



WATER & RISK

Editorial

The International Year of Sanitation and the International Year of the Potato have a great deal in common.

The United Nations declared the year 2008 to be the International Year of Sanitation (IYS) and the International Year of the Potato (IYP), thereby bringing light to two hidden treasures. For decades sanitation has languished between sectoral approaches, taboos and political neglect. In a British Medical Journal online poll on the most important medical advances since 1840, sanitation was ranked first, surely qualifying it to be a treasure. It is likely that neither the two thirds of the global population who regard access to improved sanitation as normal, nor the one third lacking appropriate sanitation consider improved sanitation as a treasure. But doing so could make those who are lacking sanitation demand it and inspire politicians to promote it.

A key challenge in the future will be to ensure food security for the world's population, which is estimated to grow by more than 100 million additional people per year in the next few decades. More than 95 % of the increase will occur in low-income countries, where pressure on land and water is already intense. Protection of the natural resource base on which we all depend is essential. The potato, remarkable for both its adaptability and its nutritional value, is an option in helping to achieve food security in almost any habitat. The tuber provides starch, an essential dietary component, is rich in vitamin C, high in potassium and an excellent source of fibre. Potatoes are easy to grow and have the ability to provide more nutritious food more quickly and on less land than any other food crop. They are truly a treasure hidden by an ugly peel.

Sustainable sanitation can be seen as a link between these two treasures. Besides protecting and promoting human health, a sustainable sanitation system has to be economically viable, socially accepted and technically and institutionally appropriate. It protects the environment and natural resources and additionally offers the hygienic reuse of nutrients from human and animal excreta which can help to ensure future food security. The current issue of the Water & Risk Newsletter includes striking examples of contributions towards reaching MDG 7, Target 10 from the grass-roots up to the political level.

During the IYS and IYP it became evident that enough knowledge and expertise already exists, ready to be shared, to tackle the lack of sanitation and to eliminate hunger and poverty. Implementing improved and sustainable sanitation and growing potatoes are simple and sustainable solutions to solve two major global problems and help meet the MDGs. The challenge for 2009 will be to build upon the political awareness gained as a result of the IYS and the IYP, to keep the treasures of sanitation and potatoes in the spotlight and to speed up efforts in reaching the 2015 goals. Let's go for it!

Susanne Herbst

Water, Sanitation & Hygiene, "WASH" Reduces Child Mortality

Malteser International, an international NGO, is committed to contributing to better health and dignified living conditions in humanitarian assistance programmes by providing access to drinking water, sanitation and health promotion for people affected by disaster, conflict and poverty. This article illustrates the integration of WASH into emergency relief and structural development programmes based on experiences from Sri Lanka, Myanmar, Indonesia, India and Thailand.

Introduction

Diarrhoeal diseases are the most common health problems and causes of death worldwide. 4.4 billion people suffer from diarrhoea every year [1] and 2.2 million people die annually from diarrhoea [2]. This includes the 5,000 children who die from diarrhoea every day. The underlying causes are well known. To date, there are 2.6 million people worldwide who lack basic sanitation and 1 billion who don't have access to safe drinking water. The transmission of diarrhoeal and other diseases is directly linked to inadequate access to water and poor hygiene measures. Diseases, caused by bacteria, viruses and parasites, are spread through water, food and direct contact with human waste. A faecal-oral transmission path is typical for waterborne diseases. However, there are a number of vector-borne diseases also related to a lack of safe water and poor sanitation. Factors additionally contributing to the risk of being affected include substandard and crowded living conditions in slums or camp situations. Poverty is directly linked to poor access to drinking water and sanitation facilities.

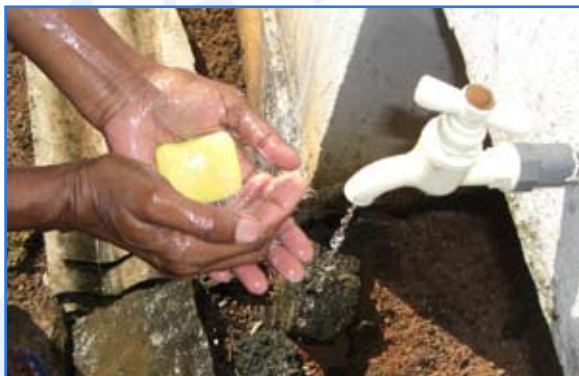


Figure 1: Making water and soap for hand-washing available in schools and households
Source: Malteser International



Based on these facts, targets to improve access to water, sanitation, hygiene, the reduction of under-five-mortality and poverty reduction have been set as Millennium Development Goals (MDGs). Those with poor access to water are also those who suffer from hunger and who live on US\$1-2 per day. Despite the improvements during the Water For Life Decade there is still a huge gap between rural (899 million people) and urban (170 million people) drinking water coverage [2].

Diseases related to a lack of clean drinking water, hygiene and sanitation can be prevented by well known and well established concepts. Making soap available or affordable for hand-washing is known to be very effective and efficient at reducing diseases like pneumonia by 50% (Figure 1). But not only the availability of safe water and sanitation are critical – people must decide that they are an advantage, that they benefit their health and constitute an improvement for their communities.

Traditional habits, ignorance and misinformation can hamper acceptance and preparedness to change attitudes and practice. There is an urgent need to educate and promote the well known basic concepts to improve hygiene in the communities. The introduction of “new” technologies, appropriate in the context and living environment of the communities, needs to be discussed, offered and planned in a participatory manner. Ownership and involvement in the decision making processes are preconditions for sustainable improvement.

A key issue is the Household Water Treatment and Storage (HWTS) concept promoted by the WHO in 2003. The premise of the initiative is clear: simple techniques for treating water at home and storing it in safe containers could save a huge number of lives each year! The commitment of the initiative is to contribute to a significant reduction in waterborne disease, especially among vulnerable populations, by promoting household water treatment and safe storage as a key component of water, sanitation and hygiene programmes.

A holistic approach to water resources and environmental health engineering

During the early 1990s increased attention was paid to climate change, sustainability and preventing exploitation of available water sources. In 1992, the Dublin Principles stressed the need for careful management of water resources for sustainability, and participatory approaches in water source development and management. Importantly, they began the movement to respect and strengthen the pivotal role of women and introduced the need to understand the economic value of water. These principles led to the concept of Integrated Water Resources Management (IWRM), a flexible, process-oriented and holistic approach to the optimal

development of water, land and related natural resources. IWRM has become an internationally recognized paradigm in water policy and has been adopted by key stakeholders such as the EU (European Union), UNICEF (United Nations Children’s Fund), and BMZ (German Ministry of Development Cooperation). This integrated and holistic approach was also promoted by research institutions, in partnership with leading donors and international NGOs in the field of water, sanitation and hygiene for developing countries and advocated increased attention to community participation, and for health and hygiene promotion activities to be integrated into any water supply project.

