



Center for Strategic and International Studies • Sandia National Laboratories
Workshop Two: Technology and Global Water Management
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Alessandro Palmieri,
World Bank

Joe Cotruvo,
J. Cotruvo Associates

Yasmina Zaidman,
Acumen Fund

Susan Murcott,
MIT

Eric Mintz,
Centers for Disease Control and Prevention

Moderators

Peter Davies,
Sandia National Laboratories

Erik Peterson,
CSIS

Center for Strategic and International Studies

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Panel Two Develop, Deliver, and Make It Work

Erik Peterson: We'd like to shift gears now and focus our panel on the issue of developing, delivering, and making it work. I'm delighted that we have another outstanding panel.

I know that you'll forgive me if I abbreviate their introductions, but I know that we'd all like to plunge into the substance.

Let me begin with a quick introduction of Alessandro Palmieri who is leading dam specialist, quality assurance and compliance unit, environmentally and socially sustainable development unit of the World Bank. Suffice it to say that he joined the bank in the year 1997. He focuses on a range of technical aspects of investment lending in the water sector including, of course, dams. He manages a range of projects and initiatives at the bank relating to water, and he's just come from India so we're doubly grateful to him for taking part in today's discussions.

Alessandro, over to you.

Alessandro Palmieri: Thank you.

Good afternoon, everybody. I'm very glad to be here. I'm very glad that this place is so near to the World Bank in this unfortunate weather day. [Laughter].

STORY LINE

- Barriers to sustainable implementation
- Strategies to make implementation sustainable
- Opportunities for innovation
- Metrics for measuring or assessing success

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I have been putting together this presentation really at the last minute and I have to apologize for that, so I didn't use a lot of fantasy in preparing the story line and I used basically the points that you have highlighted in the content of this session, so barriers to sustainable implementation, strategies to make implementation sustainable, opportunity for innovation, and metrics for measuring or assessing success. It's useless to say that we could stay here one year dealing about these subjects, but I am trying to give a few examples that came to my mind based on my experience in the developing world regarding these issues.

On barriers for sustainable implementation. Well, there are so many of course, but those that came to my mind why some projects fail, and please don't think that I am listing them in order of importance. But the first one is lack of beneficiary participation in shaping a project, a program, whatever. In many cases it happens.

Second, also very important, reluctance by decisionmakers to make hard choices in terms of tradeoffs. Tradeoffs between different things. The first one that comes to mind is everybody's environment and development and stuff like that.

What are the barriers to effective sustainable implementation?

- Lack of beneficiary participation
- Reluctance to make hard choices in terms of trade-offs
- Less than adequate governance
- International barriers (subsidies)

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Then less than adequate governance in many countries in which we work. This is a problem. It is a reason more for which we should remain engaged.

The last one which I'm not going to make any comments because I don't think that it's worth making them, is that the international barriers [considerably] by the subsidies that are there in Europe and in North America to agriculture and other things that make it very hard if not impossible for developing countries to export their products.

What strategies are necessary to make implementation sustainable?

- Work on demand: identify needs, listen to stakeholders

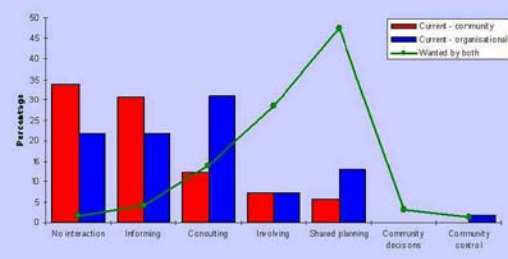
So the first one, what strategies are necessary to make implementation sustainable? I would say work on demand, identify needs and listen to stakeholders. Meaning identify clearly in a project what the needs are and then design the objective of the project to meet those needs.

In relation to this, there is an interesting study carried out by an Australian scientist back in 1994 about what is the community and professional perceptions of the community roles in influencing this issue of water location. Surprisingly enough, here you see an histogram in which in red you see the current community

perception on how decision are made, and in blue the current perception by the organization which is supposed to deliver the services.

So the spectrum goes all the way from no interaction with the stakeholder with community, all the way to community control. Although many governments are concerned that listening too much to communities might take to situation like community decisions or community control, that is not actually the case. You see that the area of common interest which is shown by the green curve lays somewhere between involvement of local communities and shared planning. So there is a way ahead in here because there is a common interest of having solutions which are rooted on the actual beneficiaries.

Community and Professional Perceptions of Current Community Roles and Preferred Community Influence in Water Allocation (McCreddin, et al, 1994)



Stakeholder Involvement in Options Assessment:
Promoting Dialogue in Meeting Water and Energy Needs
A Sourcebook

ESMAP

Report 26473
July 2003

The Four Principles

- Create an Enabling Environment
- Engage all Stakeholders
- Put all Options on Table
- Reach a Decision

We took up from that and we worked a source booker. She's called stakeholder involvement in operation assessment. I made a copy available to the institute here. If you are interested, I can send more copies of that. I don't have time to enter into details, but basically it is built on four principles and it looks at several case studies of successful and not successful initiatives and basically deals with create -- The four principles are creating and enabling environment, engage all stakeholders, put all options on the table, and most important, reach a decision. Because the stakeholder process should be an end to reach a decision to meet a need, that is the philosophy in that book.

The second point, I would say keep an open mind. Consider all options and do not ideology make the choice. Do not confuse mainstreaming with imposition. Ideology, I mean maybe in the '50s or '60s the ideology was do whatever you need in terms of large infrastructure, there is plenty of sites, don't

are about environmental or social impacts. And gradually we came to learn how important they are. Now in some cases you find the opposite. The approach is do not do anything that can cause an impact, and so don't do anything.

Unfortunately there are tradeoffs and we should be pragmatic in addressing them and work in this direction.

A recent case that you might have come across has been an article in the World Watch Journal titled "A Challenge to Conservationists" in which there is clear, very healthy dialogue on concerns between protecting and conserving some ecosystems but at the same time not having enough attention to the need of the people who live there. Indigenous peoples and so on. This has generated a very healthy debate among people, activists, the indigenous people and conservationists and has been a very learning discussion that is still going on I understand.

What strategies are necessary to make implementation sustainable?

- Work on demand: identify needs, listen to stakeholders
- Keep an open mind: consider all options, do not let "ideology" make the choice, do not confuse "mainstreaming" with "imposition".
- Assist governments with revenue management programs (e.g. Chad-Cameroon Pipeline, and Nam Theun 2 HPP)

What strategies are necessary to make implementation sustainable?

- Work on demand: identify needs, listen to stakeholders
- Keep an open mind: consider all options, do not let "ideology" make the choice, do not confuse "mainstreaming" with "imposition".

Finally, another strategy that should be put in place especially when large projects are financed to improve governance is to assist governments with revenue management programs. Especially in rather small economics, large projects can provide a big change and the way in which these revenues are used are extremely important, especially for an institution like the World Bank which is owned by all governments in the world so we are using taxpayer money basically.

These revenue management programs are very important. There are two recent examples in which we have worked with

governments to put in place these programs which include of course training and capacity building, the Chad-Cameroon Pipeline and [Nantutu] Project in Laos, an integrated project.

Where are opportunities for innovation implementation? The first one that comes to my mind, again, having an open mind, taking all, using all tools to facilitate development. So largescale projects and locally appropriate interventions are both necessary.


I was listening with a lot of interest before, the lady was pointing out the lack of research in small scale water and sanitation programs which is actually something that the bank is financing very much, both in terms of research and in terms of implementation in the last ten years or so. Probably we are now too much focused on that. I would say we should be able to keep a balance between large investment in infrastructure and locally appropriate investment. The two things are not one against the other. They should go in parallel. You need both of them for the simple reason that large investments have benefits that go beyond the direct benefits. They are what are called economic multipliers, indirect benefits. And while the local interventions, small scale interventions,

Where are opportunities for innovation in implementation?

- Large scale (multipliers) AND locally appropriate interventions

have the power of giving immediate answer to the needs of the people. So both are needed to development.

Economic Multipliers Effect: Bhakra Dam on the Sutlej... indirect benefits to the regional economy about equal to the direct benefits...



Panoramic View of Bhakra Dam

Irrigated 7 million hectares and provided 2800 mw of power

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The next slide, this is a large dam in India, Bagra Dam, and this is a case study that we studied in the bank in terms of quantifying the multiplier effects of this dam. We came out with the conclusion that the indirect benefits were on the same order as the direct benefits. When I say indirect benefits I mean there is an industry that grows in the area so there is more money available, there is more education, there is more supply and demand and things like that.

So this should be kept in mind. We should not be in favor only to large infrastructure or to locally appropriate investment. We should be very open to consider both as tools for development in different countries.

Another point, innovation implementation. Self-regulating initiatives by the industry. We have a lot of guidelines, compliance rules and so on but we should not forget that the best rules of the game are those that progressive and innovative industry is able to impose to itself in order to do a better job because in such a competitive environment, those who are going to succeed more are those who can demonstrate to be cautious, not only economic and financial, but also environmentally and socially.

A recent example by the International Hydropower Association that issued sustainable power guidelines as a guidance for their membership in managing and implementing new hydrology projects.

Finally, among these opportunities, something that I am very in favor of is promoting synergy between or among different forms of renewable energy. We all know how much is important the issue of climate change, whatever you want to call it, and the need to reduce emissions and so on. And the way ahead is not to promote one renewable form of energy or another one is again to have a synergy from that.

Where are opportunities for innovation in implementation?

- Large scale (multipliers) AND locally appropriate interventions
- Self-regulating initiatives by the Industry

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Where are opportunities for innovation in implementation?

- Large scale (multipliers) AND locally appropriate interventions
- Self-regulating initiatives by the Industry
- Synergy among different forms of renewable energy

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For example, look at the possibility between hydropower and wind. There are organizations like Hydro Tasmania which are producing energy with hydropower and wind together in a synergic form. When there is enough wind or not too much wind they can generate electricity and save water in the reservoir but when there is not enough wind or the wind is not adequate for generation, they can use this water and back up energy from wind.

So the future of renewable energy is not in one form or the other, is in a synergy among them. And if hydropower is not included full-fledged in this array, there is no future for


renewable, at least in the short term. In the future we might have very exciting discoveries, but at the moment --

The phrase that I very often use is not all kilowatt hours are born equal in the sense that different forms of energy provides different quality of intense of energy.

The final question that you asked for this session, what are the key metrics for measuring or assessing success. I could flood you with metrics in the bank that we have in terms of logical framework, how to evaluate, and so on. I think you would be very bored. You can access the web site and find whatever.

What are the key metrics for measuring or assessing success?

- Gross National Happiness in Bhutan
- The Himalayan state's development strategies are now based on this novel but little understood concept



<http://www.cseindia.org/programme/pov-env/bhutan.htm>

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"Not all kWh are born equal"

- Hydropower and Wind are both renewable forms of energy conversion
- Wind can conserve water in the reservoir when winds are favorable
- Hydropower can back-up wind when there is no wind, or too much wind

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I thought it was more provocative to quote a recent case that you might have come across. There was a discussion in the magazine of the Economist about that. It is the fact that Butan, which is a very remote kingdom in the Himalayas, northeast of India, came out with [a prefix] to the concept of gross national products or gross domestic product, and they redefined it as gross national happiness. This is serious. It's something that they are pursuing with a lot of effort and if you are interested there is a web site where you can look at the arguments there. There is also Nobel Prize that commented on that.

Butan is a very remote place, very poor, and there is an [unintelligible] there. But they have quite challenging settings for their development. I would say that summarizing, they have a look at fighting poverty but with a development attitude. They think that fighting poverty is not enough for them. They want to fight poverty but to have the opportunity of development.

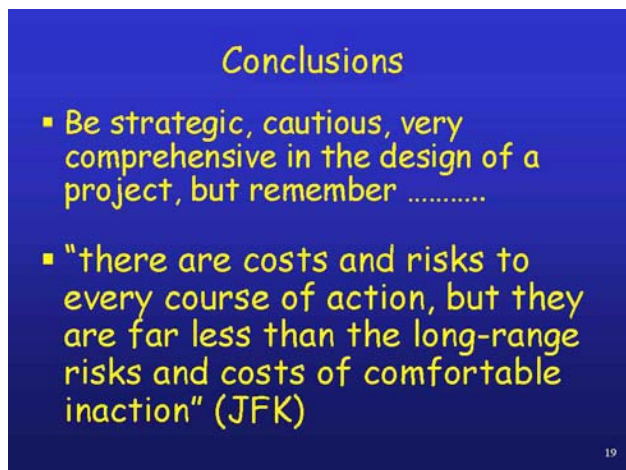
They find this opportunity for development using their indigenal resources which are basically forestry and water and head, and there is a huge amount of investment coming from India to develop their hydropower potential. India put all their financial resources, they get royalties, and they are growing very much. Something that is working in Butan, but unfortunately is not working in Nepal for the political situation that we well know.

Going back to the concept of gross national happiness. This is a comparison that is in that web site between the millennium development goals and the gross national happiness

Gross National Happiness (GNH): Defining 'development'	
MDGs (Millennium Development Goals)	GNH (Gross National Happiness)
Eradicate extreme poverty and hunger	Sustainable and socio-economic development or economic self reliance
Achieve universal primary education	Preservation and promotion of cultural heritage; Enrolment of children between 6-12 years of age in primary schools to 90-95 per cent
Ensure environmental sustainability	Preservation and sustainable use of the environment
Open trading system that includes a commitment to good governance, development and poverty reduction	Good governance.

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concept. You see that most of them are similar, but I would point out the first one and the third one. While the millennium development goals say to eradicate extreme poverty and hunger, they say sustainable and social economic development or economic self reliance is something more than that. They want more development than just poverty reduction.



Conclusions

- Be strategic, cautious, very comprehensive in the design of a project, but remember
- "there are costs and risks to every course of action, but they are far less than the long-range risks and costs of comfortable inaction" (JFK)

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The one before the last, while the MPG aim at ensure environment sustainability which we all agree, they say something more. They say preservation and sustainable use of the environment. They have located a certain amount of their area to be preserved forever and the rest to be used in a sustainable way. So I think this is what I wanted to say.

