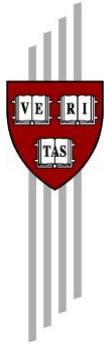
- We need to learn more about how to scale-up implement. Efforts by user groups and local community efforts to achieve sustainability have been unsuccessful in many contexts. Debates of

private sector versus government versus NGOs are misplaced, and we need to find a way to integrate these stakeholders in a productive system.

- Coalitions with local (i.e., district or county level) government are underexplored and potentially underexploited. This may be a fruitful avenue for advancing the water and sanitation agenda. Identifying relevant coalitions in different settings is a key challenge for practitioners and policymakers seeking to drive change.

References

- Di Tella, Rafael, Sebastian Galiani, and Ernesto Schargrodsy. 2009. Reality versus propaganda in the formation of beliefs about privatization. Draft of July 14, 2009.
- Galiani, Sebastian, Paul Gertler, and Ernesto Schargrodsy. 2005. Water for life: The impact of the privatization of water services on child mortality. *Journal of Political Economy* 113 (10): 83–120.
- Galiani, Sebastian, W. Martin Gonzalez-Rozadaz, and Ernesto Schargrodsy. 2008. Water expansions in shantytowns: Health and savings. *Economica* 1–16.
- Lantagne, D. S., B. C. Blount, F. Cardinali and R. Quick. 2008. Disinfection by-product formation and mitigation strategies in point-of-use chlorination of turbid and non-turbid waters in western Kenya. *Journal of Water and Health* 6 (1): 67–82.
- Luby, S. Md.S. Islam, and R. Johnston. 2006. Chlorine spot treatment of flooded tube wells, an efficacy trial. *Journal of Applied Microbiology* 100 (2006): 1154–1158.
- Mara, Duncan and Graham Alabaster. 2008. A new paradigm for low-cost urban water supplies and sanitation in developing countries. *Water Policy* 10: 119–129.
- Schmidt, Wolf-Peter and Sandy Cairncross. 2009. Household water treatment in poor populations: Is there enough evidence for scaling up now? *Environmental Science and Technology* 43 (4): 986–992.
- Clasen, Thomas, Jamie Bartram, John Colford, Stephen Luby, Robert Quick, and Mark Sobsey. 2009. Comment on “Household water treatment in poor populations: Is there enough evidence for scaling up now?” *Environmental Science and Technology* 43 (14): 5542–5544.
- Schmidt, Wolf-Peter and Sandy Cairncross. 2009. Response to Comment on “Household water treatment in poor populations: Is there enough evidence for scaling up now?” *Environmental Science and Technology* 43(14): 5545.
- Rogers, Peter. 2008. Facing the freshwater crisis. *Scientific American* 299 (2): 46–53.
- Rowe A, F. Angulo, L. Roberts, and R. Tauxe. 1998. Chlorinating well water with liquid bleach was not an effective water disinfection strategy in Guinea-Bissau. *International Journal of Environmental Health Research* 8: 339–40.
- Zwane, Alix Peterson and Michael Kremer. 2007. What works in fighting diarrheal diseases in developing countries? A critical review. *World Bank Research Observer* 22: 1–24.



Center for International Development *at Harvard University*

Sustainability Science Program

Water and Human Well Being
Executive Session on Grand Challenges of the Sustainability Transition
Venice International University, San Servolo, Italy
July 20-21, 2009

Presentation slides are posted at
<http://www.hks.harvard.edu/centers/cid/programs/sustsci/events/workshops/2009/water>

Agenda

MONDAY, JULY 20

Welcome

This extended introductory session covers the meeting genesis, goals, and ground rules. All participants introduce themselves and share their expectations for the convening.

William Clark, Harvard University

Corrado Clini, Italian Ministry for the Environment, Land and Sea

Ignazio Musu, Venice International University

Water and Health: Scientific background

This session provides a scientific overview of the burden of diarrheal disease and evidence on impact of various approaches to address it (big picture, including sanitation and handwashing, but key focus on water).

[Water and Health: Scientific background](#)

Stephen Luby, International Center for Diarrheal Disease Research, Bangladesh and US Centers for Disease Control

What works in preventing water-related disease: Infrastructure solutions?

Infrastructure solutions have a mixed record. What have we learned? How can it be improved?

[What works in preventing water-related diseases: Infrastructure solutions](#)

Duncan Mara, University of Leeds

[Water privatization and health outcomes: Evidence and beliefs](#)

Discussant: **Ernesto Schargrodsky**, Universidad Torcuato Di Tella

What works in preventing water-related disease: New technological solutions?

What engineering solutions are available? What do they cost? What do we know from market research?

