Notes d'Aigua Agbar

# The Global Sanitation Crisis Why Should 5,000 Dead Children per Day be a Taboo Subject? Arno Rosemarin

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# Notes d'Aigua Agbar

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The Global Sanitation Crisis

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Why is sanitation an unending, last chapter in human development? Taboos are something of the past, one might say. With the power of the global media, nothing has managed to stay hidden in the hush-hush closets of the past – incest, homosexuality, paedophilia, alcoholism, drug abuse, mental illness, dyslexia and autism are all out in the open and humanity has attained new tools to cope.

But the hyper taboo subject of human excreta is still hidden in the closet – and this mega secret is also causing great human suffering.

# 1. Humans and Their Connection with Nature

This question of sanitation really has to do with our link with nature. Urbanization has largely disconnected humans from natural cycles. Most urbanites know nothing about where their water supply comes from or where it goes after use. When we in the global North happen to suffer from "tourist diarrhoea" while visiting exotic countries, there is basically no understanding of why. After all, we wouldn't want to return if the explanation was faecal contamination of water and food.

Let's face facts: we are primate animals and if we expect to remain thriving on this planet for several generations in the future, we might as well acknowledge our vulnerable disposition as humans (and primates) now, before it's too late. But this developmental chapter on sanitation is far from being concluded – and there is no beacon yet to lead us through the darkness of ignorance and apathy.



Source: A. Rosemarin. 2005. Sustainable sanitation and water in small urban centres.

Although all creatures excrete by-products as part of their natural cycles, humans have managed to turn this into a very taboo subject. As a result, there is a serious lack of political, institutional and intellectual attention paid to this issue. And more than half the world is grossly suffering for this. Sanitation is first about human behaviour. But people don't normally want to talk about toilets, excreta, urine, faeces, etc., let alone hand-washing. The last meaningful discussion people had about this subject may have been during their last diaper change at 3 years old. And from then on, they're basically on their own.

# Principle of closing the nutrient and water ecocycles

Ecosan solutions for cities include decentralised systems allowing for more flexibility and choice of possible options. This means that a variety of resilient technologies can be provided depending on the immediate community requirements and ability to finance. Source separation of urine, faeces, grey water, kitchen organics and solid wastes is the ideal goal allowing for relatively smaller volumes of higher quality materials that can then be reused following treatment or processing.

Ideally, ecosan systems enable an efficient recovery of all nutrients, trace elements and energy contained in household wastewater and organic waste and their reuse in agriculture.

Humans produce about 500 litres of urine and 50 litres of faeces per year and this provides enough fertiliser to grow crops such as wheat or maize over a surface area of 300-400 sq m. Urine, yellow water, contains approximately 90% of the total nitrogen, 55% of the total phosphorus and a substantial portion of the potassium contained in human bodily waste matter. These nutrients are in a form directly available to plants, and can be used as effectively as some mineral fertilisers.

**Human faeces** obtained after separation, show valuable soil improvement qualities (in particular improving the structure of the soil and raising its water retention capacity). If required, they can be treated together with the organic fraction of solid waste and/or animal manure and in a way suited to local conditions (climate, power demand, socio-cultural acceptance etc.) using the processes of aerobic composting, dehydration, stabilisation, or anaerobic digestion. This allows the organics and nutrients contained in faeces to be used in a concentrated and hygienically safe form as a dry fertiliser, compost or a fluid fertiliser. Depending on the type of treatment, energy can be produced if necessary in the form of biogas after anaerobic digestion.

Wastewater generated as a result of domestic processes such as laundry, dishwashing or bathing is known as **greywater**. This makes up the largest proportion of the total wastewater flow from homes, but normally has a low nutrient content. It can therefore be fairly easily treated to a high quality using techniques such as constructed wetlands, ponds, bio-films or activated sludge processes. For high-tech applications where recycling water for drinking purposes is required, more sophisticated treatments, such as membrane filtration or activated charcoal filters, may be added. Treated grey water can be put to particularly good use in agricultural irrigation (especially in water scarce regions), but may also be used for groundwater recharge, industrial or urban reuse or discharged into surrounding watercourses.

