WORLD WATER WEEK

in Stockholm,
August 16–22, 2009

Responding to Global Changes: Accessing Water for the Common Good

with Special Focus on Transboundary Waters

www.worldwaterweek.org

Table of Contents

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The High Level Panel on Transboundary Waters gathered leading experts and policy makers in the field for a spirited discussion on shared waters.

Water for the Common Good

The 2009 World Water Week in Stockholm brought more than 2,400 leaders together from many different sectors of the scientific, government, civil society and NGO fields to focus new thinking and positive action toward the water-related problems facing our world. The theme for the week was "Responding to Global Changes: Accessing Water for the Common Good", with a special focus on Transboundary Waters.

Throughout the Week, experts and organisations from many sectors explored various issues through plenary sessions, workshops, seminars, side events, and panels. These issues include topics such as transboundary waters, sanitation, food security, water resources management, governance, human rights and agriculture, as well as specific issues focused on the central theme.

The 2009 World Water Week proved to be especially notable in its call for the COP-15 negotiators to include water as a fundamental factor in deliberations regarding climate and adaptation. At the Week's closing plenary, the assembled participants unanimously voted to send a formal message – now commonly called "The Stockholm Message" – outlining the specific reasons why water must be part of any agreements for effectively responding to the climate changes facing the planet.

As the organiser and host of the 2009 World Water Week, the Stockholm International Water Institute (SIWI) has prepared and published these overarching conclusions. The report analyses the issues, initiatives and recommendations put forward during the Week for the benefit of the participants and the broader water and development communities.

- The Overarching Conclusions in section one are compiled and written by SIWI to try to capture what we feel were the key issues and insights advanced during the week.
- Section two includes analysis by the appointed World Water Week rapporteur teams covering five thematic streams.
- Section three highlights the work of those honoured during the week with the Stockholm Water Prize, the Stockholm Junior Water Prize, the Stockholm Industry Water Award, the Swedish Baltic Sea Water Award and the Best Poster.

The primary goal of World Water Week is to provide an annual focal point for solutions to the growing array of water and development challenges facing the world. We urge you to visit the World Water Week website, www.worldwaterweek.org, where you will find a rich resource of summaries, materials, presentations, references, and links pertaining to each and every session. The website compliments this publication and is designed to serve as a year round resource on the issues covered during World Water Week, all of it easily accessible through the interactive "event finder" tool under Programme 2009.

I would like to thank all of you – convening organisations, participants, sponsors and partners alike – for your role in making the 2009 World Water Week in Stockholm a tremendous success. Please mark your calendars for September 5-11, 2010 so you can join us for the 20th anniversary World Water Week, when our theme will be "Responding to Global Changes: The Water Quality Challenge – Prevention, Wise Use and Abatement."

Anders Berntell
Executive Director
Stockholm International Water Institute

Photo: Mats Lannerstad

Overarching Conclusions

This section is based on Stockholm International Water Institute's conclusions and what we consider as the key threads that emerged from the week. These overarching conclusions are also based on the summary reports from workshops and seminars and the rapporteur theme reports (see next section of this publication). Our interpretation of issues raised from over 100 substantive sessions are intended to provide meaningful messages for both participants who were at the week and other stakeholders unable to attend. The overall aim is to maintain a dialogue beyond the intense and fruitful discussions during the World Water Week itself.

Access to water

Water scarcity, poverty in its multiple manifestations, conflicts and political circumstances influence people's ability to access water, particularly for the daily requirements for drinking water and household needs. Water may be available in aquifers, in nearby streams or even in village ponds, but due to technical, economic, cultural and other reasons many people may not have access to water sources or to the services that are organised by the public sector or other providers. Not having access to the most basic necessity of life is causing dramatic and detrimental consequences for the people concerned. Detailed statistical accounts and a large number of illustrated cases of people affected from a lack of access to drinking and household water, are repeatedly presented in literature and media. It is, indeed, mindboggling that in spite of repeated high level commitments and the fact that there are few, if any, political disagreements, the efforts to substantially reduce the plight of the 1.1 billion who lack access to household water are not enough. It is essential to recognise that it is not only the 1.1 billion who are affected. Families and relatives of those who are affected, their farms or work places and society at large also bear the brunt of this lingering tragedy. For various reasons, there is less evidence of these wider costs to society.

The purpose of the 2009 World Water Week was to link the issue of access to the wider picture. If access is improved for those who today are deprived, it is not only those that are served that will reap the benefits, but also the community, the economy and the development of society as a whole. In other words, it would serve the common good. The word "common" features in many prominent reports; "our common future" from the Gro Harlem Bruntland Commission (1987), "our common crisis" the Willy Brandt Commission (1983) and "our common security" from the Olof Palme Commission (1982). Accessing water may be seen from a similar perspective: lacking access to water represents a fundamental problem for those who do not enjoy access to this basic need, and it is also a significant threat to the stabile and harmonious development of society, the common good.

Poor access to water is exacerbated by increasing climate variability and the occurrence of conflict or natural disasters. Efforts must be made to allocate and use the entire water resource in the most worthwhile manner, taking into account the social,

economic and environmental needs. Household provisions are, of course, the most basic need, but for overall development, it is of paramount importance to remember that water is *sine qua non* in virtually all sectors of society and that household water requirements are quite small in quantitative terms. Another major difference is the variation in water requirements over time and between sectors. For example, the agricultural sector needs water on a seasonal basis whereas households require drinking water on a daily continuous basis. Storage is consequently an important issue.

The different options for storing water, from large dams to household rainwater tanks, were examined during the week. Each option has benefits and risks, necessitating an integrated basin approach that enhances the potential complementarities between the options. With growing concentrations of people in areas where natural availability is limited, bulk transfers are often seen as an option. Demands to transfer water over long distances come from many sectors, although the most pressing claims are related to urban expansion. For inter-basin transfers, it was recommended to first explore and maximise the potential of other options, such as increasing water efficiency and improving allocation, before embarking on the costly and often contentious option of transfer schemes.

The issue of the human right to water was highlighted during the World Water Week by the participation of the UN Independent Expert on the Human Right to Water and Sanitation. Despite countries not being obliged to provide access to drinking water and sanitation free of charge, the most basic requirement is that these services must be organised, affordable and not compromise the realisation of other rights such as food, housing and health. Different settings require different and flexible drinking water and sanitation solutions. An important aspect of the right to drinking water and sanitation is that it establishes a legal framework, which clearly defines rights and obligations, and promotes pro-poor and non-discriminatory service provision.

Dealing with social and political boundaries

The special focus on transboundary waters in 2009 saw over 25 sessions deal with various aspects related to managing and governing water across not just national administrative boundaries, but also economic, cultural and sectoral boundaries. The rapporteur report "Managing Water Across Borders" found on pages 9-12 presents more findings related to this special focus.

Governing water resources that cross boundaries involves complex technical, financial and monitoring tasks that are intertwined with sensitive and pressing political, social and environmental concerns. The tasks that are deemed necessary must be sanctioned and driven by political decisions. For effective implementation and adherence, agreements among the riparian countries are essential. But prior to this, it is a requirement that national and sub-national water policies and arrangements within each riparian must first be well developed and implemented. Managing transboundary water resources does, naturally, include challenges that are more complex than national and local water management issues. The magnitude and complexity of the water challenge is compounded by the variation in political regimes, level of economic progress, and demographic and cultural circumstances.

Attention to transboundary surface water systems has been apparent for several decades, whereas the interest and concern for transboundary aquifers has only recently gained traction. With climate change and the associated increase in surface water variability, groundwater abstraction and use is expected to increase, which means that improved coordination in the planning and monitoring of surface and groundwater systems is essential.

The geopolitical scope and complexity means that, in most cases, the international community plays an important role both in terms of strategic guidance, technical and financial support and as an intermediary agent. Wherever the political power and interests are skewed and detrimental to one or more of the riparian countries, a fair outcome of transboundary water governance cannot be expected in the absence of negotiations, and without a systematic and broad support from a third party. It is a delicate task to design "support" so that the effects of power asymmetries are addressed and minimised. A mix of "sticks and carrots" may be required to guide the process. These may include targeted loans and investment schemes that are linked to how well a particular country has initiated and performed in mutually acceptable agreements. In this context, it is relevant to underline the reference to water and environmental diplomacy during the World Water Week. A new kind of professionalism needs to be promoted where negotiators, to be successful, need to have basic insights into water and environmental issues in addition to conventional diplomatic skills. Progress, in the end, hinges on the ability of the involved parties to realise and accept that a perpetuation of asymmetry increases the risk of costly conflicts and will preclude opportunities for sound development of trade and exchange in other respects.

As discussed at a number of meetings during the Week, attention in transboundary water governance should not only be given to water as such, but rather to the benefits that may be generated through rational allocation and efficient use of the resource. It is relevant to demonstrate, over and over again, what is at stake if such an attitude and strategy is lacking. The notion of benefit sharing is generally endorsed, but we need more practical examples of how to generate benefits and how and among whom they are to be shared. We also need to talk more about how to share the risks and commitments that are integral parts of an international water development agenda. The concept of "benefit sharing" is primarily about the goods

and services that may be developed and exchanged as a result of human intervention in water systems. It should be remembered, however, that in many poor areas, direct access to water in the river is presumably the most tangible benefit that communities perceive. To produce other goods and services, for example water supply, navigation, hydropower, irrigation and trade, requires interventions such as investments and technology.

Water is required by society as well as ecosystems

To balance the water requirements for different uses in society with the requirements to sustain aquatic and terrestrial ecosystems is an urgent and complicated task. It will require difficult tradeoffs and a process whereby those making the decisions need to be aware of the direct and indirect consequences of their decisions to society and the ecosystems on which it depends.

The challenge is to respond to the fact that water has many parallel functions in a catchment, including as a carrier of solutes and silt, a habitat for aquatic ecosystems, and a linkage between upstream and downstream. An integrated approach to land use, water and ecosystems, is the suggested way forward. The overarching aim of such an approach has to be one of moving towards catchment-based compatibility between human activities and the requirements of ecosystems to remain resilient to change. The inherent complexity makes systems analysis an indispensable tool.

Business finds its voice

Water is the bloodstream of society linking all sectors and stakeholders. Each sector has a role to play in how water is managed and developed. The business sector has assumed multiple roles as a user of water, a supplier of water, and as an innovator in technologies and partnership building. The water footprint tool was examined during the Week as a method for business to measure its direct and indirect water use. This concept is gaining increased recognition throughout the business sector and wider water community as a way to establish the link between consumption in one part of the world with the impacts on water systems elsewhere.

Despite difficult financial times, representatives from business maintain that the path to sustainability should not be interrupted. In fact, a new model of sustainability was being embraced by many water utility companies based on five principles: living within environmental limits; ensuring a strong, healthy and just society; achieving a sustainable economy;

Photo: Mikael Ullén/SIWI

Prof. Liu Junguo, Donna Jefferies and Sylvain Lhôte discuss the application of the water footprint concept in China, the plastics industry and throughout the business sector.

using sound science responsibly; and promoting good governance. The need to incorporate sustainable water governance into business strategies was recognised by leading companies. This has stemmed from the need to "prove" their sustainability assertions to a more aware public.

A major challenge for business when developing new products, such as water purifiers, is the lag in social acceptance and knowledge. According to some companies, products have failed in the past due to potential customers not being aware that it was polluted water that was making them sick, and therefore they were not willing to pay for the products. The question was discussed of what enabling environment is needed for business to enter new markets. To answer this, an analysis is needed of the products themselves, the target market (i.e. ultra-poor vs. poor or rural vs. urban) and the inherent market and financial risks.

Vision and leadership for "doing the right thing"

It is often iterated at meetings of the water community that proper institutional arrangements are essential to pave the way for effective water management. However, it tends to be overlooked that it is not the institutional arrangements per se that are vital, but the human and financial resources that are mobilised so that initiatives, skills and practices are stimulated, implemented and replicated. It is through mobilising these resources in all sectors of society that we will enable and deliver concrete and effective actions for dealing with the immense water challenges we face.

It is also often remarked that vision and leadership in the political arena is of paramount importance, yet this same vision and leadership also applies to institutions and organisations in all parts of society, such as inter-governmental, research, business, non-governmental and civil society. Leadership and the ability to act are critical aspects of good governance. People who dare to do unconventional things and who are able to take action can make a significant difference. A case in point is the 2009 Stockholm Water Prize laureate, Dr. Bindeshwar Pathak, in his work to overcome caste divisions in the Indian society and to uplift the poor and downtrodden members of society.

