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University of Bonn - IHPH Institute for Hygiene and Public Health

WATER & RISK

Editorial

Dear colleagues,
We are happy to send you our WHOCC Newsletter just before the end of 2007.

In the current issue, we invited Ian Lake from the University of East Anglia to highlight the benefits of Water Safety Plans for epidemiological studies. Study limitations due to the lack of suitable water quality monitoring data can be overcome using risk-based measures of drinking water exposure, the principles of which are similar to those of Water Safety Plans.

In Rwanda, the rate of access to safe drinking-water is still unsatisfactory, not only in rural areas, but even in the fast growing capital, Kigali City. Eugene Dusingizumuremyi from the Kigali Institute of Science and Technology has investigated the impact of inadequate sanitation and unsafe drinking water on human health and concludes that water-related diseases substantially handicap the development of Kigali City.

The Institute for Hygiene and Public Health recently concluded a study on microbial loads from diffuse sources in a small river catchment. Esther Rind, Christiane Franke and Andrea Rechenburg compare these results with the impact of municipal wastewater and combined sewage overflow.

The newsletter is once again completed by short reports from several conferences and meetings: Andrea Rechenburg and Christiane Franke visited the biennial symposium of the IWA specialist group on health-related water microbiology in Tokyo in September 2007; Yvonne Walz reports from the Annual Meeting of the German Working Group of Medical Geography in Bayreuth in October 2007; and Oksana Krämling shares her impressions with us of the 12th International Medical Geography Symposium, which was hosted by our Institute in July 2007.

We wish our readership untroubled and peaceful Christmas days as well as health and success in 2008!

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The Use of Water Safety Plans in Epidemiological Studies

The constituents of drinking water can affect human health - a fact that has been known for over 2000 years. However, since the 19th century, these links have been rigorously examined in epidemiological studies which link health outcome data to the concentration of a particular drinking water constituent.

For practical reasons, it is not possible for water authorities to monitor the concentrations of every possible constituent of drinking water. Therefore, a significant problem exists for epidemiological studies if there is no exposure data to compare to the health data. Even if water quality monitoring data does exist, there may be instances where it is not fit for comparison. This often occurs when the frequency of monitoring is not sufficient to obtain adequate measures of exposure. For example, some microbial contaminants may pass through drinking water supplies in a matter of hours. Few water supplies are monitored on a regular enough basis to detect these.

The aim of this research project was to investigate whether the problem of missing or poor water quality monitoring data could be overcome by substituting this monitoring data with measures describing the risk that these constituents exist in drinking water. The risk measures derived were similar to those calculated in Water Safety Plans (Davison et al., 2005). Such an approach involves tracing the whole water supply system from catchment to consumer (Medema et al., 2003), and then examining the whole system to enable estimation of the risk that a constituent exists in the supply. For example, a water supply with large numbers of livestock in its supply catchment is at higher risk of microbial contamination than a supply with no livestock in the catchment. Similarly a water supply using membrane filtration is at lower risk of microbial contamination than a supply which is not.

Cryptosporidiosis Case Study

The use of risk based exposure measures in epidemiology was explored through a case study investigating the role that water supply might play in the distribution of cryptosporidiosis across England and Wales. Cryptosporidiosis is a severe gastroenteritis caused by ingestion of the protozoa Cryptosporidium. The home addresses of 3,000 patients who suffered from cryptosporidiosis were obtained from the Cryptosporidiosis Reference Unit and compared to the locations of an identical number of controls. Each case was divided into one of two species, *C. parvum* or *C. hominis*.

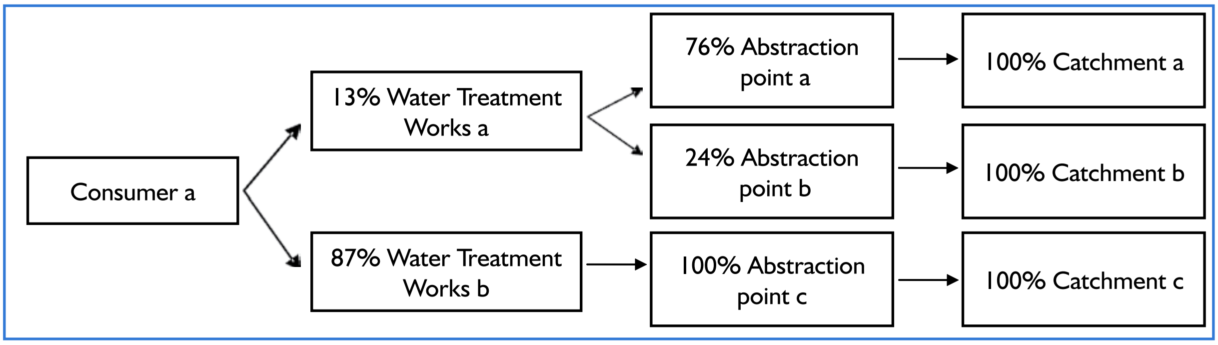


Figure1: Sample water supply pathway

The first stage in the creation of variables estimating the risk of *Cryptosporidium* in the water supply of each case and control was to identify the path that the individual's drinking water takes from the source catchment through to the tap. In most cases, the individual's water was a blend of water from different water treatment works which obtained water from multiple abstraction points and hence catchments. This is illustrated for a hypothetical consumer in Figure 1. For each case and control the water supply was mapped using information from the England and Wales Drinking Water Inspectorate. For the surface water abstractions, the catchments were calculated using a Geographical Information System. For groundwater abstractions, the catchments were obtained from the UK Environment Agency.