Source: UNESCO/IHP and Deutsche Gesellschaft für Technische Zusammenarbeit (GTZ) GmbH. 2006. Capacity Building for Ecological Sanitation. Concepts for Ecologically Sustainable Sanitation in Formal and Continuing Education, UNESCO Working Series SC-2006/WS/5.

# **2**. The Hygiene-Sanitation Nexus

When you were taught about hygiene in school why didn't the word faeces come into the picture? Why are facts about the epidemic diseases spread through faecal-oral contamination not properly explained? Without a dialogue on hygiene and sanitation, the world will remain in a fix.

# **Definition of Sanitation**

The World Health Organization (WHO) defines sanitation as group of methods to collect human excreta and urine as well as community waste waters in a hygienic way, where human and community health is not altered. Sanitation methods aim to decrease the spreading of diseases by adequate waste water, excreta and other waste treatment, proper handling of water and food and by restricting the occurrence of the causes of disease.

Sanitation is a system to increase and maintain a healthy life and environment. Its purpose is also to assure people enough clean water for washing and drinking purposes. Typically health and hygiene education is connected to sanitation in order to make people recognize how health problems originate and how to improve sanitation through their own actions. An essential part of sanitation is building and maintaining education on sewerage systems, dishwashing and toilet facilities.

In defining the United Nations' Millennium Development Goals (MDG) two terms are used as regards sanitation: improved sanitation or broader concept basic sanitation.

Developed sanitation services are defined in the WHO's and UNICEF's Joint Monitoring Program (JMP) "Global water supply and sanitation assessment 2000".

The following methods are considered to be developed sanitation services:

- public sewers
- septic tanks
- pour-flush latrines
- pit latrines with slab
- ventilated improved pits
- composting (ecosan) latrines

The following sanitation methods are considered to be undeveloped:

- service or bucket latrines (where untreated excreta are manually removed)
- public latrines
- open latrines
- excretion to environment

Basic sanitation was defined in the UN's World Summit on Sustainable Development (WSSD) in 2002.

## By definition basic sanitation consists in the:

- development and implementation of efficient household sanitation systems
- improvement of sanitation in public institutions, especially in schools
- promotion of safe hygiene practices
- promotion of education and outreach actions focused on children, as agents of behavioural change
- promotion of affordable and socially and culturally acceptable technologies and practices
   development of innovative financing and partnership mechanisms
- integration of sanitation into water resources management strategies in a manner which does not have a negative impact on the environment

Source: Tampere Polytechnic, University of Applied Sciences. 2006. A Guide to Sanitation and Hygiene for Those Working in Developing Countries.

The successful fight to eliminate polio was done through the wonders of modern medicine and vaccination. But did we actually learn anything from this? What child or parent was informed about preventing other serious viral diseases, through improved hygiene practices and properly working toilets? Did anyone learn more about these threatening diseases that also follow the faecal-oral route: giardiasis, hepatitis A and E, bacillary dysentery, typhoid fever, vibrio parahaemolyticus infections, or cholera? Why are beaches closed to swimming in most cities of the world? What is tourist diarrhoea anyway? How is avian influenza spread? Do our sanitation systems ensure containment and sanitization to reduce the risk of disease?

Pathogens and parasites found in human excreta, if ingested, can result in a variety of illnesses, including diarrhoea leading to malnutrition. If left untreated, these illnesses can result in poor growth, iron deficiency (anaemia), vitamin A deficiency, and leave the body's immune system weakened and susceptible to more serious infections.

Not all pathogens and parasites result in death, but the resulting malnutrition creates persistent poor health and a predisposition to other diseases and death from such other causes. Safe sanitation is an imperative for any society and its people to function sustainably.

# 3. The Suffering You Never Hear About

But the key facts are still taboo. The fact that between five and six thousand children die every day in the world due to water-borne diseases linked to a lack of basic sanitation; that 2.6 billion people lack basic sanitation – yes that's 2.6 billion people excreting about 4 million tons of urine and faeces per day (90% of which is urine by the way) in the open; that 700 million people in 50 countries eat food from crops irrigated with



untreated sewage;<sup>1</sup> and that there are 60 million DALYs<sup>2</sup> lost from diarrhoea every year. What about the fact that 3.5 billion people are infected with helminth worm parasites<sup>3</sup> – a well-kept and dangerous secret? This should be a big deal – at least as big as HIV/AIDS, TB or malaria. But the global sanitation crisis is not a general knowledge thing. There is no AI Gore here, no political leader has decided to take this one on. The crisis is handled on a piecemeal basis with lim-



ited public oversight. So where are Greenpeace and WWF? The welcome fact that 2008 has been declared by the UN as International Year of Sanitation has yet to hit the streets. It's all a big secret.