Throughout the World Water Week, there was an urge to place water higher on the political and policy-making agendas. That is important. But it is equally important that water must be high on the agenda of other groups of people in society. At the time of writing this report, it is not clear to what extent and how water issues will be addressed in COP-15 although water is clearly one of the most tangible dimensions of climate change. A call for action must be directed to a cross section of people in society. In any society and virtually in any social and political system, there is inertia in the sense that people tend to cling to what they are used to and minimise risk and unpleasant experiences. Human behaviour and activities are guided by social and cultural norms and practice. Yet despite this resistance, it has been shown that is possible to change and to empower change throughout society. Again, this is illustrated in the uplifting work of Dr. Pathak and the Sulabh International Social Service Organisation. More efforts that help disadvantaged people to get better access to water and sanitation services are urgently needed.

Presentations and discussions throughout the World Water Week illustrate that formal rules, transparency and financial resources continue to play an important role. But it has also been convincingly argued that a flexible system for decision-making that allows for adapting policy as we learn is of great relevance. During the Week, it was eloquently argued that it is better to do the right thing a bit poorly, than to continue to do the wrong thing well. Doing the right thing will depend on our ability to overcome an array of obstacles, which are due largely to the political realities and inertia we face today. Problems with social acceptability, data sharing, demand management, and rational decision-making will make the road ahead treacherous, yet we can draw inspiration from the work of many people and organisations, such as the past and future Stockholm Water Prize laureates.

Photo: Thomas Henrikson/SIWI

"People started laughing when we suggested making toilets available in all important public places. Now we have installed more than 7,500", said Dr. Bindeshwar Pathak the 2009 Stockholm Water Prize Laureate Lecture at the opening plenary.

Photo: Mikael Ullén/SIWI

The assembled participants made a unanimous and unambiguous vote for "The Stockholm Message to the COP-15".

The Stockholm Message to COP-15

Introduction

Climate change is happening and adding complexity to existing global challenges. A strong and fair agreement on future global commitments on climate change measures – both mitigation and adaptation – is crucial in order to secure future water resource availability. The negotiations towards a Copenhagen Agreement are therefore of great concern to the global water community.

The importance of water must be properly and adequately reflected within the COP-15 agreement, and in processes beyond COP-15. In recent months substantial efforts have been undertaken to ensure that this is achieved including the Dialogue on Climate Change Adaptation for Land and Water Management, the 5th World Water Forum in Istanbul and during dialogues held at the Climate Change Negotiations.

Reflecting these efforts, and the urgent need to ensure that the global community is adequately prepared to respond to climate change, the following messages are conveyed from World Water Week in Stockholm to Copenhagen:

- Water is a key medium through which climate change impacts will be felt. Managing the resource effectively, including through well-conceived IWRM approaches and at a transboundary level, is central to successful adaptation planning and implementation, and to building the resilience of communities, countries and regions;
- Adaptation is a prerequisite for sustainable development and poverty reduction. Adaptation measures thus need proper integration within broader development goals and objectives, including the Millennium Development Goals;
- Integration of water with land and forest management is key to effective adaptation. We strongly endorse the Nairobi Statement on Integrated Land and Water Resources Management for Climate Change Adaptation; we also emphasise that water-related adaptation can and should support global mitigation actions;
- Ecosystem protection and sustainability is fundamental to adaptation and human development. We therefore urge increased efforts towards and investment in the protection and restoration of natural resources – including water – as an essential part of any adaptation process;
- Higher-quality information that is more effectively shared will strengthen responses. In particular there is a critical need for the water and climate communities to increase the sharing of information at all levels of policy and practice – from global to local, and from local to global;
- Vulnerability assessments and risk management are critical to sound adaptation practice. Knowing where and how the impacts of climate change are most likely to affect populations and ecosystems through the water cycle will help in the identification of areas for early intervention or 'hot spots'; these include arid regions, areas highly dependent on groundwater, small island developing states, low-lying deltas and fragile mountainous areas;
- New and additional funds are essential. It is imperative that additional funding is allocated in support of developing adaptive strategies for vulnerable groups and ecosystems; there is a need for an initial mobilisation of finance to assist vulnerable, low income countries already affected by climate change, followed by the establishment of a well-resourced mechanism for funding adaptation as part of ongoing climate negotiations.

Follow up

We urge the global water and climate communities to look beyond COP-15 and work through dialogue to strengthen global mechanisms that can enhance collective action on water and adaptation. These should include, but not be limited to, better sharing of knowledge and technology in support of adaptation measures in developing countries, active support for capacity building and access to improved levels of financing.

Finally, the water community expresses its commitment to strengthening institutional cooperation at all levels between the climate, water and wider development communities under appropriate mechanisms and institutional arrangements in order to work more collectively to address the immense development challenges ahead.

Photo: Kai Wegerich

Managing Water Across Borders

Lead Rapporteurs: Dr. Mark Zeitoun and Ms. Lena Salame
Junior Rapporteurs: Ms. Veronika Ahrens, Mr. Jonathan Kvist, Mr. Abdelaziz Abdelkarim and Ms. Karina Barquet

Context

The 2009 World Water Week had a special focus on international transboundary waters – and for good reason. There are over 500 international aquifers and river basins, and rapidly increasing demand directly challenges sovereignty and national interests for many countries around the globe. Dealing with how transboundary flows relate to livelihoods, development, and regional security is more urgent than ever. Amongst the water community, there is near consensus that the challenges must be tackled collectively – at the peril of increased tensions and squandered resources. Yet, on the water front, decision-makers or events ensure the perpetuation of numerous unresolved (if not always violent) water conflicts that lead us exactly there. There is clearly a need to synchronise and make relevant lessons learned by the water community with the river basin reality.

The World Water Week held over twenty-five seminars and workshops devoted to precisely that aim. This report summarises the insights that were generated collectively, as well as the challenges, opportunities and recommendations for the future.

Progress made to date and major insights

Dipak Gyawali from the Nepal Water Conservation Foundation and a World Water Week participant summarised the challenges faced in the complex world of water policy, research and project implementation. "There are 'wicked' types of problems generating 'uncomfortable knowledge' – and the answers are best dealt with through 'clumsy solutions'." In other words, the perfect answer to complex issues may not exist – and our time would be better spent on finding second-best solutions based on principles, than on worsening the problem. Along the same vein, Tony Allan reminds us of the old saying: "it is better to do the right thing somewhat poorly, than the wrong thing extremely well."

The pithy sayings are perhaps most crucial in international transboundary contexts. The complexity of normal problems are compounded exponentially with each additional riparian added to the basin. Effective transboundary water cooperation between two riparian states – say Ethiopia and Sudan on the Nile, a case looked extensively during the Week – is difficult enough. Cooperation with three or more riparians (or ten on the Nile) is a formidable challenge or lofty goal. Doing the wrong thing extremely well in such circumstances is gambling with the future – consider the difference in possible outcomes of a policy focused on continued supply-side management rather than demand management. The multiple sessions devoted to the challenge provided a rich tapestry of insight. The types of insight are grouped together and discussed below in no particular order.

Transboundary aquifers deserve greater attention. The rise, fall and use of rivers is followed by farmers, the public and policy-makers alike. Transboundary aquifers remain generally 'out of sight – out of mind' but deserve particular attention. Over 276 aquifer basins cross international boundaries – with around 40 in Africa alone.

Many solutions lie outside of the basins – in the 'problemshed'. The links between water and other global processes was emphasised throughout the week. The water/energy/trade nexus in particular was dwelled upon. Whereas water was once recognised to produce energy through hydropower, water now uses energy (desalination) to produce it. Water still indirectly produces energy via bio-fuels, but at a cost to competing demanders of water and even food security – an issue that did not exist during this century in which we have become over-reliant on fossil fuels. The political economy similarly serves to explain problems with the water sector. Obstacles to water demand management, for example, are to be found in pricing signals meant to satisfy the political will of large farmers or needs of small farmers. The political economy can also provide potential part solutions through the 'import' of virtual water (especially food goods, see below). It follows that policy aimed at the energy sector and/or operating in the political economy will have significant impact (negative or positive) for the water sector.

The pros and cons of benefit-sharing and virtual water 'trade'. The concept of sharing the benefits of a river (the river itself, or benefits beyond the river) has taken deeper root in the international water community. The first applications of the concept are emerging through the equitable arrangments reached between Mali, Senegal, Guinea and Mauritania through the Organisation Pour La Mise En Valeur Du Fleuve Senegal (OMVS) on the Senegal River. The limits of the benefit-sharing approach were also identified – for instance that the concept relies on rational decision-making by states, or that it displaces the main issues (water-sharing) until they re-appear as issues under different governments. The limits of the possibility of food trade (i.e. virtual water trade) for reducing conflict were also identified. The livelihoods of Iraqi farmers or Cambodian fishermen were noted to be degraded by state-level policies of importing food from upstream states, for instance.

Power matters. Mark Reisner's famous saying that "water flows uphill to money" was taken up throughout the week. Whereas the role of power in the process and outcome of transboundary water interaction was neglected five years ago, it is now seen as yet another factor that must be considered. The opportunities provided by the stability of power asymmetry have been highlighted, though the emphasis was generally on the obstacles the asymmetry places on 'effective cooperation' (see below). 'What to do with the basin hegemon?' was a recurring theme.

There is a call for more 'effective' cooperation. Though the numerous instances of cooperation are duly noted, several of the week's panels noted that cooperation does not always achieve expected or intended results. Not all forms of cooperation have positive effects – some can serve to perpetuate asymmetric and harmful situations. The promotion of effective transboundary 'cooperation' is considered crucial – and may be rendered more sustainable by consideration of the power asymmetry of the actors involved. The understanding of 'effective' cooperation is not settled as yet, however. Does effective cooperation mean equitable in process and outcome, or simply reaching the stated goals?

Growing support for objective water-sharing standards. There were several panels and side events dedicated to exploring the ever-emerging body of water-related law. This includes panels promoting and testing the utility of the 1997 UN Watercourses Convention; discussions on the 2008 Groundwater Principles; and the potential for replicability of the UNECE Convention outside of Europe. The principles of equitability and sustainability were recurring themes.

Several key analytical tools are being developed that enable sharper analysis of transboundary water interaction. These include great improvements in data gathering and through increased use of GIS; the Transboundary Water Interaction NexuS (TWINS) that allows us to work with the dual nature of co-existing conflict and cooperation; continued improvement and expansion of education and capacity-building; and the Transboundary Water Opportunity (TWO) analytical method. Through methodological consideration of crucial areas of interaction, the application of the TWO analysis to the Nile, Jordan and SADC rivers points to potential opportunities that few had previously thought possible.

Common characteristics of transboundary interaction are identified. Numerous conditions for sustainable transboundary interaction have been identified. These include the importance of knowledge sharing; common 'language' to reduce confusion; joint management and oversight bodies; agreed rules and procedures; long-term commitment; consideration of environment and ecosystem services. Drivers of transboundary water interaction were suggested to include the opportunities for shared risk, shared costs and increased benefits. Education and capacity enhancement were mentioned as essential for progress in cooperation and trust building around transboundary water resources.

Challenges and obstacles to progress

The considerable insight generated by the Week stemmed from focussed attention on the realities of transboundary water contexts today. None of the challenges or obstacles to improvement that were identified are new, but they remain nonetheless considerable.

A primary challenge identified was the increasing demand for water through rapidly growing water-intensive diets, consumption related to obesity, and population growth. The participants of the week were not averse to addressing such 'uncomfortable knowledge' as the fact that meat-eaters consume more than twice the water as vegetarians, that the 'water footprint' of citizens in industrialised countries dwarfs that of most of the rest of the world, and that population figures continue to rise. The implications for transboundary water are most striking when the water used for such purposes is from irrigated activity (blue water) – as such water use could be considered wasteful.

Photo: Mikael Ullén/SIWI

Lead rapporteurs Ms. Lena Salame (centre) and Dr. Mark Zeitoun (to her left) see long-term thinking, commitment and perspective and keys to improving transboundary water management.