I think I have a last slide which my experience say okay, in making a project be strategic, cautious, very comprehensive in the same approach, remember there are costs and risks to every course of action but they are far less than the long range risks and costs of

comfortable inaction. These are not my words, but they are words of a person that you know very well and the name is there.

Thank you.

[Applause].

Erik Peterson: Thank you, Alessandro.

Now it's with equal pleasure that I introduce Joe Cotruvo who is President of Joseph Cotruvo and Associates, environmental and public health consultants. He holds a doctorate in physical organic chemistry and did post-doctoral studies in heterocyclic chemistry on the one hand, and in law on the other. I'll let him explain the relationship there.

He currently serves on several World Health Organization Drinking Water Guidelines panels and a range of other national and international panels and organizations.

It's with great pleasure that I introduced Joe Cotruvo.

Jose Cotruvo: Thank you very much.

This is a very large topic, of course, and fortunately Alessandro did a very nice job of talking about a number of the sociopolitical elements that ultimately determine implementation. Not so much technology. Ultimately it's those implementation efforts that need to function at the local level, as we all know, so I'm glad he covered that very well. I'll touch upon it a little bit.

The topic is traditional and non-traditional. I'll focus on the non-traditional, of course. I guess the take home message is that there really are a lot of options. There are a lot of technological and structural options that can apply and they're not all expensive and they're not all complicated and they're not all high tech. But the point of it all is that to choose the right one for the particular community and its needs that it can survive with that will be sustainable in that community. But I think ultimately the bottom line is sooner is better than later.

The high priced technologies take a lot of time and cost a lot of money and if there's something that can be done sooner, sometimes as a stopgap, but sometimes it might even be the ultimate solution for some communities. That's a good thing.

So we'll talk about some of those choices and some of the considerations and some of the costs and go from there.

This is the summary, basically, of the story. It means there are conclusions, but I think they're actually axiomatic to a great degree.

CONCLUSIONS/Axioms

- Quality becomes an issue after Quantity is sufficient**
- Drinking water quality and sanitation are intimately linked as the basis for public health protection**
- Microbial Contamination is the predominant risk
ALWAYS and EVERYWHERE**
- Solutions are low tech and are not usually financially limited, with exceptions esp. fluoride and arsenic**
- Decentralized system solutions are feasible , cheaper and quicker than centralized in many cases (esp. small)**
- Needs: Prevention, Public buy in, Regulatory and Legal Structure, Enforcement, Political Will, Willingness to pay**
- Private sector can have significant role in the solution**

We've talked a lot about quality. We heard a little bit about quantity in the irrigation discussion and the water sources discussion before. But if there isn't enough quantity then survival really isn't possible. So quantity's first, then very quickly after that is quality, and it's not only drinking water but it's also sanitation that's important and we've heard that before.

But also really, everywhere, it's the microbial contamination that's a concern, and that means even in the United States. We spend a lot of time talking about a lot of esoteric concerns in drinking water in the United States, but it's really the microbiology that's the concern and that has to be, a level of diligence has to be maintained at all times. That not only applies here but even more so of course in some of the developing countries.

Some of those low tech solutions, and there are many low tech solutions, aren't really financially limited. It's more a matter of establishing the process, making the decision, making it work in the field. We know that some things cost more, fluoride and arsenic removal, and those are really the two key drinking water contamination issues for WHO after biological contamination and Susan talked about some of those. But they're more expensive, of course, but nevertheless important.

In the non-traditional sense, the decentralized solutions are really very feasible. They exist, they're cheaper, they're quicker, and in many respects they may be the best solution for some particular community. And we're typically talking about smaller communities here. Obviously when you get to the point of having economics of scale and the additional benefits as Alessandro talked about, bigger systems than can work. But they're not easy. We know history tells us that they don't work for long in many cases.

But bottom line then is what do we need to do? Well first of all, prevent contamination if you can, because if you don't have to take it out then that's cheaper than treating to remove the contamination. The public has to be involved and they need to agree that this is what they want and that they're willing to use it ultimately. There needs to be some kind of regulatory legal structure that functions, some kind of regulatory oversight that provides an inducement to produce the water of appropriate quality, but also that there's an actual contracts enforcement system that operates within that country so that people will live by their words. If they buy something they'll pay for it, and that's a key question that doesn't always exist. And the e-word, enforcement, sometimes is necessary in the regulatory context. If you don't enforce, then why bother having regulations?

Political will is really the bottom line of it all. If it's from the national to the local political level, something that is desired, it can happen. Many barriers can be overcome. And then ultimately of course, willingness to pay. It's important that these projects be self-sustaining. Ultimately we have to get people educated to the point that they're willing to keep them sustainable for their own benefit, of course, by paying and sometimes paying less than they would have paid through the alternative.

Then the bottom line ultimately is that the private sector can have a lot to do with this. This is not the province entirely of government. I don't think, and I think there are a number of situations, and especially even in a place like in the United States. I think in small communities in the United States I think private sector is maybe the salvation. The small community problem has always existed here. It's never been solved. It's always one of those hand-wringing things. There are not economies of scale but there are ways that the private sector can make it work in the small communities of the United States and possibly in developing countries, too.

WORLD DRINKING WATER PROBLEMS

Some waterborne diseases: typhoid, cholera, gastroenteritis, diarrhea, salmonellosis, cryptosporidiosis, giardiasis, numerous intestinal parasites.

Water/sanitation /hygiene-related worldwide disease burden 1999 WHO estimate:

2,213,000 deaths

82,196,000 Disability Adjusted Life Years (DALYs)

You know about diseases and the only reason I put this up here is we know that WHO has estimated about two million deaths a year to water and sanitation problems, and they calculate something called disability adjustment life years which are basically the aggregated amount of time lost due to illness and death. So for two million deaths I think they've grossly underestimated the disabilities here. I would

imagine it's at least ten times more than it is. We're talking about maybe close to a billion disability adjusted life years lost as due to problems with water and sanitation. So it's a bigger problem than maybe they think it is even.

Water Service Requisite to Protect Health (WHO 2003)

Optimal	100 lpcd	(continuous, tap)
Intermediate	50 lpcd	(tap or within 100 m)
Basic	20 lpcd	(< 1000 m, or within 30 min.)
Very Marginal	<5 lpcd	(> 1000 m, or > 30 min.)

Access to Improved and Piped Supplies (WHO)--

Year	No Access	Improved Sources	Household Connections
1990	21%, 1.1 B	38%, 2.0 B	41%, 2.2 B
2000	16% 1.1 B	43% 2.9 B	41%, 2.8 B

We talked about quantity and access to water. In the United States the per capita consumption on average is well over 100 gallons per day, which is way more than anybody needs for drinking water, of course, but from a number of calculations mostly in the developing world we can see that WHO feels that on the order of 100 liters, this is 100 liters per capita per day is optimal, and it needs to be continuous supply, reliable supply, and at the tap so that it's readily accessible.

WATER CONSUMPTION in USA (temperate averages)

<1% of Supplied Drinking Water is Ingested

1.2	lpcd mean-----
2	lpcd 88th percentile
2.9	lpcd 95th percentile
4	lpcd 99th percentile

Hot climate and Physically Active:
~ 4.5 lpcd for hydration
up to ~11 L/day max.

There are lesser levels down to the very lowest, barest survival on the order of five liters per capita per day or less. You've seen some of these statistics before that this is the decade of the '90s to 2000 and there have been significant improvements, but the population has increased substantially at the same time. So basically the number of people that are still in a situation of insufficient supply and insufficient quality and insufficient access is about the same as it was in 1990, and unless something is done, obviously, it's going to keep going downward.

But does it require sort of heroic efforts on an international periodic basis such as the decade of the 80s? And then there's another one that's starting now. I think it's more important that someone finds a way to provide a sustainable impetus so that these problems can be alleviated more quickly and in a more concerted manner.

Pipe supplies have a way of demanding a lot of water. And in the United States we, and in Europe of course, we require that the pipe supply be drinking water quality even though a very minute portion of that is ultimately used for drinking water. On average, just a little over one liter a day per person is actually consumed, drunk, and used maybe in cooking. So that leads me to say maybe this isn't going to go on forever. Maybe, even in a place like the United States and Europe, it will become clear ultimately that there are other economic ways to provide water of ultra high quality without spending the money and throwing 99 percent of it away. Ninety-nine percent goes to flushing the toilets and washing the cars and watering the lawns.

It's only been like this for about 100 years in the United States. There's nothing to my mind that says it's going to continue like this forever, so there is innovation in the works. There are economic drivers, there are social driver that are moving us in the direction of having a different paradigm for providing so-called drinking water in the future compared to what it's been in the past.

So again, innovation is a good thing. We shouldn't assume that the conventional engineering solutions are the best way to do it. There are plenty of options. We'll talk about a few of those.

Just to mention the demand for basically sustainable life in a situation where one is living in a warm climate, one has some level of physical activity, perhaps about four liters, four, four and a half liters per day is necessary to sustain life in a situation like that. Up to a maximum of 11 liters, people that work extremely hard, who are out there, for example, even military in the field. They really shouldn't drink more than 11 liters a day. It becomes medically a problem -- salts depletion and other problems like that. So one can drink too much water. And therefore there is a relationship between physical activity, climate, optimal water consumption as well as minimum water consumption to sustain life. It's not an infinite number.

This is just a rough outline of some comparisons of situations. I mean, why do we have difficulties in delivering water in different kinds of societies? I just put down a few notes comparing developed, intermediate and developing environments as to what are the differences and what are the similarities? There are a lot of similarities, actually. But the difference is, I think the biggest difference in the developed world is you have a legal regulatory structure that basically provides a context for the system to function, whereas as you go into intermediate situations, where there certainly are public water supplies but they don't really function all of the time, they're not, I don't know what the impetus is that could force them to do better, but they don't. We know that there are supplies around, big city supplies where water is only in the pipes a few hours a day, where the pipes are of very significantly damaged condition so there are losses in transit on the order of 50 or 60 percent and more.

DEVELOPED	INTERMEDIATE	DEVELOPING
Regulated PWS	PWS etc.- not reg.	PWS etc.- not reg.
	Peri urban	Peri urban
Rural-not reg.	Rural- not reg.	Rural- not reg.
Home wells/springs	Home wells/springs	Home wells/springs
Treatment	PWS Uncertainty	PWS Uncertainty
Secure supply	Inconsistent supply	Quantity>Quality
	Pressure loss/leaks	Pressure loss/leaks
		Limited access
Oversight	Partial Oversight	Limited

So one of the key elements of it all is not only having a public water supply, but having a supply that works, that's consistent, that's reliable. And that's one of the failings as one begins to come down the spectrum from developed to the intermediate and ultimately to the developing countries of course where it's even less. We know they have specific problems relative to peri-urban areas where we have large population centers with hundreds of thousands of people moving in to the peri-urban areas where there is

no water service, where they somehow have to find access to water and where this becomes not only an economic problem and an infrastructure problem but also a social problem.

So fortunately we don't deal with those kinds of situations.

Rural supplies are good everywhere. If you have your own well and you're lucky and it's not a contaminated aquifer, that's fine. It doesn't make any difference where you are in the world. The same thing with wells and springs, so those are similar across the board. The problem occurs as population density increases. As that begins to occur the water demands increase, the waste demands increase, the possibilities for illness increase because of proximity, contamination, of course. So it all boils down to population density.

Treatment exists in the developed world, of course, and it's reliable. It also exists in some of these other places but it's not reliable. Again, due to the structure, due to the environment, due to the aggregate of the situation that people are in, be they partly economic, partly political, partly lack of will.

Ultimately what exists in the developed world is some kind of legal oversight and what doesn't appear to exist in these other situations is that level of legal oversight that provides that extra incentive to perform.

Historical Water Service

POU

Central Distribution

Central Treatment

Central/Supplemental

Decentralized POU/Bottled Water

Well, a little bit of history. POU became kind of a novel idea in the states about 20 years ago as people began to look for supplements to their public water supply, supplemental treatment, but it all began with point of use. There are writings 4000 BC where recommendations to boil the water, to filter it through sand, to use even clay pots for filtering and so forth. Those were providing water for aesthetic purposes at that time when obviously there was no concern at all about disease, nobody had any concept of disease. It was simply a matter of producing water that tasted good, reasonably.

It started with POU. Then as history moved along we come to the Persians and the Romans and the Phoenicians, and they were great engineers. They brought in water, they built aqueducts. Distribution was their key, again not for health purposes but for fire protection, for fountains, for baths, the whole works. They were able to distribute water. And when you think about it, about 2,000 years elapsed and nothing happened. There were no advances in the technology of providing water between about the

current millennium, well about the year one, let's say, in the Roman system and about 1850. The technology was the same. It was distribution, it had nothing to do with quality and sometimes distribution enhanced the opportunities for waterborne disease. You could, if you efficiently transported contaminated water to your population in the community, you made more sick people. So it wasn't until right about the turn of the century, the turn of the 19th to the 20th Century where water treatment became a functional reality, where chlorine, it was learned that chlorine could disinfect, where filtration was put in on a large scale. There was some of that in the 19th Century but more so right around the 20th Century.

Then it moved in to current time where people are becoming dissatisfied with their water supply and so now they're going back to point of use treatment and bottled water, and ultimately the idea being that one drinks, one wants to drink a very high quality product and all that other water in the system doesn't really need to be consumed and therefore it doesn't really need to be at the same high level of quality as the beverage water that you need in small quantity. So we've really kind of come full circle in some respects if you look at it that way. And again, I say it's only been about 100 years since this current paradigm has existed of central distribution and central treatment and there are other options. There are other approaches that can build from there to make more a more optimal arrangement and perhaps a more economically efficient arrangement.

So what are we trying to do in this kind of a context? Well, we want to provide an adequate quantity of water for health and welfare. We really need to provide a smaller quantity probably of microbiologically safe water for human consumption, but we need to do it pretty fast. It's not something that should be a ten year project in a community. It's something you'd like to do next month if you could because people are dying, people are getting sick. So you need to do something for the short term.