When Sweden's King Carl XVI Gustav opened the Swedish parliament in September this year, he mentioned that there were only 7-8 years left until 2015 when the MDGs (Millennium Development Goals) should be met. The MDGs address the many problems linked to today's world poverty, from disease and malnutrition to lack of water and sanitation, illiteracy, and so on. But what most

<sup>&</sup>lt;sup>1</sup> IDRC. 2004. *Wastewater Use in Irrigated Agriculture: Confronting the Livelihood and Environmental Realities.* <sup>2</sup> Disability Adjusted Life Years. One DALY can be thought of as one lost year of 'healthy' life and the burden of disease as a measurement of the gap between current health status and an ideal situation where everyone lives into old age free of disease and disability.

<sup>&</sup>lt;sup>3</sup> UNESCO. 2006. Water A Shared Responsibility. Berghahn Books

# The International Year of Sanitation 2008

The UN Department of Economic and Social Affairs is coordinating IYS, in collaboration with stakeholders including UNICEF, the World Health Organization, UN-Habitat, the Water Supply and Sanitation Collaborative Council, the UN Environment Programme, the UN Development Programme, the UN Secretary-General's Advisory Board on Water and Sanitation, non-governmental organizations, the private sector and academia.

A Sanitation Task Force has been formed to lead activities among the several member organizations of UN-Water undertaking IYS activities and initiatives in both the developed and developing worlds.

To find out what you can do to help, please contact: sanitation@un.org Website: http://esa.un.org/iys/

# The five key messages of the International Year of Sanitation 2008 are:

## 1. Sanitation is vital for health.

A lack of toilets; the failure to safely confine excreta away from hands, feet, drinking water and eating utensils; a lack of hygiene (in particular not washing hands after defecation) can lead to the transmission of diarrhoeal disease. Provision of sanitation is important for the prevention of illness of all kinds, and saves the huge costs of medical treatment.

## 2. Sanitation contributes to social development.

Where sanitation facilities and hygienic behaviour are present, rates of illness drop; malnutrition in children is reduced; more children (especially girls) attend school and learn more; and women's safety and dignity are improved.

# 3. Sanitation is a good economic investment.

Improved sanitation has positive economic benefits. Livelihoods and employment opportunities are enhanced; the cost of illness and lost productivity to the community and to the nation is reduced.

# 4. Sanitation helps the environment.

Improved disposal of human waste promotes environmental cleanliness and protects streams, rivers, lakes and underground aquifers from pollution. Safely composted, excreta can be used as fertilizer.

# 5. Sanitation is achievable.

Tried and tested appropriate technologies, programme models and people-centred approaches can be rolled out where there is the will to do so. The cost of meeting the Sanitation Millennium Development Goal – US\$9.5 billion a year to 2015 – is affordable.

Source: International Year of Sanitation. 2008. UN-Water Tackling a global crisis.

of the world doesn't know or remember is that the sanitation target – to halve between 1990 and 2015 the proportion of people lacking sanitation – was in fact forgotten when the MDGs were launched in 2000. An addendum was made in 2002 at the UN WSSD meetings in Johannesburg, very appropriately: this is the largest single MDG of all, dwarfing water scarcity and hunger by almost 3-fold.



