

At the End of the Pipe?



Proceedings

Expert meetings held in the Netherlands
on a shift in the sanitation paradigm

January – March 2005



WASTE October 2005

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on a shift in the sanitation paradigm
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'At the End of the Pipe?' Proceedings of expert meetings held in the Netherlands is part of a set of three publications on the outcomes of the project 'At the End of the Pipe'.

The other two documents cover:

- Pamphlet with a summary of the outcomes of the expert meetings
- Booklet with *Insights, visions and ideas on a shift in the sanitation paradigm* formulated during expert meetings held in the Netherlands January - March 2005

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Table of contents

Foreword

1	Introduction	5
1.1	At the End of the Pipe?	5
1.2	Formulation of required initiatives	5
1.3	Set-up of the programme and reading guide	6
2	Summary of discussion meeting 1 on sanitation planning and demand	7
2.1	Introduction	7
2.2	Presentations	7
2.2.1	Moses Ocholo Otieno – WASTE-IHE, Nakuru, Kenya	7
2.2.2	Aussie Austin – CSIR Building and Construction Technology, South Africa	7
2.2.3	Adriaan Mels – Lettinga Associates Foundation, the Netherlands	7
2.2.4	Harm Baten – Water Control Board district Rijnland, the Netherlands	8
2.3	Statements derived from plenary discussion on sanitation planning and demand	8
3	Summary of discussion meeting 2 on sanitation management	9
3.1	Introduction	9
3.2	Presentations	9
3.2.1	Harald Hiessl – Fraunhofer ISI, Germany	9
3.2.2	Anton Peter-Fröhlich – Berliner Wasserbetriebe, Germany	9
3.2.3	Viju James - Pragmatix Research & Advisory Services Pvt. Ltd., India	9
3.2.4	Dan Lapid – CAPS-Centre for Advanced Philippine Studies, the Philippines	10
3.3	Statements derived from the plenary discussion on sanitation management	10
4	Summary of discussion meeting 3 on resource management of human excreta	12
4.1	Introduction	12
4.2	Presentations	12
4.2.1	Pascal Karlsson – Municipality of Göteborg, Sweden	12
4.2.2	Lin Jiang – Guangxi Committee JiuSan Society, China	12
4.2.3	Caroline Schönning – Swedish Institute for Infectious Disease Control, Sweden	12
4.3	Statements derived from the plenary discussion on resource management of human excreta	12
5	Public Debate – Are we connected?	14
5.1	Introduction	14
5.2	Presentations	14
5.2.1	Joep Bijlmer – DGIS ~ Dutch Ministry of Foreign Affairs	14
5.2.2	Anna Tsvetkova – Mama 86, Ukraine	14
5.2.3	Ron Sawyer – Sarar Transformación SC, Mexico	15
5.2.4	Arno Rosemarin – Stockholm Environment Institute, Sweden	15
5.3	Plenary discussion on the thematic presentations	15
5.4	Actions and measures compiled from the informal discussion meetings	16
5.5	Result of prioritisation of actions and measures	16
5.6	Closing and follow-up of the meeting by Joep Bijlmer – DGIS ~ Dutch Ministry of Foreign Affairs	17
6	At the End of the Pipe contribution to 13th meeting of commission for sustainable development	18
6.1	Background on CSD-13	18
6.2	Recommendations formulated during At the End of the Pipe	18
7	Analysis of the statements of 13th meeting of Commission for Sustainable Development	20

Foreword

In January - March 2005, a total of four expert meetings were held to discuss the relationship between sustainable sanitation and integrated urban planning. During these meetings, Dutch participants from various professions were encouraged to look beyond the boundaries of their discipline and the borders of the Netherlands. Their observations lead to a critical evaluation of the sustainability of current sanitation systems and to a series of recommendations to ensure the implementation of sustainable and efficient approaches now and in the future.

'At the End of the Pipe' aimed to accelerate the policy dialogue in the Netherlands towards the adoption of integrated urban sanitation planning, a strategic approach, which should enable a more effective response to the current environmental challenges facing decision-makers. The programme also sought to develop a number of concrete proposals for increasing the sustainability of sanitation provision to present to the 13th CSD meeting in New York in April 2005.

'At the End of the Pipe' would not have been possible without the contributions of a team of nearly 100 participants including guest speakers, hosts and moderators.

The guest speakers were: Harm Baten (Water Control Board District Rijnland, the Netherlands), Adriaan Mels (Lettinga Associates Foundation, the Netherlands), Aussie Austin (CSIR Building and Construction Technology, South Africa), Moses Ochola Otieno (WASTE-IHE, Nakuru, Kenya) Harald Hiessl (Fraunhofer ISI, Germany) Anton Peter- Fröhlich (Berliner Wasserbetriebe, Germany), Viju James (Pragmatix Research & Advisory Services Pvt. Ltd., India), Dan Lapid (CAPS-Centre for Advanced Philippine Studies, Manila, the Philippines), Pascal Karlsson (Municipality of Göteborg, Sweden), Lin Jiang (Guangxi Committee JiuSan Society, China), Caroline Schönning (Swedish Institute for Infectious Disease Control, Sweden), Anna Tsvetkova (Mama 86, Ukraine), Ron Sawyer (Sara Transformación SC, Mexico), Arno Rosemarin (Stockholm Environment Institute, Sweden) and Patrick Bracken (Deutsche Gesellschaft für Technische Zusammenarbeit GmbH, Germany).