Technology Solutions in water treatment

Glenn Austin, Partnership for Affordable Technology for Health

What works in preventing water-related disease: New technological solutions?

Discussant: **Jamie Bartram**, University of North Carolina

Paying for solutions

What do we know about consumer demand for clean water? What are the implications for service delivery?

Paying for solutions and some promising approaches

Alix Peterson Zwane, Bill and Melinda Gates Foundation

Paying for solutions: Veolia Water

Discussant: **Olivier Gilbert**, Veolia Water Africa Middle East India

Promising new solutions

Chlorine dispensers

Michael Kremer, Harvard University

Point-of-use and point-of-collection chlorination

Robert Quick, Enteric Diseases Epidemiology Branch, Centers for Disease Control and Prevention

Plenary discussion

Chair: **Alix Peterson Zwane**, Bill and Melinda Gates Foundation

Wrap-up and stage setting

TUESDAY, JULY 21

Goals for this day: What's new and take away messages

The second day of the workshop tackles two practical questions: How does scale-up occur? What is the policy-driven research agenda?

Discussion begun by **Tanvi Nagpal**, Global Water Challenge

How do we measure the impacts of interventions?

Discussion begun by **Clair Null**, Emory University

Moving beyond pilot projects: How do we take interventions to scale?

Discussion

Summary messages and looking forward to next year: Policymaker and practitioner needs from academia

What do people trying to promote healthy water need from the R&D community that they are not getting currently?

Michael Kremer, Harvard University

Participants

Ayad Al Safi, Deputy Minister of Municipalities and Public Works of Iraq
Azzam Alwash, Chief Executive Officer, Nature Iraq
Glenn Austin, Director of the Safe Water Project, Partnership for Affordable Technology for Health
Jamie Bartram, Professor and Director of Global Water Institute, Gillings School of Global Public Health, University of North Carolina at Chapel Hill
John Briscoe, Gordon McKay Professor of the Practice of Environmental Health, School of Engineering and Applied Sciences, Harvard University
Edmund J. Cain, Vice President, Grant Programs, Conrad N. Hilton Foundation
William Clark, Harvey Brooks Professor of International Science, Public Policy and Human Development and Co-director, Sustainability Science Program, Harvard University
Corrado Clini, Director General, Ministry for the Environment, Land and Sea of Italy
Gary Edson, Chief International Officer, Case Foundation
Olivier Gilbert, Sustainable Development Director, Veolia Water Africa Middle East India
Vivian Hoffmann, Assistant Professor, Department of Agricultural and Resource Economics, University of Maryland College Park
Michael Kremer, Gates Professor of Developing Societies, Harvard University and Codirector, Sustainability Science Program, Harvard University
Kamal H. Lateef, Deputy Minister of Environment for Technical Affairs, Iraq
Steve Luby, Head, Program on Infectious Diseases and Vaccine Sciences, International Center for Diarrheal Disease Research
Duncan Mara, Professor, School of Civil Engineering, University of Leeds
Richard Mire, Corporate Environmental Manager, Exxon Mobil Corporation
Ignazio Musu, Professor of Economics, Ca' Foscari University, Venice International University
Tanvi Nagpal, Director of Water and Sanitation Initiatives, Global Water Challenge
George Ndegwa, Deputy Chief Economist, Ministry of Local Government of Kenya
Wuletaw Nigussie, Executive Director, Organization for Rehabilitation and Development of Ethiopia
Clair Null, Assistant Professor, Rollins School of Public Health, Emory University
Kepha Ombacho, Chief Public Health Officer, Ministry of Public Health of Kenya 2
Robert Quick, Enteric Diseases Epidemiology Branch, Centers for Disease Control and Prevention
Peter Rogers, Gordon McKay Professor of Environmental Engineering and Professor of City and Regional Planning, Harvard University
Ernesto Schargrodsky, Professor, Universidad Torcuato Di Tella, Argentina
Cecilia Scharp, Head of Team Sustainable Services, Swedish International Development Cooperation Agency
Alix Peterson Zwane, Program Officer, Global Development, Bill and Melinda Gates Foundation

Observers:

Amrita Ahuja, Giorgio Ruffolo Post-doctoral Fellow in Sustainability Science, Sustainability Science Program, Harvard University
Nancy Dickson, Co-director, Sustainability Science Program, Harvard University
Robyn Meeks, Giorgio Ruffolo Doctoral Fellow in Sustainability Science, Sustainability Science Program, Harvard University
Augusto Pretner, SGI Studio Galli Ingegneria Spa
Gloria Visconti, Ministry for the Environment, Land and Sea of Italy