Limited knowledge and data remain priority obstacles to overcome, primarily for transboundary aquifers. The ever-present gap between theory and practice – policy-makers and academics remain out of touch (how many farmers or their representatives were present at the Week, for instance?) – continues to haunt. Institutional and governance challenges remain, including gaps in international infrastructure, poor capacity, inefficiencies, duplication and complexities (hydrocracies, in Gyawali's terms), and the absence of monitoring mechanisms. Relatively new obstacles identified include the lack of awareness of the potential effect of climate change on water resources, and the considerable interest in climate change negatively affecting instead of complementing water agendas.

Asymmetries of various sorts were also highlighted as obstacles, for instance, unfair distribution of water, costs and benefits, or asymmetric access to information and unlevel playing fields. Power asymmetry in particular could hamper transboundary water cooperation in a number of cases. It was noted that basin hegemons acting as 'bullies' can maintain inequitable sharing arrangements through a variety of forms of power. And the ever-unresolved tensions between state sovereignty and transboundary flows ensures that national responsibilities are more relevant to decision-makers than international responsibilities.

A final key obstacle to improvement was related to the role of third parties and donors. The lack of long-term programming or political and financial investments on the part of the donors perpetuates the short-term cycles and visions that beset so many non-industrialised contexts. The problem is compounded when there is duplication amongst the donors – doing the wrong thing poorly, in other words.

Opportunities for further progress

A number of opportunities were also highlighted by the Week's participants. Notwithstanding the previously mentioned conflict-creating aspects of virtual water 'trade', the conflict-mitigating role that it plays remains potentially vital, and virtual water 'trading' is expected to increase. Maximising the benefit means paying special attention to the relation between costs, pricing, and subsidies, but efficient decisions cannot be made unless institutions and values are in place. Trade and virtual water concepts work, but are not a result of price signals or coherent political decisions.

International law and improved regulation and best practices can help with more effective transboundary water interaction. Considering international inter-basin transfers, examples from the USA and Jordan provide strong arguments that a clear and comprehensive policy and legal framework and the development of regional treaties are pre-conditions and form the basis for the development, negotiation and implementation of any national and transboundary inter-basin transfer schemes. These may also mitigate perceptions and threats to national water security posed by international water transfers. The growing support for the various aspects of international water law is key in this regard.

Improved technology offers opportunity in a number of ways. Improved water treatment technology makes unconventional water resources more readily available, thereby reducing pressure on and national interests in transboundary freshwater. This was seen as a possible key to resolution of the Jordan River conflict, in particular, where increased desalination on the coast may reduce tensions over the inequitable freshwater allocations. Improved data gathering and analysis technology (relating

to, for example, rainfall variability or groundwater levels and quality) may encourage or facilitate the required knowledge sharing. Improved alternative energy technology (for example solar thermal and wind) can help decrease our reliance on fossil fuels or the negative side-effects of bio-fuel production.

Though normally considered an obstacle to progress, power asymmetry was also viewed as an opportunity. Basin hegemons acting as leaders can enable effective cooperation and sharing of water and benefits. Power asymmetry can also provide opportunities for its challenge, through levelling the playing field (law) or levelling the players (capacity-building and education).

One of the more innovative opportunities identified was a call for increased 'environmental diplomacy'. The potential of third parties for data gathering or mediation should not be under-considered, and may be particularly useful when applied by 'water diplomats' who are readily familiar with the complexity of the issues inside (and outside) the basin. A second innovative opportunity identified was to leverage the interest in climate change to promote water issues. Closer consideration of the hydrological and carbon cycles is required in any case, and the Stockholm Message sent by the World Water Week to Copenhagen ahead of the COP-15 meeting in December is a good step in this direction.

Photo: Anton Earle, SIWI

Conclusions and recommendations

The level and depth of discussion on transboundary water management throughout the week reveals that the bulk of the international water community takes a considered, informed and distinct position. While the media and politicians can manipulate cynicism to emphasise the causal relationships between water scarcity (or floods) and violent conflict, others contend that the evidence of cooperation that exists globally suggests a comforting trend towards stability. The international water community present at the 2009 World Water Week stresses the existence of numerous water conflicts that fall short of violence.

Still with the idea that it is *better to do the right thing a little poorly than the wrong thing extremely well* in mind, the following recommendations are proposed.

Do the right thing, for the long haul. Doing what is politically possible in the short-term does not always help in the long-term. Long-term thinking, commitment and perspective are absolutely key for improvement of transboundary water management.

Be bold. Transformational change was advocated in many cases. Incremental steps towards optimisation of water use were seen as insufficient to meet the current challenges of global change including climate change and rapid urban growth.

Look beyond the river – to aquifers. Increased pumping of the unseen groundwater resource means more attention must be paid to transboundary aquifers. This includes not only improvements in remote sensing, hydrogeology and hydrochemistry, but the continued development and application of groundwater sharing principles such as the UN Resolution on the Law of Transboundary Aquifers.

Look outside the basin – to the problemshed. Many of the problems – and solutions – lie outside of the river or aquifer basin. Improvements in the energy sector or solutions that consider the political economy are sure to go a long way.

Reach for new tools. The week has highlighted a number of new analytical tools that may help to understand transboundary contexts – and ultimately to inform policy.

Don't give up on proven ways. Continued testing and learning from positive and negative experiences may fall out of fashion, but not out of use. Similarly, persistent and long-term commitments to harmonise and share data, or to improvements in training and capacity are always important.

Try innovative (but grounded) approaches. This means considering how to increase the leverage of legal instruments, exploring the conflict-resolution role of technology like desalination, the development of more resilient and flexible approaches to transboundary water (in terms of management structures, law, institutions, policies), and reconsidering the notion that all conflict is bad and any cooperation is good.

Photo: Lovisa Selander, SIWI

Coping with Climate Change

Lead Rapporteurs: Prof. John H. Matthews and Ms. Kusum Athukorala
Junior Rapporteurs: Ms. Helen Chapman, Ms. Kristen Downs, Ms. Sara Tynnerson and Ms. Eva Westin

Although August 19 and 20 were designated as the days for Water and Climate focus sessions for the 2009 World Water Week, climate change issues appeared in most of the conference sessions, panels, and presentations. The intensity relating to climate and water was also very high. The intensity of the discussions was quite high, driven at least in part by an urgent sense that critical issues for the water community are at stake during the December 2009 United Nations Framework Convention on Climate Change's Conference of the Parties 15 (UNFCCC COP-15) in Copenhagen. COP-15 clearly focused the audiences, organisers, and presenters, particularly in a series of panels and presentations explicitly addressing the relevance of UNFCCC processes and institutions to the water community. However, while the official agenda for COP-15 overwhelmingly targets climate mitigation efforts (i.e., reducing the rate of emissions and concentration of atmospheric greenhouse gases), World Water Week centered on climate change adaptation (CCA), which encompasses the responses of ecosystems, species, livelihoods, and societies to realised and emerging impacts from anthropogenic climate change.

Major issues in climate change

Although climate change occupied more of the discussion space at World Water Week relative to 2008, talks and panel discussions fell into a relatively small number of themes. For the most part, the greater focus on climate change probably reflected a higher level of sophistication and interest in these issues in the water community over the last year.

Impacts science, mitigation, and adaptation. In 2008, many talks described climate change impacts or climate mitigation efforts. In some cases, confusion was evident in usage of climate change mitigation versus adaptation. However, for 2009's conference, "climate change" almost always assumed a reference to climate change adaptation. This year demonstrated a widespread level of awareness of the differences between mitigation and adaptation, with no more than a handful of talks focused exclusively on efforts to reduce greenhouse gas emissions. Climate change impacts were widely discussed, but almost always as a prelude to adaptation strategies, challenges, or plans.

Managing uncertainty in freshwater climate change impacts. One of the most important themes to emerge in 2009 was the problem of managing water resources in the face of uncertain climate impacts in the future beyond assumptions of "stationarity" (i.e., the past eco-hydrological record is a sufficiently accurate guide to future conditions for infrastructure and water resource planning). Important questions emerged in the discussion to challenge how we thoughtfully move forward. Do current water planning and management techniques suffice, or do we need modified or even radically different approaches?

Photo: Mikael Ullén/SIWI

Lead rapporteurs Ms. Kusum Athukorala and Prof. John Matthews note: International and national water management institution must to do more to adapt to climate change.

Can global circulation models that have been coupled to hydrological models be accurately downscaled for water infrastructure planning and design? Can risk assessment decision-making strategies be used as an alternative to downscaling?

Defining principles and approaches to adaptation. A consensus appeared to be emerging this year that climate change adaptation for the water community represented a small set of core techniques, such as scenario-based flexible planning for a range of potential futures, active monitoring of water conditions, and the need for ecosystem-based adaptation. Most panels in particular represented a consensus that methods of water management such as IWRM and environmental flows, even without modification, would go far towards preparing communities and ecosystems for emerging climate change impacts. However, many speakers also emphasised that some of these techniques should be made more climate aware and that climate change implied reprioritising existing water management approaches. Speakers consistently emphasised the urgency of action in and beyond the water community to improve and protect livelihoods and ecosystems.

The importance of climate change relative to other threats to freshwater resources. Many talks assumed that impacts from anthropogenic climate change were already or would soon be critical drivers, requiring resource management intervention. In some cases, speakers emphasised that climate change represented an opportunity for addressing a variety of water management, development, or environmental issues holistically or in a transdisciplinary approach rather than separately — that climate change adaptation represents an opportunity for integrating perspectives. The importance of climate change to freshwater was more often challenged by audience members than speakers, suggesting the potential for a backlash against climate adaptation or reflecting an implicit concern that climate change could overwhelm other topics deemed more pressing or urgent, such as sanitation or environmental flows.

National and international water management institutions must do more to encourage adaptation. There is a widespread sense in the water community that while progress is being made in terms of technical responses, legislative and policy approaches are lagging. These gaps span the developed and developing world, though there is a strong sense that international institutions such as the UNFCCC must make significant strides for national-level decision-makers to act.

COP-15 and beyond: Water, the UNFCCC, and the Stockholm Message

COP-15 probably is the first UNFCCC meeting to have a realistic opportunity to finalise a climate mitigation successor to the Kyoto Protocol, but there is also palpable concern among water sector professionals about an overemphasis on climate mitigation at the expense of climate adaptation and very limited references to water or water management's special problems

in light of climate change. At the time of 2009's World Water Week, one section of the negotiating text for COP-15 refers to the creation of an international adaptation fund to transfer money to developing nations, particularly those that are seen as especially sensitive or exposed to climate change impacts. Less than 15 references to water had been included within the text by August 2009.

Many panellists and speakers felt that the UNFCCC had an important role to play in encouraging climate change adaptation, but, by implication, they also felt that the UNFCCC was not currently relevant to successful national and local climate change adaptation efforts.

In UNFCCC documents, climate change adaptation primarily refers to human communities rather than non-human species or ecosystems generally, and UNFCCC negotiators have historically eschewed "privileging" a particular sector as being particularly important for adaptation. The majority of speakers assumed that water was the medium through which the impacts of climate change will be experienced by humans. Many speakers advocated the use of the term "water community" over "water sector" to emphasise the collective or universal experience of climate impacts and the cross-cutting importance of water to sectors such as agriculture and energy. Moreover, there was concern that climate mitigation might come at the expense of some aspects of climate adaptation, such as through the incautious implementation of clean energy mechanisms such as hydropower that could sacrifice or negate options for adaptation.

Critical gaps were seen in UNFCCC processes. Most UNFCCC staff and delegates do not have a clear understanding of adaptation relative to their understanding of mitigation, and as a result there is little or no recognition that the water community should have a privileged position relative to other areas. Some speakers also expressed a fear or concern that mitigation negotiators view adaptation as unimportant. A few speakers also criticised the water community itself for not working to understand UNFCCC processes and language.

Many speakers and several sessions also alluded to efforts by the Danish Government, host of COP-15, to introduce a more holistic vision about good adaptation practice into international policy. This vision was formally articulated in a Denmark-UNEP hosted meeting in Nairobi, Kenya, in April 2009 with the Nairobi Statement on Land and Water Management for Adaptation to Climate Change, which stressed the principles of sustainable development, ecosystem-based resilience, sound governance, information sharing, and effective finance and funding for adaptation to climate change. The "Stockholm Message" to COP-15 (endorsed by acclamation in the final plenary session) was arguably the strongest expression of this view at 2009's conference, explicitly referencing the Nairobi Guiding Principles (the Stockholm Message can be found on page 8 in this report).