Special acknowledgements also go to:

- *The discussion hosts: Ton Boon von Ochssee, Dutch Ambassador for Sustainable Development - Ministry of Foreign Affairs; Wouter J. Veening, Director Institute for Environmental Security; René van Veenhuizen, ETC-UA (ETC Foundation, Urban Agriculture Programme); Joep Bijlmer, DGIS - Dutch Ministry of Foreign Affairs; and moderators André Frijters, Ron Spreekmeester and Jaap Warners.*
- *The organisations that provided rooms: Ministry of Housing, Spatial Planning and the Environment (VROM); Partners for Water; Dutch Ministry of Agriculture; Nature and Food Quality (LNV); and Habitat Platform.*
- *The other individuals who contributed to the development and implementation of the programme, among whom were Stefan Ouboter (NOK), Hugo Gastkemper (RIONED Foundation) and Irna van der Molen, Jos Brouwers and Annica Hondorp (University of Twente).*

The organisers,

Mirjam Geurts

WASTE Advisers on urban environment and development

1 Introduction

1.1 At the End of the Pipe?

Over the last 150 years, the provision of sanitation facilities has led to remarkable progress in the reduction of gastro-intestinal illnesses. Nevertheless, both existing and newly emerging problems in the sanitation sector pose a threat to sustainable development. Specifically:

- Two-fifths of the world's population (2.4 billion people) still don't have access to improved sanitation;
- Large amounts of treated (drinking) water are used in the transport of human excreta;
- Destruction of nutrients and wastage of increasingly valuable water resources;
- High energy consumption for wastewater transportation and treatment;
- The direct discharge of sewage into water bodies and discharge from sewer overflows and badly maintained sewers and the discharge of poorly treated effluent from wastewater treatment plants mean that potentially lethal chemicals, hormones and traces of medicines are released into surface waters;
- Leaking sewers and latrines cause widespread ground water pollution;
- Sludge accumulation from cesspits and wastewater treatment plants; and
- Increasing investment costs for the construction, replacement, and maintenance of sewerage and wastewater treatment systems.

These problems raise the question as to whether the traditional principles of the wastewater treatment chain i.e. the '*transfer of problems and an end-of-the-pipeline solution*' still provide the best option from the point of view of sustainable urban planning and resource management. This is especially significant when one considers the growing number of sanitation options designed to take into account sustainability criteria such as resource and energy use, the closing of food production cycles, emission prevention and a reduction in sensitivity due to climate variations (precipitation, temperature).

1.2 Formulation of required initiatives

In response to current environmental challenges, concrete actions and measures to move towards an integrated urban sanitation planning have to be identified and implemented. In order to accelerate the discussion about required actions *Habitat Platform*, *NCDO*, *Dutch Water Partnership (NWP)*, *Partners for Water* and *WASTE*, developed the programme '*At the End of the Pipe*' of which the present proceedings is the main output. In January - March 2005, a total of four expert meetings were held to discuss the relation between sustainable sanitation and integrated urban planning.

During the meetings, participants discussed the need for a shift in the sanitation paradigm with respect to meeting international sanitation targets, caused by:

- Rapid urbanisation that presents an increasing challenge for the sanitation sector. In order to ensure adequate sanitation provision for urban inhabitants, the sector needs to develop both the logistical and organisational aspects of sanitation provision.
- The water crisis in many urban areas which, is often due not to a lack of water but to a lack of clean water, caused by the absence of adequate sanitation facilities and / or poor sanitary conditions.
- The fact that water is required to ensure good hygiene, but not necessarily good sanitation. Policy makers must acknowledge this difference in order to select the most appropriate sanitation option. For example, sanitation practices that do not demand large water volumes are particularly valuable for water stressed regions and regions with vulnerable water resources.
- The opportunity to promote sustainable development through the resolution of current sanitation problems. New sanitation approaches, that avoid the problems of existing sanitation facilities and contribute to the objectives of the Millennium Development Goals, must be welcomed.
- That large-scale implementation of new sanitation approaches will help generate a better understanding and demonstrate the advantages of natural resource recycling.

In addition to local and national authorities responsible for water and sanitation, entrepreneurs, research institutes, and civil society organisations were also invited to participate in the programme and had the opportunity to broaden their vision on sustainable development within the sanitation sector. Practical examples from outside Europe and examples of innovations within Europe provided these participants with a basis from which to develop a more integrated sanitation planning approach.

Programme Goals

- To evaluate existing sanitation systems as part of urban environmental infrastructure in the Netherlands.
- To bring different sectors and stakeholders together and evaluate existing sanitation approaches as part of urban environmental infrastructure.
- To exchange and compare experiences in the development and management of sanitation facilities between developing countries and the Netherlands.
- To familiarise stakeholders with the social, environmental, institutional, legal, and financial aspects of sustainable sanitation approaches developed outside the Netherlands.
- To accelerate the policy dialogue in the Netherlands to move towards an integrated approach to urban sanitation planning which responds to current environmental challenges.
- To discuss current sanitation problems from the point of view of worldwide sanitation demand, management and resource recovery in order to formulate concrete recommendations about required initiatives and stakeholders that need to participate in these initiatives. Programme recommendations include recommendations for policy makers at the 13th session of the *Commission for Sustainable Development (CSD-13)* and recommendations for actions needed for the implementation of the goals of the *European Union Water Directive ('Europese Kaderrichtlijn Water')*.