The Millennium Development Goals

Research and the lessons learnt over the 1980s and 1990s, culminated in the year 2000, when the United Nations General Assembly adopted the eight MDGs that challenged the global community to reduce poverty and to increase the health and well-being of all peoples. The International Development Target was accepted and agreed to halve, by the year 2015, the proportion of people who are unable to reach or to afford safe drinking water and the proportion of people who do not have access to basic sanitation”.

Malteser International has incorporated these principles and approaches in their Country Programmes throughout Asia and Africa. Their activities to date consist of inter-related projects that run in parallel to facilitate the development and improvement of public health facilities in poor communities, and consider other issues such as gender and community participation in decision making. Malteser International expanded their activities in Asia following the devastating tsunami in 2004 and participated in the unprecedented relief operation in India, Sri Lanka, Indonesia and Thailand. The emergency response was built around the concept of long-term relief, rehabilitation and development (LRRD), and many of the current country programmes are now focusing on the latter stage and are coordinated with national institutions and local partners.

Rain water harvesting

Water is vital to all aspects of life, and its supply is necessary not only for drinking purposes, but also for domes-



Figure 2: Rain water harvesting
Source: Malteser International



tic activities such as cleaning and the preparation of food, rearing livestock and agriculture. There are a number of water source types that can be manipulated or exploited in order to provide a supply at household or community level, and these predominantly involve the extraction of groundwater. However, Malteser International are involved in sourcing water from the opposite end of the hydrological cycle, and are implementing a number of rain-water harvesting (RWH) projects serving households in rural communities in Myanmar and Sri Lanka (Figure 2).

There has been increased interest in RWH during the last two decades and this has been facilitated by the shift towards more community-based approaches and technologies which emphasize participation, ownership and sustainability. The failure of many piped water supply systems due to poor maintenance and the increased availability of low-cost tanks (e.g. made of ferroconcrete or plastic) have also made RWH an attractive option for domestic water supply. The RWH system consists of a 5m³ ferroconcrete tank that stores rainwater collected from the roof catchment. Debris, dust, droppings and dirt washed from the roof during the first rainfall can reduce the quality of water if collected in the tank. Diverting this 'first flush' is therefore necessary (Figure 3). PVC guttering along the side of the roof channels water towards a downpipe with a removable plug at its base. The plug is inserted after about 15 minutes of rainfall, allowing 'clean' rainwater to then pass through to the tank via a bucket containing a filter to remove any remaining particles. It has proved to be an



Figure 3: The need to maintain the RWH system and check the water quality
Source: Malteser International

advantage for the beneficiaries, particularly for women, in terms of the energy and time required to collect water. The fact that the system is their own property enables them to maintain and control it without the need to rely on others. The RWH system is easy to use. However, the first flush is a weak point that gains regular attention due to its relationship with the quality of water that collects in the tank. Malteser International, together with its local partner in Sri Lanka, seeks to further develop an appropriate, user-friendly and affordable solution to discharge the 'first flush'. The families are educated with illustrated pictures on how to use and maintain their tanks.

Within the emergency response following the devastating cyclone Nargis in Myanmar in 2008 Malteser International utilized improvised emergency rain water collection systems to provide drinking water for the affected population.



Figure 4: The need to keep your latrine clean
Source: Malteser International

The introduction of latrines and ecological sanitation

Sanitation refers to the safe disposal of human excreta, waste and wastewater, and constitutes the second of the three inter-related elements that contribute to improving public health. Malteser International is implementing a number of sanitation projects as part of this holistic approach (Figure 4).

The provision of a latrine is the first step in the collection of human excreta in order to avoid the transmission of harmful bacteria to hosts such as flies and humans who come into contact with it. A new area of interest is ecological sanitation (ecosan) which recognizes human excreta and household wastewater not only as waste, but also as resources that can be recovered, treated where necessary and safely used again. Conventional sanitation technologies are coming under increasing criticism for being economically and ecologically unsustainable, which has led to calls for alternative approaches and solutions. Ecosan is therefore emerging as an area for considerable development and Malteser International has already completed a successful solid waste management project in southern Sri Lanka. Another simple and effective form of technology that falls within the concept of ecosan is the bio-sand filter. A recent pilot project introduced these filters to a small community in Galle District, Sri Lanka.

With these new approaches come increasing challenges in terms of raising awareness and conveying messages as to their importance within the community. Malteser International has gained significant experience in the essential software components that are vital to support any newly implemented technology.

Hygiene Promotion and Water Safety Plans

Once a water supply has been established, its quality cannot always be guaranteed and if it is safe the potential for re-contamination at the source, during collection, transport and storage remains. Changes in hygiene behaviour are therefore necessary. These are promoted through hygiene education and awareness, and the importance of integrating such activities in any water supply and sanitation intervention must be stressed.

In humanitarian assistance and development one of the significant areas in which NGOs can improve hygiene practices is through the promotion of hand washing with soap and the safe handling of drinking water at the household level, which can make a significant difference in terms



of its bacteriological quality. According to a study in 2005, treating water at the point of use can result in a 35% reduction in diarrhoeal disease, provided the water is not re-contaminated during storage and use [3]. The WHO has been actively promoting Household Water Treatment and Safe Storage (HWTS) in combating waterborne disease, and advocates that it should be integrated into any water supply project as part of a holistic approach to environmental health.

A UNICEF co-funded project on Water Safety Plans (WSPs) in southern Sri Lanka has these concepts at its core and promotes HWTS and safe hygiene practices amongst the beneficiaries of the parallel RWH project. The two projects were designed to complement each other with an overriding goal of improving water security and water quality amongst rural communities in Galle, Matara and Hambantota districts in southern Sri Lanka. The WSPs promote the following methods for HWTS:

- the three pot system
- boiling
- chlorination
- filtering
- SODIS (solar water disinfection) (Figure 5)

SODIS, the use of water bottles exposed to sunlight, has been introduced in schools in Sri Lanka. This provides



Figure 5: School children are trained to apply "Solar Water Desinfection", SODIS

Source: Malteser International

water for the students and raises awareness of water and hygiene issues. Other methods to improve water quality could include coagulation and flocculation with the use of natural ingredients such as Moringa seeds. Another is the use of bio-sand filters to remove disease-causing microorganisms from contaminated water. The "three pot system" is a method for emergency water treatment only to be applied when there are no other more effective means available. Water is poured from the first to the second and third pot - quality improves by sedimentation [4].

By introducing a number of available options to the community to improve the quality of their water, Malteser International hopes to encourage households to select the one which is most suitable to their circumstances. The introduction of these options follows from discussions with community members to identify the consequences of unsafe water, and therefore why they are necessary. Participation and contributions from all groups in the community are encouraged in order to maximize the transfer of hygiene messages.