Threshold Water/Health Challenges:

- Provide adequate quantity for health and welfare**
- Provide a smaller amount of microbially safe water for human consumption**
- Do it quickly and economically**

The conventional wisdom, the conventional policy at this point is disinfection of filtration are really what you need. Those are the essentials for most waters, and the current requirement is such as in developed countries, is central treatment piped distribution, and consistent distribution. So that would be the ideal.

We'd like to do that everywhere but we can't necessarily because there are a lot of barriers to central treatment and distribution and a lot of environments.

Basic and Sufficient: Disinfection and Filtration (surface water)

Current Standard:

Central Treatment Piped Distribution Safe/Consistent Distribution

So if you look at developing countries as the situation, but you can also look at some, a lot of small communities in the United States too that basically face very similar problems.

Adequate supply. Adequate quantity of the source water. If you're going to build a central system, a central treatment plant you have to have the appropriate engineering expertise to do it. If you have that, you now have a responsibility to maintain and operate that system so you need people that are properly trained, and you've got to be able to do the repairs and you have to do the parts, and if you produce a very high quality water and then you distribute it through leaky pipes, it's going to be recontaminated so why bother?

Piped Central Treatment & Distribution

Problems in Developing Countries and in Small Systems

Source water quantity
Engineering expertise to build
Operating expertise to maintain
Training, Repairs, Parts
Distribution system condition/leaks
Deterioration in transit
Time to plan, finance and build
Costs---Sunk costs
Sanitary Sewage System

The question is, it's all in one piece. It's all together. You can't do one without the other. And that's another significant investment in time and money, that distribution system. And it deteriorates during distribution in some situations. It takes a lot of time to plan and finance all of this. And once you have invested and found the finances and built the system, you have a tremendous amount of capital sunk into the system. Of course once you have a central treatment and central distribution system, water consumption will probably go up and you now will need a sewage system to take away sewage that's being generated.

So in a well financed developed country, piped central distribution systems are the way to go, of course. But they may not be the way to go in a lot of other situations just because they're complicated and they're expensive and they take a lot of time. And the time that you are not putting in improved water quality people are dying every day so you've got to do something in the shorter term.

What are the choices? There are some non-traditional choices. There's a much longer list than this, I've abbreviated it, but one is a two-tiered kind of system where you produce microbiologically safe water at the central treatment system for bulk use and then you have a supplemental water that is treated in the home. Or without that central system you have a home household kind of a treatment system such as Susan talked about, from whatever the source, or even bottled water. System supplied bottled water isn't out of the question here from a financial and economic perspective and a public acceptance perspective.

Non Traditional Water Service

Two Tier Water Systems (Decentralized Production)

**Microbiologically Safe (if possible) Central Treated Water for bulk
uses**

**System –managed ‘Beverage’ water produced by Point-of-Use
treatment,**

or

System supplied bottled water

Dual Distribution Networks

There are a lot more complicated systems, dual distributions, but we won't get into that.

So why think about decentralized? Well, a lot of people can think about it, first of all. Obviously it's always done in the case of emergencies anywhere. Bottled water is trucked in, whatever. Travelers need it right now. If you're traveling in an area where the water is of uncertain quality you need to have some way of assuring that you will have access to safe water, and there are ways you can do it as a traveler, and they're the same, basically the same ways that can be done in the community itself, among the residents in these same areas.

Decentralized Operational Modes:

**Emergency
Travelers**

**Routine Supply:
Pending central treatment/distribution
Supplemental to central treatment
Long term**

**Small Systems
Large Systems (supplemental)**

You might do it as the long term or as the short term solution. You might invoke some kind of decentralized household kind of treatment approach pending ultimate introduction of central treatment and distribution, which you may do later. Who knows when? It may be a supplemental to central treatment where you have uncertain quality, for example, that provides an extra margin of safety. But ultimately, in some situations, some small communities it may well be the best solution, the decentralized household point of views approach. Maybe the long term solution. And this is particularly appropriate in small systems but it may well be appropriate even in peri-urban areas where there's very little hope of pipe distribution being extended in the near term.

So there are a number of applications where some of these approaches can exist.

POU Disinfection Options:

Chlorine forms

Iodine

Boiling

Ceramic filters

Fine filters

We said before disinfection and filtration are really the two key technologies. They are old technologies, they both work very well. Lots of ways to disinfect water in your home, be it chlorine, iodine, boiling, filters, various sorts.

Comparison costs. For ten liters of water, to boil it, which is certainly not a convenient thing to do, but it costs about five cents worth of fuel in a developing country to do that. To simply disinfect it with chlorine bleach, standard bleach it costs about a tenth of a cent, U.S. prices. There are new technologies, recently developed technologies. One, there's a KX filter that's coming along about to be test launched that can process 100 gallons of water at the cost of about 2.5 cents for ten liters. That's a reasonable price. We know P&G has their PuR product which is an excellent system and it provides both disinfection and the equivalent of filtration with its coagulation system so it produces a safe as well as a better quality water than some of these others would do.

If you were going to put in a central system and put in a chlorinator, just the chlorination system itself in a small community with the tanks and the meters and all that would probably cost about \$5,000 or so. So that could delay implementation. So the point is there are some choices, there are some options that you can do a lot quicker.

Cost Estimates (USD) for POU Disinfection (10 liters of water)

Boiling ~ 0.05 (kerosene)
2 ml Bleach ~ 0.001 (US retail)
KX Filter ~ 0.025 (test launch in Asia)
P&G PuR ~ 0.10 (also coagulation)

**Small system chlorinator with tanks, meter,
pump, mixer ~ \$5,000 capital US**

And what about bottled water? I'm thinking in terms of centrally supplied bottled water, not catch as catch can, not consumer driven bottled water, but where the community invests in providing a source of water of appropriate quality and the costs of production can be fairly reasonable, on the order of 15 cents a gallon for producing the water itself which is about four cents a liter. That's if there were bulk production and no packaging. But if it's packaged, the way that's done issuing a polyethylene bag which is the cheapest way to do it, it then comes to about 13 cents a liter. So this is more than some of these point of use technologies, but potentially a much better quality product that can be available. I got these figures from [Heidia-Leister] who are developers of this technology.

System Supplied Bottled Water production cost

~0.15/gallon---bulk

~0.04/L---bulk

~0.13/L---PE bag

from Hidell-Eyster Inc.

We've talked about really basic treatment now. Disinfection in the home, that sort of stuff. But let's go up a level. Still decentralized. This is a cases for arsenic removal by decentralized systems. This is a water system managed point of use treatment technology in the home in each home in a community of a little more than 100 residences.

**Arsenic Treatment by Decentralized POU
~ 100 Homes (Grimes Demo Project Draft)**

	Alumina	Iron Oxide
Units Purchase	14,500	7,900
Installation	13,000	13,000
Pilot	5,000	5,000
Total Capital	32,500	25,900

So here's a case where, this is decentralized and two different approaches, but you can see the capital cost for going this route. Decentralized, technology in each home. On the order of \$25,000 to \$30,000 or so, in that range. It sounds like a lot of money, but what's the alternative? The alternative is put in a central system with arsenic removal, same technology. But now you're talking a whole lot more. You're talking somewhere between \$150,000 and \$180,000 of capital costs plus various O&M costs that have to go with it and that doesn't even include the labor. So the point again is, this is a viable option. The idea of putting good technology into individual homes, managing them centrally, even in the United States can make sense in the right environment. In a small community particularly. And there are economies of scale, and eventually there's a cross-over point where it becomes more cost-effective to go to the central treatment, of course. But the point is there are about 50,000 very small communities in the United States and the decentralized approach may well be the most economical and best approach for them.

**Central Water Treatment System for Arsenic Removal
~ 100 Homes (Grimes Demo Project Draft)**

	Alumina	Iron Oxide
Equipment	56,000	74,000
Installation	18,500	24,500
Building	32,000	32,000
Engineering	50,000	50,000
Total Capital	156,500	180,500
 Annual O&M	 6,000	 8,000
Plus labor -----		

There's a monthly cost comparison using those two comparisons. It's not cheap by our standards. POU, and let's just look at the iron oxide, central treatment, about almost \$28, \$28 to \$30 monthly cost for POU arsenic removal, central treatment, versus about \$13 monthly cost POU arsenic removal, point of use.

**Comparative Monthly Costs for Central Treatment vs POU
Annualized 7%/7 years (Grimes draft report to EPA)**

	Central	POU(annual change)
Alumina	31.42	14.67
Iron Oxide	28.37	12.82

I don't know how these translate into Asia or Africa. These are intended to be relative comparative figures to demonstrate that indeed there is more than one way to treat drinking water and there are approaches that may be optimized for particular circumstances. And it's not one size fits all. It's not all central treatment and distribution.

Well, this just kind of aggregates a number of principles that relate to a great degree small communities in the United States as well as developing countries where we have concerns about providing water that meets safety standards. Obviously there are number of factors that have to be evaluated critically to be sure that one is making the right choice, and obviously you've got to look at cost, you have to compare the options, different approaches, and it's a function of community size and proximity to other communities, because you may have some economies of scale opportunities by sharing services in a region. Proximity to service providers.

Important Decision Factors for Implementation -Central or POU

Cost: Comparison of Options
Community Size
Proximity to other Communities
Proximity to Service Providers

Legal/Regulatory: Reg. Requirements
Ordinances and Contracts
Liability
Waste Disposal

Selection: Condition of Distribution System
Suitable Technology for Application
Warning or Shutoff when exhausted(POU)

I think one of the other points that I'd like to make is that it may well be that the most effective and efficient way to do this in the long term is through private sector service providers as opposed to public sector people who are basically amateurs at the process. You really need professionals who know how to do it so that they can install the right product, keep it running, and therefore provide a guaranteed, good quality water.

We talked before about legal regulatory issues and the regulatory requirements can be restrictive. They need to be dealt with appropriately. You need a system that will have enforceable contracts, otherwise forget about private sector. There may be liability issues, certainly waste disposal issues in some situations.

Then the question of which choice. Again, central versus decentralized. The condition of the distribution system is very important. It's totally absurd to spend a lot of money, put in a very high quality central treatment system, produce a very high quality water, and then put it into a poor distribution system with leaks and recontamination and all kinds of things like that.

So that's part of the factor and that's one of the positives of point of use treatment because it can compensate for the problems in the distribution step. You've got to pick the right technology for what the contaminant is you're trying to deal with, and you need some sort of protective system to assure that the system is working, obviously, so that the consumer will easily know.

Installation/Management:

**Community Control or
Contracted Control (best?)
Purchase or Rental
Professional Installation(POU)
Community administration
Operation & Maintenance**

Political Will***

Community Buy-in***

Willingness to Use***

Willingness to Pay***

Community control or contracted? What's better? In a lot of cases, probably contracted but again, case by case decision. Purchaser or rental? Another case by case decision on cost. Professional installation? Yes. Right kind of community administration. A process for providing appropriate operation and maintenance, otherwise no system works successfully.

But ultimately regardless of all that other stuff, ultimately it's political will and the community's buy-in. The community really wants this, and that they'll actually use it when it's installed, and that they're actually willing to pay for it. I think those four things taken together deal with about 90 percent of the problem.

CONCLUSIONS/Axioms

- Quality becomes an issue after Quantity is sufficient**
- Drinking water quality and sanitation are intimately linked as the basis for public health protection**
- Microbial Contamination is the predominant risk ALWAYS and EVERYWHERE**
- Many solutions are low tech and are not usually financially limited, with exceptions e.g. fluoride/arsenic**
- Decentralized system solutions are feasible, cheaper and quicker than centralized in many cases (esp. small)**
- Needs: Prevention, Public buy in, Regulatory and Legal Structure, Enforcement, Political Will, Willingness to pay**
- Private sector can have significant role in the solution**

So back to the same conclusions. Bottom line is there are ways, there are alternatives, and they don't all cost a fortune. They don't all take a lot of time. Some may be short term, some may be long term, but the important factor is to choose the right solution for the right situation that will ultimately be sustainable and reduce the disease burden in that community as quickly as possible. Then other factors can come in later, economic development and so forth. There are a few references that one can dig in if they want to.

Thanks very much.

Erik Peterson: Thank you, Joe.

[Applause].

Erik Peterson: Thank you very much.

It's with pleasure that I introduce Yasmina Zaidman who is portfolio manager of Water Innovations at the Acumen Fund. Prior to joining Acumen, she worked in the area of international environmental protection, social entrepreneurship. Most recently she led the Environmental Innovations Initiative at Ashoka where as Acting Director she headed an effort to capture and disseminate best practices.

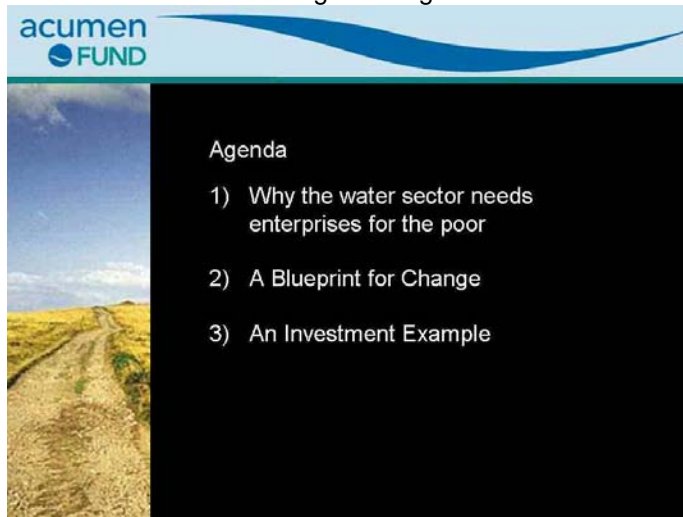
So Yasmina, welcome.

Yasmina Zaidman: Great. Thank you. It's really a pleasure to be here today and I think it's a really good segue from the last presentation.

What I want to talk about, really, is a little bit about one particular approach that Acumen Fund is using to support the delivery of critical goods and services, including water, to what we call the base of

the pyramid. This is a term I'm sure most of you are familiar with, but it's a little bit different from, I think, some of the target audiences that have been discussed today in that for us we're thinking about the four billion people who make less than \$4 a day and tend to lack access to the quality and reliability of services in key areas like water, housing, and health. Not necessarily the poorest of the poor, but people who generally lack adequate affordable alternatives in these critical areas.