Photo: Xu Jianchu

Climate without borders: Transboundary, sectoral, and regional issues

Climate change is not experienced in the same way or at the same rate across regions, nor are all groups, ecosystems, economic sectors equally vulnerable or resilient – even in the same region. Several sessions focused on particular countries or regions and important local vulnerabilities (for example, Brazil and the Middle East). Other climate change sessions targeted particular sectors within the water community (for example, WASH, funding water infrastructure, and agriculture).

Transboundary water issues were a major emphasis for World Water Week in 2009, and in the context of climate change they were discussed as a potential complicating factor in effective basin management. Sharing of water management strategies, linking real-time or historical flow data for management bodies, and coordinating resource management institutions and policies across international boundaries was seen as an important challenge. Concern over the development of flood and drought control infrastructure, for instance, could have negative ramifications for downstream nations. Several speakers noted as well that transboundary issues could also become critical within countries if water management devolved from federal/national levels to provincial/state levels. In a few cases, adaptation was mentioned as a promising vehicle for promoting successful transboundary cooperation.

Conclusions and issues ahead

Several major topics were repeatedly raised in 2009 but discussed in a marginal or superficial manner that might be worth explicitly elevating for 2010.

Communicating the importance of water and climate change to broader audiences. If water is indeed the medium through which climate change will be felt by humans, the water community must find more effective ways of making climate-resilient water management relevant to vulnerable groups such as women, young people, farmers, and consumers. The importance of water must be articulated from many audiences in order for decision-makers to act, not just from those directly involved in water resource management.

Forums for exchanging adaptation lessons. Enormous gaps remain between scales (project, basin, national), specialty (engineering, economics, finance, hydrology, ecology, development, policy), and within and between regions. Can World Water Week create more dynamic platforms for exchanging lessons and removing barriers rather than lecture-speaker approaches?

Enabling institutions and policies. Discussions about institutions and policies that enable climate change adaptation or become "adaptive institutions" would be extremely useful. While these terms were raised repeatedly in 2009, they remained largely in the abstract, with few case studies or examples of the positive roles that national and international institutions should be playing.

Mitigation vs adaptation, or mitigation and adaptation? In most instances where mitigation and adaptation were both mentioned, there was little discussion of how these could be integrated or where the limits of integration lay. Can and should wetlands be managed as carbon sinks, as has been proposed for the UNFCCC for forest carbon? When climate mitigation is in conflict with climate adaptation, which should be favoured?

Gender. While the research and advocacy on climate change is showing that women are major victims in agricultural communities, there was little explicit discussion what gender-relevant adaptation interventions might look like, such as a gender policy in the water sector.

The philosophy of adaptation. Most discussions of climate change adaptation techniques described building resilience to climate variability and resisting ecological tipping points, which in effect is about buffering impacts or reducing rates of change. But some talks also explored adaptation as facilitating changes in ecosystems and economies. These approaches are probably distinct. How are they related? When should one approach be favoured over another?

The limits of adaptation. A number of regions such the Himalayas and the Andes are experiencing very rapid rates of climate change, particularly in their water resources. Are there limits to what can be adapted to? How do we define those limits?

Climate services. Only a handful of speakers mentioned climate services, a topic that is gaining traction in some scientific and policy circles. Climate services are roughly comparable to ecosystem services, such that regions like the Amazon "provide" climate services such as large quantities of airborne moisture. The water community is largely focused on surface and groundwaters rather than the larger eco-hydrological cycle. Should the focus of adaptation shift to encompass climate services?

Groundwater. In many regions, groundwater is a very significant portion of water for irrigation, domestic, and industrial use, while monitoring of usage and recharge processes or regulation of groundwater resources are extremely limited. Climate change is likely altering recharge and demand of groundwater resources globally.

Finance and funding as instruments of adaptation. Water infrastructure affects most major and many small bodies of water. What role can the finance industry and development groups play in promoting climate-sustainable water management practices?

Climate change and water footprint. Water footprint has become a powerful means of articulating how economic processes can transfer good and bad water resource management within goods and services. Some governments and corporations are now turning water footprint messaging into water management policies. However, the water footprint movement does not encompass realised or projected climate change impacts.

Photo: Jakob Granit, SIWI

Balancing Competing Demands

Lead Rapporteurs: Dr. Thomas Chiramba and Prof. Hubert Savenije
Junior Rapporteurs: Mr. Carlo Iacovino, Mr. Kenge James Gunya and Ms. Virginia Hooper

Context

Competing claims for water are becoming increasingly acute as demographic and environmental changes place pressure on limited resources. Population growth, urbanisation, dietary changes and climate change are arguably the most significant factors contributing to growing water scarcity and the need to balance claims among different users. Current trends show that regardless of the cause, preparation must be made for reduced water availability in many parts of the world and from all sectors, particularly agriculture.

Over the course of the World Water Week, the question of how to balance competing demands was raised across different sessions. These discussions have been summarised in the following key areas: managing demands from urban centres and mega cities, improving agricultural productivity through increasing and efficient use of green water and effectively communicating water demand. The issue of water quality was shown to be critical as too often the focus is purely volumetric. A number of other relevant general concepts were also voiced repeatedly, such as the need for cross-sectoral water management, the inclusion of local knowledge and stakeholder participation in water management decisions, the use of systems approaches to water management and the role of neutral facilitators and moderators in water allocation and benefit sharing discussions.

Mega cities and urban water management

As the world's population grows towards 8 billion people, a larger proportion of the population is expected to live in urban or peri-urban areas. Greater demands are therefore placed on the environmental flows and irrigation districts in areas surrounding cities. Water may well have to move away from the agricultural sector which currently consumes 70 percent of supply; however, growing urban centres will be unable to source all their requirements from irrigated agricultural supplies and ecosystems. This is particularly important as increased water abstraction from the environment reduces 'environmental flows' which support vital natural infrastructure and many direct and indirect human activities.

In order to meet growing demands for water in urban centres, greater focus should be given to: re-using wastewater, recycling, managing surface water, green infrastructure and the management of nutrients (for example with urban agriculture).

In the session *Global Dialogue on Sustainable Strategies in Water Utilities: 'Walking the Talk'*, water utilities provided examples of new experiences and progress made to date. An important example is the City of Los Angeles, whose new policy goal is to: "Meet all new water demands through water conservation and recycling" (2008). Similarly, Junguo Liu reported that China has adopted the policy that growing cities should not increase

Photo: Mikael Ullén/SIWI

Population growth, urbanisation, dietary changes and climate change are increasing pressure on limited water resources, explain Prof. Hubert Savenjie and Dr. Thomas Chiramba at the closing plenary.

their water consumption and that the agricultural sector has to decrease its water consumption, through higher efficiency and recycling. In contrast, in Australia, a pipeline built to supply the city of Melbourne has caused significant political conflict as farmers protest the diversion of water from drought-ridden irrigation districts to the city.

Despite this progress, the main challenges to these schemes were identified as public perception issues and the high energy requirements associated with water reuse. Experiences from Singapore also show that effective policies to manage reuse systems must be in place before developments are constructed to ensure that policy recommendations are implemented.

Water and agriculture

The demand for food will continue to grow worldwide as population continues to increase; projections suggest that an extra 2.5 billion people will need to be supported by 2050. Meeting the challenge of growing more food with less water requires a shift in focus from purely blue water resources which are becoming rapidly scarcer to green water management. This was the subject of the workshop *Access to Green and Blue Water in a Water Scarcity Situation* where the continuum from green to blue water management was highlighted. A key challenge that was identified was financing and scaling up of initiatives. For example, Green Water Credits were identified as a mechanism whereby farmers could be incentivised to manage soil and water resources to optimise green water use. Further initiatives, for example in Jordan, where green and blue water modelling has been used to understand water demands were described.

Legislation was shown to be a useful tool and future applications of these laws to agricultural water management were highlighted. For example in California, there are laws which prohibit the waste and unreasonable use of water. Discussions revealed that this legislation may be applied to agriculture in the future. They could limit the cultivation of water intensive crops such as alfalfa, which is an important source of fodder.

The '3R concept' – Recharge, Retention and Reuse was highlighted as a crosscutting issue which can upscale the use and management of ground-, soil- and rain-water for livelihood security, including agriculture and climate change adaptation. This approach is thought to fill in some of the 'gaps' in IWRM as it captures water onsite and is viewed as a holistic approach to basin management. The most promising aspect with regard to balancing competing demands is that it provides a buffer function through increased storage at a local level, which allows for greater flexibility in the management of peaks and lows in water access and the increasing variability of climate change. This concept provides options to optimise water use and thus must be considered across all sectors.

Allocating water to ecosystems

Ecosystems provide vital natural water infrastructure but require minimum water requirements to function effectively. Discussions centred on how water allocations continue to be made in the absence of knowledge of how much water is available, or how much is needed to maintain sensitive areas, for example

wetlands, to be able to provide other ecosystem services. Water allocations are too often approached from a sectoral basis rather than using a cross-sectoral systems approach.

An example from eastern India showed how the incorporation of local knowledge into the decision-making process enabled the balance of fishery and ecosystem requirements in the Mahanadi Delta.

Using the framework of ecosystem services to balance competing demands for water was proposed at the seminar *For Wise-use of Land and Water Resources: Balancing Competing Claims for Water, Food, Energy and Ecosystems*. Here the idea of supporting regulating and cultural ecosystem services to 'balance' provisioning services (agriculture) was explored. This framework moves away from the idea of 'competition' between users. A case study from Vietnam, demonstrated how the synergies of water users could be explored between the demands for water by ecosystems and food production systems. The multiple functions per 'domain' of water was a central concept.

The seminar *Environmental Flows for Sustainable Development, Poverty Alleviation and Biodiversity Conservation* demonstrated that allocating water to the environment is often unpopular in decision-making circles and the concept of environmental flows was not well understood outside the scientific community. Will valuation of ecosystem services allow more effective allocation of water to the environment or is legislation required to ensure that the environment is treated as a stakeholder?

Communicating water demand

A clear picture of the impact that consumption patterns make on global water resources is needed. A promising new development is the 'water footprint' of production chains. These can be communicated to consumers, policy-makers and the public at large. In addition, 'water stewardship' schemes or voluntary certification programmes aim to create global standards, assessment processes and branding that will recognise conscientious water users.

Using these two tools, key water risks can be linked to the market and consumers. Water footprint has a global dimension where one can see that certain areas in the world are more efficient, or more appropriate for production of some crops and commodities. The concept of water footprinting and virtual water, if embraced, could be an effective measure in reducing excess agricultural and industrial water demand in water scarce regions of the world.

While these tools allow information on water use to be communicated quickly and simply, they mask complex issues. For example, water footprint is complicated, as is IWRM. Many factors require assessment as these are often difficult to quantify. In particular, the diversification of water footprint into the different types of water use (the more and less sustainable components) is a major challenge. For instance, there are different ways to produce coffee: completely rainfed in an ecologically sound production system (a green water footprint), or irrigated (a blue water footprint) or making use of many fertilisers and pesticides (a grey water footprint). Once again, the inclusion of water quality considerations is a challenge when applying accreditation methods to such products.

New tools to balance demands

One opportunity for balancing the demands arising from biodiversity requirements is the Integrated Biodiversity Assessment Tool (IBAT). Using this product, the demands of biodiversity and ecosystems can be represented in the planning process earlier and more effectively. Species requirements can be made visible to planners and policy makers allowing competing demands to be assessed more effectively. Tools such as IBAT are a new way to prepare, package and deliver protected area and biodiversity information to policy makers and the business sector (many who may not normally ask for access to this information).

It has been developed in conjunction with the private sector that will actually use it (Bank of America, Shell, Chevron, Microsoft, BP, Rio Tinto and others). Through the use of such an easily accessible tool, the demands of biodiversity can be presented before development in an area of ecological value proceeds.

It is not only that there are new tools available to manage water resources and balance demands but also new potential methods of financing these activities. A clear message from the Week was that it is possible to link water projects to wider funding channels, for example, through the implicit association of water management and climate change adaptation.

Conclusions

A number of conclusions and recommendations can be drawn from the material presented at the 2009 World Water Week. They cover the central issues of water for agriculture, water for cities and allocating water to the environment using new tools and new funding mechanisms. A summary of the key messages is given below:

- Urban and peri-urban water demands must be met without increasing supply at the expense of agricultural districts and environmental flows.
- New tools for communication can quickly provide information to consumers, developers and markets regarding water demands; further investment is however required for their development.
- New models of ecosystem service frameworks have been effective in balancing competing demands between users in recent regional examples.
- Access to linked sources of finance such as carbon funds can provide new sources of capital for water-related projects.
- Water quality concerns must be given as much consideration as water quantity.