Conclusion

Malteser International recognizes the need for a holistic and integrated approach to working in the field of water, sanitation and hygiene. It requires the integration of improvements in domestic water supply (quantity, quality, accessibility and reliability), improvements in sanitation (safe disposal of excreta, wastewater and solid waste) and improvements in hygiene practices. These components are implemented by working together with the community to identify appropriate solutions together and finally by considering the social aspects, and other issues that cut across our work, such as affordability and gender roles.

The importance of participation within the community (with emphasis on the involvement of women and children) is integrated into all projects, thus enabling a greater sense of ownership and responsibility amongst the beneficiaries, and therefore a significant contribution to the sustainability of the technologies and messages introduced.

Some results from basic concepts with proven effectiveness in the prevention of communicable diseases, as applied by Malteser International:

- The provision of 336,000 bars of soap annually to 28,000 refugees and the construction of 2,521 latrines with community participation in remote areas of Thailand.
- The construction of 88 latrines for 114 families in Sri Lanka in 2006; bio-filter sewage systems for 540 houses on Sumatra; 242 wells for 85,000 people in Ariwara (DR Congo) in 2004.
- 251 community health workers, 584 student leaders, 83 mothers and 14 village committees trained on the basics of hygiene in remote areas of Thailand.
- 1,209 household RWH tanks constructed in tsunami-affected areas of Galle and Matara districts in Sri Lanka and another 1,005 under construction.
- Villagers built 1,751 family latrines in the western Township of Maungdaw, Rakhine State, Myanmar with the support of Malteser International.

References

- [1] The global burden of disease: 2004 update, WHO; http://www.who.int/healthinfo/global_burden_disease/2004_report_update/en/index.html [accessed 4 December 2008]
- [2] WHO household water treatment network; http://www.who.int/household_water/en/ [accessed 4 December 2008]
- [3] Clasen, T., 2005. Household water treatment, WELL Factsheet, Loughborough, UK
- [4] WHO – emergency treatment of water at point of use. Technical note No. 5

Literature

- Almedom, A. & Curtis, V., 1995. Studying hygiene behaviour – where are we now? *Waterlines* 13.3
- Scott, V., Curtis B. & Cardoso, J., 2005. The handwashing handbook; www.globalhandwashing.org [accessed 4 December 2008]
- Ministry for Economic Cooperation and Development (BMZ), 2006. The water sector in German development cooperation, Germany
- Malteser International, 2008. From safe water and sanitation to good health, (Malteser International brochure), Cologne, Germany
- More on Malteser International's work on WASH: www.malteser-international.org



Dr. Peter Schmitz, MD, Dipl. Ing.
Chief Medical Officer of Malteser International
Email: peter.schmitz@malteser-international.org



Behaviour Change Communication against Diarrhoeal Diseases in Rwanda: A Study on Knowledge, Attitudes and Practices

Diarrhoeal diseases remain a worldwide leading cause of morbidity and mortality. Every year they kill around 2.2 million people in developing countries, particularly children under five years of age [1]. Rwanda is one of the countries with the worldwide highest mortality rate due to diarrhoeal diseases amongst children under five. In 2001, the Rwandan Ministry of Energy, Water and Natural Resources, in collaboration with the Water and Sanitation Program for Africa (WSP-AF) and UNICEF implemented the community-based methodology “Participatory Hygiene and Sanitation Transformation” (PHAST) to promote higher standards in hygiene practices within the population. PHAST is an interactive method using tools and techniques to stimulate the participation of the population in the promotion of hygiene and the construction of sanitation facilities [2].

The objective of this study was to determine what impact the PHAST programme has had on the population’s knowledge, attitudes and practices and therefore on the reduction of diarrhoeal diseases among children under five.

The theoretical basis was provided by Protection Motivation Theory (Figure 1) [3], which is a health psychology model. Protection Motivation Theory assumes that behaviour change is the consequence of a cognitive process. It distinguishes between environmental and intrapersonal sources of information stimulating a recipient and leading to the cognitive processes of threat and coping appraisal [4]. In threat appraisal the individual compares the intrinsic and extrinsic rewards of a risky behaviour with the perceived severity of an incident and his personal vulnerability towards it. In coping appraisal the individual estimates his capacity to adopt coping measures and compares this with the associated barriers. After having balanced these components, the individual opts for a certain protection motivation, which can finally lead to the recommended practices [5].



Figure 2: Rusumo, study area with “intervention”
Source: Mareile Zöllner

tion whether the higher hygiene standards and the lower morbidity rate due to diarrhoea in Rusumo were related to the higher socio-demographic status or due to the presence of PHAST (Figure 3).

Ultimately, the study revealed that the population’s knowledge about the origins, consequences, prevention and treatment measures of diarrhoea probably does not result from the PHAST programme. Those responsible for the transfer of knowledge are parents, the school, the health centre and the health animators as well as individuals’ own experiences.

However, the study has shown that the implementation of the PHAST methodology in Rusumo has had an impact on the population’s attitudes and practices with regard to recommended hygiene practices, or in terms of Protection Motivation Theory, on their appraised self-efficacy and competence to overcome barriers. The population in Umuycange perceive their poverty as an insurmountable barrier and their self-efficacy as very limited. In contrast, the population in Rusumo has, despite their poverty, a higher awareness of alternative and cost-effective ways to fulfil hygiene measures. Additionally, the community’s participation in the construction of public latrines and the FOSACOM (Formation Sanitaire Communauté) in Rusumo has established a sense of ownership

and responsibility in the operation and the maintenance of the new infrastructure. PHAST should therefore not be accepted as a simple source of information, but instead as a programme that encourages the collaboration and communication of several institutions together with individuals in a society.