Once the water supply pathway had been identified, the second stage involved defining parameters related to the risk of *Cryptosporidium* along the entire pathway from tap to catchment. Examples of the water supply risk variables calculated for each case and control include the proportion of surface water, and the proportion of groundwater supplied to the individual. Surface water supplies are likely to have a higher risk of *Cryptosporidium*. The type of treatment to which the drinking water was subjected was also recorded, again hypothesising that superior treatment, such as membrane filtration, would reduce the risk of *Cryptosporidium* in the water supply.

Animal manure is a significant potential source of *Cryptosporidium* contamination if it occurs in the catchment of the drinking water abstraction point. The quantity of *Cryptosporidium* applied to land, directly from animals or through manure spreading, was estimated by combining the catchment boundaries with a countrywide map of *Cryptosporidium* applications to land from animal manure. The *Cryptosporidium* applications map was created by the ADAS Environment Group using information on animal numbers and locations from the agricultural census, land use data and information from animal excreta and manure management surveys. This produced a map of manure applications across the country which was converted into a map of *Cryptosporidium* concentrations using published data on *Cryptosporidium* concentrations in manure. Exam-

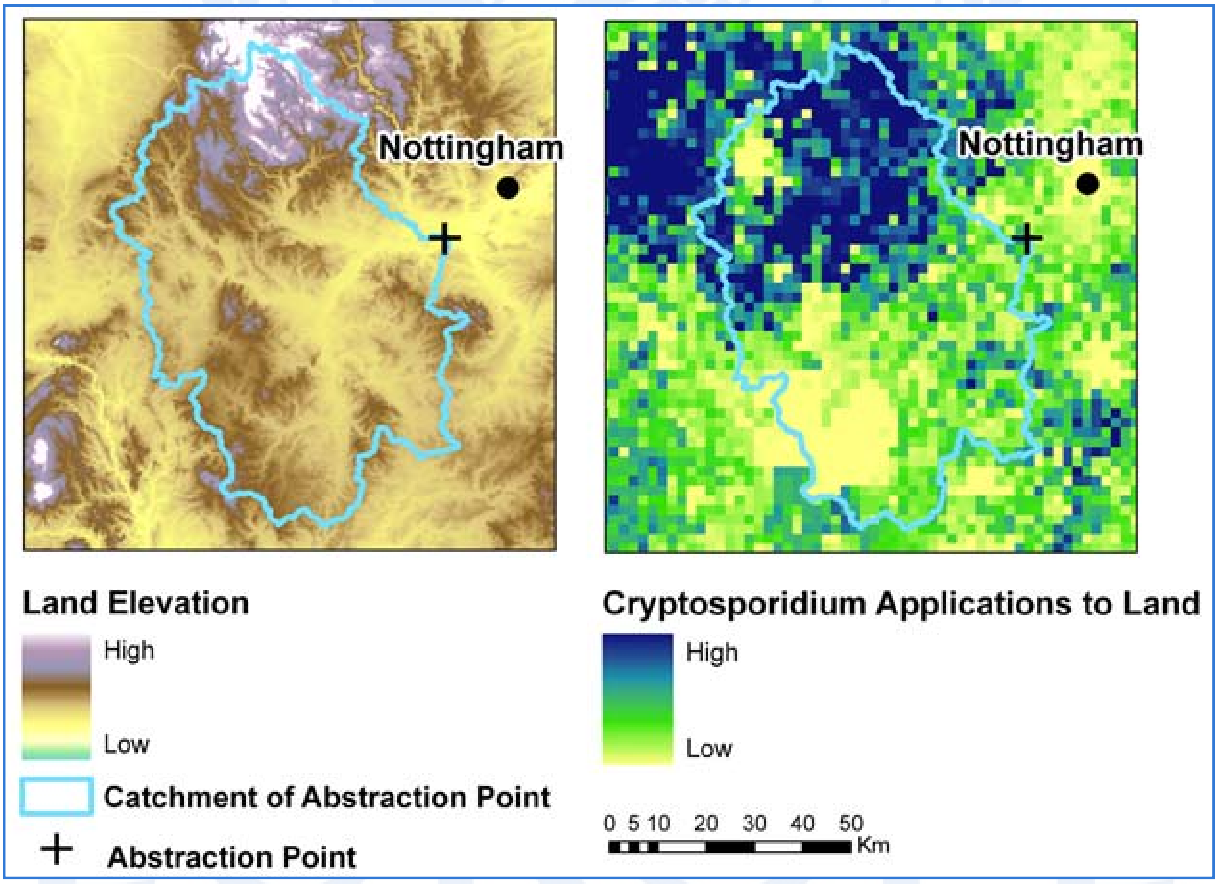
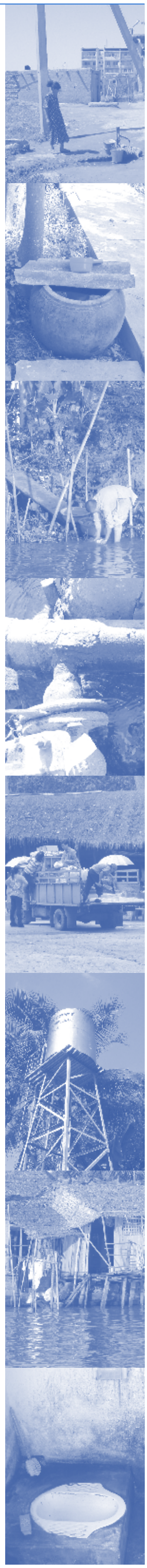
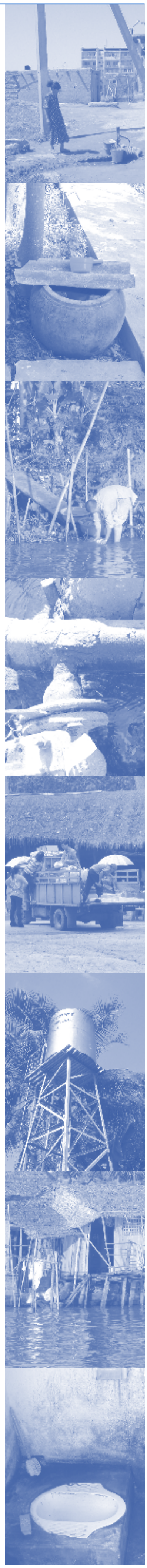


Figure 2: Elevation, Surface Water Catchment and Cryptosporidium Density for an Abstraction Point on the River Trent





ples of these data are presented in Figure 2 for a water abstraction point on the River Trent to the south-west of Nottingham. The left hand panel shows the land elevation and the associated catchment area of the abstraction point. The right hand panel shows the catchment area and the Cryptosporidium density from manure applications.