One thing I want to emphasize is that I agree with what's been stated several times today, that there are no silver bullets and so with what we're doing at Acumen Fund, we're not looking for the right solution for the world, we're looking for a model that we think can enhance what's currently available when it comes to delivering critical goods and services.



So what I want to talk about is why the sector needs entrepreneurial models, our approach to delivering those and then, lastly, an example. I'll actually try to give a couple of examples because I think it's the most helpful for illustrating how we work. And then, again, I really want to emphasize that we're not -- Our organization is very small, it's relatively new. Acumen Fund was started just four years ago and we have no pretensions at being the organization that's going to solve these problems, but we are very excited to be introducing an innovative model that we think fits into the solving of these problems, which is very much a market-based model that focuses on the role

of entrepreneurs, the private sector, to enhance the amount of innovation capital available to solving some of these problems.

Our overall goal is to invest in and support financially sustainable and scalable enterprises that deliver critical goods and services to the poor and the way we do that is we not only find enterprises that achieve sort of a double bottom line in terms of delivering a critical good or service, but doing it sustainably as well. We focus on providing the support, capacity building, management support, business development services, in these key areas that are to us just business fundamentals.

So when we think about innovation, we're usually thinking about innovation in distribution models, marketing, innovative product design, and not necessarily on the technology side.

As you heard in the first presentation, there are some incredible technologies that have already been developed and continue to be developed. Our focus is on how do you make those available to this target market and we do that with these sort of five building blocks that I'll talk about later.





Our Assumptions

- 1) The poor are demanding safe and sufficient access to water
- 2) The poor already pay, but at exorbitant prices
- 3) Markets alone will not deliver water resources to the poor
- 4) Governments and non-profits do not reach enough people
- 5) Social entrepreneurs with a double-bottom line can help address the water demands of the poor

Our assumptions when it comes to addressing particularly the issue of water is that people are demanding improved access and reliability, that they are already willing to pay and in many cases they are paying much more than they should be in comparison to either wealthier markets within their own country or people in the U.S.. So in poor communities, people can pay between 20 to sometimes 70 percent of their income for water and clearly there's an imbalance there because people are already paying in some form.

We're also aware that markets alone are not going to solve this problem because if they were, they would have long time ago; that for very key reasons these markets that we're looking at of people who make less than \$4 a day and particularly at the low end of that are definitely overlooked by the market and we think that's a combination of things going on.

One is that these are tougher markets. The behavior of these consumers is not well understood. Generally these products have to be designed completely differently because they can't be as expensive as the products that are targeted to middle and high income markets. But also these people are by definition in remote areas, they're in rural areas, they're off the grid electronically, they're harder to reach. So there are a lot of additional challenges that go into this and it's one of the reasons why today Acumen Fund is a non-profit organization and our capital comes from philanthropic sources.

So our goal is to prove that this is an opportunity out there and to try to bridge these two worlds of social change and trying to figure out how to access private capital, but we're not yet saying that this is the best way to make a lot of money fast. We just aren't confident of that yet, but we want to figure out how to leverage donor funds and philanthropic capital more effectively to achieve much more accelerated change at a much bigger scale. So that's, again, sort of the framework that we're looking at, that markets alone is not the solution, and at the same time if you solely rely on governments and NGOs, we don't feel that there's this sort of dynamism and the potential for scale that the private sector and entrepreneurial models could perhaps bring to this.

So what we're focusing on are social entrepreneurs who really have a double bottom line approach and these are sort of unusual characters because they start out with a commitment to addressing a critical social problem but they are very comfortable with the idea of building a well-managed, sustainable, growing enterprise. They're comfortable with making money because they see that as a way to get this idea to scale.

And, again, if I hadn't met several in the last two years, I would probably wonder are they really out there, but they are and I think they deserve to be recognized for bringing these two spaces together of social change and entrepreneurship.

I don't really need to go into the challenges of the water issue. I think that the issue is complex. You've seen some of the social impacts of lack of access to safe and sufficient water. Some of the other issues I want to mention is that there's a lot of money being pumped into this sector and I think there are a lot of inefficiencies, so part of the challenge is to figure out how to take existing resources and use them more efficiently.



The Stakes Have Never Been Higher

- \$13 Billion invested in water every year – but products and services do not reach the poor
- Donor funds and philanthropic capital are insufficient to address the gap in water access
- Large subsidies distort the market and stifle enterprise development

Another key challenge is to look at subsidies. Basically to identify all the different players that are out there and figure out what is the best role for each organization to play. Because in some cases what we've seen is that simply throwing money at the problem not only is sort of unreliable as a solution because money does run out, but it also scares away any entrepreneurs because it eliminates any incentive to create a viable model and you have a lot of communities now who have gotten the message very clearly that because they're looked at in a certain way as poor people, they shouldn't have to pay for water, so they're waiting. And I think, to me, that's the worst case scenario for what subsidies can do. The subsidies aren't reaching them, but they're waiting for them, and there's a sense that they themselves don't have to take responsibility of helping to assess and define and pay for solutions that they want.



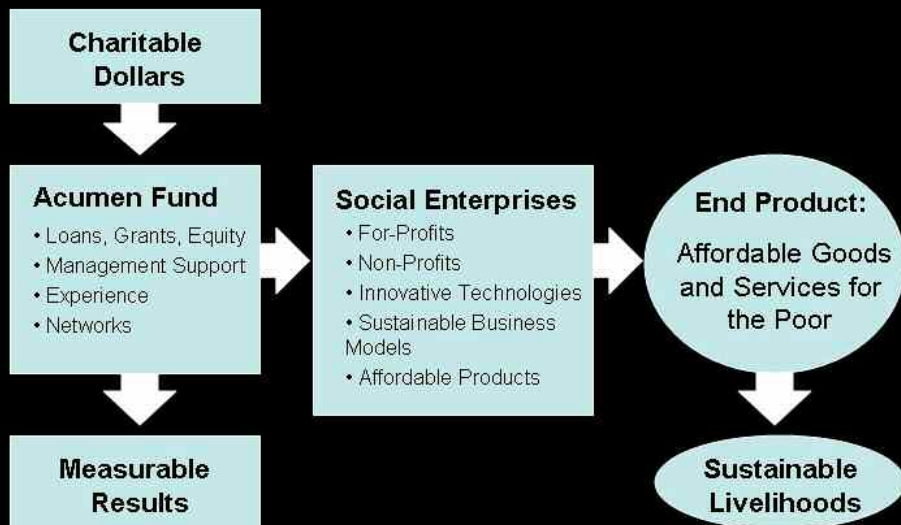
The Opportunity Has Never Been Greater

- Enhancements in global communications
- Advances in technology
- Extraordinary social entrepreneurs
- Interest from all sectors and new models for collaboration

I also feel like the opportunity has never been greater. The kinds of technological innovations we've talked about today, a lot of really creative partnerships between different kinds of organizations that are now possible because of communications technology, sort of globalization of the citizen sector and of the scientific world. There is this phenomenon of people out there who don't necessarily follow the lines of public versus private or government versus non-profit or making money versus giving things away. They sort of are breaking down these boundaries and I think we're hearing a lot of that today, that if you start to break down those boundaries you start to see opportunities that maybe weren't visible before or you see a partnership that's possible between a government and a community and a private sector entrepreneur, and that's really what we're looking for.



Creating a Blueprint for Change



The way we work, just to clarify, because we use the word fund, we talk about investing, it can get a little confusing. We're non-profit. We raise charitable dollars from foundations and individuals for the most part. We invest those using grants, loans and equity into financially sustainable enterprises in three different areas: water, health and housing. We also provide a lot of hands-on management support to those enterprises. They then produce products and services that can be sold either directly to a consumer or to an entrepreneur, who creates a microenterprise out of that product or service. Our goal is to not only create the delivery of this product or service, but you've got a sustainable model that will continue to grow and thrive after your investment cycle has completed itself.



Criteria for Investments

- 1) Sustainability
- 2) Scalability
- 3) Leadership

The criteria we use for investing are very simple: sustainability, scale and leadership, which is another reason why we don't have to find the perfect technology because to find an entrepreneur who has had the sense to identify a viable technology and then built a business model around that is hard enough that we're very flexible around technology. What we're looking for are people who have thought about is there a market for this product, is this affordable, is this desirable? They've got a whole business plan built around it and that business plan is sustainable.

In terms of thinking about scale, there are sort of two levels of that. One is if this business is successful, will it affect a critical number of people? So from a philanthropic perspective, are we really getting a lot of bang for our buck with this philanthropic investment?

Then the other side is, what is the success of this enterprise going to say to the world about opportunities in the sector? So, for example, we're right now investing in a model to bring third party loan funding to slums in Hyderabad in India to allow them to invest in improved water infrastructure. This is something that the government would like to do, but doesn't have the capital to do, so they're sort of on a long-term plan for getting more reliable water access to these communities. This accelerates it and we've found that these communities are perfectly willing to pay a monthly user fee to have reliable access to water.

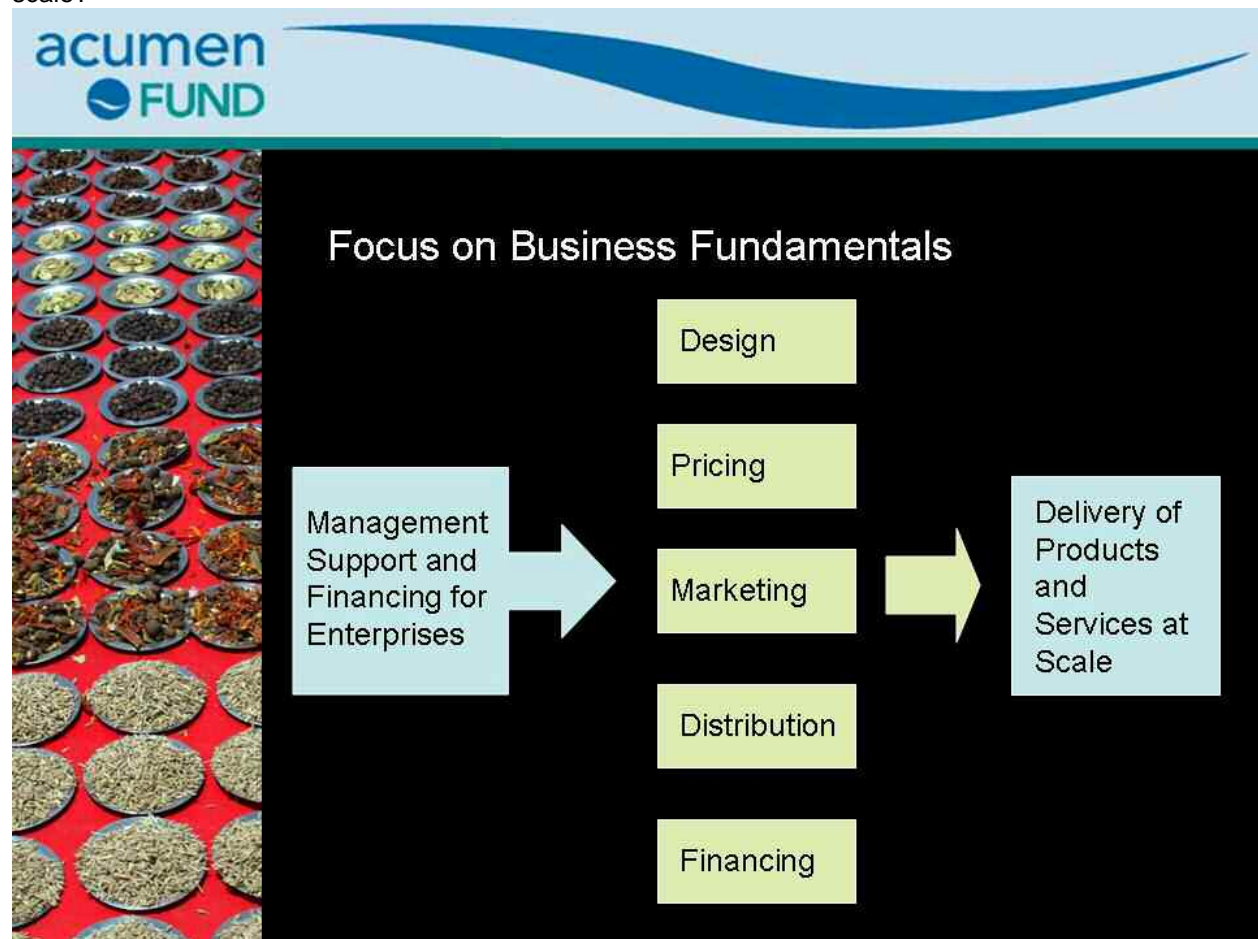
If this is successful in 50 slums in Hyderabad, that means that about 150,000 people have benefitted from this project, which to us, from the perspective of an organization trying to get some sort of scale with social impact, 150,000 people is nothing to sneeze at, if we can achieve that within a two or three-year period.

The bigger issue is achieving this in 50 slums, is that going to change the model? Is that going to change the way people think about this? Will it mean that local banks recognize that these communities are credit worthy and start making financing available for other projects like this? And that, to us, is really

what scale is about, is changing the paradigm and demonstrating that these models can be replicated and done on a much larger scale. It's not just the people affected by each project.

And then leadership is basically what any venture capitalist would look for and some people also today have mentioned the challenge of local capacity. We're looking for entrepreneurs and teams that have the capacity to do this. We recognize that often they'll have certain strengths and weaknesses in other areas, but they also have to have the flexibility and the openness to learning and developing strong enterprises. So we're really, at the end of the day, focusing on building institutions that look like strong, viable businesses and finding management teams that are excited about that as well.

So this is just, again, to return to these building blocks, where we see real room for innovation and what we focus on at Acumen are these five issues and they seem to come up again and again when it comes to figuring out how do you get this product or service to be available in the market on a large scale?



They are design -- so let's say you take a core technology, you know it works. How do you package it so that it is durable, it is desirable, it works for this market? It's not just that it works in the lab, but it's something that people want to put in their living room and use to get clean water.

