

***“Preliminary”* Overview of Current Research and
Possible Research Priorities**

- Small Community Drinking Water Supplies -



Contents

THIS IS A FIRST STEP AND IS NOT INTENDED TO REPRESENT A COMPREHENSIVE REVIEW OR ASSESSMENT OF PRIORITIES

- Purpose and objectives
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- Overview of Current Research
- Possible Research Priorities
 - Health Risks
 - Source Water Protection (beyond RAT)
 - Infrastructure & Technology
 - Socio-economic & Capacity
 - Knowledge Transfer
 - Policy/Governance
- Considerations for a way forward - how to get it done?
 - Networks
 - Communication
 - Business and Funding models



Purpose & Objectives

Initiate discussion, leading to input, ideas and recommendations to advance our understanding and focus:

- Preliminary assessment of state of knowledge related to major challenges
- Where should research efforts focus to most effectively reduce burden of illness (developed and developing countries)
- How to most effectively promote and support research and the transfer of knowledge
- Next steps



CONTEXT

Global Costs

- Over 1.1 billion people lack access to safe drinking water
- Diarrhoeal disease kills an estimated 1.8 million people each year (i.e. 5000 per day), the majority children under five
- Burden of illness from water, sanitation and hygiene approximately 4% of all deaths (*Pruess et al, 2002*)
- Health care costs in \$7 billion/yr (*Hutton et al, 2004*)
- Value of time lost - \$63 billion/yr

Benefits

- 3.7% annual average growth by poor countries with improved water and sanitation versus 0.1% for those without (*Sachs, 2001*)
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Context

World Health Organization

- Small Community Water Supply Management Network
 - Objective of establishing a coordinated global response for safety of drinking water in developed and developing countries (Millennium Development Goal – 175,000 per day), through
 - Development of management tools (e.g., Water Safety Plans), and Best Management Practices
 - Communication and Education
 - Capacity building
 - Knowledge and Knowledge transfer (research and technology)
 - Advocacy
- Research Theme (2007):
 - Preliminary scan of current research
 - Examine interest in establishing a research network
 - Expert input (industry, academics, governments)



Overview

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Source Water

- Availability
- Vulnerability
- Pollution (micro/chemical)

Infrastructure

- Collection
- Treatment technology
- Distribution & Plumbing
- Operations & Maintenance



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Capacity

- Financial
- People
- Knowledge

Socio-economic

- Culture
- Governance
- Business models



Overview of Research

Approach

1. Recognize existing research in driving solutions
2. The focus: Identify areas where more research would contribute to goal of safe drinking water in small communities (e.g.: research to support implementation of Water Safety Plans – multi-barrier approach)
 - Gaps and priorities
 - Mechanisms to direct/guide research, deliver and/or fund projects
3. Context - Recognition that one size does not fit all; geographical, regional, political, cultural differences will affect whether and how research can be applied to any one community

Overview

- Health-based research significant (not directly linked to community size)
- Strong focus on treatment technology
 - most high-end systems research is focused on developed countries
 - much work in developing countries takes place in conjunction with implementation projects and focus on simpler systems (pumps, bore-hole, cisterns,) - opportunities
- Source water protection research – limited; specific watershed case studies; closely tied to socioeconomics/capacity
- Capacity and Socioeconomic research – governance, cultural/traditional, behaviour, resources and capacity
 - limited; broad-based to community based; possibly key factor in promoting adoption of solutions



Health Risks

Assessment

- Health effects research related to pathogens and chemicals in drinking water extensive and high quality
 - Not directly linked to size of water system
 - Focus on both chronic and acute: GI, carcinogens (e.g., arsenic), reproductive and developmental health effects (Disinfection by-products, ...)
- Key driver in addressing safety of small community water supply

Potential Areas for more work

- Health impacts, surveillance, monitoring of acute and chronic illnesses in developing countries, syndromic surveillance?
- Comparative Risk analyses (regions, communities)
- Other?

Arsenic in Bangladesh - health-risk substitution

Between 35 and 77 million people of the country's total population of 125 million are at risk of exposure to arsenic in their drinking water –



Infrastructure & Technology

Assessment

- Most research applicable to large community systems and for systems in developed countries (O₃, UV, membrane, remote system monitoring SCADA ..)
- In general, engineering solutions exist but cost and infrastructure capacity prevent application or adequate maintenance
- Movement towards distributed systems for small communities (POE, POU's)
- Need for integrated water-energy solutions to address poverty issues in tandem
- Linked to socio-economic – resource and capacity, knowledge

Potential Areas for more work

- Affordable, operator-friendly treatment technologies for full range of contaminants, including inorganics (e.g. high natural levels of arsenic)
- Need for reliable, robust and resilient systems – multi-barrier (**SCADA systems**)
- Non-piped improved distribution systems (e.g. community taps, rainwater collection)
- Natural disasters and system security, climate change – potential changes in quality and availability of water
- Energy Challenge - “Turn-key” packages for water-renewable energy systems, e.g. wind power, dams, waste, etc.
- Comparative analysis of available technologies; breakpoints in economies of scale
- Monitoring, testing tools - e.g. affordable systems; cheap, low-tech pathogen monitoring
- Other?