A full set of results from the study are presented in (Lake et al., 2007) and demonstrated that drinking water was only a significant risk factor for infection with *C. parvum*. For this species, the risk was lower in areas where the water supply was subject to superior treatment (e.g. slow sand filtration or membrane filtration) and where the water consumed was predominantly groundwater sourced. However, the analysis also demonstrated that although groundwater was generally protective, if the groundwater catchment had a large quantity of *Cryptosporidium* applications within it, then this was positively associated with risk. Furthermore, in drinking water supplies categorised as having the highest risk of *Cryptosporidium* (surface water supplies with poor treatment and a high level of *Cryptosporidium* applications in the catchment) there was a slight lowering of the risk. This could be due to an immune effect in the population or to enhanced monitoring and attention paid to the highest risk drinking water supplies.

Conclusions

Many epidemiological studies of drinking water and health are limited by the lack of suitable water quality monitoring data. In this article we have demonstrated how these problems can be overcome using risk based measures of drinking water exposure. These use similar principles to those in Water Safety Plans. Our case study into cryptosporidiosis demonstrated that these risk based measures can be a useful substitute for actual exposure measures and provide informative insights into the relationships between drinking water and human health. In this article we have focused upon *Cryptosporidium*, but the techniques developed could be adapted for other potential drinking water constituents. In spite of these advantages, there are several limitations in the approach presented. The most important is the time and effort required to map water supply pathways and derive a measure of risk at each stage for large numbers of individuals. In our case study the data required to perform such an analysis were held by a range of organisations, thereby increasing the time and complexity of the analysis. However, in the future the resources required to produce such risk based exposure estimates may be reduced. As Water Safety Plans become more common, the water industry and its regulators are likely to have to collate and integrate many of the data sources used in this study as part of their routine operations. We have demonstrated that, in addition to their use in Water Safety Plans, these data have significant potential use in epidemiological studies.

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Impacts of Inadequate Sanitation and Unsafe Drinking Water on Human Health: A Case Study of Kigali City, the Capital of Rwanda

More than 2.6 billion people, around forty per cent of the world's population, do not have basic sanitation facilities, and over one billion people still use unsafe drinking water sources (UNICEF, 2006). As a result, thousands of children die every day from diarrhoea, cholera, malaria and other water and sanitation related diseases. Lack of access to safe water and adequate sanitation has an impact on human life as well as on the natural environment. Poor farmers and low wage earners are less productive because they often suffer from waterborne diseases. The main reason for poor results from hygiene and sanitation education is linked to the top-down approaches which have been implemented (UNICEF, 2006). This gives rise to poorer community participation than expected.

Poverty is one of the main barriers to access to basic services like safe water and adequate sanitation facilities, especially in rural areas and poor urban fringes. Hence, waterborne diseases and poor health conditions are constant realities in these settings. Following Abrams (1999) "lack of adequate education is an indicator of poverty and a cause of poverty", which is considered the main cause of inadequate sanitation and water pollution.

1. Rwanda Facts and Figures

Rwanda is a small landlocked country with an area of 26,338 km² (RDG, 2007). It is the most densely populated country in Africa with an estimated 310 inhabitants per km². According to the national census, the total popula-

Figure 1: Map of Rwanda
Source: NBI, 2006

tion was 8,162,175 in 2002 and annual population growth approximately 3.1% (MINITERE, 2004).

Rwanda has abundant water resources. However, the distribution of potable water is still inadequate taking into consideration demand and accessibility. The average rainfall in Rwanda is 1200 mm per year which is highly favourable. However, the rate of access to safe drinking water in the entire country is approximately 54% and does not exceed 44% in rural areas (MINITERE, 2004). The lack of access to potable water has various negative effects on the population such as the time spent fetching water and also water borne diseases.

According to the annual report 2005 by ELECTROGAZ - the public company in charge of supplying treated water, gas and electricity - only 34% of the water need in urban areas has been covered. Specifically in Kigali City, the water servicing rate was 45%. This means that in 2005 55% of the population was not provided with treated water.

According to MINITERE (2004) 80% of the population in Rwanda has access to latrines, but only 8% of the population use hygienic latrines. This means that 20% had no access to latrines, while 92% had unhygienic latrines. This situation contributes to water resource pollution and an increase in water and sanitation related diseases.

According to a joint report by UNICEF and WHO in 2006, Rwanda is still lagging behind other nations in particular on the attainment of drinking water and sanitation coverage targets (UNICEF & WHO, 2006). Table I shows the percentages of drinking water and sanitation coverage as reported by UNICEF and WHO in rural and urban areas. It furthermore demonstrates the progress towards the Millennium Development Goals (MGDs) in more detail: Even if the coverage of drinking water and sanitation in urban areas is high in comparison with rural areas, there is still a long way to go in order to achieve the MDGs. For instance, the increase in sanitation coverage was only 7% over 14 years in urban areas, while the increase in rural areas was 2%. Regarding safe drinking water, the connection of households to the network is still a dream in most cases. In urban areas only 8% of the households are connected and in rural areas only 1% (UNICEF & WHO, 2006).