Pricing is another one. People often come up with technologies that I've seen that get the job done beautifully, better than anything else, totally unaffordable in any model. And so there seems to be that sort of -- and we have other organizations that all they think about is how to make the product affordable and there's a lot of creativity that can go into that in terms of sourcing materials and creating more efficient supply chains.

Marketing is another really critical issue and I think can be a real obstacle for products, particularly in water treatment, where the safety of water is not necessarily a top priority for a household that is worried about having enough water for irrigation, getting their children educated. Often, treating

water is low on the list of priorities and education and marketing can change that, but it can be a very long, slow process.

So innovation and marketing and getting people excited about improving the quality of their water or being willing to invest in an innovative product is really important and I think marketing is an area where partnerships are particularly important because a single organization may not have the resources to change the way people think about an issue, whereas there are other partner organizations like UNICEF or WHO or CDC that have put a lot of thought into really sophisticated strategies for changing the way people think about these problems.

Distribution, I would say, is the number one problem I think about day-to-day. It's actually building networks that get products physically from one place to another. I think another area for a lot of creativity, it doesn't have to be one company that owns the whole distribution channel. We're finding that there are incredibly creative partnerships between different kinds of organizations, corporations, NGOs, micro-entrepreneurs. There's a lot of interesting things going on, but it tends to be the block that ends up stopping the business from growing when they haven't thought through distribution.

And then lastly, financing. You may have a product that people want and are willing to pay for, they simply don't have the capital to pay for it on day one. So you can build in a model for making that product affordable by having people pay for it over one or two or even three years, depending on what the product is. And that's another area we're looking for really creative models.



Water Innovation #1: Affordable Drip Irrigation

- \$100,000 grant to IDE India to develop low-income market
- 2nd stage multi-year equity investment or loan in for-profit company

Design

- Efficient technology at the cheapest price

Pricing

- Modular product can be purchased incrementally
- 2 fold income increase from \$30 drip system

Marketing

- Storytelling and entertaining Bollywood film
- Market potential of 18.2 million small farmers

Distribution

- Extensive dealer network to educate farmers
- Exports to Pakistan and Egypt

This is an example that I wanted to give where we thought about these different issues. We talked earlier with Netafim about drip irrigation. We're working with an organization in India called IDE India that has spent about five years doing research and development on a very low cost drip irrigation system that would be affordable to farmers making \$1 a day or less.

The goal is to make a modular product that a farmer can buy at whatever level of income he is at and then increase his investment in drip irrigation over time as his income goes up.

So the design of the product was a big part of this. How do we break this down to make it as cheap as possible?

The way that they've done this is by changing the thickness of the plastic of the drip irrigation system so the first kit you buy, if you're making 50 cents a day, it's going to last you one season. It's going to be a small system, you'll go and buy as much of the micro tubes and the laterals as you can afford, but that could double your income. So the next year, maybe you invest in a higher value crop, maybe you buy a bigger system, but they change the product design and the pricing together to make this affordable to the poorest farmers.

In terms of marketing, they use very locally appropriate marketing. They have sort of storytelling demonstration projects, a lot of word of mouth marketing. They found that in this particular culture, farmers are very comfortable sharing their successes with other farmers and that's been very persuasive. So it's organizing the marketing strategy around what is locally appropriate and what people respond to.

And then on distribution, basically what they've done is they've coordinated with manufacturers. They don't themselves have to deal with the up-front capital cost of developing a manufacturing capacity, they subcontract, provide the design for the product and buy the drip irrigation systems from manufacturers, and then deliver them to dealers. They've developed this vast network of dealers, which took them, granted, many years. It wasn't sort of like they decided to have a dealer network and then they had one, but they invested in their distribution network and, as a result, now have a platform to get lots of different kinds of products into the market.

We made a grant investment in ID India and we're really excited about working with them to see if this product really had the potential be to commercialized and also to extend beyond India because the potential for using drip irrigation is vast worldwide. So what we've spent the last year doing is really helping them think a business model that goes beyond what they've done currently, which is selling about 30,000 a year -- no, they sold 30,000 their first five years while they were doing R&D. Now they're selling about 10,000 a year. We think it could be more like 30, 40 or 50,000 a year, so we're working with them to think about how can they step up their distribution channels, their access to manufacturers, et cetera.



Measurable Success

- The Result:
 - 30,000 drip irrigation systems sold
 - Distribution network of 30 new dealers since investment
 - Launching for-profit company to commercialize KB Drip
- Next Steps:
 - Develop for-profit company
 - Increase distribution through existing supply chain
 - Explore export markets for drip irrigation in Sri Lanka and Pakistan

And what's exciting is they feel like this is a particular product that has that potential to be commercialized. They wouldn't say that about all the different technologies that they work with, but that's where we find this overlap and the shared interest in trying to really step up the level of scale and the sustainability of the project.

So far they've sold about 30,000 drip systems. They've expanded their distribution network by about 30 dealers since we started working with them. They're launching this for profit company and we're working with them to explore export markets in countries like Sri Lanka and Pakistan.

This is definitely a high risk venture. They've got some great data on how farmers respond to the technology, but as they push out, there's a lot of uncertainties about how this product will work when you're dealing with a lot of government subsidies, the potential for drought, lots of competitors. So like any business model there are a lot of risks involved, but by focusing on these three criteria, we think this is a scalable, sustainable technology with a really good team behind it and our role is to see if we can catalyze the acceleration of this model becoming much more widespread in India and outside.

So that's really how we work. We feel like right now there's a lot of great technologies out there. I think that continued R&D is important, particularly as people bring in different design parameters, thinking about how to make technologies more decentralized, something that can be scaled down, something that can be affordable. People are thinking about reducing the need for energy inputs. These are all of the things that are going on in the world of technology.

On our side, we want to focus on sort of the technology of sustainable businesses and so we, again, are focusing on these key questions of marketing, distribution, product financing, that we think very much complement what's going on sort of on the technology side.

There are a couple of other investments that we've made that I think I just want to mention before wrapping up and I have a couple of other points as well. One is this Mitry [ph] filter that Susan mentioned

earlier. This is a very small company that had worked with UNICEF as they were developing a technology based on activated alumina to remove fluoride from groundwater. This is an interesting example of what we're trying to do. It's a small company, they had started out as a non-profit. They were distributing and promoting these filters on a subsidized basis with funding from UNICEF and then decided to make a switch and become for-profit entrepreneurs.

It's a really difficult switch to make and they're really struggling with the issues of how do you build a business when you're really just getting started, getting their head wrapped around issues of financial management, accounting, dealing with how do you anticipate sales so that they can buy materials. They're doing manufacturing as well. So we're watching up close just how difficult it is and we have no illusions about the challenges that an entrepreneur will face, particularly if they stay focused on the base of the pyramid market because there's always going to be that temptation to just sell the product to a wealthier market and make money faster.

And what we've found is that this product has enormous potential, but the business model around it will continue to be a challenge because of issues like marketing and distribution. It's also an expensive product. It's about \$28 per household. So these are things we're wrestling with right now, is how can we make this product affordable, can we work with microfinance groups so that families can pay for it over time? All questions that we're dealing with day-to-day. This is hard. I think George Bush said that once, but it seems appropriate in this case.

We're not starting any wars, but this is hard and we're finding that our work becomes more effective as we partner with different organizations that do have strengths in areas like marketing, behavior change, product financing, et cetera.

And then another one I want to mention because a representative of this company is here, we've recently invested in Water Health International, which is a U.S.-based company that is working in the Philippines, Ghana, Mexico and India which is sort of a really major thrust now, and they've also started a program in Sri Lanka in response to the tsunami.

They have a community scale approach which uses UV as well as filtration to provide safe drinking water at a very low cost to communities of about 3000 to 5000 people. Of the different technologies that have been discussed today, this one is possibly one of the cheapest, but it does have that up-front cost of having to set up a system and figure out how to make that viable for a community.

We see this as a very, very strong potential for decentralized water treatment throughout the developing world and, again, are thinking through the same issues of how do you market this, how do you find the right local partners to get these systems set up. But, again, we think that taking risks on the kinds of entrepreneurs that are thinking not only about doing something that works, but doing it big, is really important and an opportunity for us to try to bring philanthropic capital and expertise to accelerate that.

One of the things I just wanted to talk about in thinking about the market is that I think there's a need to think about markets in more nuanced ways. It's very easy to lump the one billion or the four billion into one big group of people who just don't have water and I find that in the work that we're doing that having some nuance allows us to identify opportunities and solutions more quickly.

So some of the nuances that we've seen are urban versus rural issues. Most of the populations in developing countries live in rural areas, but cities are growing rapidly and by 2050, most people in those countries will live in cities, so anticipating some of those issues and figuring out how do you start to build systems in cities that work for people who live in the slums, who often are facing the same kinds of health problems and lack of water access that they faced when they were living in rural areas.

Another one is willingness to pay. Different cultures, different countries, urban versus rural populations, have very different outlooks on willingness to pay and because what we're trying to do is prove that there are some market opportunities, we're not looking for the toughest market. We're not trying to find the most remote, poorest and least willing to pay community, but we're looking for those communities that have gotten to a place where they are already investing or are willing to invest and yet

there are no alternatives available to them. And I think that's a very significant portion of the markets that we're talking about.

So thinking a little bit about where are there real opportunities to respond to demand and willingness to pay that's been demonstrated and to make the options available much more equitable, more effective and affordable to those groups.

And then another one that I just want to mention to be a little controversial, there's been a lot of discussion of Maslow's pyramid. Something that really took me by surprise is that within these communities you can go into someone's home where you know that they're struggling to find access to nutritional food, they may not have regular access to education, we know that they don't have piped water supplies, but you go into their homes and you'll see that there is art on the wall. They have a small TV. They might have an electrical fan. And I think recognizing that there is a really strong sense of aspiration within this, again, this very broad speaking market, and responding to that as well. The aesthetics of water are very important, I think, in these communities, not only the safety of the water.

And in some cases, the aesthetic is the only way someone will really relate to the water they're drinking because they're going to do a microbial test and they may not know what that is, but they'll know the difference between water that tastes and looks good and water that tastes and looks bad.

So these are some of the issues that have informed our thinking about how do you start to look at these people as a market, as consumers, and respond to that. Personally, I find that it brings a lot of dignity to our work to respect that the decisions they're making with the scarce resources that they have should be respected and it's really about providing viable, attractive alternatives.

And then, lastly, I think just in terms of defining success or failure, we're very early on our path and we have a lot to learn about how to bring entrepreneurial models into addressing these critical needs. We feel that with the scale that we're seeing in some of these projects, whether it's 30,000 drip irrigation systems in a year, 10,000 fluoride filters in a year, I think that Water Health International has a goal of having at least 50,000 people receiving clean water this year. We're seeing some progress, some helpful numbers, but more importantly what we want to see is that the idea of entrepreneurship in the market becomes more palatable and that the relationship between entrepreneurs, private investors and non-profits and government and innovators starts to become more intermeshed.

This, again, is not the solution, it's not the silver bullet, but what we're seeing is that there are these opportunities for shared ideas, shared strengths and ideally a more important role for entrepreneurs.

So lastly, I guess, just thank you for taking the time to listen and I'm happy to answer any questions.

Erik Peterson: Thank you, Yasmina.

[Applause].

Erik Peterson: Thank you very much.

We've heard CDC mentioned repeatedly and I should also note that if I had a nickel every time someone said as we were doing preliminary research here, you have to get Dr. Erik Mintz involved, I think we would all be very rich.

He's Chief of the Diarrheal Disease Epidemiology Section, Foodborne and Diarrheal Disease Branch at the CDC. He has extensive teaching and writing experience, well known I believe to many people here. So I'd like to offer a warm welcome to Dr. Eric Mintz.

[Applause].

Erik Mintz: I'd like to collect a royalty on those nickels. [Laughter].

It's a pleasure to be here. I really sense, I hope it's not just me, I hope you sense this too, I sense a certain coherency, a theme running through this panel, and I'll try and add to that and I'll try not to be redundant and repeat what other people have said, but there's really something central that we're talking around here.

So some issues, I'm a health guy. More accurately, I'm a diarrheal guy. I'm not a water guy. [Laughter]. And my perspective is that of sort of public health. What I'll try and talk about is not technological innovation which I think is a great thing, but innovation around two core issues for public health and across the spectrum of public health problems.

The first one is how to deliver the right stuff to the public whether it's vaccines to prevent measles or polio or vitamins and micronutrients to prevent malnutrition, bed nets to prevent malaria, condoms to prevent sexually transmitted diseases and AIDs, or safe water to prevent waterborne diseases, you've got to get the right stuff to the public.

Once you do that, or as you do that, and these two challenges are intricately linked by the law of supply and demand, the second challenge is how to get the public to use the right stuff. So the challenge of behavior change.

One thing that I think is really the greatest value of technological innovation is that if it's done right it can reduce those delivery costs and it can catalyze the behavior change, so I'm all for it.

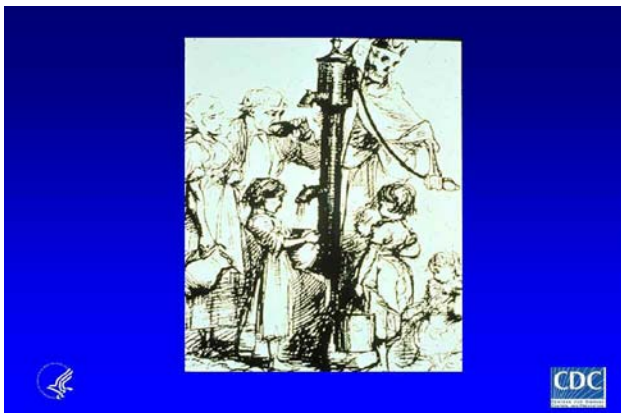
I've titled the presentation "The Power of Partnerships and Point of Use Treatment". I'm more of an optimist, I think, perhaps today than Yasmina. I actually agree with you, there is no one single silver bullet. Maybe this is half full, half empty. I think we've got hundreds of silver bullets. What we don't have is the right gun to fire them with and to get them out there.