1.3 Set-up of the programme and reading guide

'*At the End of the Pipe*' consisted of three closed informal discussion meetings and concluded with one public debate. The informal meetings each highlighted one element of sanitation systems. The first informal discussion meeting focussed on planning and demand, the second meeting on management, while the last meeting focussed on resource management of human excreta. The public debate expanded upon the ideas and statements that were generated during the informal discussion meetings and prioritised the actions and measures identified.

These proceedings reflect the contents of the informal discussion meetings, as well as the public debate and provide reference material on the progress towards sustainable sanitation approaches within the context of integrated urban planning. *Chapter 2, 3 and 4* outline the expert presentations given during the informal meetings, and present the conclusions, insights and visions shared during these meetings as separate summary statements. *Chapter 5* gives an overview of the speeches delivered and the discussions arising during the public debate and presents the outcome of the prioritisation of recommendations that took place in this meeting.

Chapter 6 summarises the material presented to the CSD-13 meeting in April 2005 and *Chapter 7* analyses the extent to which this material influenced both interim and final statements of the CSD-13 meeting.

Finally, speaker presentations and participant lists for all four programme meetings can be found in the *Annexes* to the current proceedings.

2 Summary of discussion meeting 1 on sanitation planning and demand

2.1 Introduction

The first informal discussion meeting was held on 20 January at the Dutch Ministry of Housing, Environment and Planning (VROM) in The Hague. During the meeting, sanitation problems, policy and developments in the Netherlands, South Africa and Kenya were presented. Special attention was given to the social aspects of moves from traditional towards sustainable sanitation planning.

Host	Ton Boon von Ochssee – <i>Dutch Ambassador for Sustainable Development, Ministry of Foreign Affairs</i>
Moderator	André Frijters – <i>Board member of WASTE; Directorate-general for Public Works and Water Management from the Dutch Ministry of Transport and Public Works</i>
Speakers	Moses Ochola Otieno – <i>WASTE-IHE, Nakuru, Kenya</i> Aussie Austin – <i>CSIR Building and Construction Technology, South Africa</i> Adriaan Mels – <i>Lettinga Associates Foundation, the Netherlands</i> Harm Baten – <i>Water Control Board district Rijnland, the Netherlands</i>

2.2 Presentations

2.2.1 Moses Ocholo Otieno – WASTE-IHE, Nakuru, Kenya

Moses Ocholo Otieno gave an overview of the sanitation situation in Nakuru City, Kenya, where only 40% of the inhabitants are served by a connection to the sewerage system. The remainder of the population either has pit latrines or some form of excreta storage tanks. This has led to a number of health and environmental protection issues. By examining the factors that influence the selection of sanitation options in Nakuru, the importance of householder perceptions of handling or reusing sanitized

human waste as well as the lack of skills on toilet construction and maintenance appeared to be important factors. Moses Ocholo Otieno concluded that understanding the opinion and behaviour of the user/consumer will help decision-makers develop affordable and convenient systems, which respond to consumer demand.

Moses Ocholo Otieno's presentation can be read in full in Annex 1.

2.2.2 Aussie Austin – CSIR Building and Construction Technology, South Africa

Aussie Austin began his presentation by asking his audience if they had a chance to implement their sanitation facilities from scratch whether they would adopt the same technologies as were currently in use. From the South African point of view, Western sanitation systems demonstrate two related myths that; 'human excreta is waste and is only suitable for disposal'; and that 'the environment is capable of assimilating this waste'. Sanitation is not just a matter of building toilets and laying pipes. In order to tackle these myths, he proposed that decision-makers consider ecological sanitation options. He concluded by stating that environmental aspects of sanitation are very important and soil fertility and food security are major problems that should be considered during sanitation planning.

Aussie Austin's presentation can be read in full in Annex 2.

2.2.3 Adriaan Mels – Lettinga Associates Foundation, the Netherlands

After having heard about the sanitation challenges facing participants from Africa and the strategies being considered to meet them, Adriaan Mels presented the Dutch challenges for wastewater management in the 21st century. Although it seems that in this part of the world sanitation systems are of high quality, several developments in both sewerage and wastewater treatment systems make it an appropriate time to consider a change. The developments mentioned included: the pressing need for large-scale sewer renovations, the permanent need to address sewer leakages and sewer

overflows and the cost increases anticipated to meet the demands of the European Water Directive. The technologies required for a system change are available and are characterised by the separate collection and treatment of wastewater flows. This approach contributes to improved waste control and results in cleaner sewage as well as opening up the possibility of nutrient reuse. It also increases the flexibility of sanitation systems.

Adriaan Mels's presentation can be read in full in Annex 3.

2.2.4 Harm Baten – Water Control Board district Rijnland, the Netherlands

Although Harm Baten wasn't present at the meeting due to illness, Adriaan Mels presented his speech on source-oriented sanitation from the point of view of a local water authority in the Netherlands. The interest of the Water Board in exploring new approaches based on source separation is driven by the fact that rain intensity is increasing, effluent standards for treated wastewater have become stricter and there is a recognised need for increased efficiency in the (waste)water chain.

Avoiding the dilution of human excreta allows for the reduction of emissions as well as energy and resource consumption. In addition, nutrient reuse becomes an option. In the medium to long term, Harm Baten suggests that a transition to another sanitation concept with greater environmental efficiency is required. Mr Baten concluded that this medium to long-term solution starts today with the implementation of demonstration projects in the Rijnland district of the Netherlands.