Photo: Rosanna Ricciuti, SIWI

Responding to Socio-economic and Demographic Changes

Lead Rapporteurs: Dr. Graham Alabaster and Mr. Björn Guterstam
Junior Rapporteurs: Ms. Ida Sylwan, Ms. Helena Claesson, Ms. Johanna Sjödin and Ms. Lovisa Lagerblad

Context

Changing population patterns and lifestyles will have important consequences for water and sanitation provision as well as for water resource management. In 2050 the world will be home to somewhere between 8.5 and 11 billion people. Together with rising standards of living in many parts of the world, this will lead to unprecedented demand for and pressures on water resources. To secure water for all, such a situation will require more investments and a far more efficient use of water than what we see today.

Most of the population increase will take place in the poorest parts of the world, where the brunt of the world's population without access to improved water and sanitation already live today. Will the poverty-water nexus be as manifest in 2050 as it is today?

Another prominent demographic pattern is the rural-to-urban migration, which challenges the flexibility of water supply and sanitation systems in cities. A recent trend is the growth in secondary cities, which often have less water management capacity compared to mega cities. Population density is also increasing globally in coastal zones, putting them under particular stress.

Major insights

Competing demands. By 2050 the population in countries with chronic water shortages will be 3–5.5 billion and most of them will live in developing countries. By then the earth will also need to feed 2.5 billion more people, and there will be less water available for agriculture. Consequently the issue of competing demands can complicate management and increase conflict.

Water for food is threatened mainly by inefficient water use in agriculture and the increasing per capita food and fuel consumption among the rich, while climate change is worsening an already complicated water management situation. This calls for water policies and governance to precede planning and development.

Water and sanitation as a human right. With only six years to go before the deadline of the United Nation's Millennium Development Goals (MDGs), there is an immense global gap in water and sanitation. Still, about one third of the global population is suffering from poor quality water and lack of safe sanitation. Progress pace is too slow and governments have to do more. MDGs have not triggered enough political commitment

and in this context the human rights perspective to water and sanitation is seen as a potential catalyst. The UN Independent Expert on the Human Right to Water and Sanitation, Catarina de Albuquerque, explained why human rights matter and that water and sanitation are related to rights to life, health and food. Recognition and understanding of the importance of affordability is an important insight for improving the access to services by the poor and for the implementation of the human right to water and sanitation. An important aspect of human rights is the empowerment of the people lacking services.

New alliances. In some parts of the world, such as Asia, there is a major shift in the role of the private sector to become a more prominent player. Although progress in India towards the MDG targets on sanitation by using new, affordable, user-friendly recycling technologies is promising, many experts believe that a functioning market is needed to reach the sanitation target on time.

Another example of the new alliances trend is the partnership between NGOs, the private sector and UNICEF presenting a "quick fix" initiative to address the financing gap for sanitation: the World Sanitation Financing Facility (WSFF).

A parallel and complementary track is the initiative of the United Nations Secretary General's Advisory Board on Water and Sanitation (UNSGAB) to build alliances through Water Operators Partnerships (WOPs). Today WOPs are established in a number of regions in the world, such as Central Asia, Latin America, Caribbean, South East Asia, and South Asia. Cooperation at utility level is a way to improve performance towards a more efficient water use and supply to the end users. Results are already seen in effective and sustained capacity building through twinning as an alternative to consulting.

NGOs, researchers and business partners also announced the formation of a Global Water Roundtable (GWRT) to develop global standards for freshwater stewardship. While the GWRT's initial focus will be on setting agreed standards for responsible environmental and social water use and accountability, the initiative could lead to certification processes recognising responsible water use.

Opportunities for progress

Pricing of water. Today the value of water is considered in a completely different way, compared to 15 years ago. This is a positive development when looking at the competing demands for water, since it can help us to distinguish between low- and high-value uses and to set prices on water accordingly.

Subsidies have long played a role in the pricing of drinking water and sanitation. A positive sign is that the debate has now moved from "for and against" into a more constructive phase, where the design of effective and sustainable subsidies is at core. In order to reach sustainable cost recovery, more responsibility from those who design subsidies is called for.

Wastewater reuse. The WHO Wastewater Guidelines are helpful when nations implement Water Safety Plans which are adapted to local conditions and build on health based targets. As a result this promotes acceptance of treated wastewater for agriculture. In this way a reconnection of cities and the countryside is established when managing water for food.

Innovative financing mechanisms. Money talks and it is considered high time to put values on the wealth of services that are fundamental for proper environmental functioning as well as economic and social development. In this context an innovative policy instrument was presented in the concept of Payment for Ecosystem Services (PES). PES makes it possible to internalise environmental costs and benefits in decision-making. PES has the potential to improve the quality of decision-making and facilitate the integration at all levels of relevant policies (for example, agriculture and forestry, urban development, water, energy and transport).

Regarding water supply and sanitation, it was shown how interest from micro credit institutions to back up entrepreneurs is still small, but could possibly grow. Microfinance for sanitation appears to be a relatively unknown area for the investors and information needs to be spread. At the same time revenues might be small, but there are investors that agree to trade financial benefits for social ones. The International Finance Corporation has also recently started research on how they can support sanitation investments.

There could also be opportunities for Official Development Assistance (ODA) to leverage private funds and microfinance to fill the financing gap for water and sanitation which have not yet been explored fully. There is a range of financing institutions and instruments including micro-financing, franchising, community/user organisations, commercial banks and international development assistance that can be leveraged by ODA to enable increased finances and good design of subsides.

Urban opportunities. Sustainable cities are a goal which engages private and public sectors as well as engineers and planners. They agree that time has come to reshape urban water and urban design to achieve long term water security. On the benefit side there are opportunities for joint optimisation of city needs, well integrated and in harmony with its surrounding environment.

Often installing water supply is prioritised before dealing with sanitation issues, while sanitation is key to maintaining the quality of available water resources. Phased approaches to the implementation of water and sanitation projects, in line with population growth and urbanisation, improve impact. When urbanisation is now taking off in smaller towns, this insight can provide an important opportunity for progress.

Virtual water. It was reported that trade and virtual water concepts work, but they are not a result of price signals or coherent political decisions. The virtual water concept has the

potential to help consumers, producers and politicians to appreciate the challenge and influence behaviour.

It has been estimated that trade with commodities containing virtual water is currently "saving" around 350 cubic kilometres per year showing that increased trade with virtual water-intense commodities is an opportunity for future water efficiency.

Challenges for progress

When taking action on the above mentioned opportunities it is important to be aware that they also entail certain challenges, which need to be dealt with if progress is to be reached.

Pricing of water. The work of implementing water pricing policies, including fee collection and subsidies to the poor, will meet considerable challenges in the absence of well functioning institutions. This is particularly the case if water pricing at the same time shall serve as a signal of water scarcity. Also when it comes to safeguarding poor people's access to affordable water, regulation will be a key challenge. Rural India can serve as an example of why pricing of water is a complicated issue. If the true cost of water for irrigation would be charged to smallholder farmers in India, most of them would lose their livelihood which will consequently increase poverty.

Wastewater reuse. Scarcity of water is driving reuse of wastewater, but is constrained by economics when it is cheaper to use conventional sources. Another challenge is to facilitate the dialogue between the wastewater sector and agriculture sector, since it is often missing.

Innovative financing mechanisms. The work on new finance mechanisms is promising but it still seems to grapple with the issue of quantifying benefits from environmental services and sanitation in monetary terms.

Photo: Mikael Ullén/SIWI

By 2050, 8.5 to 11 billion people will call earth home. Lead rapporteurs Dr. Graham Alabaster and Björn Guterstam look for more productive agriculture, wastewater reuse, finance mechanisms and pricing structures.

Urban challenges. Achieving sustainable cities requires a truly different way of working in a progressive closing-of-the-loop of urban water and treatment, including major increases in water use efficiency, energy and nutrient recovery. It also means a need to urgently rethink how to construct the water systems supporting cities. This in turn will necessitate an integrated city and water planning which so far is rarely seen anywhere in the world.

Virtual water. There is at present a socio-economic inequity between South and North in which northern consumers do not bear the full cost of the virtual water in commodities that are now part of their lifestyle (for example, asparagus from Peru, flowers from Kenya). This cost is born by people in the South in terms of increased water scarcity, for example by lowering of groundwater tables.

There is a need for meaningful measurements to inform about the resource allocation and valuation challenge. Today we are only at the beginning of the journey to achieve this. The presented case studies on virtual water help by providing a methodical approach.

Virtual water trading will increase. It will be only partly influenced by water endowments so there is a need to understand the many other variables better. This includes the important interaction between costs, pricing, and subsidies, but efficient decisions cannot be made unless institutions and values are in place.

Conclusions and recommendations

The following recommendations are proposed building on the findings above and the sessions related to the theme of responding to socio-economic and demographic changes:

- Increase attention on socio-economic and demographic changes compared to climate change, in view of their respective impact on future water stress.
- Allocate a price on water that reflects its scarcity and its value in different uses.
- Reform land tenure to make farming more productive and profitable.
- Create a water efficiency index where countries, companies and food producers can be ranked.
- Learn from other sectors how they tackle subjects as demographic and socio-economic changes.
- Service providers: keep your eyes open to innovative approaches to operation and maintenance, such as the franchising model.
- Sanitation planning must consider the whole system, i.e. start small and get bigger!
- Gender issues are overlooked and need much better attention. Too much attention has been given to the number of women in water committees and too little on the underlying attitudes of people regarding gender issues.
- Appreciate the gains from joint city and water planning!

Photo: Anton Earle, SIWI

Ensuring Human and Environmental Health

Lead Rapporteurs: Dr. Akiça Bahri and Mr. Piers Cross
Junior Rapporteurs: Mr. Nelson Ekane, Ms. Chibeso Pensulo and Mr. Zhang Wenxin

Context

Human and environmental health depend on often complex and often poorly understood interactions between water supply, sanitation, solid waste, hygiene, health, agriculture and environment. Traditionally, water supply, sanitation and water management are planned, designed and managed quite separately and in different time-scales. Environmentally sound systems require taking into account the whole cycle, from production to reuse. They require an integrated approach involving a variety of stakeholders, crossing current sector divisions and rural-urban divides.

Insufficient water and, inadequate water quality, sanitation and hygiene are, after malnutrition, the second biggest cause of death and illness. Ensuring human and environmental health is a 'trillion dollar' vision. Yet sector leaders are trying to achieve this vision with woefully inadequate resources, a dysfunctional sector, untested instruments and an uneven knowledge base.

Major insights from 2009

Two related and underlying areas for action emerged from the discussions on this theme at the 2009 World Water Week in Stockholm: (1) the primacy of working across sector silos and building systems approaches; and (2) redefining a framework for action in the water sector.

Breaking the silos. 'Silo' thinking in the water, sanitation, hygiene, agriculture and environment sectors continues to prevent the emergence of a holistic agenda for promoting environmental and human health, despite compelling evidence of interconnectivity. The cross-over between water, sanitation and reuse illustrates this aptly: ecosystem thinking can lead to improved food production, a cleaner environment, water savings, better pest control, less disease transmission, new business opportunities, more public goods, greater economic productivity and growth, and an overall improvement in livelihoods. A lack of an integrated perspective risks greater vulnerability to disease, water pollution, loss of nutrients, exposure to droughts and floods, submergence of coastal areas, lower agricultural productivity, food shortages and loss of ecosystem shortages.

Part of the difficulty lies in paradigms that create and sustain isolated information structures in sectors, and 'business-as-usual' conduct among practitioners. Breaking the silos demands fundamental changes in political, financial, institutional and cultural boundaries. To achieve environmental and human health, participants called for greater synergies between sector disciplines at all levels in both defining challenges and designing sustainable and inclusive solutions.

Global Framework for Action. A Global Framework for Action (GF4A) is being developed to improve the international architecture for the water supply and sanitation sector. Despite the political commitments and financial investments of international donors, national governments and the private sector, several countries are at risk of failing to meet the Millennium

Development Goals (MDGs) on water and sanitation. The GF4A seeks impetus for bringing 'off-track' countries back on the path to meeting the MDGs. The GF4A is in the process of bringing together high level representatives from governments, donor organisations and international agencies to engage in political action; hold decision-makers accountable for the commitments that have been made; analyse financial flows to improve aid effectiveness; and generate credible, consistent information to assist decision-making.