2. Kigali City and Water Pollution

Kigali City has grown very fast since the 1994 genocide in Rwanda. Kigali City is a young city which was established in 1907 and has 3 districts: Gasabo, Kicukiro and Nyarugenge. The total area under the control of Kigali City Council is 731 km², with a total population of 871,098 inhabitants (Kigali City Council - bureau of statistics, 2006).

Due to this growth in population, sanitation issues are becoming complex due to poor planning in the past. To this end, water resources are affected because of the unsafe disposal of untreated wastewater and a lack of sustainable sanitation infrastructure.

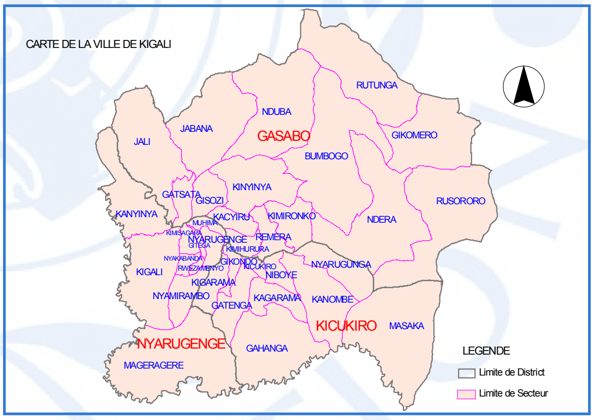


Figure 2: Map of Kigali City, Capital of Rwanda, after institutional reform based on decentralization policy.
Source: Kigali City Council, June 2006.

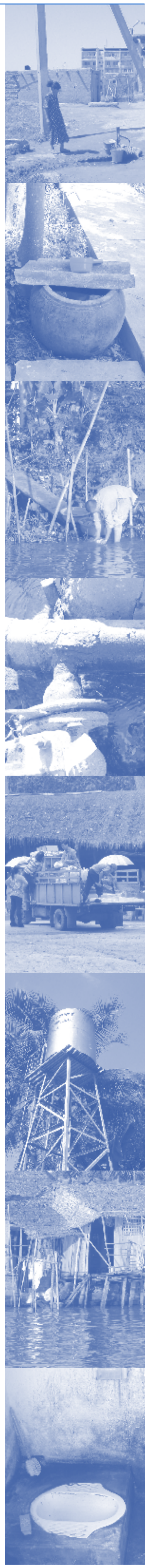


Table 1: Drinking Water and Sanitation Coverage in Rwanda, Rural and Urban Areas

Objectives	Year	Achievements towards MDGs in 1990-2004: Total (%)		Urban (%)		Rural (%)	
		Total	Household Connection*	Total	Household Connection*	Total	Household Connection*
Improved Drinking Water Coverage	1990	37	1	88	24	57	0
	2004	74	8	92	34	69	1
Improved Sanitation Coverage	1990	37		49		36	
	2004	42		56		38	

Source: Adapted from UNICEF & WHO, 2006
** Household Connections means households connected to piped water and having access to safe drinking water in yards or in the house*

Figure 3: Old Kigali fringe - Kacyiru sector: This urban fringe is draining untreated wastewater into the Nyabugogo wetland as a result of poor housing planning in Kigali.
Source: E. Dusingizumuremyi

Kigali City needs an increase in water and sanitation coverage in order to cope with water and sanitation related diseases.

2.1 Different Causes of Inadequate Sanitation and Water Pollution

The ideas presented below are the results of research carried out in Kigali City between May and June 2006 by the author. The results are based on observations and interviews with different concerned stakeholders as well as a review of documents relating to water and sanitation in Rwanda.

Inadequate Sanitation Facilities and Poor Planning

Kigali City is characterised by old urban fringes and a poor population. Figure 3 represents a poor urban fringe without drainage systems and lacking enough space for the traditional pit latrines commonly used in Kigali City. It is difficult to plan for modern, sustainable sanitation infrastructure in this fringe due to the initial poor housing planning.

Untreated wastewater from such slums is discharged directly into water bodies or wetlands, which are thereby contaminated with multiple pollutants. Hence, Kigali City needs special planning and a sanitation code to cope with the complexity of sanitation and resulting water pollution.

Behaviour of Inhabitants

Figure 4 illustrates the extent to which the Nyabugogo River draining Kigali City is receiving and draining off wastewater as well as solid wastes from Kigali City households and commercial areas. This river has other tributaries such as the Mpazi River, where solid wastes from public markets and public car parks are dumped. This kind of water pollution in Kigali City is significantly linked to behavioural aspects of its inhabitants.

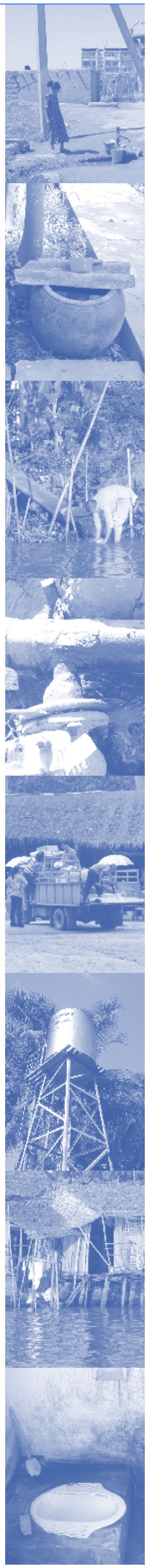
Despite the fact that women collect daily waste from households and commercial areas, many people are still dumping their waste in open water channels. Dustbins have been put in place all over the city. However, the behaviour of the inhabitants is still a determining factor and it is clear that the attitudes and habits of many people in Kigali City contribute to water resource pollution.