Harm Baten's presentation can be read in full in Annex 4.

2.3 Statements derived from plenary discussion on sanitation planning and demand

Based on the summary given by Ton Boon von Ochssee during the meeting's closing session.

- Sanitation deserves the same status on the national agenda as water. Ministries and departments need to give equal importance to waste and excreta management as to water supply. Governments need to demonstrate leadership in this discussion.
- Public awareness, communication and demand responsive approaches are important aspects for starting the discussion about the need for new sanitation approaches. Without them it is difficult to overcome people's discomfort about discussing 'toilet' issues.
- It will take several steps to bring about a paradigm shift in the sanitation sector towards resource driven sanitation systems. This shift can be initiated from various angles at the same time, though not necessarily at the same place.
- Change the perception of why people want, and society needs good sanitation. Seek the right motivation for change.
- Water is needed for good hygiene, but not necessarily for good sanitation. Policy makers must acknowledge this difference in order to choose the sanitation options that are most appropriate, especially, in water stressed regions and regions with vulnerable water resources.
- Avoid the mixing of waste and the generation of sewage as much as possible. Strive to make material cycles as short as possible, based on an understanding of the water cycle, nutrient cycle and pathogen cycle.
- New approaches and technologies need to be demonstrated now. Why wait until the private sector indicates that they are forced to deal with the mounting problems resulting from current sanitation practices? Anticipate those problems and look for economically viable opportunities to resolve them.

3 Summary of discussion meeting 2 on sanitation management

3.1 Introduction

The second informal discussion meeting was held on 27 January at *Partners for Water in The Hague*. The meeting focussed upon sanitation management issues. The presentations provided insights into how cities in Germany, India and the Philippines are dealing with the excreta management problems of current sanitation systems in the context of overall urban development.

Host	Wouter J. Veening – <i>Director Institute for Environmental Security</i>
Moderator	Ron Spreekmeester – <i>Habitat Platform</i>
Speakers	Harald Hiessl – <i>Fraunhofer ISI, Germany</i> Anton Peter-Fröhlich – <i>Berliner Wasserbetriebe, Germany</i> Viju James – <i>Pragmatix Research & Advisory Services Pvt. Ltd., India</i> Dan Lapid – <i>CAPS-Centre for Advanced Philippine Studies, the Philippines</i>

3.2 Presentations

3.2.1 Harald Hiessl – Fraunhofer ISI, Germany

Harald Hiessl presented the AKWA Project in Germany, a study on long-term options for sustainable urban water infrastructure based on two case studies. Several factors have led to the development of this initiative. These factors include: leakages in existing sewerage systems; the appearance of ‘new’ pollutants in sewage; and more stringent wastewater quality requirements. Climate change was also given as a reason to identify long-term options to modernize urban water infrastructure systems in Germany.

Besides characterising the sustainability of different options, the project aims to provide strategic support to municipal decision makers and derive proposals for system transition. The study concluded that there are alternatives available that are comparable to conven-

tional systems in terms of costs but which are more sustainable. It also became clear that the decentralisation of sanitation provision was not just a technical issue but also had implications for both the ownership and operation of sanitation facilities.

Harald Hiessl concluded by saying that due to the long lifetime of this infrastructure, long-term perspectives are essential to improve the sustainability of sanitation systems. He stressed this by quoting Albert Einstein ‘we cannot solve our problems with the same thinking we used when we created them’.

Harald Hiessl’s presentation can be read in full in Annex 6.

3.2.2 Anton Peter-Fröhlich – Berliner Wasserbetriebe, Germany

Anton Peter- Fröhlich presented the Berliner Wasserbetriebe initiative. This demonstration project was designed to allow the separate treatment of urine, faeces and grey water in Berlin. The Berliner Wasserbetriebe concept is set to provide sanitation solutions not only for remote areas but also for rapidly growing conurbations in developing countries. This approach, based upon the water and nutrient recycling, helps respond to the problems of increasing worldwide water scarcity and decreasing phosphorus reserves. From both a European as well as a developing country perspective, the demand for new sanitation concepts is high. This fact coupled with the results of a pre-study showing that new sanitation concepts may have cost advantages, has encouraged the Berliner Wasserbetriebe to develop a demonstration project with gravity and vacuum separation toilets.

Anton Peter- Fröhlich’s presentation can be read in full in Annex 7.

3.2.3 Viju James - Pragmatix Research & Advisory Services Pvt. Ltd., India

Viju James presented the sanitation situation in India, where service coverage is low and where even if toilets are constructed they are not always used. Viju James discussed not only human excreta handling but also solid

waste management. Both services have a relatively low status. Mr James stressed the need for a clear vision of sanitation management among major stakeholders including a thorough review of all existing information.

In India, an important constraint for increasing service coverage is the lack of political commitment to and 'ownership' of sanitation schemes, campaigns, and programmes. Although lots of initiatives are launched they are often not consolidated after they have served a political purpose e.g. to help a politician win elections. Viju James concluded that project experiences should be disseminated and internalised within an organisation and not be restricted to the individuals working directly on them. Information networks for sensible decision-making are very important in order to move forward.

Viju James's presentation can be read in full in Annex 8.