# **Millennium Development Goals**

Goal 1: Eradicate extreme poverty and hunger <i>Target 1:</i> Halve, between 1990 and 2015, the proportion of people whose income is less than one dollar a day <i>Target 2:</i> Halve, between 1990 and 2015, the proportion of people who suffer from hunger
<b>Goal 2:</b> Achieve universal primary education <i>Target 3:</i> Ensure that, by 2015, children everywhere, boys and girls alike, will be able to complete a full course of primary schooling
<b>Goal 3:</b> Promote gender equality and empower women <i>Target 4:</i> Eliminate gender disparity in primary and secondary education, preferably by 2005, and in all levels of education no later than 2015
<b>Goal 4:</b> Reduce child mortality <i>Target 5:</i> Reduce by two-thirds, between 1990 and 2015, the under-five mortality rate
<b>Goal 5:</b> Improve maternal health <i>Target 6:</i> Reduce by three-quarters, between 1990 and 2015, the maternal mortality ratio
<b>Goal 6:</b> Combat HIV/AIDS, malaria and other diseases <i>Target 7:</i> Have halted by 2015 and begun to reverse the spread of HIV/AIDS <i>Target 8:</i> Have halted by 2015 and begun to reverse the incidence of malaria and other major diseases
<ul> <li>Goal 7: Ensure environmental sustainability</li> <li><i>Target 9:</i> Integrate the principles of sustainable development into country policies and programmes and reverse the loss of environmental resources</li> <li><i>Target 10:</i> Halve, by 2015, the proportion of people without sustainable access to safe drinking water and sanitation</li> <li><i>Target 11:</i> By 2020, to have achieved a significant improvement in the lives of at least 100 million slum dwellers</li> </ul>
<ul> <li>Goal 8: Develop a global partnership for development</li> <li><i>Target 12</i>: Develop further an open, rule-based, predictable, non-discriminatory trading and financial system [Includes a commitment to good governance, development, and poverty reduction – both nationally and internationally]</li> <li><i>Target 13</i>: Address the special needs of the least developed countries [Includes: tariff and quota free access for LDC exports; enhanced programme of debt relief for HIPC and cancellation of official bilateral debt; and more generous ODA for countries committed to poverty reduction]</li> <li><i>Target 14</i>: Address the special needs of landlocked countries and small island developing states</li> </ul>
<ul> <li>(Inrough the Programme of Action for the Sustainable Development of Small Island Developing States and the outcome of the 22nd special session of the General Assembly)</li> <li><i>Target 15:</i> Deal comprehensively with the debt problems of developing countries through national and international measures in order to make debt sustainable in the long term</li> <li><i>Target 16:</i> In co-operation with developing countries, develop and implement strategies for decent and productive work for youth</li> <li><i>Target 17:</i> In co-operation with pharmaceutical companies, provide access to affordable, essential drugs in developing countries</li> </ul>
gies, especially information and communications

Let's face facts: many more children die from diarrhoea caused by lack of sanitation and hygiene than from AIDS.<sup>4</sup> But how many people attended the last AIDS conference in Toronto – a whopping 25,000! Has there ever been a similar conference on the sanitation crisis? The sad answer is no. Sanitation seminars and conferences are not designed for general public awareness but for specialized engineers and most of these meetings deal with high-end technologies. Let's face it, having access to a functional and safe toilet is still a luxury for about half the world today.



# 4. Some Basic Facts

Some more basic facts are important to consider. The average adult produces only about 500 litres of urine and 50 litres of faeces per year. Urine from healthy bodies is basically sterile. Faeces, on the other hand, are a source of pathogens and require containment and treatment. With the advent of the flush toilet some

<sup>&</sup>lt;sup>4</sup> Stockholm Environment Institute. 2006. Interview with Prof. Hans Rosling. www.sanitet.nu.





100 years ago, significant improvements in hygiene and health, odour control, collection and transport were achieved, and a new behaviour called "flush and forget" was born. With water toilets the 550 litres became 15,000 to 20,000 litres per person per year. In addition, water used in kitchens and bathrooms and even storm water drainage were added into the same collector pipes.

A sewage treatment plant today needs to treat anywhere from 50,000 to 100,000 litres per person per year. A sophisticated centralized sewage treatment plant like the one at Henriksdal in Stockholm handles around 3,000 litres a second.

But this standard of a sanitation collector and treatment system is a rarity in the world. Cities in developing countries cannot afford these investments and even if systems are built with grants from donor countries, the maintenance and operational challenges are enormous, requiring expertise and equipment that are not yet available.