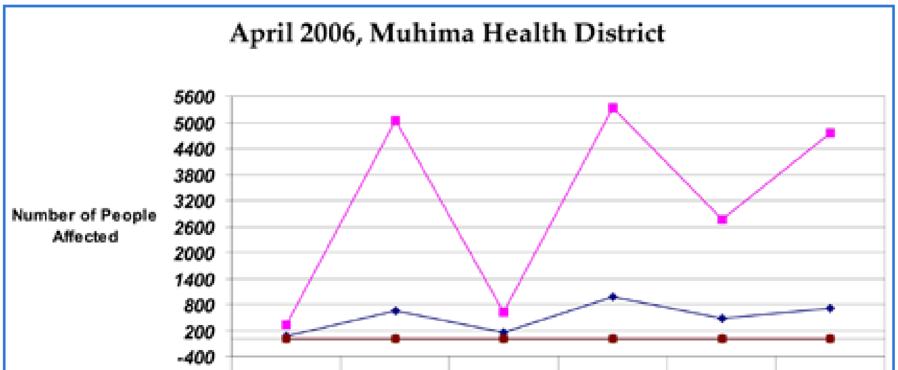
Behaviour change programmes are vital to change the undesirable behaviour of the inhabitants. Hence, the protection of public health should be based on behaviour change education together with the provision of environmental tools.

3. The Impact of Polluted Water on Public Health in Kigali City

Many people are victims of the inadequate sanitation situation and water pollution in Kigali City. The consequences of inadequate sanitation and insufficient safe drinking water in Kigali City are illness and death mostly resulting from waterborne diseases. Figure 5 shows different cases of water and sanitation related diseases in a six month period from November 2005 to April 2006. Malaria is the top killer in Kigali City and many cases occurred in December 2005 and February 2006. December is the end of the rainy season while February is the beginning of the heavy rainy season in Rwanda. This could indicate that malaria and other diseases are linked to the rainy seasons when the breeding of mosquitoes occurs in stagnant water masses.

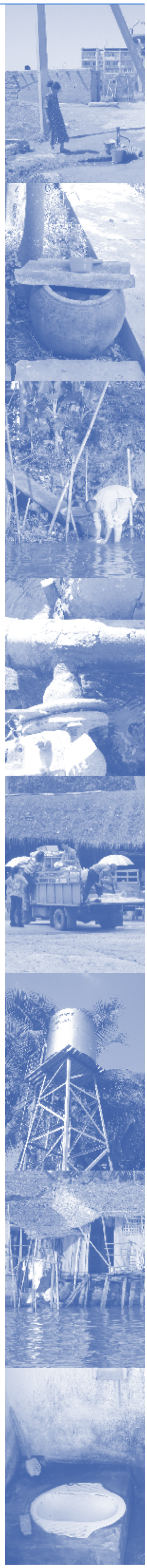
Figure 4: Direct discharge of wastewater and disposal of solid waste into river water bodies. Example from the Nyabugogo River draining wastewater and solid wastes from Kigali City.
Source: E. Dusingizumuremyi





	November	December	January	February	March	April
Diarrhoea	80	650	163	966	475	712
Malaria	329	5056	610	5340	2768	4740
Cholera	0	0	1	0	0	0
Diarrhoea Death	4	2	0	2	0	2
Malaria Death	3	7	5	2	0	0
Cholera Death	0	0	1	0	0	0

Figure 5: Water and sanitation related diseases discovered in Kigali City over the six month period, November 2005 to April 2006
Source: Raw data from TRAC (Training and Research AIDS Centre) - modified by the author



Many other diseases are endemic in Kigali City due to the low water and sanitation coverage (Figure 5). Among the water and sanitation related diseases identified are diarrhoea, malaria, and cholera. However, cholera is rare in Kigali City; and only one fatal case was identified in the six month period considered. The prevalence of water and sanitation related diseases contributes to poverty due to the loss of active labour in the city.

4. Concluding Remarks

Water and sanitation related diseases handicap development in Kigali City with people suffering from waterborne diseases being less productive than would otherwise be the case. Generally, these diseases are caused by inadequate sanitation and insufficient access to safe drinking water. Inadequate sanitation in Kigali City is linked to the behaviour and attitudes of the inhabitants which result in waste being disposed of in open spaces and water channels instead of in the available dustbins. In addition, poor planning and unsustainable water and sanitation infrastructure are major causes of water pollution and the resulting diseases.

To deal with water and sanitation related diseases, Kigali City needs proper urban planning and a sustainable water and sanitation infrastructure. The increase in safe drinking water and adequate sanitation coverage is critical. Moreover, education to change individual behaviour and participatory planning at all levels should be one way to meet the MDGs and Kigali City Council targets. Subsequently, public health should be a prime concern of Kigali City to reconcile sustainable development and the welfare of the citizens. To this end, water and sanitation should be among the top priorities in economic development and poverty reduction strategies.

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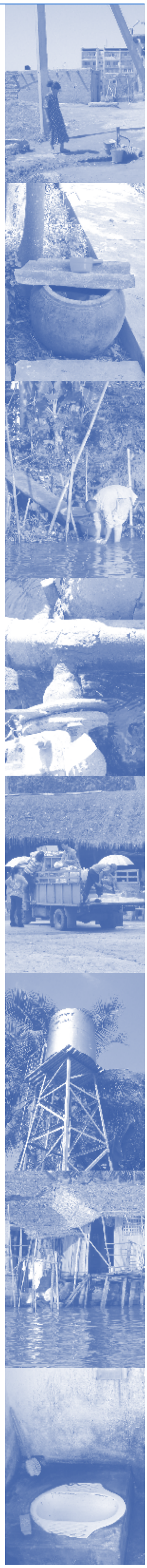

Quantifying the Microbiological Loads from Point Sources and Diffuse Pollution in a Small River Catchment in Germany

The European Water Framework Directive came into force in October 2000 and is a tool for the protection of water sources, including all surface, ground, estuarine and marine waters. It establishes a framework for water management and aims to improve the quality of all water bodies to "good ecological status" by 2015. The key objectives at the European level are the protection of drinking water and recreational water resources (Directorate-General for the Environment, 2007). In order to meet the requirements of the European Water Framework Directive, Germany is obliged to implement catchment-orientated water management, which necessitates a comprehensive assessment of hazards affecting the quality of watercourses.