3.2.4 Dan Lapid – CAPS-Centre for Advanced Philippine Studies, the Philippines

Dan Lapid presented sanitation management in Metro Manila, where efforts to increase sanitation facility coverage have to take into account rapid population increase. The big challenge in Metro Manila is caused by high population density and hence the existence of heavily congested areas. Currently only 3.3% of the annual investment on water supply and sanitation is spent on sanitation. The capital investments for 100% sanitation coverage using conventional systems would be huge and is not affordable to a large proportion of the population. Therefore, Dan Lapid states that decentralised approaches are necessary to cope with increasing demand. Ecological sanitation should therefore be considered as a viable approach for Metro Manila.

Dan Lapid's presentation can be read in full in Annex 9.

3.3 Statements derived from the plenary discussion on sanitation management

The Albert Einstein quote *"We cannot solve our problems with the same thinking we used when we created them"* was cited several times during the discussion.

- Poor urban sanitation pollutes local drinking water resources. In most urban areas, the water crisis is not due to a lack of water but a lack of clean water, caused by the absence of sanitation facilities and / or poor sanitation conditions.
- New sanitation approaches that avoid the problems of existing sanitation systems, and contribute to the objectives of the Millennium Development Goals, must be welcomed.
- Many stakeholders are directly or indirectly involved in sanitation management. This creates a need for an integrated approach and a cooperating-management-culture. Don't stick to the limits of organisations and their responsibilities.
- Intersectoral cooperating entities should manage the water and sanitation cycle because sanitation systems are complex and several organisations share responsibility for its functioning.
- Waste- and sanitation management can be looked upon as a business opportunity (for informal and formal sector alike) instead of a social cost that has to be taken on by the government.
- Encourage the private sector to invest in urban services by providing appropriate financial instruments. Economic market mechanisms can support change. Currently, the role of municipal government is often overestimated, while the role of the private sector is underestimated.
- Incorporate the organic waste flow into a sanitation system to provide advantages of efficient resource management and energy generation.

- Social preferences, norms, and attitudes may block necessary transitions. However, it appears that engineers and managers are often more reluctant to change than consumers. Nevertheless, efforts need to be made to explain and demonstrate new systems to consumers. These awareness-raising efforts should be incorporated into the market strategy for new sanitation options.
- Anchor acknowledgements of new viable sanitation options in institutions and institutional memory. Don't depend on individual projects or people.
- Form learning alliances to share experiences and knowledge about new sanitation options in order to avoid losing information and to ensure structured and continuous dissemination of experiences. Guide each other, e.g. village communities.
- Demonstrate different sanitation options simultaneously.
- Incorporate institutional aspects in pilot projects instead of only focussing on technical aspects. Experience shows that the main bottleneck for innovations is often related to institutional obstacles, rather than technical ones.



4 Summary of discussion meeting 3 on resource management of human excreta

4.1 Introduction

The third informal discussion meeting was held on 3 February at the *Dutch Ministry of Agriculture, Nature and Food Quality (LNV)* in The Hague. The presentations that introduced the resource management theme provided an overview of the search for sustainable sanitation options, which incorporate resource recovery from human excreta in Sweden and China. Insights were also given as to how to deal with related safety issues and recycling issues in agriculture.

Host	René van Veenhuizen – <i>ETC-UA (ETC-Foundation, Urban Agriculture Programme)</i>
Moderator	Jaap Warners – <i>Amongst others former council of Environment from the city of Gouda, and chairman of the Task Force Wind Energy</i>
Speakers	Pascal Karlsson – <i>Municipality of Göteborg, Sweden</i> Lin Jiang – <i>Guangxi Committee JiuSan Society, China</i> Caroline Schönning – <i>Swedish Institute for Infectious Disease Control, Sweden</i>

4.2 Presentations

4.2.1 Pascal Karlsson – Municipality of Göteborg, Sweden

Looking at the nutrient cycle, Pascal Karlsson presented a vision for sustainable water and waste handling in the City of Göteborg, which is supported by the Swedish Government. The City of Göteborg aims to attain a 'higher level of sustainability'. Therefore Göteborg has chosen to invest in a series of sanitation pilot projects designed to identify the best method to optimise the recovery and reuse of nutrients. The long-term goal of the City is that nutrients removed from arable land are

recycled back into the food production chain or are otherwise used in such a way as to enable the replacement of mineral fertilisers.

Pascal Karlsson's presentation can be read in full in Annex 11.

4.2.2 Lin Jiang – Guangxi Committee JiuSan Society, China

Lin Jiang compared sanitation conditions in China with global conditions and found them to be relatively similar. This presentation revealed that resource recovery from human excreta is an accepted sanitation strategy, which has been used in China from early history. The introduction of new sanitation approaches is for the most part economically driven and only partially dependent upon environmental issues.

Lin Jiang's presentation can be read in full in Annex 12.