The insight from World Water Week participants was that GF4A needs fully to incorporate water and environmental linkages. It should also cast its sights beyond the 2015 MDG targets to secure sustainable access, and long term environmental sustainability of water and sanitation services.

Prospects and opportunities for further progress

Business opportunities exist along the entire value chain. Business opportunities exist along the entire water, sanitation and reuse value chains. Private, often informal, entrepreneurs already provide the bulk of onsite sanitation services, such as latrine construction, maintenance and desludging. In Malawi, private, on-site service providers are giving credit to households unable to build composting toilets against future manure sales.

Business opportunities are expanding as more people demand improved water and sanitation products and services. Food security is at present heavily dependent on the supply of phosphorous, a major component in artificial fertilisers. Recent increases in the price of artificial fertilisers and dwindling phosphate reserves have generated a market opening for organic fertilisers from animal manure, human excreta and other biowastes. In Burkina Faso, the demand for urine for agricultural use is outstripping supply. These activities contribute towards 'closing the loop' in managing nutrients, land and water – the Triple Green Approach. Business opportunities arise throughout the whole value chain. Seizing these business opportunities may also enhance the sustainability of services.

Money talks! Evidence of the economic costs of inaction. A powerful signal for stimulating change – particularly at the national level – is the magnitude of the economic losses that result from poor water and sanitation services. Avoidable expenditure is incurred not only in terms of health care costs, loss of worker-hours due to illness and environmental damage; but also through curtailed tourism and business potential. In Cambodia, for instance, inadequate sanitation costs the country seven per cent of its GDP. The situation is likely to be the same or worse in several other developing countries. The message: inaction in the water and sanitation sector is an impediment to economic growth and can be an expensive misjudgement! But it is essential that water sector professionals engage with those outside the sector – especially in finance ministries – to advocate the advantages of sanitation investments.

Emerging progress in changing attitudes. Sanitation and hygiene professionals stress the importance of breaking taboos and communicating clear and direct messages to change behaviours. The stigma attached to discussing open defecation, menstrual hygiene and manual scavenging hampers the successful implementation of interventions.

There are encouraging signs that a better understanding of the triggers to behaviour change can result in rapid shifts in service demand. Community Led Total Sanitation (CLTS) is an example of such an approach. Using participatory methods, CLTS uses peer pressure and the human disgust of contact with excreta to eliminate open defecation in entire communities. The approach is gaining ground in several developing countries, including Indonesia, India, Bangladesh and many African countries. These experiences highlight the importance of continuous engagement between communities and local governments to secure permanent behaviour changes and that a range of effective service options are available to meet the created demand. To achieve scale, alternative approaches to behaviour require policy changes and changes in conventional financial flows.

School-led sanitation also offers a channel for promoting community-wide behavioural change. Students are sensitised in the classroom to sanitation and hygiene issues, and carry the messages home to their parents. Renewed efforts in India to eliminate manual scavenging advocate that excreta management should not involve the dehumanisation of specific communities or groups. A struggle to reclaim human dignity becomes a trigger for improved health.

Challenges

Institutional and 'mindset' barriers. Several frameworks have been drawn up to inform 'best practice' in water, sanitation, agriculture, hygiene and environment. These include Water Safety Plans (WSP) for drinking-water quality, WHO guidelines for the safe use of wastewater in agriculture, and EAWAG/SANDEC's Compendium of Sanitation Systems and Technologies. However, these impressive documents are not always adopted in developing countries. In Ghana, where faecal sludge is used in agriculture, many professionals are reportedly unaware of and unable to implement of both the WHO wastewater safety guidelines and national policies that prohibit the application of faecal sludge. The complexity and expense of the recommended techniques, lack of institutional capacity and weak promotion limit implementation.

Moreover, the scope of many existing frameworks is limited. To realise the full benefits of environmental and human health, frameworks need to be complimentary. Co-ordination between practitioners in the different sectors is hampered by vested interests, conventional 'mindsets', established policies, institutions and laws, disciplinary boundaries, or even fundamental issues such as narrow definitions of 'sanitation'.

Photo: Mikael Ullén/SIWI

Lead rapporteurs Dr. Akiça Bahri and Mr. Piers Cross see business opportunities along the entire water, sanitation, and reuse value chains.

'Mindset' barriers may both prevent reuse, or encourage inappropriate reuse practices. In Ghana, for instance, there is prejudice against excreta reuse, despite the fact that it improves soil quality and crop yields for poor farmers during the current period of high artificial fertiliser prices. Simultaneously, those farmers who are involved in reuse believe that faecal sludge cannot run-off into rivers and groundwater. This misconception compromises environmental and human health.

Make conventional approaches sustainable and visionary approaches practical. The use of human excreta and urine in agriculture are examples of ecological sanitation (ecosan). Ecosan represents a conceptual shift in the relationship between people and the environment and links people and soil. This visionary concept breaks the silos between the water, sanitation, hygiene, agriculture and environment sectors. Ecosan involves the recovery of nutrients from human, animal and household wastes and prepares them for reuse in agriculture, offering promising environmental and health benefits.

However ecosan technologies are often expensive and under present financing arrangements they are not accessible by the poor. There is a pressing need to develop practical financing approaches that translate the additional environmental and health benefits into affordability. Other innovative technologies – such as urine diversion dry toilets (UDDTs) – are not widely promoted, have not overcome implementation problems and are infrequently adopted at scale. Another aspect of ecosan is the realisation that it is not just about the technology: you also need to change views and attitudes towards using human excreta in agriculture.

Conventional and visionary sanitation need to be made financially viable and sustainable. Households themselves need to value sanitation services, and understand the risks to their health of poor waste management. Waste management should be linked with other economic sectors for faster cost-recovery, risk reduction, financial stability and lasting implementation. Well-defined public-private and public-public partnerships can enhance investments and improve service delivery, operations and maintenance. Cost-recovery requires smarter approaches to meet social equity goals.

The growing consensus on 'the right to water' also needs to be translated into practical implementation. Progress is being made on key issues, such as that the right to water does not mean free water. This growing body of experience on the practical adoption of environmental and health rights needs to be shared more widely. Clarity is needed on the practical implications of sanitation rights. Much might be achieved, especially in sanitation, by the combining passion and enthusiasm for rights and environmental sustainability with the wisdom and pragmatism of conventional approaches.

Fill the financing gap. The current financial crisis re-emphasises the importance of seeking alternative funding mechanisms for water supply and sanitation. Rather than regarding public finance as endlessly being able to accommodate all social objectives, specific strategies are needed to focus aid on leveraging resources from local authorities, consumers and the private sector. Successful microfinance, output-based aid and loan-financed approaches require adoption as core strategies. Conventional public sector financing of water and sanitation

services frequently does not reach the poor and vulnerable and specific strategies are needed, many of which involve alternate funding sources. Decreased aid flows due to the financial crisis may spur the development of local-scale businesses, particularly in the sanitation sector. External funding could then take the form of microfinance to sanitation entrepreneurs, instead of donor macro-funding to governments.

Tackle water governance. Sound water governance is fundamental to ensuring human and environmental health. It requires robust national policies, plans and programmes, as well as instruments to measure and benchmark progress. There are many dimensions to governance, and several developing countries are already taking steps to improve the overall management of their water resources, services and institutions. Tools are evolving, such as those developed by the Water Integrity Network on corruption, but much more work is required to bring the sector to a common understanding of the steps and measures required for sound governance reform.

Environmental and human health services in post-conflict and disaster contexts. Post-conflict and post-disaster contexts – whether caused by armed conflict or natural disasters – face an increased need in environmental and human health services. Many of the most poorly served populations live in these settings. Yet, services provision is severely constrained by weakened physical, economic and social infrastructures. Post-conflict or post-disaster actions must respond directly to the emergency; whilst at the same time planning for long-term recovery. Direct and sustained impact is most likely to emerge through good coordination and communication between relief and recovery teams, affected communities and emerging leadership. Systematic data collection in conflict and disaster prone areas is recommended where possible for steering emergency responses. Better integration of humanitarian and development initiatives, particularly in financing, will enhance recovery. Disaster risk reduction should be mainstreamed; with water and sanitation infrastructure being made more resilient to disaster impacts.

Knowledge gaps

A continuum of water, sanitation, hygiene, agriculture and environment is clearly emerging. Knowledge gaps that need to be filled include:

- Improving 'best practice' guidelines: Guidelines, frameworks and standard measuring techniques need to be more accessible and better communicated to practitioners.
- New research priorities: Include pathogen reduction rates, removing emerging contaminants, and evaluating benefits in disability-adjusted life years (DALYs).
- Behaviour change: Research is needed to understand the triggers for behaviour change in target groups and to better design programmes and strategies for changing water, sanitation and hygiene practices.
- Monitoring: More effective monitoring systems are required, quality of data needs to be improved, better understanding is needed between global and local data, and regulation and policy direction need reliable information sources. Very little is known about household and private sector investment in the sanitation and water sector. Aid flows from non-OECD countries is rarely reported.
- Costing water and sanitation: Work is required to be done in fine-tuning valuation methods and better understanding unit costs. Available costing builds on scanty data and short timeframes and is rarely integrated into sector guidelines. For instance, sanitation costs are country, time and material specific and there are insufficient numbers of urban ecosan projects at appropriate scales from which to derive information.

Conclusions and recommendations

Move to systems thinking from 'cradle to reincarnation'. Achieving environmental and human health in water and sanitation requires a significant shift from a piecemeal approach to systems thinking. A holistic perspective considers all elements required to provide sustainable and appropriate sanitation services. It offers new pathways within sector-wide, city-wide and service-delivery contexts: Indonesian sanitation strategies, which disaggregate markets but address the whole city, from an initial 12, have now been adopted in over 330 cities.

A system approach provides a vantage point across the entire sanitation chain, from cradle to grave and reincarnation – that is, getting to the toilet seat, confinement (safe storage under the seat), removal and transportation of faecal sludge, treatment and disposal or reuse. This holistic approach reflects the potential of scaling up sanitation management from the perspectives of institution development, budget allocation, capacity building and technological innovation. Such an approach can promote 'environmental flows' – a fundamental component of sustainable water resource management – to yield a wide variety of benefits to sustainable development, human wellbeing and human livelihood. Systems thinking does not dismiss the importance of nurturing leadership and change-makers. As the Stockholm Water Prize laureates testify, huge leaps forward are made by brilliant minds and visionary individuals.

Build alliances, dialogue and knowledge. There is a need to build alliances, dialogue and knowledge across the water, sanitation, hygiene, agriculture and environment silos. This, in turn, demands transforming institutions and providing innovative incentives. Examples of ongoing efforts include the Sustainable Sanitation Alliance (SuSaNa), the Water Integrity Network (WIN), the Global Framework for Action (GF4A) and the Water Footprint Network (WFN).

The dialogues between water supply, water resource, sanitation and agricultural silos; between treatment for disposal and reuse; and transboundary water needs to be built in countries.

Photo: Frida Lanshammar

The UN-System is an important forum for supporting dialogue: UN-Water needs to be more effective in breaking down the culture of protecting turf and encouraging intersectoral action. Wastewater management has been neglected in the UN family to date. The UN should exert more pressure on its member states to reduce pollution, recycle grey-water and extract valuable nutrients for reuse in agriculture.

Stimulate demand through behavioural change. The commercial and marketing worlds offer valuable lessons on how to change behaviour. These need to be applied to the promotion of health and the environmental public goods: including washing hands with soap, eating health foods, creating a demand for sanitation, building sanitation facilities and taking on civic duties with respect to sanitation, hygiene and protecting the natural environment.

Frameworks and guidelines need to incorporate the professional facilitation of behaviour change. Approaches should include identifying behaviour change triggers, awareness-raising campaigns, social marketing, and developing incentives or regulations control.

Trade and virtual water concepts are also helping consumers, producers and politicians to appreciate the challenge of securing access to water-related goods, and to influence behaviour. However, these are continually evolving notions and virtual water trading may only be partly influenced by the water endowment. Other variables need to be better understood, including the interactions between costs, pricing, and subsidies.