Source Water Protection (SWP)

Assessment

- Key in applying multi-barrier approach (Water Safety Systems) – identifying and addressing vulnerabilities
- Relatively new focus of attention – research generally multi-disciplinary and specific to watershed (case studies).
- SWP research more of focus in developed countries (part of regulatory approach) ...?
- Expansion to all regions would be facilitated by current WHO Network focus on developing a risk assessment tool, including identification of source water vulnerabilities
- Challenge is one of capacity, knowledge and socio-economics
- Universitas 21 (20 universities/12 countries) – focus of research on Water Futures for Sustainable Cities (water availability & climate change, natural disasters, changing demographics, ...)
- Challenge in implementing solutions once vulnerabilities known – governance and socio-economics

Potential Areas for more work

- Multi-disciplinary SWP research covering more watersheds (especially developing countries)
- Research, networking challenges and information sharing to optimize transfer and application
- Emerging issues – climate change, etc.
- Social, cultural and economic aspects for SWP need to be factored in (see Socio-economic & Capacity)
- Community-driven research
- Other ...?



Socio-Economics & Capacity

Assessment

- Research is limited, specialized and not necessarily incorporated into decision making process
- Socio-economic/capacity factors are often identified as the key to SCWS success in developed and developing countries
 - Investment versus cost (value of safe drinking water) (CBA)
 - Cultural priorities, values
 - Importance of knowledge and capacity to sustain systems
- Challenge is that these factors tend to be specific to a region, community and culture

Potential Areas for more work

- Cost-benefit Analysis link important
- Business models: service delivery, pricing, water system/infrastructure management
- Decision-making: social structures; role/value of water in a community; role of demographics/migration
- Participatory research: involving community members and end-users in the research project, e.g. ArcticNet
- Other?



Knowledge Transfer

Assessment

- Knowledge transfer of research directly or indirectly linked to improving safety in small community water supplies – room for improvement
- Examples of sharing of information linking end users and communities to research include WHO Network (informal), (Universitas 21), Canadian Water Network, Conferences (National Drinking Water Conference 2008 – theme is small systems), other

Potential Areas for more work

- Transfer to end-users: optimize application of research results to stakeholders, end-users, communities
 - Research on how best to transfer knowledge to small communities
 - Build on existing Networks (e.g. Rural Water Supply Network, U.S. Networks, Canadian Water Network model, UN University INWEH, WHO ...)
- Research Networks: build broad-based network re: small community water supplies (academia, government, ...) to share information, build collaboration and help in setting priorities (preliminary survey indicates interest among university researchers)
- Inventory of case studies illustrating application of research
- Other?



Policy

Assessment

- Value placed on regulations and policy “indicates” commitment of government, a necessary precursor in moving towards safer drinking water
- Most countries/regions have regulations, guidelines, policies to guide the provision of safe drinking water (e.g., WHO guidelines) – however, significant variation in design, application and enforceability
- However, they are not necessarily tailored for small systems, or simply cannot be met
 - Treatment inadequate or lacking
 - Operation and maintenance not supported
 - Monitoring and testing can be particularly onerous for small communities
 - Inadequate laboratory access affects ability to receive timely sampling results

Potential Areas for more work

- Evaluation of best approaches and economic implications for regulation/policy for small systems (country or region based; developing countries)
- Hierarchical/risk-based monitoring frameworks for chemicals
- Other ...?



Preliminary “Assessment”

	<u>Status</u>	<u>Rank</u>
Research Priorities (“Gaps”)		
• Socioeconomics & Capacity	• limited	H
• Source water protection	• limited	M-H
• Infrastructure & Treatment	• significant	M
• Health risks (micro/chemical)	• significant	L
Related Priorities		
• Knowledge transfer <ul style="list-style-type: none">• Case studies• Networks• communication	• limited	H
• Policy	• region-based	M



Preliminary Observations

1. Opportunity to champion socio-economic research as a priority “gap” – importance of investing in safe water for health
2. Promote Source Water Protection research, technology development, particularly for developing countries
3. Promote and support Knowledge Transfer and Networks to optimize application of research results, including health effects, technology,

How?

- By building on existing networks and considering creation of network for research on small community water supplies
- Seek funding support (international, bilateral, foundations)
- Other ?



Next Steps

- Validation / Correction
- Discussion

**Perfection or
incremental
improvement ...?**

THANK YOU



Health Canada Santé Canada