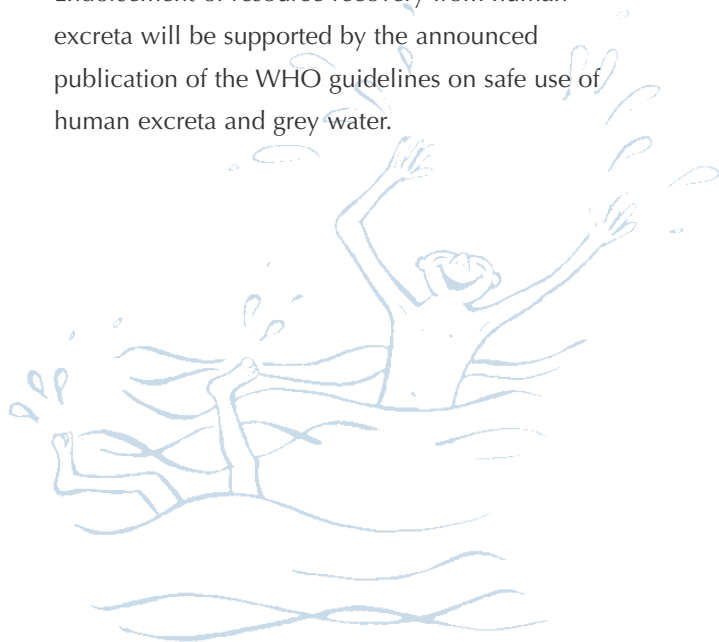
4.2.3 Caroline Schönning – Swedish Institute for Infectious Disease Control, Sweden

Caroline Schönning highlighted the risks of recycling and reuse of nutrients derived from human excreta. The presentation revealed that people often perceive the risks of recycling as greater than they actually are. Nevertheless, health and hygiene should be major sustainability criteria for sanitation concepts. Systems need to take these risks into account at all levels of the sanitation system.

Caroline Schönning's presentation can be read in full in Annex 13.

4.3 Statements derived from the plenary discussion on resource management of human excreta

- Raise awareness at all levels about the relation between sanitation and the challenge of food security.
- The food industry should be major target group for awareness raising, as this sector is currently the weakest link in the chain for resource recovery of nutrients from human excreta.
- Rapid urbanisation presents an increasing challenge for the sanitation sector. Especially in the areas of logistics and organisational aspects many new ideas and progress are required.
- The need to solve current sanitation problems may be seen as opportunity for sustainable development.
- Start by making changes in the existing system (For example: after a soccer game where urine can easily be collected separately, urine can be applied on the field as fertiliser; storm water storage facilities can be used for grey water treatment; etc.) Starting in this way shows that with relatively simple measures we can make a significant change.
- The responsibility for ensuring 'safe sanitation for all' has to remain a public responsibility. A public / legal framework should be developed in which the private sector is encouraged to provide good sanitation services designed with close attention to the health- and environmental aspects of sanitation.
- Large-scale implementation of new sanitation approaches allows for a better understanding and demonstration of the advantages of recycling of natural resources.
- Consider the 'farmer' as a 'consumer' and the agricultural sector as a 'market' with respect to resource management of nutrients.
- The 'mineral fertiliser producers' should be encouraged to develop into 'overall fertiliser providers'. A development similar to the development the energy companies have made from oil and gas providers to providers of energy services
- (Inter) national regulations and guidelines for sanitation have to cover resource recovery in the sanitation process.
- European Union legislation should allow the use of fertilisers derived from human excreta in the ecological farming sector, thus enabling this sector to increase the total supply of organic fertilisers.
- Reduce, and eventually lift subsidies for artificial fertiliser and tax the environmental pollution it causes. This will serve as a driving force for the marketing of organic fertilisers recovered from renewable resources such as human and animal excreta.
- Political decisions are often limited to the question of what acceptable risks are. We have to review the vision on risk management that is solely based on absolute minimalisation of current environmental or health risks.
- Endorsement of resource recovery from human excreta will be supported by the announced publication of the WHO guidelines on safe use of human excreta and grey water.



5 Public debate – Are we connected?

5.1 Introduction

The fourth meeting, the concluding public debate was held on 3 March at the *Dutch Habitat Platform* in The Hague.

Host	Joep Bijlmer – <i>DGIS ~ Dutch Ministry of Foreign Affairs</i>
Moderator	Ron Spreekmeester – <i>Habitat Platform</i>
Speakers	Anna Tsvetkova – <i>Mama 86, Ukraine</i> Ron Sawyer – <i>Sarar Transformación SC, Mexico</i> Arno Rosemarin – <i>Stockholm Environment Institute, Sweden</i>
Jury	Patrick Bracken (Chair) – <i>GTZ, Germany</i> Anna Tsvetkova – <i>Mama 86, Ukraine</i> Ron Sawyer – <i>Sarar Transformación SC, Mexico</i> Arno Rosemarin – <i>Stockholm Environment Institute, Sweden</i>

The public debate further developed the ideas and statements gathered during the three informal expert meetings, and aimed to formulate a concrete input for the 13th session of the *Commission for Sustainable Development* (CSD-13). Details of this international meeting are provided in *Chapter 6*.

Though the discussions at CSD-13 are held at an international level, to be effective policies need to be implemented at European as well as at national level. Hence European Water policy can be regarded as one of the translations of these international goals. It is important to both understand and input into the CSD sessions to determine the effect that these international policies will have on the Netherlands a country where population and urban areas are still expanding.

5.2 Presentations

5.2.1 Joep Bijlmer – *DGIS ~ Dutch Ministry of Foreign Affairs,*

Joep Bijlmer gave an introduction to the subject from an international and national perspective. He emphasised that the discussions should have a direct bearing on the actions promoted to achieve the Millennium Development Goals. Sanitation should take its rightful place amongst other political commitments next to several food related and financial priorities. This often does not occur, as many people do not understand the relationship between these issues.

Increasing urbanisation in many developing countries increases the need for appropriate solutions. Development investment highlights the limitations of pilot projects, which can be seen as islands of excellence in an otherwise unchanged world. In this respect pilot projects should include strategies for scaling up and for providing a range of different options from which people and authorities can choose the most appropriate to their context.