Stimulate the sanitation and water recycling market. The promotion of human and environmental health can be stimulated by establishing policies that give incentives to local sanitation service providers. These incentive mechanisms can take the form of credit, tax breaks, education, market analysis or innovative technologies. The business model for sanitation service delivery needs to be viable: businesses may need to include sanitation services within a suite of other services to make business sense. There are a range of financing instruments, including microfinance, loan finance, franchising, and output-based aid that can be appropriately leveraged to stimulate the sanitation and reuse market and the good design of subsidies.

Green and blue water concepts help to deal with the emerging challenges of environmental change. Financial mechanisms and incentives are needed to support improved water management across the continuum of green and blue (and also grey/brown) investments. Green Water Credits is a potential mechanism that bridges the incentive gap through taking regular compensation from water users to water providers for specified water management services. It builds a link between sectors of upstream land management and downstream water supply, and creates a market in water management services of supporting rural livelihoods.

Convening Organisations

- Acacia Water
- African Development Bank (AfDB)
- African Civil Society Network on Water and Sanitation (ANEW)
- African Ministers' Council on Water (AMCOW)
- Agence Française de Développement (AFD)
- Alliance for Water Stewardship (AWS)
- Alterra-Wageningen University and Research Center (WUR)
- Amanz'abantu Services
- Arab Countries Water Utilities Association (ACWUA)
- Asian Development Bank (ADB)
- Asia-Pacific Water Forum (APWF)
- Association of European Parliamentarians for Africa (AWEPA)
- Bill & Melinda Gates Foundation
- BIOKAVANGO Project of UNDP-GEF/Government of Botswana
- BirdLife International
- BRAC, Bangladesh
- Building Partnerships for Development in Water and Sanitation (BPD)
- Cap-Net – Capacity Building for Integrated Water Resources Management
- Centre Régional pour l'Eau Potable et l'Assainissement à faible coût (CREPA)
- CEO Water Mandate
- Church of Sweden
- Conservation International (CI)
- Cooperative Programme on Water and Climate (CPWC)
- Council for Scientific and Industrial Research, South Africa (CSIR)
- Danish International Development Agency (DANIDA)
- Danish Water Forum (DWF)
- Deltares
- Department for International Development, UK (DfID)
- Department of Water and Environmental Affairs, South Africa (DWEA)
- Department of Water and Sanitation in Developing Countries at the Swiss Federal Institute of Aquatic Science and Technology (Eawag-Sandec)
- DHI Water and Environment
- Directorate-General for International Cooperation, Dutch Ministry of Foreign Affairs (DGIS)
- Duke University, USA
- Ecological Sanitation Research Programme (EcoSanRes)
- EcoPeace/Friends of the Earth Middle East (FoEME)
- Entwicklungsbank (KfW)
- Euphrates Tigris Initiative for Cooperation (ETIC)
- European Commission (EC)
- European Investment Bank (EIB)
- European Union of National Associations of Water Suppliers and Waste Water Services (Eureau)
- European Water Partnership (EWP)
- Federal Institute for Geosciences and Natural Resources, Germany (BGR)
- Federal Ministry for Economic Cooperation and Development, Germany (BMZ)
- Federal Ministry for the Environment, Nature Conservation and Nuclear Safety, Germany (BMU)
- FEMSA Foundation
- Food and Agriculture Organization of the United Nations (FAO)
- French Ministry of Foreign and European Affairs (MAEE)
- Friends of the Earth Middle East (FoEME)
- German Technical Cooperation (GTZ)
- Global Environment Facility (GEF)
- Global Environmental Flows Network (eFlowNet)
- Global Nature Fund
- Global Public Policy Network (GPPN)
- Global Water Operators' Partnerships Alliance (Global WOPs Alliance)
- Global Water Partnership (GWP)
- Green Cross International (GCI)
- Inter-American Development Bank (IDB)
- International Association of Hydrogeologists (IAH)
- International Development Research Centre (IDRC)
- International Fund for Agricultural Development (IFAD)
- International Joint Commission of Canada and the United States of America (IJC)
- International Network of Basin Organizations (INBO)
- International Resources Group (IRG)
- International Union for the Conservation of Nature (IUCN)
- International Water Association (IWA)
- International Water Management Institute (IWMI)
- IRC International Water and Sanitation Centre (IRC)
- Irish Aid
- Issam Fares Institute for Public Policy and International Affairs (IFI)
- Itaipu Binacional
- King's College London (KCL)
- Lake Chad Basin Commission (LCBC)
- Mekong River Commission Secretariat (MRCS)
- Ministry for Water and Irrigation, Kenya
- Ministry of Land, Infrastructure, Transport and Tourism, Japan (MLIT)
- Munich Re Foundation (MRF)
- National Water and Sanitation Association of the Philippines (NAWASA)
- National Water Agency of Brazil (ANA)
- Netherlands Ministry of Agriculture, Nature and Food Quality (Min. LNV)

Photo: Mattias Granberg

- Netherlands Water Partnership (NWP)
- Network of Asian River Basin Organisations (NARBO)
- Network of Women Water Professionals (NetWwater)
- Nile Basin Initiative (NBI)
- Oregon State University, USA (OSU)
- Palestinian Water Authority (PWA)
- Phillips Robinson and Associates (PRA)
- Potsdam Institute for Climate Impact Research (PIK)
- RAIN Foundation: Rainwater Harvesting Implementation Network (RAIN)
- Ramsar Convention Secretariat (Ramsar)
- Red Centramericana de Instituciones de Ingenieria (REDICA)
- Rhama Consultoria, Pesquisa e Treinamento Ambiental
- South Asia Consortium for Interdisciplinary Water Resources Studies (SaciWATERs)
- Southern African Development Community Water Division (SADC)
- Southern and Eastern Africa Rainwater Harvesting Network (SEARNET)
- Stakeholder Forum for a Sustainable Future
- STEPS Centre, University of Sussex
- Stockholm Environment Institute (SEI)
- Stockholm International Water Institute (SIWI)
- Sulabh International
- Sustainable Sanitation Alliance (SuSanA)
- Swedish Environment Secretariat for Asia (Sida-SENSA)
- Swedish International Development Cooperation Agency (Sida)
- Swedish Ministry for Foreign Affairs
- Swedish Ministry of the Environment
- Swedish River Basin District Authorities
- Swedish University of Agricultural Sciences (SLU)
- Swedish Water and Wastewater Association (SWWA)
- Swedish Water House (SWH)
- Swiss Agency for Development and Cooperation (SDC)
- Swiss Government
- SWITCH
- Tearfund
- The 5th World Water Forum Secretariat
- The Nature Conservancy (TNC)
- UEA/KCL London Water Research Group (LWRG)
- UN World Water Assessment Programme (WWAP)
- UNDP Water Governance Facility at SIWI (WGF)
- UNEP-DHI Centre for Water and Environment (UDC)
- UNEP – World Conservation Monitoring Centre (UNEP-WCMC)
- UNESCO – Center for Water Law, Policy and Science
- UNESCO – Division of Water Sciences
- UNESCO – Institute for Water Education (UNESCO-IHE)
- UNESCO – International Hydrological Programme (UNESCO-IHP)
- United Nations Children's Fund (UNICEF)
- United Nations Development Programme (UNDP)
- United Nations Economic Commission for Europe (UNECE)
- United Nations Educational, Scientific and Cultural Organization (UNESCO)
- United Nations Environment Programme (UNEP)
- United Nations Environment Programme Finance Initiative (UNEP FI)
- United Nations Human Settlements Programme (UN-HABITAT)
- United Nations Secretary-General's Advisory Board on Water and Sanitation (UNSGAB)
- United Nations University – International Network on Water, Environment and Health (UNU-INWEH)
- United States Agency for International Development (USAID)
- Universities Partnership on Transboundary Waters (UPTW)
- University of East Anglia, UK (UEA)
- University of Geneva, Switzerland
- University of Twente, The Netherlands
- UN-Water
- UN-Water Task Force on Transboundary Waters
- USAID – Advancing the Blue Revolution Initiative (USAID-ABRI)
- USAID – Global Water for Sustainability Program (GLOWS)
- USAID's Office of Development Credit
- WaterAid
- Water and Sanitation Program (WSP)
- Water Center for Latin America and the Caribbean (CAALCA)
- Water Environment Federation (WEF)
- Water Footprint Network (WFN)
- Water for People (WfP)
- Water Integrity Network (WIN)
- WaterPartners International
- Water Research Commission, South Africa (WRC)
- Water Supply and Sanitation Collaborative Council (WSSCC)
- Wetlands International (WI)
- Women for Water Partnership (WfWP)
- Working Group on WASH and Climate Change
- World Agroforestry Centre (ICRAF)
- World Bank (WB)
- World Business Council for Sustainable Development (WBCSD)
- World Health Organization (WHO)
- World Meteorological Organization (WMO)
- World Sanitation Financing Facility (WSFF)
- World Water Council (WWC)
- World Wide Fund for Nature (WWF)

2009 Stockholm Water Prize

Photo: Exray

Dr. Bindeshwar Pathak received the 2009 Stockholm Water Prize on August 20 from the hands of H.R.H. Prince Carl Philip of Sweden.

Founder of the Sulabh Sanitation Movement in India, Dr. Bindeshwar Pathak received the 2009 Stockholm Water Prize for his work to improve the lives, health and dignity of millions of people across the world. Dr. Pathak is known around the world for his wide ranging work in the sanitation field to improve public health, advance social progress, and improve human rights in India and other countries. His accomplishments span the fields of sanitation technology, social enterprise, and healthcare education for millions of people in his native India and serves as a model for NGO agencies and public health initiatives globally.

In 1970, he established the Sulabh International Social Service Organization, an NGO that has been a catalyst for improved sanitation and social change across India. Today, the organisation employs 50,000 associate members who are rendering their voluntary services. In collaboration with UN-HABITAT, Sulabh has trained engineers, architects, planners and administrators from 14 countries in Africa. Sulabh is now planning to start work in Ethiopia, Cambodia, Laos, Angola, Madagascar, Dominican Republic, Tajikistan and other countries.

Through Sulabh, Dr. Pathak has waged a decades-long campaign to abolish the traditional practice of manual scavenging of human waste from the simple pit latrines that have predominated across much of India. His early concern for the plight of the untouchable scavenger caste led to the development of the Sulabh Shauchalaya toilets to eliminate the need for scavenging in poor communities. Over the years he has led multiple initiatives to champion social dignity, economic justice, and liberation from the caste-oriented system for former untouchable scavengers and their families.

Sanitation innovator

Frequently citing the common toilet as one of civilisation's most significant advances, Dr. Pathak has led the development of cost-effective and culturally appropriate toilets and related treatment systems to replace the traditional unsanitary bucket latrines in poor communities throughout India. His most prominent innovations include the Sulabh Shauchalaya twin pit, pour-flush toilet system which is now in use in more than 1.2 million residences and buildings built by Sulabh. Sulabh public toilet and bath facilities based on that system are now standing in 7,500 locations, together serving more than 10 million people daily. These pay-per-use public facilities provide an economically sustainable, ecological, and culturally acceptable solution to hygiene problems in crowded slum communities and public places.

"The results of Dr. Pathak endeavours constitute one of the most amazing examples of how one person can impact the well being of millions," noted the Stockholm Water Prize nominating committee in its citation. "Dr. Pathak's leadership in attaining these remarkable socio-environmental results has been universally recognised, and not least by those who have secured the freedom of human dignity as a consequence of his efforts."

About the Stockholm Water Prize

First presented in 1991, The Stockholm Water Prize is the world's most prestigious prize for outstanding achievement in water-related activities. The annual prize, which includes a USD 150,000 award and a crystal sculpture specially designed and created by Orrefors, honours individuals, institutions or organisations whose work contributes broadly to the conservation and protection of water resources and to improved health of the planet's inhabitants and ecosystems. The patron of the Stockholm Water Prize is H.M. King Carl XVI Gustaf of Sweden.

Founders of the Stockholm Water Prize

The Founders of the Stockholm Water Prize are Swedish and international companies who strive to push sustainability forward in the water sector. The Founders of the Stockholm Water Prize working in cooperation with the City of Stockholm are: Bacardi, Borealis & Borouge, DuPont, Europeiska Insurance, Fujitsu, General Motors, Grundfos Management, Hewlett Packard, ITT Water & Wastewater, Kemira Water, KPMG Sweden, Läckeby Water, P&G, Ragn-Sells, Scandic, SAS (Scandinavian Airlines), Siemens, SJ (Swedish Railways), Snecma, Uponor, Water Environment Federation and Ålandsbanken Sverige.