This report outlines a project investigating the impact of microbiological loads from point sources and diffuse pollution on a small river catchment in Germany. The project aims to provide a comprehensive microbiological characterization of several sources of contamination in a catchment area. The following key objectives are pursued (Kistemann et al., 2002; Rechenburg et al., 2006):

- the assessment of the microbiological pollution of untreated wastewater,
- the evaluation of the removal efficacy of different treatment types,
- the assessment of the impact of combined sewer overflow basins,
- the evaluation of the impact of diffuse sources of pollution,
- the quantification of the relative contribution of each source of contamination in order to provide a comprehensive microbiological hazard characterization of the catchment area taking into consideration different seasons and weather conditions.

Currently, the project consists of three subprojects, each focusing on a different source of potential contamination. The first subproject (Swist 1) assesses the microbiological impact of sewage treatment plants on the catchment area. The second subproject (Swist 2) highlights the microbiological significance of combined sewer overflow basins. The third project (Swist 3) investigates diffuse sources of pollution from different land use types and combines the results of the entire project.

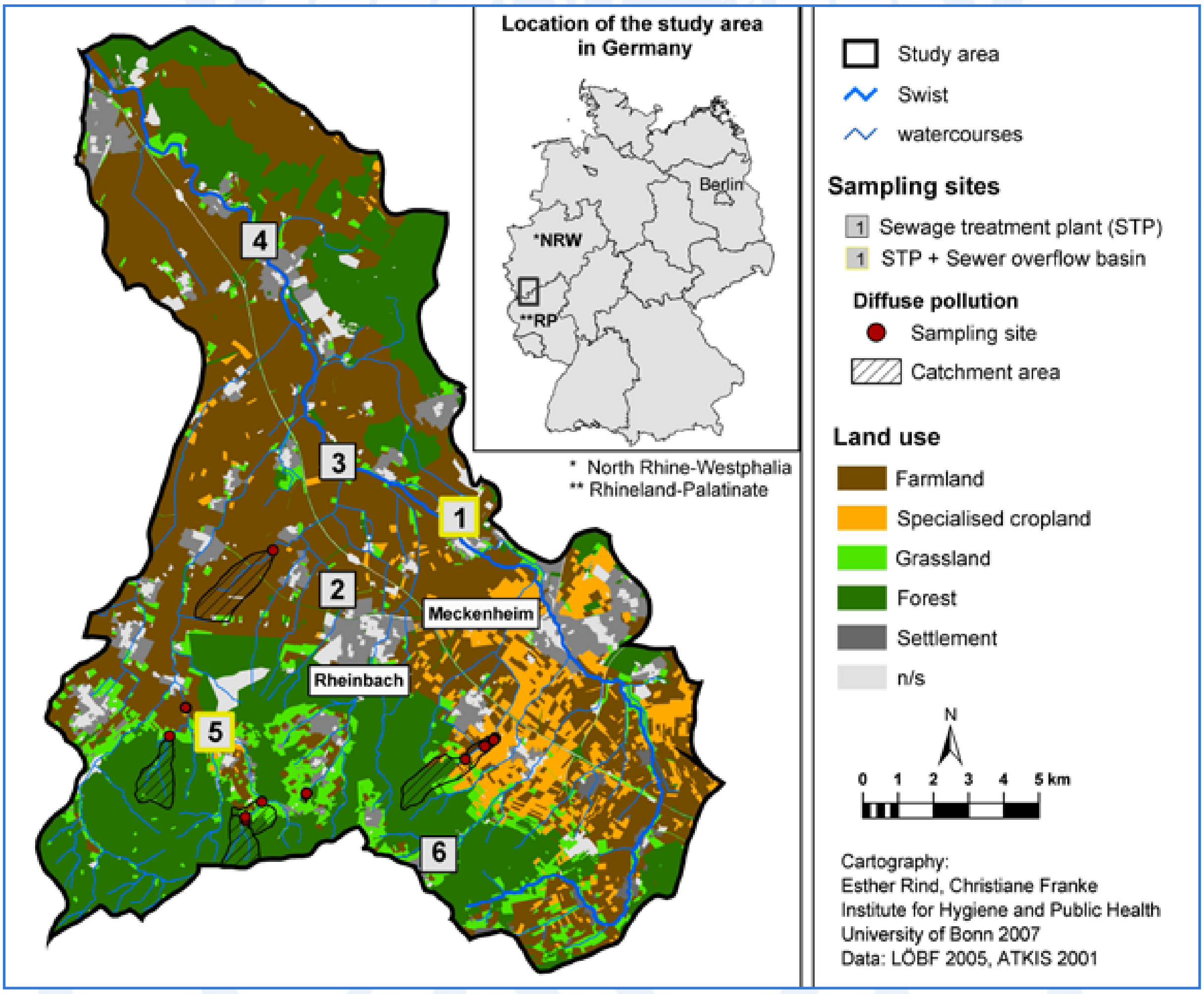

Figure 1: Study area and sampling sites

Study Area

The study area is located in the south-west of Germany, in the provinces of North Rhine-Westphalia (NRW) and the Rhineland-Palatinate, and covers the 289km² catchment area of the river Swist (length: 43.6 km) (Figure 1). The area is characterized by a high proportion of agricultural land use, and the mild climate is advantageous for intensive farming, including the cultivation of fruit and vegetables. The sewage treatment plants investigated differ in size and treatment procedures, and mainly process municipal wastewater. According to results from a biological water qualification undertaken by the environmental authority of NRW in 2001, the Swist is moderately polluted, and some of its tributaries are critically polluted.