Joep Bijlmer's speech can be read in full in Annex 15.

5.2.2 Anna Tsvetkova – *Mama 86, Ukraine*

Anna Tsvetkova provided an overview of sanitation demand in the Ukraine. She described the current poor state of sanitation in the country and the resulting pollution of many important water sources. She mentioned that conventional approaches to sanitation require a greater level of investment than is available and have high operating and maintenance costs. Furthermore, she underlined the increasing cost of sludge disposal from existing conventional treatment systems. She concluded that decentralised sanitation systems which include resource recovery (nutrients, water, energy) and which are often referred to as Ecological Sanitation, do offer some rays of hope because they can provide improved sanitation facilities at a lower cost.

Anna Tsvetkova's presentation can be read in full in Annex 16.

5.2.3 Ron Sawyer – *Sarar Transformación SC, Mexico*

Ron Sawyer described an urban ecological sanitation pilot programme in Tepoztlán, Mexico. The cultural context is in this case, favourable to the use of ecological sanitation, as people have traditionally used urine as a source of nutrients in agriculture. Demonstration projects such as this require a multidisciplinary approach using communication strategies such as *Talking Toilets* to raise awareness and ensure that the sanitation strategies adopted respond to local demand. Communication strategies are an important tool for starting the discussion on new sanitation approaches. Projects that seek to close the food production cycle such as this one will go a long way to demonstrate the long, difficult, but very rewarding way ahead.

Ron Sawyer's presentation can be read in full in Annex 17.

5.2.4 Arno Rosemarin – *Stockholm Environment Institute, Sweden*

Arno Rosemarin discussed the precarious global geopolitics of phosphorous. He suggested that using a zero growth scenario phosphorous stocks would be completely depleted within the next 130 years. This depletion will be much faster if the growth rate for phosphorous stocks continues according to historical trends. In fact, stocks in many developed countries are likely to be completely depleted within the next 30 years. The major remaining sources of phosphorous known today are in Western Sahara/Morocco and China, hence the title of the presentation *The Geopolitical Aspects of Phosphorous*.

When asked whether this phosphorous shortfall could be overcome by the use of urine in agriculture, he answered that he did not think the amount recycled in this way would be sufficient to meet demand. The most important sources of phosphorous depletion are agricultural losses due to inefficiencies in agricultural practices. Recycling of phosphorous from topsoil requires slash and burn practices and hence is not a viable route. Another difficulty with phosphorous reserves is that they typically contain traces of cadmium. If the amounts of cadmium are higher than trace levels, these have to be removed thus increasing the overall cost of phosphorous.

Arno Rosemarin's presentation can be read in full in Annex 18.

5.3 Plenary discussion on the thematic presentations

During the plenary discussion the participants were encouraged to develop further the ideas outlined in the presentations and to discuss the main obstacles and opportunities for a transition to sustainable sanitation approaches as embodied by for example the concept of Ecological Sanitation. Ecological Sanitation is defined as a sanitation system that is based upon the idea that urine, faeces and water are all resources in an ecological loop. By ensuring the closure of this loop through the recovery of these resources it is possible to optimise the use of nutrients, water and energy, prevent pollution of the environment and protect public and occupational health.

It became clear from the discussion that attitudes towards the recovery and re-use of urine depend a lot upon local customs. In Mexico and China urine has traditionally been used in agriculture whereas in Europe regulations prohibit urine reuse. Local attitudes also affect markets for these products. Where urine is considered to be an organic fertiliser it is possible for products to find markets e.g. some special types of cactus are exported from Mexico to Japan. Ron Sawyer pointed out that in Mexico there was a ready market for tomatoes and avocados grown in this way.

From the discussion on urine diversion techniques with respect to nutrient recovery, it was stated that the use of urine in agriculture will not by itself stem the overall depletion of vital phosphorous stocks and hence the on-going risk to global food security. Priority should be given to changing agricultural practices to avoid phosphorous wastage. In addition, research and development is being undertaken to find alternative sources of phosphorous. Nevertheless, separation of urine from faeces does contribute to a more sustainable resource management approach.

The question was then raised as to the extent that Ecological Sanitation approaches can contribute to

increasing sustainability and the achievement of the Millennium Development Goals.

Participants highlighted the fact that Ecological Sanitation is considered an approach that also allows for low cost sanitation options that makes sanitation more accessible to the poor. It also offers additional benefits to rural, peri-urban and urban users involved in agricultural activities. The example was provided where urine diversion was added to existing pit latrines with urine being used to replace mineral fertilisers in local agriculture. In this way poor farmers in Kirgystan save money that would otherwise have been spent on artificial fertilisers.

Hence the consensus of the public debate was that Ecological Sanitation offers the possibility of increasing service coverage at a lower cost, it contributes to the protection of local water and soil resources and helps improve food security and income generating opportunities of some of the poorest rural and peri-urban dwellers.

5.4 Actions and measures compiled from the informal discussion meetings

At the End of the Pipe programme organisers took the statements made in the first three informal meetings and brought together those that addressed similar issues to come up with the following nine consensus statements of the first phase of the programme. Participants of the public debate were then asked to prioritise the implementation of these actions and measures.