Only about 1.1 billion people in the world have access to conventional sewage systems and of these about 30% receive advanced end-of-thepipe treatment.<sup>5</sup> Some 3 billion people have access to other types of toilet like pit latrines (hide and forget) and pour-flush/cess pits, which leaves about 2.6 billion people today with no access to any basic sanitation services.<sup>6</sup> This group gain the classification 'open defecators'.







# 5. Dysfunctional and Non-Existent Sewage Treatment Systems and the Bottled Water Boom

Brussels only began treating all its sewage last year, while Athens began when they held the Olympics in 2004 after having built an offshore island, and Milan, after 40 years of discussion, got their final plant on line in 2006. Still, many countries in Europe lag behind in wastewater treatment with coverage in Belgium and Portugal at 40%, and Greece, Italy and Poland running at 60%.

Sanitation in	n the	Commonwealth	of	Inde	pendent	States
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	1999 Population (thousands)				2004 Population (thousands)					
Urban	Total	Served	Unserved	% Served	% house connections	Total	Served	Unserved	% Served	% house connections
Rural	184.230	169.833	14.397	92	81>	177.776	163.117	14.659	92	82
Total	97.259	60.911	36.268	63	21>	100.488	67.087	33.401	67	19
lotal	281.489	230.489	50.665	82	60>	278.264	230.204	48.060	83	59

Source: Roger Aertgeerts, April 2008, Water21, p.46.

# European Union. Third Ministerial Conference on Environment and Health Protocol on Water and Health. 16-18 June 1999

Signed by:

Albania, Ármenia, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Georgia, Germany, Greece, Hungary, Iceland, Italy, Malta, Monaco, the Netherlands, Norway, Poland, Portugal, Romania, The Russian Federation, Slovakia, Slovenia, Spain, Sweden, Switzerland, Ukraine and the United Kingdom.

Committing themselves to take all appropriate measures for the purpose of achieving:

- Adequate supplies of wholesome drinking water which is free from any micro-organisms, parasites and substances which, owing to their numbers or concentrations, constitute a potential threat to human health. This shall include the protection of water resources which are used as sources of drinking water, treatment of water and the establishment, improvement and maintenance of collective systems.
- Adequate sanitation of a standard which sufficiently protects human health and the environment.
- Effective protection of water resources used as sources of drinking water and their related water ecosystems, from pollution from other causes, including agriculture, industry and other discharges and emissions of hazardous substances.
- Adequate safeguards for human health against water-related disease arising from the use of water for recreational purposes or for the production of fish from aquaculture, from the water in which shellfish are produced or from which they are harvested, from the use of waste water for irrigation or from the use of sewage sludge in agriculture.
- Effective systems for monitoring situations likely to result in out-breaks or incidents of water-related diseases and for responding to such outbreaks and incidents and the risk of them.

Source: Third Ministerial Conference on Environment and Health, European Environment and Health Committee (EEHC), www.euro.who.int/document/e69046.pdf. 1999. Declaration.

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Margot Wallström tried to expose this issue within the EU when she was Environment Commissioner at a 'name-and-shame' seminar in Brussels. Lack of proper sewage treatment in southern European cities has never become a major issue. The media, the public and our politicians have not made it an issue. But London's sewage collection system, built in the mid-1800s for 3 to 4 million people, is grossly under-dimensioned, so raw sewage is bypassed into the River Thames every time there are heavy rains – that should set alarm bells ringing for our aging cities.



Canada announced in September that it needs to upgrade its 4,600 cities with proper sewage treatment. This will require added funds of C\$33 billion dollars over the next 7 years.<sup>7</sup> If we want the convenience to flush and forget, a lot of money will have to be spent on infrastructure and operations and maintenance. Public sewage treatment plants in Japan consume 6.3 billion kWh of electricity and annually produce



350 million tons of sludge.<sup>8</sup> Since 1972 Americans have spent US\$70 billion on sewage treatment plants,<sup>9</sup> but are today emitting nearly the same amount of organic waste openly into natural streams, because sewage creation has grown as fast as sewage treatment.