Swist 1

This subproject measures the microbiological load of untreated municipal wastewater discharged from six sewage treatment plants in the catchment area of the river Swist. Further, it evaluates the microbiological removal efficacy of different treatment systems, and assesses the impact of the discharged treated wastewater on the receiving watercourse. The six facilities investigated vary in size and treatment procedures, and it is anticipated that this significantly impacts the microbiological quality of the water discharged into the receiving water course. Influent and effluent samples were taken to analyse various chemical, bacterial, and parasitological parameters.

Swist 2

The impact of combined sewage overflow basins on the water quality of the river Swist is explored during heavy rainfall events. In order to ensure real-time water sampling, an automatic sampling device was installed. The capacity of the investigated basins differs in size ranging from 312m³ to 23,392m³. Microbiological analysis covers for example, *E. coli*, total coliform bacteria, *Cryptosporidium* oocysts and *Giardia* cysts.

Swist 3

Since both of the other projects focus on the contamination from point sources, this project investigates diffuse sources of pollution from different land use types; and also combines the results of the entire project. Water samples were taken regularly and during heavy rainfall events, using a sampling device specially developed to collect corresponding surface water and subsurface-runoff samples. For this project, it is particularly relevant to assess the microbiological effluent from different land use types; thus, samples were taken at five, relatively homogenous sampling sites located in a forest, on pastureland, farmland, specialised cropland, and at the outlet of a fishpond. Finally, this project quantifies the relative contribution of each source of contamination and provides a comprehensive microbiological hazard characterization of the catchment area.

Intermediate Results

Intermediate results indicate that the sewage treatment plants investigated have a significant continuous impact on the receiving watercourse which mainly depends on the size and capacity of each facility rather than on specific characteristics of the catchment area. The microbial contribution of both of the combined sewer overflow basins is, however, discontinuous and distinctly exceeds the microbiological loads of the investigated sewage treatment plants. The effect of diffuse pollution and the overall contribution of each source of contamination have yet to be quantified. Further results from this project are about to be published.

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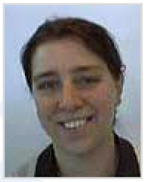

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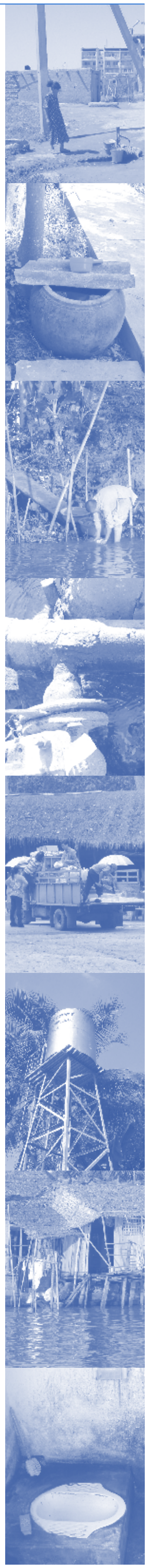

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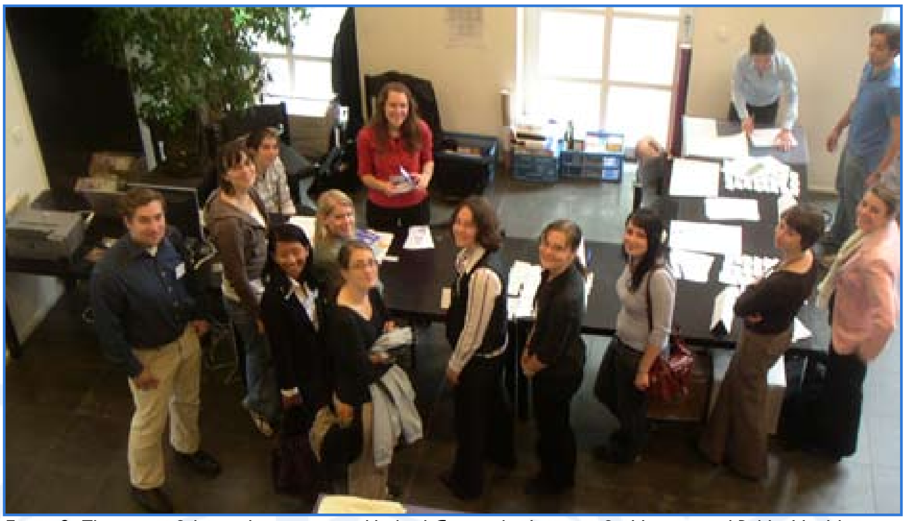


Figure 2: The team of the working group on Medical Geography, Institute for Hygiene and Public Health. Source: Thomas Kistemann

The 12th International Medical Geography Symposium with the theme "Changing Geographies of Public Health" took place from 9-13 July 2007 in Bonn, Germany. It was jointly organized by the Working Committee for Medical Geography of the German Society for Geography, the Working Group on Medical Geography of the Institute of Hygiene and Public Health at the University of Bonn (Thomas Kistemann) and the Department of Geo-Information at the University of Applied Sciences in Berlin (Juergen Schweikart).