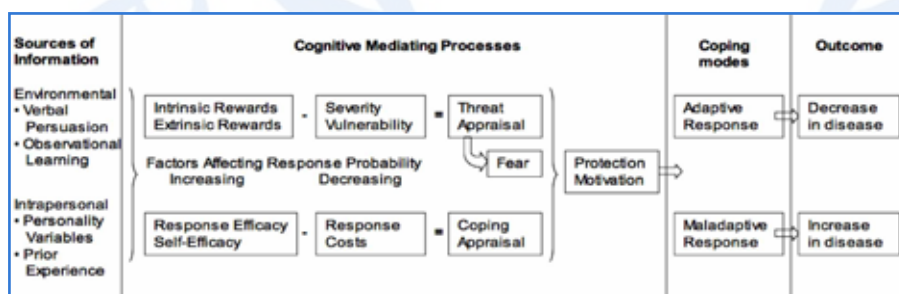


Figure 1: Protection Motivation Theory
Source: Rogers, 1983, modified by Mareile Zöllner

In order to verify the impact of PHAST on the community, a village “with intervention” (Rusumo) (Figure 2) has been compared with a village “without intervention” (Umuycange). The findings collected by means of a standardised household questionnaire showed an immense difference in the hygiene-related behaviour, in the incidence of diarrhoeal diseases as well as in socio-demographic variables between the two study villages. The challenge of the study was then to determine through expert interviews, group discussions with the population and participatory observa-

tion whether the higher hygiene standards and the lower morbidity rate due to diarrhoea in Rusumo were related to the higher socio-demographic status or due to the presence of PHAST (Figure 3). Ultimately, the study revealed that the population’s knowledge about the origins, consequences, prevention and treatment measures of diarrhoea probably does not result from the PHAST programme. Those responsible for the transfer of knowledge are parents, the school, the health centre and the health animators as well as individuals’ own experiences. However, the study has shown that the implementation of the PHAST methodology in Rusumo has had an impact on the population’s attitudes and practices with regard to recommended hygiene practices, or in terms of Protection Motivation Theory, on their appraised self-efficacy and competence to overcome barriers. The population in Umuycange perceive their poverty as an insurmountable barrier and their self-efficacy as very limited. In contrast, the population in Rusumo has, despite their poverty, a higher awareness of alternative and cost-effective ways to fulfil hygiene measures. Additionally, the community’s participation in the construction of public latrines and the FOSACOM (Formation Sanitaire Communauté) in Rusumo has established a sense of ownership and responsibility in the operation and the maintenance of the new infrastructure. PHAST should therefore not be accepted as a simple source of information, but instead as a programme that encourages the collaboration and communication of several institutions together with individuals in a society. Another important impact of PHAST becomes clear regarding the method of how to convince people to make the effort to implement the recommended practices despite living in poverty. In Umuycange, the population particularly respects prevention measures that are regularly controlled by the local authorities, including the construction of latrines and two-chamber compost dumps. In this case, the protection motivation can be predominantly explained by the household inspections and the threatened penalties of the local authorities. In Rusumo in contrast, in addition to



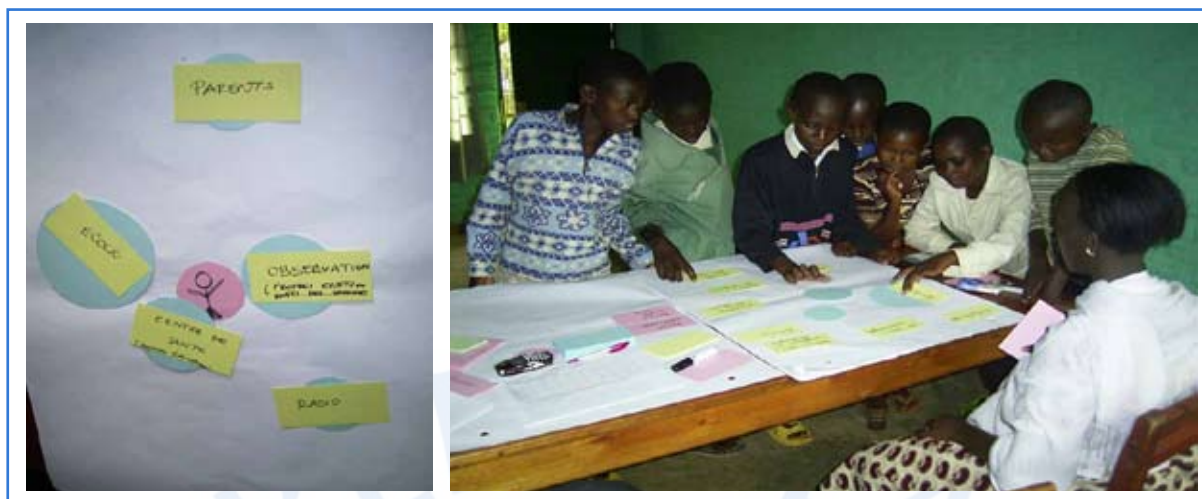


Figure 3: Venn-diagram performed by women from Umuyange (left) and elaboration of venn-diagram with the pupils in Umuyange (right)
Source: Mareile Zöllner

implementing the controllable prevention measures, the population also pays attention to uncontrollable measures such as washing hands with soap or boiling drinking water (Figure 4). In Rusumo, the protection motivation has more to do with conviction leading to better comprehension, a higher personal responsibility and a hygiene-related communication culture within the community. Knowledge, attitudes and practices concerning the treatment of diarrhoea have nothing to do with the implementation of PHAST,

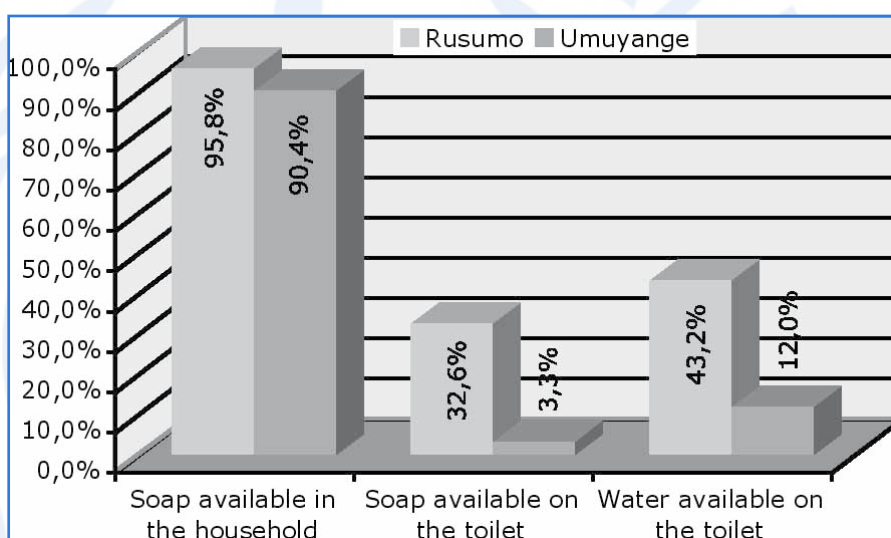


Figure 4: Availability of water and soap
Source: Field study 2006, Mareile Zöllner

Table 1: Sources of information about prevention and treatment of diarrhoea

Source: Field study 2006, Mareile Zöllner

	Spontaneous answer	
	Rusumo	Umuyange
Health Centre or hospital	60,0%	81,3%
Radio	47,4%	12,5%
School	37,9%	11,5%
Health animators	32,6%	56,3%
Personal experience	25,3%	14,6%
Friends & neighbours	23,2%	13,5%
Parents & family members	21,1%	28,1%
Brochures	16,8%	28,1%
PHAST	13,7%	0%
Television	4,2%	0%
Posters on the street	2,1%	1,0%
Others	5,3%	2,1%

but are related to the ORS (Oral Rehydration Salts) campaigns by health centres and health animators or to informal sources of information (Table 1). Due to an obligatory health insurance system, the diarrhoea mortality rate has possibly been reduced further for the population living close to the health centres. The households that are still affected by high mortality rates are those situated in the countryside far from the health centres.