2009 Stockholm Junior Water Prize

"Many young people are concerned about climate change, but few will take action to identify a solution… This year's winner had a spark of genius in developing this high tech solution."

Citation: Stockholm Junior Water Prize Jury

Ceren Berçak Dag looked to clouds and discovered an untapped source of clean energy. And, no, she is not clairvoyant. But she is very smart.

A keen physicist, the 18 year old Turkish teenager realised that we could be getting a whole lot more from the rain. When water droplets fall from the sky, they hit the ground hard. Ceren demonstrated how to combine some clever thinking and with some "smart" materials to turn the kinetic energy from a midday shower into carbon free electricity. Her brilliant research earned her the top honour in the 2009 Stockholm Junior Water Prize.

Using polyvnylidene fluoride (PVDF) covered in aluminum electrodes, Ceren was able to create piezoelectricity from the mechanical energy produced by the impact of raindrops that landed on the conductor she constructed. Her research in the newly emerging field was the first to thoroughly observe energy from natural precipitation both in the lab and outdoors. She advanced the technological and conceptual knowledge on rain based electricity production and pushed it closer towards development.

The Stockholm Junior Water Prize Jury noted in its citation "Reducing CO^2 emissions by developing alternative environment-friendly, renewable energy sources is a specific response to this global problem. This year's winner had a spark of genius in developing this high tech solution."

Her experiments yielded several valuable findings. First, she showed that the rain panels could generate 250 mV during rainfall, which she calculated as being one quarter of the average production of a solar panel. During rainy days, however, the solar panels produced a comparable amount of electricity, and at night produced significantly less (only 1.7 mV with artificial light). Ceren concludes that the future of alternative energy will follow the weather, not change the climate. She explained, "I hope that my work will contribute to the development of the next generation of energy panels where rain, sun, and wind are combined. This new generation energy panel, which may be called the 'Combined Energy Panel' may position itself to generate solar or rain energy according to the weather condition." Rain or shine, clean energy can be available all the time.

The jury also awarded two Diplomas of Excellence to Emily Elhacham of Israel for her project, *Detecting water contamination chemical sensors using metal nanoparticle networks*, and Mary Zhao of Canada, for her project, *Grasping water: A novel method of inducing precipitation using the Ice Nucleating Protein*. The international victors were selected from a field of 29 national winners and 5,600 total submitted projects.

About the Stockholm Junior Water Prize

The international Stockholm Junior Water Prize competition brings together the world's brightest students to encourage their continued interest in water and the environment. Each year, thousands of participants, age 15-20, join national competitions for the chance to represent their country at the international final held during the World Water Week in Stockholm. The international winner receives a USD 5,000 award and a prize sculpture.

ITT Corporation is the global sponsor of the Stockholm Junior Water Prize. H.R.H. Crown Princess Victoria of Sweden is the Patron of the Stockholm Junior Water Prize.

Photo: Exray

Ceren Burçak Dag receives the prize from Mr. Peter Forssman, Chairman of the Stockholm Water Foundation at the award ceremony.

2009 Stockholm Industry Water Award

Photo: Exray

Mr. Peter Forssman, Chairman of Stockholm Water Foundation and Mr. Marvin DeVries, President, Trojan Technologies at the prize ceremony.

"Private enterprise can do a lot to help steer society towards more sustainable water management. By making competitive, sustainable solutions available to decision-makers, companies like Trojan can help to influence society in a positive way."

Mr. Marvin DeVries, President, Trojan Technologies

Trojan Technologies, a global leader in ultraviolet (UV) disinfection systems, received the the 2009 Stockholm Industry Water Award for their pioneering work to protect public health and develop new sources of water supply.

Trojan Technologies produces open channel and pressurised UV disinfection systems for industrial applications, municipal water and wastewater treatment, commercial integration, residential use, and elimination of environmental contaminants from wells and other sources of drinking water, including reused water. The company's innovations in low-energy lamp design and optimised reactor performance have established benchmarks for the field that have fostered global adoption of UV technology. With installed systems at more than 5,800 facilities in more than 80 countries, Trojan has led the worldwide drive for commercial, engineering, and regulatory acceptance of the technology as an environmentally sound alternative to traditional chlorine based water treatment.

A better solution to a global problem

UV treatment presents an especially effective solution to the interrelated challenges of water quality and sufficient supply in arid regions. UV light purifies water by destroying the ability of microorganisms to function and reproduce. In water-treatment applications, such as those pioneered by Trojan Technologies, specialised lamps project intense UV light into the water, effectively neutralising the organic contaminants it contains. The technology works more than 20 times faster than traditional chlorine based systems, with no environmental impacts from chemical leaks or any known disinfection by-products that could be harmful to health. In its citation, the Stockholm Industry Water Award committee highlighted several recent installations of Trojan systems that illustrate the potential of UV treatment for wastewater reuse applications. The most notable of these are large-scale projects in Orange County, California and South East Queensland, Australia.

"Trojan's success has contributed to a viable competitive industry in the area of ultraviolet technologies, leading to the development of a full range of industrial technologies in both specialised and general applications," noted the Stockholm Industry Water Award committee.

"Their work with other members of the UV industry has advanced world-wide regulatory acceptance, overcome many limitations of existing technologies, and provided a new means of protecting public health and developing new sources of water supply."

About the Stockholm Industry Water Award

The Stockholm Industry Water Award honours contributions by business and industry that improve the global water situation. It recognises and encourages innovation and leadership in sustainable development of the water sector. Established in 2000 in collaboration with the Royal Swedish Academy of Engineering Sciences and the World Business Council for Sustainable Development, the award celebrated its 10th anniversary during the 2009 World Water Week. Nominations for the 2010 Stockholm Industry Water Award close on February 15, 2010. Read more on how to nominate at www.industrywateraward.org.

2009 Swedish Baltic Sea Water Award

The Helsinki Commission (HELCOM) received the 2009 Swedish Baltic Sea Water Award. HELCOM works to protect the marine environment of the Baltic Sea from all sources of pollution through intergovernmental cooperation between Denmark, Estonia, the European Community, Finland, Germany, Latvia, Lithuania, Poland, Russia and Sweden. The organisation is the governing body of the "Convention on the Protection of the Marine Environment of the Baltic Sea Area" – commonly known as the Helsinki Convention.

The Swedish Baltic Sea Water Award, presented by Sweden's Ministry for Foreign Affairs, highlights important work towards halting the Baltic's deterioration and improving its ecological balance. Because of its special geographical, climatological, and oceanographic characteristics, the Baltic is highly sensitive to the environmental impacts of human activities in its sea area and its catchment area, which is home to over 85 million people. The Sea currently suffers extensive eutrophication from phosporous and nitrogen pollution that causes large-scale algae blooms, as well as overfishing, oil spills, waste from cruise ships, and an oxygen depleted-seabed, among other problems.

The Jury's motivation for giving the award was that "HELCOM and its Secretariat under Executive Secretary Anne Christine Brusendorff have taken marine environmental protection to a new level. HELCOM has shown exemplary commitment to improving the Baltic Sea through the adoption of the Baltic Sea Action Plan. The action plan takes on the complexity of issues that need to be addressed in an innovative manner, linking it to ongoing initiatives and becoming the backbone of the environmental actions in the coming Baltic Sea Strategy."

The award, worth 150,000 SEK, was presented by H.M. King Carl XVI Gustaf of Sweden at a ceremony in Stockholm held in connection with a dinner hosted by EU Minister Cecilia Malmström on the eve of a Ministerial Conference on the EU Strategy for the Baltic Sea region.

HELCOM is considered an environmental policy-maker in the Baltic Sea area and one of the most advanced regional seas commissions in terms of the level of cooperation between the coastal countries, and monitoring and protecting the marine environment. In 2007, the HELCOM countries adopted an ambitious overarching Baltic Sea Action Plan to radically reduce pollution to the sea and restore its good ecological status by 2021. The holistic plan contains concrete and meaningful actions to solve the major problems affecting the Baltic Sea. It is also a first ever attempt by a regional seas convention to incorporate the ecosystem-based approach into the protection of the marine environment. The core policy of the plan is based on "ecological objectives" defined to reflect a common vision of a healthy sea – a sea with diverse biological components functioning in balance and supporting a wide range of sustainable human economic and social activities.

The HELCOM Baltic Sea Action Plan has already been heralded as a pioneer scheme for European seas. The European Commission has recognised that the HELCOM plan will be instrumental for the successful implementation of the EU Marine Strategy Framework Directive in the Baltic Sea region. The importance of HELCOM's work is also recognised in relation to the EU Maritime Policy, and the EU Strategy for the Baltic Sea Region draws heavily from the HELCOM Baltic Sea Action Plan in its environmental as well as safety and security pillars.

The Swedish Baltic Sea Water Award is administered by the Stockholm International Water Institute (SIWI). A jury appointed by the Swedish Government reviews the nominations, selects the winner and provides written motivation of its choice.

Photo: Mikael Ullén/SIWI

HELCOM Executive Secretary Dr. Anne Christine Brussendorff (right) with Swedish Minister for International Development Cooperation Hon. Gunilla Carlsson (left) at the prize announcement.

Best Poster

Dr. Aracely Castro received the 2009 World Water Week Best Poster for the entry "Improving the efficiency of rainwater use on hillsides in the sub-humid tropics: Agricultural and environmental benefits of Quesungual system". The poster, selected among 70 entries, was co-authored by: Mariela Rivera, Oscar Ferreira, Idupulapati Rao, Edwin García, María Eugenia Baltodano (CIAT); Jellin Pavón (Instituto Nicaragüense de Tecnología Agropecuaria – INTA); Edgar Amézquita, Miguel Ayarza (Corporación Colombiana de Investigación Agropecuaria – CORPOICA); Edmundo Barrios (EMBRAPA, Brasil); Marco Rondón (IDRC, Canadá); Natasha Pauli (University of Western Australia); Bismark Mendoza (Universidad Nacional de Agricultura – UNA, Nicaragua); Luis A. Wélchez (FAO-Honduras); Nancy Johnson (ILRI, Kenya); Jorge Rubiano and Simon Cook (CPWF, Colombia).

An alternative to slash and burn

Practised by over 200 million people, slash and burn agriculture covers 20 percent of all tropical land area worldwide. Farmers burn because it does offer short-term benefits: It provides firewood, nutrients for crop development, and kills pests. But in the long-term it destroys the soil and productivity of the land to the point where most plots are abandoned within three years. The continued deforestation has devastating impacts on the environment – ecosystem services and biodiversity are reduced while huge portions of carbon are released into the atmosphere. It also poses great risks for the farmers: Burnt soil is drier and less fertile which increases the chance for crop failure in a dry season.

In the rural village of Quezungual, Honduras, agricultural innovators found an alternative that worked so well for the local population that they named their system after them. The Quesungual Slash and Mulch Agroforestry System (QSMAS) is a smallholder production system that combines simple principles with smart technologies and practices to improve the management of vegetation, soil, water and nutrients in drought-prone areas of the sub-humid tropics. The first step is to manage the natural vegetation, not burn it, through selective and progressive "slashing-and-pruning". Next, the biomass from the trees, shrubs and weeds are used to enrich the permanent soil cover. Potentially damaging forms of agriculture, such as tillage and direct seedling are replaced. Finally, fertilisers are applied at the appropriate time and place.

QSMAS has already been adopted by 6,000 farmers in 7,000 hectares in Candelaria, Honduras, and is expanding throughout Latin America. The mulching is paying off: runoff, erosion, water turbidity and surface evaporation have gone down dramatically, while infiltration, green water use and soil water storage capacity have increased. Essentially, the increased quality of the soil boils down to more crop per drop of water and hour of labor. Local farmers are spreading the word to their neighbors in Nicaragua (Somotillo) and Colombia (Suárez) where the system has taken root. Dr. Castro is confident that it could be adopted by smallholders under similar conditions in sub-humid tropics worldwide. The potential to mitigate climate change and improve food security to millions is enormous.

Photo: Mikael Ullén/SIWI

Dr. Aracely Castro received the 2009 Best Poster Award from Dr. Akiça Bahri of the Scientific Programme Committee for the entry "Improving the efficiency of rainwater use on hillsides in the sub-humid tropics: agricultural and environmental benefits of Quesungual system".

Photo: EdelPix

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