This is my daughter Nichole. She's getting a glass of water at our kitchen there. One day, some day when all the world's population has universal, continuous, in-home access to safe water as we do, millions more children like Nichole will survive to adulthood. That will be a great thing. I am not sure I'll be around to see

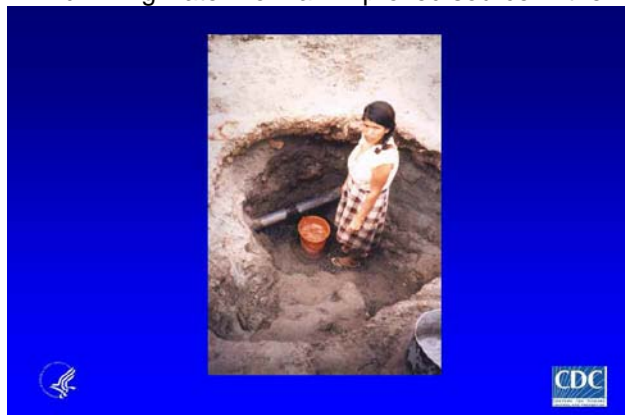
that. I'm not that much of an optimist, but hopefully some of us in the room will.

I do want to draw a distinction though between access to safe water and access to water from an improved source and this is important when thinking about the millennium development goals and those issues.



This is an old engraving. It's called Death's Dispensary, and it shows some children Nichole's age and they're collecting drinking water in buckets from an improved source. This is the pump in Broad Street in London. It's a piped private water system of its day about 1866. You can see the pump's being operated by King Cholera, and the water that's coming out of that pump is just as deadly, just as contaminated as the water in the Thames River from which it was drawn, but it's an improved water source.

We can flash forward about 130 years. Here's another woman. She's also collecting a bucket of drinking water from an improved source in the middle of a cholera epidemic. This woman is in Trujillo,



Peru in 1991, and she's doing what she and her family have been doing for many years. They're getting their drinking water through a "conneccion clandestina", a clandestine connection to the city water system which is really the only way to get water out of that system because the pressure in the pipes is so low that it's not being pushed up above ground to the taps. And of course when you get water like that you're also introducing contamination into the system. Any chlorine that may have been put in at the treatment plant is no longer present.

Here's the point of concern that I think we'll all agree with. Water from improved sources is not always safe to drink. The problem is that -- Well, many of us know that because of our own experiences. We've visited developing world megacities -- Calcutta, Karachi, Lagos, Mumbai, Nairobi. There's a long list of these cities. And how many of you drink the tap water when you're there? [Laughter]. That's good, I don't see any hands raised. [Laughter]. I know I don't, and I know if you look at CDC's travel health web site it will advise you not to. In fact if you talk to the residents of those cities most of them will tell you not to drink the tap water either.

Points of Concern

- **Water from improved sources is not always safe to drink**

It's a sad reality, but a lot of the water from these improved sources isn't safe to drink.

The issue is, we've heard it a couple of times today, we say 1.1 billion people lack safe water. I've said that myself hundreds of times. It's far from the truth, that figure. That figure is based on coverage. So 1.1 billion people don't have access to an improved water source. It's easy to measure coverage. Whenever you put in a well or a municipal system you've got a pretty good idea of how many people you're serving.

It's much harder to measure the quality of the water coming from that water source. Routine visits, laboratories, it's a real challenge and it's a problem for public health and for the water sanitation community. So that's not a very popular reality, it doesn't get talked about a lot, and you'll probably lose some friends if you raise it too often at gatherings like these, but it's just something I thought I'd get out there.

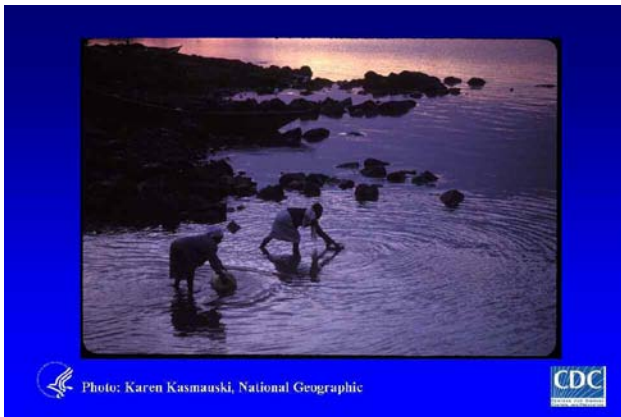
Point-of-Use Water Treatment

- **Treating water at the point of collection or consumption to render it safe to drink**

So with that preamble, what is point of use water treatment? We've already heard a lot about it. It simply means, here's one definition, treating water at the point of collection or consumption to render it safe to drink. There are many different methods, as we've heard, for doing this. Any of us who have been traveling either on a camping trip or to one of the developing world cities, we boil our water or we filter it or treat it with iodine or bleach. That's it. We've got first-hand experience with point of use water treatment. In fact, for us the whole thing started when we went to Peru during the cholera epidemic and we were investigating it

and one of the women said well how come you don't get cholera? You're here. We said we go to the hotel and we've got these plastic bottles and we put in a little iodine pill and mix it up and then that water's safe to drink. She said, we could do that. Duh. Okay. It's true.

So sometimes, I've often thought we should call it point of truth drinking water treatment because the water coming out of those taps is in fact not safe to drink. But most of our focus has been on people like this girl in Afghanistan. She's gathering her family's drinking water from an unimproved source, a stream. This is a photo from Kenya of women gathering drinking water from Lake Victoria. Children in Peru gathering water from an uncovered sort of shallow, hand-dug well. All of us know these water sources are not safe, they're heavily contaminated.



But, point number two, even if the water from these sources was safe, before it can be drunk it has to be carried home. Here are some people carrying water home. It's often in open buckets, hands curled around the top. And once you get home it has to be stored. Again, often in open containers, until it's removed for drinking. And as this child is doing, that's done with the hands or with dippers like the tin can that he's using. I'm sure you all would give me this -- No matter how clean that water was, how safe it was, how pure it was at the source, water that's collected, transported, and stored unsafely

quickly becomes contaminated and unsafe to drink.

So a simple point of concern, number two, water from any source is subject to contamination during collection, transport and storage.

Points of Concern

- **Water from improved sources is not always safe to drink**
- **Water from any source is subject to contamination during collection, transport, and storage**

Finally, the CDC safe water system. This is not rocket science. In fact this is sort of so basic it's almost embarrassing to be here talking to a group of scientists about it, but it was designed to help overcome these problems.

Just two simple products. Dilute sodium hypochlorite bleach to treat the drinking water at the point of use; and a storage vessel to store the treated drinking water safely.

Here's some of our hypochlorite solution

bottles. This is from Madagascar and India. This is the Indonesian bottle. It costs about 15 to 30 cents. One capful. They're usually about 150ml. One capful treats one 20 liter storage container. And one bottle is generally enough for a family to treat their drinking water for one month.

CDC Safe Water System - Product

Treat drinking water at the point of use

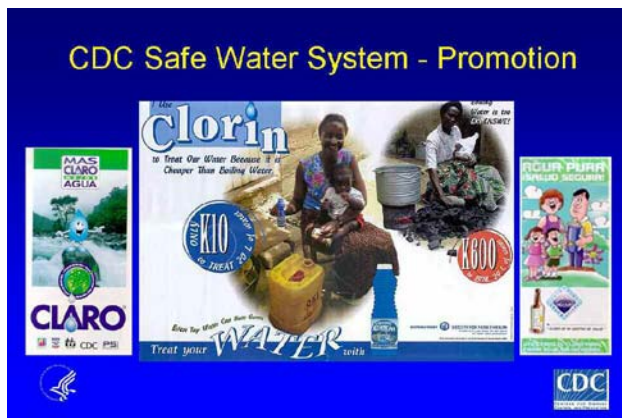
Dilute sodium hypochlorite bleach

Store treated drinking water safely

Narrow-mouthed, lidded 20 L vessels with spigots

So the system integrates all of those steps of collection, transport, storage and treatment.

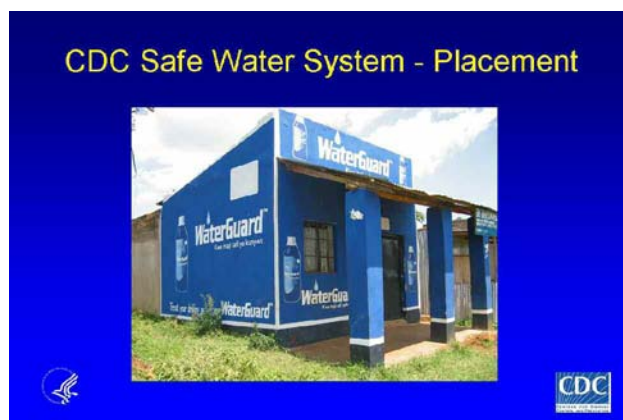
Both of the products are manufactured locally. They're promoted. They're sold locally so they therefore provide some direct economic benefits to the local community as well as indirect benefits by preventing waterborne disease.



Those two elements are the hardware of the safe water system. This is sort of an attempt to illustrate the software. That's, we discovered, the most critical component. It's the message and the means that our partners use to induce and sustain healthy changes in behavior. These are some poster, so it's about safe water handling. It's also about safe food handling, hand washing, what you do with the water when you have it in your home, and by the way, it's easier to wash your hands when your water is in a container with a spigot than when it's in an open bucket. And all of

the other things, the practical behaviors people can adopt in their home to prevent diarrheal diseases.

Here's a festival in Madagascar to launch the Surro brand water product, and this is sort of under the heading of promotion. Here's something in rural areas of western Kenya, a village theater event that CARE Kenya helped do. Again, to promote the chlorine product there.



So we've talked about product, promotion. After that comes placement. And to deliver, this is the delivery part, the safe water system to consumers. We work with social marketers and with the commercial infrastructure that exists, and such as this, the thousands of roadside convenience stores all over the world.

It's stocked and stored in these stores and can be sold at a very small profit to the retailer. But enough of a profit to keep it on the shelves.

So through this route our partners sold nearly five million bottles of water treatment solution to an estimated one million families in 12 countries last year. And that's great, but remember that 1.1 billion or maybe it should be two billion, people we're trying to reach. We're not there yet. We're far from there.

So we've begun to expand our delivery system beyond this traditional commercial sector. I'll talk about that in a little while, but first let's move to the fourth P, and that's proof of effectiveness or proof of prevention, if you are a real fan of alliteration. This is a decade's worth of studies in eight countries. Many of them are randomized, controlled trials. They show on average that the safe water system, that treating your water prevents diarrhea. No surprise, but it's important to prove that and prove that over and over again.

CDC Safe Water System – Proof of Effectiveness

Bolivia*	1994	44% overall; 53% in infants
Uzbekistan*	1996	85% overall
Zambia*	1998	48% overall
Guatemala	2001	25% overall
Madagascar*	2001	95% against cholera
Kenya	2001	55% in children <5 years old
Madagascar	2002	63% overall
Pakistan*	2002	49% overall
Kenya	2003	19% overall; decreased mortality in infants
Uganda	2003	35% in HIV-infected persons

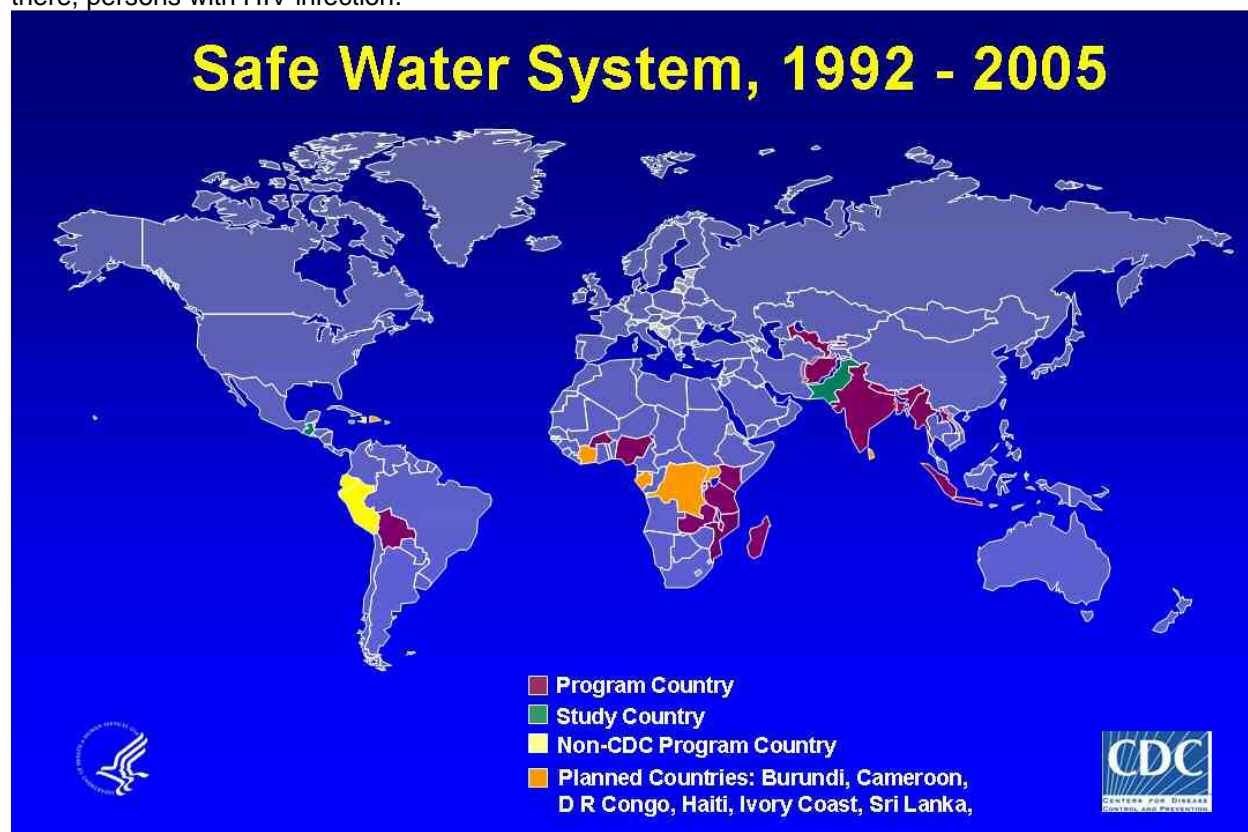


*publication available



The average is about 50 percent. You can see there's a range there. One of the things we like about it is it prevents diarrhea in the most vulnerable populations, that is infants and down at the bottom there, persons with HIV infection.