In conclusion, the study has shown that the implementation of the PHAST programme has achieved its overall goal to involve people in the planning process and to encourage them to find ways to improve their own hygiene behaviour and local sanitation facilities (Figure 5). The interviews have shown that the people in both Rusumo and Umuyange are open-minded and willing to participate in community work. In order to combat poverty and the nutrition insufficiency in Umuyange its population could learn a lesson from some of the microfinance projects in Rusumo, such as rabbit breeding or pisciculture. This would mean that even in Umuyange, despite the poorer socio-economic status, PHAST could be successful and strengthen the community's self-efficacy.





Figure 5: Latrine with cement base and washing water, Rusumo (left) and wooden latrine, Umuyange (right)
Source: Mareile Zöllner

References

[1] World Health Organisation WHO, 2006. World Health Statistics 2006, Geneva. <http://www.who.int/en/> [accessed 10 May 2007].
 [2] Ministère de l’Energie, Eau et Ressources Naturelles du Rwanda, 2001. Direction de l’Eau et Assainissement, 2001. Atelier National de Concertation sur la Méthodologie PHAST, Kigali.
 [3] Rogers, R. W., 1983. Cognitive and physiological processes in fear appeals and attitude change. A revised theory of protection motivation. In: Cacioppo, J. T. & D. R. Petty (eds.): Social psychophysiology. New York: 153-176.
 [4] Schwarzer, R., 2004. Psychologie des Gesundheitsverhaltens. Einführung in die Gesundheitspsychologie. Göttingen.

[5] Bengel, J. & Belz-Merk, M., 1990. Subjektive Gesundheitskonzepte. In: Schwarzer, Ralf (ed.), 1990. Gesundheitspsychologie, Göttingen, pp. 105-115.

Mareile Zöllner
 Deutscher Entwicklungsdienst (DED)
 Population Services International (PSI) Haiti
 Email: zoellnermareile@hotmail.com



Water and Malaria Transmission in South Western Kenya

Malaria is a vector borne infectious disease caused by protozoan parasites of the genus *Plasmodium*. The parasites are transmitted from person to person by the bite of an infected female *Anopheles* mosquito. When an infected mosquito bites a human host, it injects a small number of sporozoites from its salivary glands into the blood. The sporozoites then travel to the liver where they grow and mature into merozoites which burst out of the liver cells and invade the red blood cells. The merozoites consume the red blood cells and break out of the empty husks, releasing more merozoites which re-invade new red blood cells [1].

The public health and economic significance of malaria is enormous, and its control remains a great challenge [2]. Globally, it is estimated that the burden of malaria exceeds 40 million Disability Adjusted Life Years (DALYs) [3].

In Kenya, malaria affects more than 4 million people annually. Some 20 million Kenyans are regularly exposed to malaria, which remains the country’s leading cause of morbidity and death [4]. Clinic attendance and admissions to hospitals show a proportional malaria morbidity of 30%, out of which 19% are admitted. It is estimated that 170 million working days are lost annually in Kenya due to malaria [5].

The principle vectors of malaria parasites in western Kenya are *Anopheles gambiae* and *Anopheles funestus*. The female *A. gambiae* preferentially select small open habitats for laying their eggs. They reproduce rapidly in the temporary open sunlit pools that develop during the rainy season. On the other hand, the *A. funestus* generally breeds in larger, semi permanent habitats like swamps and other man-made habitats like fish ponds and brick-making sites [6]. This article highlights the importance of small water surfaces for malaria transmission in a study carried out in south-western Kenya.

Methods

The study was undertaken during a peak malaria transmission season between May and July 2007. Malaria patients were randomly sampled from a local health care facility. Each malaria case was matched with a control of the same age and sex. All the study subjects were visited in their homes within a period of two weeks after their attendance at the health care facility. Data collection involved the identification and spot checking of all possible mosquito breeding places around the homesteads. Specifically, domestic water collection points, animal stalls, garbage

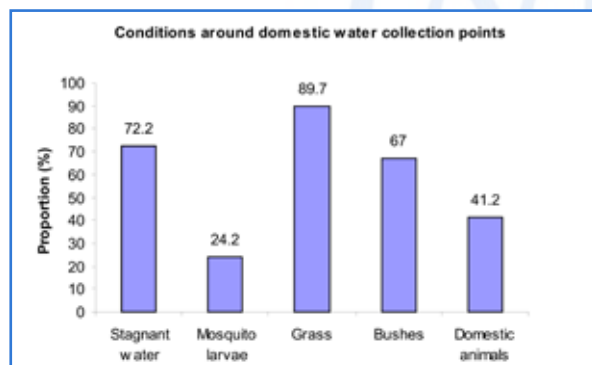


Figure 1: Risk factors around water collection points
Source: Field data 2007, Sophia Githinji





Figure 2: A woman fetches water from a spring
Source: Sophia Githinji

and waste water disposal facilities were spot checked for stagnant water and mosquito larvae. In addition, the proximity to swamps, fishponds and/or brick-making sites was investigated.

Results: water collection points

The main domestic water sources were found to be springs, rooftops, rivers, streams and boreholes. Stagnant water was observed in 72.2% of the water collection points, of which 24.2 % had mosquito larvae in them. Animal hoof prints near stagnant water were observed in 41.2% of the water collection points (Figures 1,2,3). Grass and bushy vegetation, suitable hiding places for adult mosquitoes, were common features around the water collection points (Figure 4).



Figure 4: Bushes surrounding a water collection point
Source: Sophia Githinji

Other risk factors associated with water collection points included containers used for rainwater harvesting, boreholes, rivers and streams (Figures 5, 6). Rain harvesting containers retained water throughout the rainy season, therefore providing suitable breeding places for mosquitoes very close to the home steads.

Boreholes were a common source of water in the area. These boreholes were usually shallow and during the rains they would be filled with water, thereby serving



Figure 6: Drawing water from a bore hole
Source: Sophia Githinji



Figure 3: Animal hoof prints near the water collection point
Source: Sophia Githinji

as possible breeding places for mosquitoes. Valleys adjacent to rivers and streams were susceptible to flooding during the rains, also providing additional breeding places for mosquitoes.