People will pay any price to avoid using tap water, and so the bottled water industry is booming, especially in North America, Europe, parts of Asia and Brazil. World consumption was 154 billion litres in 2004.<sup>10</sup> Our lack of confidence in drinking water may have something to do with the fact that only about 80 major European cities mainly in the north of Europe have advanced sewage treatment. Other cities have either less advanced or no treatment at all and at least 35 major cities are still waiting for a system.<sup>11</sup> But the real insult is that the amount moneyed people spend on bottled water - about US\$100 billion per year - is around three times the investment needed to meet the MDG targets on water and sanitation.



The bottled water boom is an indication of how far this problem has gone. Water is just not potable in and around the cities of world. And in order to make drinking water bacteriologically safe, high chlorination levels are used, often causing taste problems, and even the formation of organochlorines that are carcino-

<sup>&</sup>lt;sup>7</sup> http://www.cnw.ca/fr/releases/archive/September2007/24/c4435.html

<sup>&</sup>lt;sup>8</sup> Katsuyuki, N. et al. 2003. "Life Cycle Inventory Analysis of a Sewage Treatment System Using Statistics"

Kagaku Kogaku Ronbunshu. 29(5) p. 640-645.

<sup>°</sup> http://www.sustainabilityinstitute.org/dhm\_archive/index.php?display\_article=limitsed

<sup>&</sup>lt;sup>10</sup> http://www.earth-policy.org/Updates/2006/Update51.htm

<sup>&</sup>lt;sup>11</sup> EU 2001. 2nd Forum on Implementation and Enforcement of Community Environmental Law: Intensifying Our Efforts to Clean Urban Wastewater.

genic.<sup>12</sup> The problem is worsened since advanced sewage treatment is not common in the developing world and is not a given priority in the industrial world. These systems are too expensive for most municipal governments to afford; the issue is not visible to the public; and the enormous taboo surrounding human excreta keeps this out of the political and media arenas. The obvious question is: why do we continue to spend billions of dollars on bottled water and not on sanitation systems?

# 6. What about the Booming Economies of China and India?

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More than half of China's 1.3 billion population, including 278 cities, live without any form of sewage treatment, it was officially reported in August 2007. Eight of those cities have populations of more than 500,000. According to the work program of the Ministry of Construction and the national 11th five-year economic plan, the Chinese government will be investing RMB330 billion (US\$41.3 billion) in the construction of new sewage treatment and recycling facilities during the 2006–2010 period.

What about India where 67% of the total population, and 78% in rural areas, lacks access to basic sanitation?<sup>13</sup> In a country that has legislated against the act of 'manual scavenging' or more specifically the emptying (and carrying, often atop one's head) of bucket latrines, one would think that hygiene awareness and sanitation would be a very high public priority. But access to toilets or pit latrines is very low, with an estimated 650 million open defecators.<sup>14</sup> For India to achieve the MDG target for sanitation would require an additional \$6 billion per year until 2015.<sup>15</sup>

<sup>&</sup>lt;sup>12</sup> Villanueva, C.M. et al. 2007. "Bladder Cancer and Exposure to Water Disinfection By-Products through Ingestion, Bathing, Showering, and Swimming in Pools". *American Journal of Epidemiology* no. 165, p. 148-156.

<sup>&</sup>lt;sup>13</sup> WHO/UNICEF. 2006. Joint Monitoring Programme, p. 47.

<sup>&</sup>lt;sup>14</sup> Srivastava, V. 2003 "Water and Sanitation Program - South Asia (India)", The World Bank. Presentation at World Bank Water Week, March.

www.worldbank.org/html/fpd/water/waterweek2003/Presentations/Session%209%20-%20Sanitation%20&%20Hygiene/Igniting\_Change.pdf

<sup>&</sup>lt;sup>15</sup> WaterAid India. 2005. "Drinking Water and Sanitation Status in India: Coverage, Financing and Emerging Concerns".

#### What is urine diversion?

The major difference of urine diversion compared to other sanitation systems is that a urine-diverting toilet has two outlets and two collection systems: one for urine and one for the faeces, in order to keep these excreta fractions separate. Other than that, the system contains only conventional technical construction material/devices, even if they might be used in completely or partly new ways. The urine-diverting toilets can be either water-flushed or dry, they come in pedestal as well as squatter models with models suitable both for those using water as well as tissue or other solid objects for anal cleansing. There are ways of achieving urine diversion both in rural settings as well as in urban areas. Research and experience show that the systems function in all these different settings, provided that they are properly installed, operated and maintained.