Safe Water System, 1992 - 2005



This is a map. There are about 19 countries where we have safe water system programs now either subnational or national. They're shown in red. A couple of study countries in green. A couple of

sort of non-CDC safe water system programs in yellow. And orange, there are six countries where we're planning to launch programs in the next year.

So finally, the fifth and the most powerful P are partnerships. None of this would have been possible without many key partners and this slide lists some of them and some of the critical roles they play. USAID here in Washington and the mission offices have supported safe water system programs. Rotary Gates, PSI. We've worked for a decade now with Procter & Gamble on the PuR product and on other ways to improve water. But what I really want to highlight here in the tradition of at the Academy Awards, is the little people. I want to thank all the little people. And under product distribution, under product manufacturer, you see the local private sector. It's really the in-country manufacturers of the bleach, of the plastic vessels, the wholesalers, the retailers, all the way down to the level of the salesmen

who go door to door, the owners of those small roadside kiosks. That's what makes it possible.

We all know it takes a lot of time and money to build the infrastructure to treat and deliver water to people. It's these local business partners that allow the safe water system programs to leverage the existing commercial infrastructure -- the roads, the trucks, the stores. To deliver inexpensive water treatment and storage products and the key hygiene and education messages to people where they live quickly and at low cost.

CDC Safe Water System - Partnerships

- Funding for project launch or expansion: USAID, Rotary Clubs, Gates Foundation, PSI, JICA, World Bank, Procter & Gamble
- Product manufacture: Local private sector
- Implementation: CARE, PSI, UNICEF, etc.
- Product distribution: Local private sector, (wholesalers, retailers, promoters), NGOs.
- Political support: Ministries of Health & Water
- Monitoring and evaluation: CDC, universities



Here's just a couple of ways that we're trying to reach even more people, going beyond the traditional commercial infrastructure to deliver the products. This is a group called the Society for Women and AIDS in Kenya, SWAK. There are rural community organizations of women. They, through a partnership, have proved to be, they've mobilized and they're proving to be a new force for delivering products and delivering behavior change.

So they form these small groups. They get a little training from CARE, from other organizations, and a little micro-financing, perhaps the Acumen Fund might be interested in this. And with that they're able to purchase a basket of goods. That includes safe water system products like these. It also includes PuR in Kenya. It includes bed nets to prevent malaria, protein-fortified flour, vitamins, micronutrients to prevent malnutrition, and soap and a few other things. They go door to door selling these products to their neighbors and they earn a small commission on each sale.

CDC Safe Water System - SWAK

- Society for Women and AIDS in Kenya
- Delivering SWS, bednets, nutritional supplements, soap, and other items in a "basket of goods" to their neighbors



CDC Safe Water System - Clinics

- Safe Water System products and education available to health care workers and patients in clinics and hospitals in western Kenya. Similar effort in Afghanistan.



So we think of them as the Avon ladies of rural western Kenya. They're selling the health-reinforcing goods and they're also influencing people by the sort of most personal and direct contact you can have to adopt healthier behaviors. And as Greg can tell you, they're also a very powerful sales force.

So a second way we're going outside the traditional commercial infrastructure is through the health care system. This should have been pretty obvious to CDC but it took us a while to get there. It was mentioned briefly by Susan earlier today, we've got this partnership with, again in Kenya, it's sort of our learning laboratory, the Nursing Council of Kenya, the Ministry of Education, EMRI and CARE, and we've got a guide now for health care workers. So they get a little course, they get a guide, and they learn about safe water and hand washing. This is something that, the importance of which isn't really stressed in their training and they've got a lot of other things to do so this helps them teach their patients.

The key to this, to making it work, is you can see here there's the modified pot and there's the bottle of chlorine solution. The chlorine solution is stocked in the pharmacy at the clinic so patients come in with diarrhea, they get treated, they get time with the health care provider, they get a message about soap, about chlorine, and they can pick that up on their way out of the hospital ward or the clinic.



One thing to mention is that there's a similar effort funded by the Gates Foundation in Afghanistan that focuses on maternal and child health clinics, so expectant mothers, mothers in the third trimester of pregnancy are getting this. Then when the newborn is in the house they've already got that behavior established.

Because persons with HIV/AIDS are very vulnerable to waterborne diseases, that places a burden on the health care system and on their home caretakers. Global AIDS funds are now being used to provide this at voluntary counseling and testing clinics. So you go in and you get your blood test. When you come back for the results if those are positive you're gold about waterborne diseases, how you can prevent them, and here's what you can use.

Finally, just back to the children. This is another partnership in Kenya with CARE, UNICEF, the Ministry of Education in Kenya, and through that safe water system products and education is being introduced to teachers, and through the teachers to students at 45 rural schools. This is a pilot project.

CDC Safe Water System - Schools

- Safe Water System products and education available to teachers and students in rural Kenyan schools

It's interesting, I saw the curriculum and it's got things about the capful is 3ml and the bottle is 150ml. It's got math in there and all kinds of things. We hope it works and we hope that all three of these model partnerships to improve access to safe water system goods and education and to change behavior, they prove successful and then prove to be replicable in other countries.




So finally, just a few words about emergency response. Many countries' safe water system programs have been used as rapid

response tools for populations that are displaced by natural disasters such as floods and cyclones and earthquakes, and in India, Indonesia and Myanmar where we have programs, the recent tsunami. So just some pictures from Indonesia. Here's a CARE worker demonstrating how to use the safe water system solution there to people in Banda Aceh. Here's a woman adding a capful of the solution to a bucket. You can see she's putting a tight lid on the bucket to keep that water safe.

What we found so far, we still have people over there working on this, but so far our experience confirms what we've seen in other natural disasters, and that is when you've already got the program elements in country they can be mobilized simply and rapidly and effectively for emergency response.

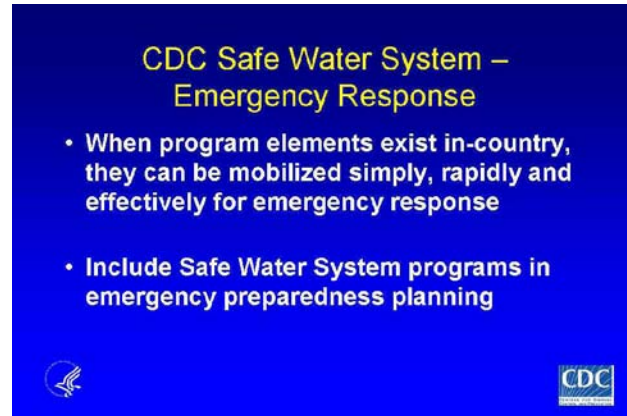
CDC Safe Water System – Emergency Response

- SWS used to respond to floods (Bangladesh, Nepal, Kenya, Malawi), cyclones (Madagascar), earthquakes (Bolivia) and the tsunami (India, Indonesia, and Myanmar)

There are many good reasons to have the safe water system programs in these countries before the emergency comes. There are people who need safe water. But emergency preparedness might be another one to add to that list. Emergency preparedness is probably the most important component of an emergency response.

So we think that the safe water system programs, we hope, will prove useful in future natural disasters.



A final point, that emergency responses for water safety should be rapid and they should be locally sustainable to maximize the short term impact, that's the rapidity, and the long term impact, that's the sustainability.

I'm just afraid that some of the high tech solutions that depend heavily on external expertise, equipment, and financial support won't prove sustainable in the long term in the prolonged, post-disaster recovery phase after the media are gone and nobody's thinking about it any more. We don't want that

Thank you very much for your attention. IF you want more information, there's our web site, www.CDC/safewater. I'd be happy to take questions.

[Applause].

Erik Peterson: Thank you, Erik.

Thank you very much. Now I'm delighted to give Susan Murcott a second chance to wax eloquent on a range of these issues. I don't need to reintroduce her except to remind you that she is a research engineer and principal investigator at MIT, and please remember the equation $H_2O_1B!$ when you think of her.

Susan?

Susan Murcott: You have all been endlessly patient and I am going to serve you up with a very very brief presentation.

I had five points I was going to make, but we can do that informally. I'm going to be here all day tomorrow as well as after this session.

I just want to talk, following up on Erik's point about partnership, on the partnership aspect of implementation. So if you'd just excuse me I'm going to race forward, introduce to you the International Network to Promote Safe Household Drinking Water Treatment and Safe Storage. This is a WHO-hosted effort begun two years ago to further this work of household drinking water treatment.

The mission is to contribute to a significant reduction in waterborne disease among vulnerable populations by promoting household water treatment and safe storage. As a component, along with water, sanitation and hygiene programs.

There are objectives to the network which involve a communications, an advocacy, a research and an implementation working group, and in fact in this forum today we have people from all four of these groups, I think. Is it correct that you are the chair of the communications group? Yes? And the advocacy group is Jeffrey Sloan who I thought was going to be here but I'm not sure of that. We have someone from Mark Sobsy's lab, the University of North Carolina. Your name is again? Mark Elliott. So

Mark Sobsey is the chair of the research working group. I with John Verazo of USAID and working with Rochelle from USAID are the co-chairs of the implementation working group.

The network has these guiding principles. We'll move forward. It is a network of professionals, private sector, NGOs, financial institutions, academic institutions and so forth. As of 2004 there are these many many partners, having started out just a year and a half or two years ago with a handful of us. And so far we've had several annual meetings. Last year in June in Nairobi, and upcoming June 2005 in Bangkok in Thailand. And to give examples of our current activities, there is a web site, a newsletter, and advocacy and communications that as I said, Greg can tell you more about informally. There's research going on and implementation is the backbone of the network.

We are working to incorporate household treatment, as I said, into all aspects of water sanitation and hygiene. There are working groups that are providing tools and guidance. Joe Cotruvo is involved in providing guidance in this process of how do we implement.

More information

Please visit:

www.who.int/household_water

Email:

hhwater@who.int

Membership is open to institutions that:

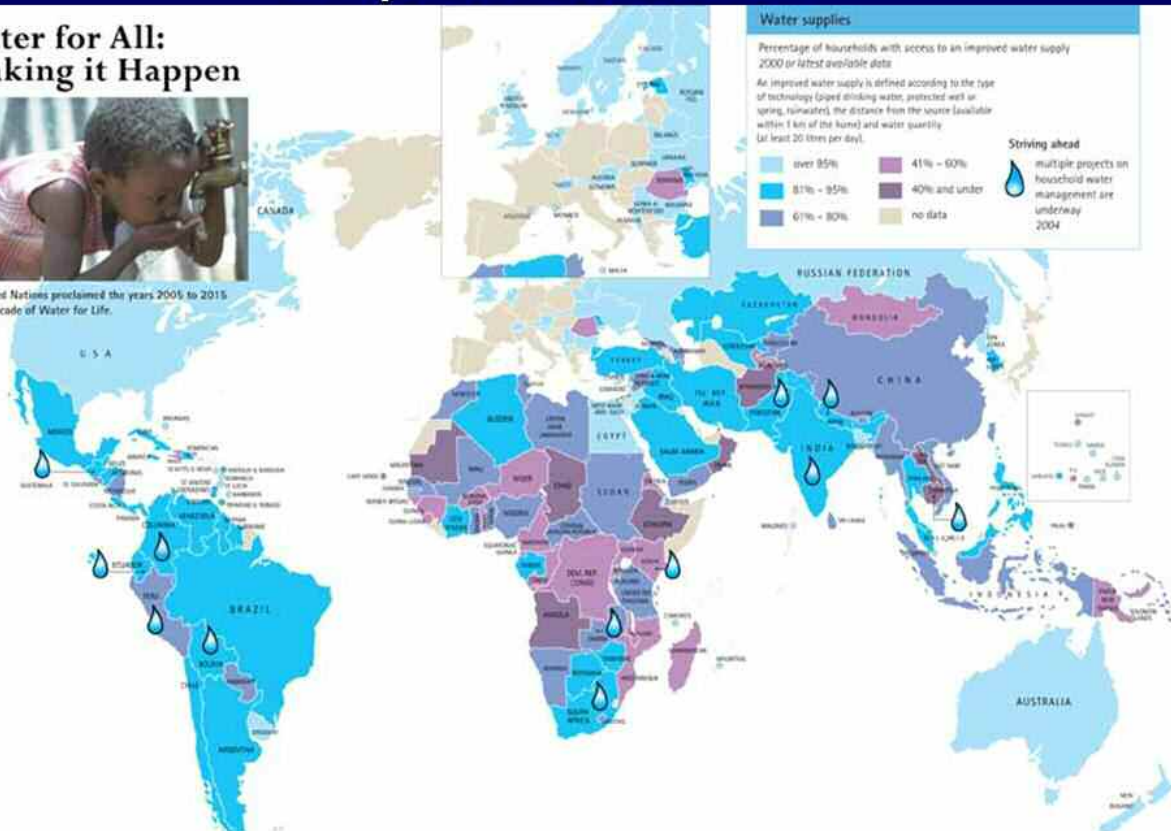
- agree with the mission, guiding principles
- contribute to the plan of work

Implementation

Water for All: Making it Happen



The United Nations proclaimed the years 2005 to 2015 as the Decade of Water for Life.



These water drops on this WHO map represent places where implementation is already going on. By June we hope to have a map we can click on and go into specific countries and show what programs are there.

My 17 students in Kenya this year, several among them, the public health student and one of my engineering students, were looking to visit and learn about all of the implementing organizations in Kenya, working side by side with the Ministry of Water. So we're reporting on that and that will be on our MIT web site.

That's all. Short and sweet. Just so that you know, this network exists and there are brochures about it, and please get involved. Thank you.

Erik Peterson: Thank you very much.

[Applause].

Erik Peterson: Ladies and gentlemen, this leaves us a little time now to have some give and take with you. Let me open the floor. Who would like to make a comment or pose a question?

Tom Hinkebein: Tom Hinkebein from Sandia Labs.