Results: risk factors associated with garbage and waste water disposal

The main risk factor found around the garbage and waste water disposal sites were old containers that occasionally contained water that would be a possible breeding place for mosquitoes. Stagnant water was observed in 16.6% of the garbage disposal sites. Mosquito larvae were occasionally observed in the stagnant water, containers and drainage channels (Figure 8).



Figure 5: Rainwater harvesting container below the roof of a house
Source: Sophia Githinji

Proximity to swamps, fish ponds and brick making sites

17.5% of the study subjects lived near a swamp, 15.4% near a brick-making site and 7.6% near a fish pond.

Statistical analysis

Statistical analysis was done with STATA Version 10. Univariate analysis was done for each of the variables investigated. Variables with a p-value ≤ 0.25 were selected for



Figure 7: A homestead built on a valley bottom near a large river
Source: Sophia Githinji



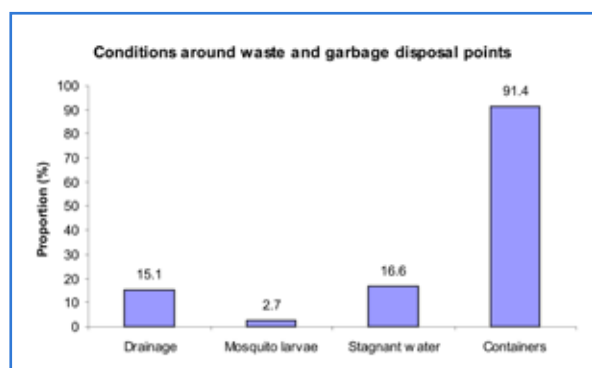


Figure 8: Risk factors associated with waste and garbage disposal sites
Source: Field data 2007, Sophia Githinji

the multivariate analysis with conditional logistic regression. Three variables: stagnant water at the garbage/waste water disposal sites, containers and proximity to swamps met the selection criteria for the multivariate data analysis. Results of the multivariate analysis are presented in Table 1.

Variable	Odd ratio	p-value	95% Confidence interval
Stagnant water	1.62	0.08	[0.92; 2.85]
Swamps	1.39	0.15	[0.88; 2.20]
Containers	1.27	0.17	[0.89; 1.82]

Table 1: Multivariate analysis of water-related risk factors for malaria

Discussion

Results of the multivariate analysis show that subjects living in surroundings with stagnant water were 1.62 times more likely to get malaria compared to those not living in such conditions. Although this variable did not meet the 0,05 level of significance, the odds ratio together with observations in the field suggested that small amounts of stagnant water collecting very close to human habitats were likely to be contributing to increased incidences of malaria in the study area.

The study concludes that keeping the home environment free of puddles and objects in which water could collect to form breeding grounds for mosquitoes plays a role in reducing the transmission of malaria.

References

- [1] Alyssa, B.E., 2005. Malaria epidemiology: insights from the genome of the malaria parasite. *Journal of Molecular and Genetic Medicine*, December 2005 1: 76-86
- [2] Keiser J., Singer B. H. and Utzinger J., 2005. Reducing the burden of malaria in different eco-epidemiological settings with environmental management: a systematic review. *Lancet Infect Dis* 5 695 - 708
- [3] Lopez, A.D., Mathers, C.D., Ezzati, M., Jamison, D.T., Murray, C.J. Global and regional burden of disease and risk factors, 2001: systematic analysis of population health data. *Lancet*, 2006, 367(9524): 1747 -1757
- [4] Republic of Kenya, Central Bureau of Statistics, 2004. Demographic and Health Survey, 2003. Government Printers Nairobi
- [5] Republic of Kenya, Ministry of Health, 2001. National Malaria Strategy, 2001- 2010
- [6] Minakawa, N., Munga, S., Atieli, F., Mushinzimana, E., Zhou, G., Githeko, A.K., and Yan, G., 2005. Spatial distribution of anopheline larval habitats in western Kenyan highlands: effects of land cover types and topography. *Am J Trop Med Hyg* 73: 57-65



Sophia Githinji
Institute for Hygiene and Public Health
University of Bonn
Email: Sophia.Githinji@ukb.uni-bonn.de

13th International Congress on Infectious Diseases 19 - 22 June 2008, Kuala Lumpur, Malaysia

The congress brought together medical scientists, microbiologists and Public Health professionals. The purpose of the congress was to provide a forum for initiating and strengthening collaborative research as well as a platform for scientific exchange.

Among the diseases featured most were influenza, TB, HIV, malaria and dengue fever. Also discussed were the challenges of drug development for most neglected diseases. Currently available drugs were said to be ineffective, difficult to administer and not registered in endemic areas. Prof. Satoshi Omura of Japan, a winner of the Robert Koch Gold Medal, made an insightful presentation on 'Drug Discovery as a Public Health Intervention: The Ivermectin Story'. His contribution in community-based mass treatment has saved thousands of people from blindness in West Africa.

The role of vaccines in the prevention of infectious diseases could not be overemphasized. Seven symposiums were dedicated to vaccines with influenza featuring in two symposiums.

Speaking about '21st Century Global Health Protection', Dr. Julie Gerberding, director of the Centers for Disease Control and Prevention (CDC) stressed the need to transform bench experiments into health practices at the individual level.



Figure 1: Scientists discuss poster session
Source: Sophia Githinji, 2008



In the final session, Dr. Heymann, an Assistant Director-General for communicable diseases at the WHO, summarized the lessons learnt from emerging infectious diseases over the last 15 years. He stressed the need for effective risk communication through the press, security agents and international health regulation. In a world where pathogens are quickly exchanged (owing to increased international travel), it is only through increased collaboration and networking among experts that the control of infectious diseases can be improved.

Sophia Githinji
 Institute for Hygiene and Public Health
 University of Bonn
 Email: Sophia.Githinji@ukb.uni-bonn.de



The View of a Young Water Professional at the 6th IWA Exhibition and Conference, 7 - 12 September 2008, Vienna, Austria

The 6th International Water Association (IWA) World Water Conference held during 7 - 12 September 2008 in Vienna, Austria was visited by 2,800 delegates. The parallel-running conference sessions covered topics such as water resources, river basin management, management of water services, water systems, (waste)water treatment, sanitation, impacts of climate change and under the headline "health and the environment" several aspects of water ecology, microbiology and chemistry. The latter in particular were extremely popular and completely overcrowded.

Morning plenary keynote sessions, workshops and industry forums as well as the exhibition in the Austria Center, Vienna with more than 300 exhibitors made up the range of scientific water aspects and water professional perspectives.



Figure 2: Crowded session on „Health and the Environment“
 Source: Christiane Franke, 2008



Figure 1: The IWA Congress 2008 took place at the Austria Centre
 Source: Christiane Franke, 2008

For the first time, a special Young Water Professionals (YWP) Programme was included in order to link young water professionals and students with potential mentors from the current generation of water leaders. The YWP Programme started with a one-day workshop prior to the conference which was attended by nearly 100 participants. Further YWP events included the launch of a mentoring programme, a lunch discussion that gave participants the opportunity to meet the Council of Distinguished Water Professionals and discuss challenges of the water profession in the light of global climate change, and the YWP Career Fair.