Urine diversion in itself shall be seen as a complementary technology since the other wastewater flows (faeces fraction, greywater not mixed with stormwater) also need to be handled and treated, see figure below.

The faecal fraction will, due to its possible high content of pathogens constitute the main hygienic risk. This aspect needs to be accounted for when designing/planning a sanitation system, especially if the faeces are also intended for reuse as a fertilizer. An effective treatment to reduce the pathogen content and safe handling procedures is of importance to manage health risks. Urine diversion can be considered a component that can improve the sustainability' of sanitation systems in several different kinds of sanitation infrastructural contexts.

<sup>1</sup> The implementation of the concept of sustainable development is symbolized by a direction indicator rather than a specific state. It is our belief that sanitation systems, including related services, which protect and promote human health and do not contribute to environmental degradation or depletion of the resource base and are technically and institutionally appropriate, economically viable and socially acceptable will take us in the direction of sustainable development.



#### Greywater

- Represents appr. 20-200 L/p, day.
- Contains appr. 0,3-0,4 Kg N and 0,07-0,37 Kg P per pe and year.
- Chemical/microbial quality reflects the habits and the use of chemicals by the household.

## Urine

- Represents appr. 1,5 L/p, day.
- One person excretes approximately 2-4 Kg N and 0,2-0,37 Kg P per years in urine.
- Extremely low metal content and low content of pathogens.

#### Feces

- Represents appr. 0,15 Kg/p, day.
- One person excretes approximately 0,3-0,55 Kg N, 0,1-0,2 Kg P, and
- Low metal content and high pathogen content.

Note: P for Phosphorus and N for Nitrogen

Urine diversion – flows and content of different wastewater fractions. Redesigned picture from original by Palmcrantz & Co.

Source: EcoSanRes Publication Series, Report 2006-1, Urine diversion: One Step Towards Sustainable Sanitation.

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# 7. Sustainable Sanitation is an Absolute Necessity

The era of sustainable development for the sanitation issue has yet to come. Because sanitation is the final chapter in human development, and the issue is characterized by a high level of dysfunction, we still have a long way to go to develop innovative, affordable and sustainable solutions. Some progress is

# The World Health Organization's (WHO) Guidelines

The third edition of the WHO's *Guidelines for the Safe Use of Wastewater, Excreta and Greywater in Agriculture and Aquaculture* is published in four volumes, addressing, respectively: policy and regulatory aspects, wastewater use in agriculture, wastewater and excreta use in aquaculture and excreta and greywater use in agriculture.

The volume on *Guidelines for the Safe Use of Excreta and Greywater* describes the present state of knowledge regarding the impact of excreta and greywater use in agriculture on health of product consumers, workers and their families and local communities. Health hazards are identified for each group at risk, and appropriate health protection measures to mitigate the risks are discussed.

The primary aim of the guidelines is to maximize public health protection and the beneficial use of important resources. The purpose of this volume is to ensure that the use of excreta and greywater in agriculture is made as safe as possible so that the nutritional and household food security benefits can be shared widely in affected communities. Thus, the adverse health impacts of excreta and greywater use in agriculture should be carefully weighed against the benefits to health and the environment associated with these practices. Yet this is not a matter of simple tradeoffs. Wherever excreta and greywater use contributes significantly to food security and nutritional status, the point is to identify associated hazards, define the risks they represent to vulnerable groups and design measures aimed at reducing these risks.

This volume of the guidelines is intended to be used as the basis for the development of international and national approaches (including standards and regulations) to managing the health risks from hazards associated with excreta and greywater use in agriculture, as well as providing a framework for national and local decision-making.

The information provided is applicable to the intentional use of excreta and greywater in agriculture, but it should also be relevant to their unintentional use.