An interesting observation. What's expensive for developed systems is water at 50 cents per cubic meter. What's cheap for developing kinds of systems is a penny a liter which corresponds to \$10 per cubic meter.

Putting them both on the same yardstick, it really brings home a question for policy that I think we really need to be talking about. How do we move people who are in the developing state to the other state where what is expensive for one and cheap for the other start to come together?

I heard some of the ideas that Erik mentioned and that Yasmina mentioned, but I'd be real curious about some other thoughts about how to leg up, how to get these developing societies legged into what would amount to a way to participate in a more developed kind of situation.

Yasmina Zaidman: I just have a clarification point. I think the 50 cents per cubic meter assumes that that's what it costs to get the water clean, like if you're using a de-sal. It doesn't assume you're building pipeline. So the one cent per liter, that's it. You have the contaminated water, you treat it at point of use, you drink it because there is no pipeline. If you have to build that, if you have a centralized very efficient largescale treatment system, it's cheaper to produce the water. To get it to somebody's house brings you in a whole other economic space.

Tom Hinkebein: We could debate that for a little bit, but the point is the cost of distribution systems is, when it's amortized over 30-40 years, and through many cubic meters of use, really gets less expensive. So the question still remains.

Alessandro Palmieri: I'd like to take up on this question. It's very relevant.

I think that in responding to the needs of developing countries we must be more humble, especially we who come from developed countries.

Most of our countries have been in the situation in which these developing countries are now, not very far away. My own country, Italy, was in very bad situation after the 2nd World War. All these things that I see around the world were there. I mean, diarrhea, malaria. Problems were there. Not sufficient water, no energy. And like Italy, many other countries. Maybe United States 200 years ago, but surely you still had these problems.

So why are we not humble and say how did we go from there to here? With which technology? Where did we make the mistakes? Where we can improve? Not presenting solutions, the big plant, the small plant, as the total, things we [share] are completely different. Either you pick up this or that. That is wrong, that is right. It's not the case. Let them give them appropriate technology now, but let's avoid to preclude them the possibility of improving standard because that is what they want.

They don't want just to have charity. They want to become a developed country. So this should be always kept in mind. Okay let's solve the immediate needs, but let's make sure that it doesn't preclude to evolve gradually to standards like the one we are.

Jose Cotruvo: As Yasmina says, it really isn't a fair comparison. One liter of drinking water versus a thousand liters of water that doesn't have to be drinking water quality.

So when you're at the point when you can build that big plant and you can run it efficiently, and you can get somebody to pay for it yes. But until you get there, there are some other choices that make more sense in the short run.

Erik Mintz: I certainly hope that no one who's adding a capful of chlorine bleach to their water feels that life is good and no longer has any aspirations to anything better. My experience says that if anything, they begin to value clean water more and in El Alto, Bolivia where we did our first project, they went to a privatized water system with taps in the home several years afterwards and no more chlorine. That just died a very natural death and we're very happy for that.

I understand now there are some problem in El Alto, Bolivia with the price of the water, but we won't even get into that issue.

I think we're in agreement that large and small scale, that we need to be pushing it on both fronts, advancing on both fronts in parallel, and it's a good question, how can we facilitate the transition from one to the other? But I think first you have to improve people's health so they live longer, so they have more money, and so they can make that transition.

Question: Greg Allgood, Proctor & Gamble.

Following on the point that Erik just made, it seems like we've done a good job at setting up the problem, and we usually talk about the public health impact that can be made and the number of children that die and the immediate problems. Then when we go to solutions we talk more about development of infrastructure.

I was just going to throw it to the panel to provide their opinions about why they think that is. For example, in Senator Frist's bill which I would applaud the effort and the focus and even mentioning of household water, when it comes to what is specifically recommended it focuses only on infrastructure and the digging of wells and the providing of infrastructure.

So where have we gone wrong, perhaps gone wrong in not making a combination both of infrastructure and of more things you can do immediately to have the biggest public health impact?

Erik Mintz: I'll make just one remark on that. We are stating in Kenya, actually, to partner with organizations that provide wells. This is in another area of Kenya. It's very dry. It's a project funded by the Atlanta Rotary Club. They're putting in wells, and we're making sure that those people have access to the chlorine product to treat the water from the well.

The reason they're putting in the wells is that people there walk many kilometers to the nearest water source, and this is going to really improve their lives. These are rural Massai sort of itinerant tribes, and they're only going to have to walk a kilometer or two at the most, maybe half a kilometer. They're still going to have to get the water out of the well, put it in a container of some sort, carry it home, store it at home, and so that chlorine residual is I think an important added value to the water source improvement.

So that's I think one step on the ladder perhaps.

Alessandro Palmieri: If your question is in general, not only to United States. In general, the problem is that instead of governance when you deal with big organization, governmental organization, they look very much at the infrastructure side. And why when you work with community base organization, I think they look at their own immediate needs.

Is a matter of putting the two things together. Why thing went wrong, probably because as I say, representation. In many case we fail to talk directly with the stakeholders, with beneficiaries. Sometimes we use some intermediate which are not really the best one we can choose, let me put it this way. Being they're consultants, NGOs or whatever. Sometimes making the effort of speaking directly with the stakeholders and bringing their voice directly to these government authorities, sometimes you find that is their interest who have local support and doing something which makes sense, which again is a blend of infrastructure and locally [appointed] technology.

Yasmina Zaidman: I also think there's a little bit of trickle-down theory when it comes to developing water infrastructure, which is that if you start by focusing in highly concentrated urban areas you'll have a more immediate impact on development or making sure water is available to the most efficient producers of food for a country. So you've got water developments that I think have more benefit to urban environments, middle class dwellers in those urban environments who have piped water supply, and largescale farm industry, which leaves out 80 percent of the rural poor who are small scale farmers or living in rural areas that are just off that grid entirely.

It's hard to say. There are these indirect benefits of having economic development go more quickly, but this same group of people seems to be left out pretty consistently.

Question: Jeff Albert, AAAS.

I want to applaud all of you. This was a marvelous way to spend an afternoon.

I guess my question was inspired by Yasmina's remark about the aesthetic and the poor sense of aesthetic. I experienced that sense of aesthetic when I was in Banda Aceh last month. I would agree with it. Refugees had a very clear aesthetic which was that they did not like the taste of chlorine in their drinking water, and for that reason, even when they were provided with chlorinated drinking water they boiled it because that was a cultural practice that's evolved over decades, and eliminated their chlorine residual.

I'm becoming a firm believer in the necessity for residual protection, and I'm wondering how the community has begun to address this question of the resistance to the distaste?

One other quick anecdote. We would do demonstrations, and I'm sure Greg can speak to this. When you hand out either the SWS purified water or the PuR purified water to North Americans or Europeans, it doesn't taste much different from their tapwater. But you hand it to a Third World consumer and they make a face.

So what's the latest on that?

Erik Mintz: Maybe I should step up to the plate and try and respond to that. It is an issue, it has come up in several places where we've worked.

On the positive side I will say that there are places where people actually value that taste of chlorine the way nowadays many of us feel comfortable when the seat belt is buckled. But those of us who are old enough to remember when they were first introduced, it really wasn't comfortable.

So it takes time to make that behavior change happen. I imagine that perhaps in Italy and perhaps in this country when chlorination was first introduced there were a lot of people who didn't like the taste either.

Working with the children is very important there. There are also alternatives to chlorination -- solar disinfection, filtration, and so there is no one size fits all for this water quality problem.

Susan Murcott: I'll just add a kind of PS to that. Amartya Sen, the Nobel Prize economist talks about development is freedom and how that translates for me into drinking water is to give people as many options as possible.

You're absolutely right, and I've seen the same, that very poor people value greatly the aesthetic taste of their water. And so give them many choices. Don't just only give them the chlorine choice, but give them many choices. And we should be able to do that. It's not rocket science, we've seen that. We should be able to do that.

Jose Cotruvo: It's come full circle in the United States. The largest selling point of use treatment devices are basically carbon filters to take out the chlorine taste. People think it's purifying the water but it's really just taking out the chlorine taste.

And it's not so long ago that people thought if you could taste the chlorine that was good, that meant the water was safe. So perceptions change.

There's an old story about in New York City when they put in the Croton Reservoir, it was a long time ago. Previously there were thousands of wells all over the city and they were all contaminated. So when people started getting this clean water from the Croton Reservoir, a lot of them complained. They said they couldn't taste it. [Laughter]. It didn't taste like it should. A lot of it is perception.

Question: A comment. Rob Ainsley Johns Hopkins University.

Kind of on the aesthetic issue, going one step further on the chlorine taste but also the aspirational issue. We know that health belief models work in some situations, not in all situations. If you're trying to promote clean water for diarrhea reduction, there are a lot of other reasons why people get diarrhea. Then you start hearing about people, if I treat my water, my child has pure water in my house, he goes to the next house, he gets bad water, he gets diarrhea. So why should I even bother about it?

So it's almost looking how do we start promoting and positioning water or treated water, point of use, in a way that is more of a lifestyle issue. That you start saying this is good water, this is healthy water. Not really focusing on the diarrheal aspect, but more aspirational. Why do we buy bottled water here in the U.S. or in other countries? Is it more pure than the water that comes out of the tap? Probably not, but everybody else is doing it. It's good water. It's the natural spring water. So there are a lot of other issues we can look at when we're promoting and positioning water that we really need to back off a little on just diarrheal reduction.

Question: I'm also from Johns Hopkins University. I have I guess a two-question part here to follow on the recent comments on behavior change.

I work on doing research for behavior change of health, and I am just really wondering why the water area has not invested enough on understanding behavior. I think that all of the presenters in the table spoke about behavior is not well understood, there has to be a willingness to use the technology. But I don't see that the water area has invested in understanding behavior enough.

Yasmina spoke about aspirational, and yes, there is a lot of aspirational in the research that we're starting to do on water, but there is more to be learned about what makes behavior change and water to be developed. That's one.

And one thing is working with kids, and that is great because kids are the adults of the future, but it's going to take time. And as Greg was saying, if we don't have the safe water in infrastructure, that infrastructure brings, there are technologies right now that can solve the problem immediately, but people are not using them properly. The question is why.

I think there is a lot of investment and need of understanding behavior. Particularly, the center has a lot of experience in working on health, on reproductive health, and we've seen a lot of investment

on understanding behavior change for reproductive health, maternal health, family planning use, sexual behavior now in youth. However in water I don't see why there is no investment on water.

I just want to bring that question to the panel, and people that are here now, that you were talking about policy for water. I think that's a missing piece. I have researched several pieces in the literature about water, and every piece concludes saying we need more research on understanding behavior, but where is the investment on understanding behavior? I think that's just my question.

Whatever, the rest of the comments are really great and all of them apply. The medical model is one, but it's not enough. So we need to do more.

Yasmina Zaidman: I hate to be irreverent on the issue because I think you're right, that it is so important. I think just sitting where I am at Acumen Fund, the issue is a little bit bigger than we feel like something we can tackle. So instead of figuring out how do we change people's behavior, we try to acknowledge that a lot of people don't boil their water. Not just because of the price but because of the time and convenience. Having the water cool down after they've boiled it. So a lot of what we look at, and again, this I think to be very honest tends to be for people who are not making less than a dollar a day. For people who have some disposable income and want to use it more efficiently.

But we look for things like convenience.

When I look at something like SODIS, I know that there's people in the village that might be, you could convince them to use it because they desperately need clean water and they really believe that it's the right thing to do, particularly for preventing diarrheal diseases or infant mortality. But if you could give them something where you show up at their door and hand them a bottle of clean water and the bottle is designed so that they just pour it out, drink it and they're happy, maybe the better thing to do is convince them, and some people don't need to be convinced, to pay a little bit more. I think that might be easier than convincing them to spend an extra hour a day or two hours a day getting their water clean.

I think that's, again, it's a shortcut and it's not viable for all income levels, but we're finding that there's a lot of interesting behaviors now around paying for things, financing things, micro-credit has taken off all over South Asia where most of our investments are made. And we think that's an interesting behavior change that we can work with, where people are saying I have some disposable income, I want to invest in great products.

Again, it's sort of avoiding the issue but I think what we're finding is that it's just too big an issue to try to convince people to do something that is so much more difficult than what they're doing today.

Yasmina Zaidman: Maria, I'm not sure if you were here when I had my earlier comments about the impoverishment of the research funding. Generally in this field, not just in behavior use aspects. But your comments do echo my own, and I think that one of the great opportunities of this forum is the opportunity to push that agenda a little bit further of the importance of this work that we're all engaged in here, and that it deserves funding.

A point that I skipped over in my closing presentation was that we all know the numbers, how many people lack access. We also maybe know, for example, that more children under five die of water-related diseases than die of HIV/AIDS. The HIV/AIDS deserves all the funding it can get, but this is an invisible problem still and it deserves a tremendous amount of more funding and it's not going to happen unless we advocate for that.

Erik Peterson: With that we come to the end of our proceedings here today.

I suspect that you will all agree with me, it's been a remarkable day. We got a very interesting message from Senator Domenici at the outset of our proceedings here. We had a tremendous panel looking at available and future technologies. I'm going to have to ask Tom Hinkebein to translate some of those expressions for those of us not in the technology [demand], and the conundrum of dealing with high

to low tech, the temporal conundrum of emergency versus structural, long term, et cetera. A number of big issues came out.

Later this afternoon we had a remarkable panel here about making it work. So I think that we've got a huge amount to think about as we carry things forward.

Tomorrow we have what I hope will be an equally interesting and compelling proceedings planned for you. We'll kick off here at 8:30 with an address from Senator Jeff Bingaman. Then we'll move to a private sector view from Robert Ayers of ITT Industries. Then we'll move into another panel on drivers of technological innovation. Hank Habichi and Henry Vaux and Greg Allgood will be participating in that panel and I'm sure that they'll have a lot of interesting points to make.

So ladies and gentlemen, would you please join me in thanking this panel here this afternoon for their very solid contribution to our proceedings.

[Applause].

Erik Peterson: And let me wish you all a very good evening, and we'll look forward to seeing you here bright and early in the morning at 8:30.

Thank you so much.

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