Last but not least, one of several awards presented at the conference, the newly created IWA Hei-Jin Woo Award, was presented to Professor Joan B. Rose, of Michigan State University, United States. This award recognises the achievements of women in the water profession and is dedicated to Hei-Jin Woo, a leading Korean female engineer and scientist who worked in the water sector.

Further information together with a list of participants and posters can be downloaded from the conference website <http://www.iwa2008vienna.org/i8/>

Christiane Franke
 Institute for Hygiene and Public Health
 University of Bonn
 Email: Christiane.Franke@ukb.uni-bonn.de



2nd Annual Meeting of the Society of Hygiene, Environmental and Public Health Sciences, 1 - 4 October 2008, Graz, Austria

The second annual meeting of the Society of Hygiene, Environmental and Public Health Sciences (GHUP), which mainly consists of members from German speaking European countries, took place from 1 - 4 October 2008 in Graz, Austria. The conference topics included a wide spectrum of health-related themes on health prevention, hospital hygiene, public health, noise pollution, air pollution, water hygiene and ecotoxicology. Medical scientists, biologists, chemists and social scientists as well as engineers were present, both from the research sector and from industry. They presented a diverse range of current projects which resulted in multidisciplinary discussions. On Saturday 4th October, there was a special symposium of indoor mould problems and healthy buildings in cooperation with the Austrian Society for Medical Mycology (ÖGMM).

In addition to the conference sessions there were many opportunities for in-depth conversations among the participants during various social events in the evenings, e.g. a bus excursion that included a tasting of the famous Styrian wines.

For further information a list of lectures and posters can still be downloaded from the conference website at <http://conventus.de/ghup2008/>.



Christiane Franke
Institute for Hygiene and Public Health
University of Bonn
Email: Christiane.Franke@ukb.uni-bonn.de



“We are fighting the same battle” – Report from the International Symposium: “Coupling Sustainable Sanitation and Groundwater Protection”, 14 - 17 October 2008, Hanover, Germany

Sanitation has been elevated on the political agenda as a result of the United Nations declaration of 2008 as the International Year of Sanitation (IYS). The Federal Institute for Geosciences and Natural Resources (BGR) aimed to highlight the immense problems of groundwater pollution due to absent or inadequate sanitation facilities in developing countries by organising an international symposium on “Coupling Sustainable Sanitation and Groundwater Protection” from 14 - 17 October 2008 in Hanover, Germany. Together with international co-convenors (BMZ, UNEP and WHO) and supporting organizations (BORDA, DED, DWA, GTZ, IAH, KfW and TTZ), BGR offered this symposium as the first event dealing with both topics. About 130 participants from more than 30 countries

discussed the links between sustainable sanitation and groundwater protection. A comprehensive poster exhibition covered the vast variety of lessons learnt, mainly in developing countries.

The symposium was one of the BGR activities realized within the framework of the Sustainable Sanitation Alliance, a network of more than 80 organizations worldwide which advocate for sustainability in sanitation and related fields (www.susana.org).

The chosen theme of “coupling sustainable sanitation and groundwater protection” reflects the fact that the 2.5 billion people worldwide without access to improved sanitation [1] pose an increasing threat to both surface and groundwater resources. Groundwater represents



Figure 1: Panel discussion
Source: Federal Institute for Geosciences and Natural Resources, 2008

not only a water source utilised by a growing number of urban dwellers, but also a resource people in arid areas completely depend upon, as well as being the most precious fresh water resource readily available to mankind. However, groundwater utilisation for drinking water is endangered because of the uncontrolled disposal of human excreta in informal settlements and the absence of sustainable sanitation concepts in exploding mega-cities and their peri-urban surroundings. Absent or malfunctioning sanitary facilities allow pathogenic and chemical pollution to find their way underground via hydraulic shortcuts or a lack of protective soil layers. Therefore, timely and effective protection of groundwater is essential in order to keep this precious resource clean and safe for future generations. Protection measures include increasing the access to sanitary facilities, especially in developing countries, but at the same time the sanitation systems implemented need to be sustainable. Only sustainable sanitation can enhance the long-term protection of groundwater.

Obviously, the two disciplines of groundwater protection and sustainable sanitation have a lot of ideas to share. Consequently, this international symposium was aimed at bringing together professionals and decision-makers as well as hydrogeologists and sanitary engineers, discussing common issues, listening to each other and forming new partnerships. Representatives from other disciplines such as water resource management, water supply engineering, planning, health, and agriculture enriched the discussions. Discussions took place during panel-led sessions including professionals from sanitation institutions, like the GTZ sector programme on ecosan, KfW-partners from the Tunisian water ministry, the Swedish Environmental Institute, the Bremen Overseas Research and Development Association, as well as partners from groundwater projects like SMART in Jordan, SANSED in Vietnam, and the International Water Management Institute in Ghana.

At the beginning of the symposium it was clear to the participants that the costs of environmental and individual damage caused by the lack of sanitation outweigh by far the costs of the recent crisis within the world financial system. Therefore, action to end the sanitation crisis is urgently needed. During discussions with keynote speakers Stephen Foster (World Bank and IAH) and Perry Mc-

Carty (Stanford University), it was stated that the successful promotion of sanitation will often at the same time improve groundwater quality, or contribute massively to the protection of vulnerable aquifers, however, other groundwater protection measures also need to be realized in order to achieve a holistic resource management strategy.

The failure of past sanitation approaches is often related to a mindset based on colonial urban planning principles. This was considered during a panel discussion with UNEP-representative Patrick Mmayi, Susanne Herbst from the WHO Collaborating Centre for Health Promoting Water Management and Risk Communication in Bonn, Germany, and Darren Saywell, a representative of IWA. Large areas within cities have been and still are neglected by mainstream planning. Town planning is dominated by top-down technocratic approaches. Powerful elites hinder changes, procedures to amend plans remain bureaucratic and corruption skews planning approaches, blocking lasting investments in infrastructure. Supply driven planning usually benefits high and middle income families, without covering operational and maintenance costs. Innovative planning requires stakeholder participation. There is a set of new sanitation planning tools which help to facilitate sustainable sanitation, especially for the urban poor. They animate planners to understand power relationships, ensure effective participation and build in the users' perspective, build partnerships, be comprehensive but realistic about the complexity of sanitation and identify the drivers of sanitation [2]. Planning concepts need to be linked to reality, not just to text book solutions and they require the poor to be served.