The guidelines provide an integrated preventive management framework for safety, applied from the point of household excreta and greywater generation to the consumption of products grown with treated excreta applied as fertilizers or treated greywater used for irrigation purposes. They describe reasonable minimum requirements of good practice to protect the health of the people using treated excreta or greywater or consuming products grown with these for fertilization or irrigation purposes and provide information that is then used lo derive health-based targets. Neither the minimum good practices nor the health-based targets are mandatory limits. The preferred approaches adopted by national or local authorities towards implementation of the guidelines, including health-based targets, may vary depending on local social, cultural, environmental and economic condition as, as well as knowledge of routes of exposure, the nature and severity of hazards and the effectiveness of health protection measures available.

The revised *Guidelines for the Safe Use of Wastewater, Excreta and Greywater* will be useful to all those concerned with issues relating to the safe use of wastewater, excreta and greywater, public health, water resources development and wastewater management. The target audience may include public health, agricultural and environmental scientists, agriculture professionals, educators, researchers, engineers, policy-makers and those responsible for developing standards and regulations.

Source: World Health Organisation, Guidelines for the Safe Use of Wastewater, Excreta and Greywater. Volume 4: Excreta and Greywater Use in Agriculture. www.who.int/water\_sanitation\_health



being made at the pilot and demonstration level, however, like source-separating toilets that allow for true containment, sanitization and recycling of urine and composted faeces. Strides are being made too in decentralized systems with artificial wetlands and root zones to treat wastewater. In 2006, new guidelines were released by WHO dealing with the safe handling and reuse of human excreta and grey water (non-industrial wastewater<sup>16</sup>) in agriculture. In all, there some two to three hundred projects around the world, so the critical mass is growing and the dialogue on sustainable sanitation has been initiated. In particular, major successes have been seen on a large-scale in China, where in rural villages there are some 10 million biogas toilets and 1 million dry urine-diverting toilets. Even a new eco-town has been built to demonstrate the use of dry sanitation and onsite grey water treatment. New ideas about upgrading dysfunctional pit latrines with soil composting toilets are being tested in parts of Sub-Saharan Africa. Modern, source-separating toilets have been developed in Sweden and are becoming a low-cost alternative to expensive on-site septic tank installations. The re-use of urine and composted faeces as fertilizer to grow nutritious staple crops, vegetables and fruits is being tested in several locations in Latin America, Africa and Asia,

## **Definition of Greywater**

Domestic wastewater, or "sewage", can be divided into two categories: blackwater which originates from toilets and kitchens, has gross faecal coliform contamination and generally has high concentrations of organic matter; and greywater which originates from bathing and laundry and constitutes the largest flow of wastewater. The term "greywater" refers to untreated household wastewater, which has not been contaminated by toilet waste. It includes the water from bathtubs, showers, hand basins, laundry tubs, floor wastes and washing machines. It does not include waste from kitchen sinks, waste disposal units or dishwashers. It is called greywater because if stored for even short periods of time, the water will often cloud and turn grey in colour. Nonetheless, the exact sources of greywater vary according to countries and organizations and some definitions do in fact include the water sourced from kitchens and dishwashers.



GreyWater Pound, Ecotown Project Inner Mongolia, China.

Source: World Health Organization. 2006. Overview of Greywater Management - Health Considerations.

<sup>&</sup>lt;sup>16</sup> Grey water is the water used by households that comes from bathrooms and kitchens but not toilets.

2008 has been declared by the UN as the International Year of Sanitation. The Sustainable Sanitation Alliance (SuSanA) comprising some 100 international organizations has been formed to help inform the world about these issues. The final chapter in human development is being written.

For more reading please see www.ecosanres.org

## Further reading:

*Capacity Building for Ecological Sanitation, Concepts for Ecologically Sustainable Sanitation in Formal and Continuing Education.* 2006. UNESCO Working Series SC-2006/WS/5 UNESCO/IHP and Deutsche Gesellschaft für Technische Zusammenarbeit (GTZ) GmbH

Winblad, U. and Simpson-Hebert, M., eds.. 2004, *Ecological Sanitation*. Stockholm Environment Institute (available from www.ecosanres.org)

Stockholm Environment Institute. 2007. Sanitation NOW. (available from www.ecosanres.org)

Morgan, P., 2007. Toilets that Produce Compost. Stockholm Environment Institute. (available from www.ecosanres.org)

# **Related links:**

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