The International Medical Geography Symposium is the world's most important Medical Geography biennial event. For the first time, this week-long symposium took place outside North America and Great Britain. Traditionally, the IMGS is attended by an international audience of scientists and public health practitioners.

About 200 participants from 26 countries – in particular from the UK, Canada and New Zealand in addition to Germany – came to Bonn in order to discuss important issues in the field of Medical Geography. They were welcomed by the Rector of the University of Bonn, Prof. Dr. Matthias Winiger and by the Chair of the IGU Working Group on Health and Environment, Prof. Mark Rosenberg (Queen's University, Ontario). The impressive keynote speeches were given by Roger Aertgeerts, (WHO European Centre for Environment and Health, Rome Regional Office) about the regional work of the WHO, and by Andreas Rechkemmer (Executive Director, International Human Dimensions Programme on Global Environmental Change) about global environmental change and health as important issues for sustainable development.

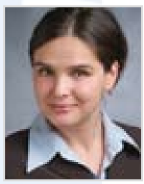
Figure 1: Roger Aertgeerts (Regional Advisor, Water and Sanitation, WHO Regional Office for Europe) held the first keynote speech at the IMGS 2007 in Bonn
Source: IHPH

There were 37 paper sessions including the presentation of 150 scientific papers. The event took place in the University Club, situated in the heart of the city and directly on the River Rhine. Its focuses covered new concepts and studies in many subjects including: globalization and public health; the epidemiology of socially and environmentally determined infectious diseases, such as malaria, HIV or tuberculosis; GIS applications and spatial data analysis; health care of the elderly, children and the disabled; therapeutic places; child and adolescent health; the epidemics of smoking and obesity; health perceptions and beliefs; health-affecting inequities as well as social capital and health. The range of contributions and discussions makes it clear that currently human geographical topics and approaches predominate over the more scientifically-oriented workings and that the cultural turn in Medical Geography / Geography of Health intensely affects the objects of research, research issues and methods as well as the interpretation of research outcomes.

In addition to the scientific programme, a day-long field trip by boat was organized to show delegates the historic and economic development of the River Rhine. This was also an opportunity for intensive discussions.

The 13th International Symposium in Medical Geography will take place at McMaster University in Canada in 2009.

More information about the IMGS 2007, the complete conference programme and the abstracts of the articles can be found on www.imgs2007.de.



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At a Glance

Annual Meeting of AK MedGEO:

On 4 October 2007, the Medical Geography Research Group (AK MedGEO) held their annual meeting within the framework of the 56. Annual Congress of the German Association for Geography in Bayreuth, Germany. The key theme 'Health for all: Contributions of Geography' has been discussed and illustrated with 3 presentations of the participants. Next year, the annual conference of the AK MedGEO will be held from 9-11 October 2008 together with the working group on Spatial Statistics of the German Region at the 'Haus Humboldtstein' in Remagen, Germany. For further information please contact http://www.med-geo.de.

IWA Symposium "WaterMicro 2007" - Japan

From 9-14 September 2007, the biennial symposium of the IWA specialist group on health-related water microbiology took place in Tokyo, Japan. Around 270 water microbiologists and scientists working on water technology or hygiene from over 40 countries around the world presented their research projects and inventions. The venue was hosted by the University of Tokyo and the conference participants benefited from outstanding Japanese hospitality and the inspiring city of Tokyo.

The multiple oral and poster presentations offered a broad overview on current research in health-related water microbiology and risk assessment. After long and interesting working days, the evenings were used to explore Tokyo without forgetting sushi and karaoke.

During the WHO seminar "Testing the Waters: Realising the Potential of Today's Technologies to Guide Better Water Management for Health", scientists, practitioners and representatives of business debated the requirements and possibilities for simple affordable water tests. A field trip to a recently completed waterwork and the Edo Tokyo Museum which exhibits examples of ancient water technology concluded the meeting.

A list of lectures and posters can still be downloaded from the conference website. See http://watermicro2007.jp/ for further information. The next meeting of the specialist group will be hosted by Greece and will take place in May 2009.

The WHOCC Operational Unit
wishes the reader of the
"Water and Risk" Newsletter
Merry Christmas and a Happy New Year 2007!

Events on Water, Health and Risk Communication:

March 2008:
International Conference on Integrated Water Resources Management (IWRM): Lessons from Implementation in Developing Countries and the 2nd Africa Regional Meeting of the IHP National Committees, 10.03. - 12.03.2008, Cape Town, South Africa
http://www.wrc.org.za/downloads/events/IWRM-IHP_ConfCall1_March08.pdf

Mai 2008:
Risk Analysis 2008: 6th International Conference on Computer Simulation Risk Analysis and Hazard Mitigation, 05.05. – 07.05.2008, Cephalonia, Greece
http://www.wessex.ac.uk/conferences/2008/risk08/index.html

The Sanitation Challenge, 19.05. - 21.05.2008, Wageningen, Netherlands
http://www.sanitation-challenge.wur.nl/UK/

July 2008:
4th IWA Young Water Professionals Conference, 16.07. - 18.07.2008, Berkeley, California, USA
http://www.iwa-ywpc.org/templates/ld_templates/layout_654239.aspx?ObjectId=654242

September 2008:
IWA World Water Congress and Exhibition, 07.09. - 12.09.2008, Vienna, Austria
http://www.iwa2008vienna.org

October 2008:
IHDP Open Meeting 2008: 7th International Science Conference on the Human Dimensions of Global Environmental Change, 16.10. - 19.10.2008, New Delhi, India
http://www.openmeeting2008.org/

Erratum in "Water & Risk" Vol.11, July 2007
In the last publication we erroneously mentioned that the Ministry of Environment in Berlin, rather than the Federal Environmental Agency in Berlin is designated as the WHO Collaborating Centre for Air Quality Management & Air Pollution.

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