The participation of all stakeholders at all levels of planning, implementation and operation is considered to be the key issue for success of any water and sanitation project. Integrated approaches like IWRM and IWM exist and cater for the need for participation and holistic concepts.

But why does sanitation still lag behind in terms of reaching the Millennium Development Goals? Major reasons for the limited activities of decision-makers in the sanitation crisis are seen in unclear responsibilities for sanitation, the resulting difficult management structures

of the institutions involved, the complexity of necessary measures, as well as the lack of awareness for immediate and responsible action. Nevertheless, the positive role of governments in providing the enabling environment for reforms and introducing new concepts and technologies must not be neglected. Professionals from all involved sectors and stakeholders have to use the enabling environment and implement sustainable solutions.

One of the main messages from this event is that there is a wide range

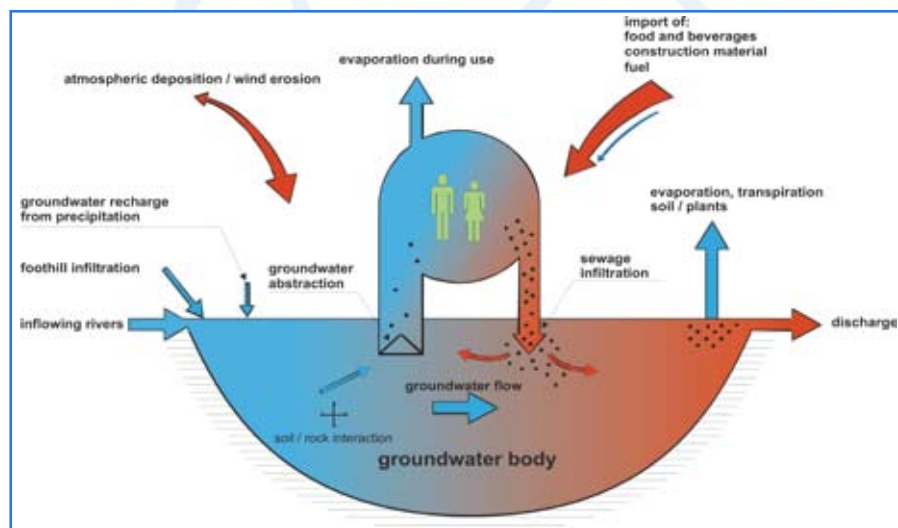


Figure 1: Water flow and pollutant transport in a groundwater system
Source: Federal Institute for Geosciences and Natural Resources



of sanitation solutions available which need to be adapted to the specific conditions of the regions of concern in order to be sustainable. To fulfil the five sustainability criteria, a sanitation system has to be not only economically viable, socially acceptable, and technically and institutionally appropriate, but it should also protect the environment and natural resources such as groundwater. BGR underlines the latter aspect in its guidelines which state that "Planet Earth is the natural basis of our lives, its resources are limited."

The aspired dialogue between the disciplines represented at the symposium resulted in the demand of the sanitation sector, especially of the planners, for more information on groundwater vulnerability. The hydrogeologists supported the aim to cooperate more closely because, as Thomas Himmelsbach, Head of the BGR Section on groundwater quality and protection put it, "we are fighting the same battle."

The symposium was considered to be very useful and a way forward to further integrate the various disciplines under the common goal of managing the limited resources in a sustainable manner for the benefit of the present and future generations.

References

- [1] World Health Organization and United Nations Children's Fund Joint Monitoring Programme for Water Supply and Sanitation (JMP), 2008. Progress on Drinking Water and Sanitation: Special Focus on Sanitation. UNICEF, New York and WHO, Geneva.
- [2] SuSanA factsheet: Planning for Sustainable Sanitation. Version 1.1, October 2008, <http://www.susana.org/images/documents/05-working-groups/wg06/final-docs/en-susana-factsheet-WG06-planning-version-1.1.pdf> [accessed 30 November 2008].

Andrea Wachtler
Federal Institute for Geosciences and
Natural Resources, Hanover
Email: Andrea.Wachtler@bgr.de



The WHO CC Bonn thanks all readers
and contributors for their commitment
in 2008 and sends Season's Greetings
and best wishes for 2009!



Events on Water, Health and Risk Communication:

February 2009

44th CENTRAL Canadian Symposium on Water Quality Research, Canadian Association on Water Quality, 23.02. - 24.02.2009, Burlington, Canada
<http://www.cawq.ca/en/44c/>

March 2009

5th World Water Forum, 16.03. - 22.03.2009, Istanbul, Turkey
<http://www.worldwaterforum5.org/>

WASSER BERLIN International Trade Fair and Congress on Water and Wastewater, 30.03. - 03.04.2009, Berlin, Germany
www.wasser-berlin.de

April 2009

The Third Yangtze Forum: Sub-forum on Climate Change and City Water Safety, 20.04. - 21.04.2009, Shanghai, China
<http://www.yangtzeforum.com/>

CIWEM Annual Conference 2009: Water and The Global Environment, 29.04. - 30.04.2009, London, England
http://www.ciwem.org/events/annual_conference/

May 2009

34th WEDC International Conference - Water, Sanitation and Hygiene: Sustainable Development and Multisectoral Approaches, 18.05. - 22.05.2009, Addis Ababa, Ethiopia
www.wedcconference.co.uk

IWA 1st Eastern European Regional Young Water Professionals Conference, 21.05. - 22.05.2009, Minsk, Belarus
http://www.iwahq.org/uploads/young%20water%20professionals/ywpc/Call_for_Paper.pdf

June 2009

Singapore International Water Week Convention, 22.06. - 26.06.2009, Singapore
www.siww.com.sg/waterconvention.php

August 2009

Dry Toilet 2009, 12.08. - 15.08.2009, Wiesbaden, Germany
www.drytoilet.org/dt2009

World Water Week: „Accessing Water for the Common Good“, 16.08. - 22.08.2009, Stockholm, Sweden
<http://www.worldwaterweek.org/>

Imprint:

Publisher:

WHO Collaborating Centre for Health Promoting
Water Management and Risk Communication
IHPH - Institute for Hygiene and Public Health
University of Bonn
Sigmund-Freud-Str. 25
53105 Bonn, Germany
Phone: +49 (0)228 - 287 19515
Fax: +49 (0)228 - 287 19516
Web: <http://www.whocc-bonn.de>

Editors:

Yvonne Walz, Dr. Susanne Herbst, Ass. Prof. Dr.
Thomas Kistemann, Prof. Dr. Martin Exner

English copy editor:

Helen Hanimann-Robinson, Forch, CH

Layout:

Yvonne Walz, Oksana Krämling

Contact:

whocc@ukb.uni-bonn.de

Contributions reflect the opinion of the authors and are not necessarily in correspondence with the position of the WHOCC