A Demand for improved sanitation

- A1 Use the EU Water Directive as a framework to initiate the implementation of new sanitation concepts because it forms part of the current political agenda.
- A2 Make amendments to existing systems to incorporate principles of resource recovery. (For example: after a soccer game where urine can easily be collected separately, urine can be applied on the field as fertiliser; storm water storage facilities can be used for grey water

treatment; etc.) Starting in this way shows that with relatively simple measures we can make a significant change.

B Management of sanitation systems

- B1 Encourage the private sector to invest in urban services by providing appropriate financial instruments. Economic market mechanisms can support change.
- B2 Form learning alliances to share experiences and knowledge about new sanitation options in order to avoid losing information and to ensure structured and continuous dissemination of experiences. Guide each other, e.g. village communities

C Management of resources in sanitation systems

- C1 Raise awareness at all levels about the relation between sanitation and the challenge of guaranteeing food security.
- C2 Encourage efficient use of sanitation systems with respect to resource management and energy generation. Advantages can be provided by incorporating the organic waste flow into the sanitation system.
- C3 Take measures to reduce, and eventually lift subsidies for artificial fertiliser.
- C4 Tax environmental pollution from artificial fertilisers. This can serve as a driving force for the marketing of organic fertilisers recovered from renewable resources.
- C5 Adapt national legislation and regulations to allow the use of nutrients originating from human excreta.

5.5 Result of prioritisation of actions and measures

A total of 43 participants from NGO's, governmental organisations, universities and research institutes, private companies as well as interested individuals were asked to prioritise each action giving it a rating from 1 – 6. The results of this prioritisation are presented below (indicating the scores). There was a high level of con-

sensus as to the most important actions to be taken but opinions differed more as to the order for less priority actions.

Actions that require special attention (> 44)

(None)

Actions that require a high level of attention (36-44)

- C5 Adapt national legislation and regulations to allow the use of nutrients originating from human excreta (41).
- C2 Encourage efficient use of sanitation systems with respect to resource management and energy generation (40).
- A2 Make amendments to the existing system incorporating principles of resource recovery (39).
- B2 Form learning alliances to share experiences and knowledge about new sanitation options (39).

Actions that require some form of attention (20-36)

- A1 Use the EU Water Directive as a framework to initiate the implementation of new sanitation concepts (34).
- C3 Take measures to reduce, and eventually lift subsidies for artificial fertiliser (34).
- B1 Encourage the private sector to invest in urban services by providing appropriate financial instruments (33).
- C1 Raise awareness at all levels about the relation between sanitation and the challenge of guaranteeing food security (33).
- C4 Tax environmental pollution from artificial fertilisers (30).

Actions that require little attention right now (12-20)

(None)

Actions that require no attention right now (<12)

(None)

5.6 Closing and follow-up of the meeting by Joep Bijlmer – DGIS ~ Dutch Ministry of Foreign Affairs

Joep Bijlmer stated in his final remarks that he was impressed with the multiplicity of views expressed. People are often not aware of the level of productivity of urban agriculture. About one sixth of total world food production is generated by urban agriculture. It requires many different inputs and since it is labour intensive it is also an important income generating activity. During the FAO conference on Water for Food and Economy, the Netherlands committed itself to providing water and sanitation for 50 million people by the year 2015. This is a formidable target and requires concerted inputs of many stakeholders.

He stated that DGIS priorities are:

- Donor coordination.
- Identification of action – who is doing what; projects should look not only at national level but also grass roots levels.
- Participative integrated approach linked to national policy levels.
- Development assistance should be seed money for private investments.
- Accountable cost recovery for water and sanitation should be included.
- Public –private partnerships.
- EU water initiative.
- Integrated water management.
- Consequences of climate changes.

Joep Bijlmer's speech can be read in full in Annex 19.

6 At the End of the Pipe contribution to 13th meeting of commission for sustainable development

6.1 Background on CSD-13

The aim of the series of meetings '*At the End of the Pipe*' was to accelerate the policy dialogue in the Netherlands to move towards an integrated approach to urban sanitation planning in order to facilitate a more effective response to current environmental challenges. The outputs of the '*At the End of the Pipe*' programme included a series of recommendations for policy makers at the 13th session of the *United Nations Commission for Sustainable Development* (CSD-13).

The United Nations Commission for Sustainable Development was created in 1992 to ensure effective follow-up of the Earth Summit (*United Nations Conference on Environment and Development*) by monitoring and reporting on implementation of Earth Summit agreements at local, national, regional and international levels.

CSD-13 is the policy session in the first two-year "Implementation Cycle" and focuses on the thematic cluster of water, sanitation and human settlements. The 13th session of the CSD follows up on the outcomes of CSD-12, the review session of the cycle. The main output related to sanitation during CSD-12 is presented in Annex 21.

The goal of CSD-13 is "to take policy decisions on practical measures and options to expedite implementation of commitments in water, sanitation and human settlements as contained in Agenda 21, the Programme for the Further Implementation of Agenda 21 and the Johannesburg Plan of Implementation, as well the Millennium Declaration." Though these discussions are held on an international level, to be effective policies also need to be adopted and implemented at European and national level.

6.2 Recommendations formulated during At the End of the Pipe

The participants of the '*At the End of the Pipe*' formulated recommendations for the development of a more sustainable approach to sanitation.

One of the key observations of '*At the End of the Pipe*' was to highlight the paradoxical situation that on the one hand water shortages are increasing, while on the other hand precious water resources are being used to transport human excreta.

Current sanitation practices also contribute to the loss and destruction of valuable soil nutrients in particular phosphorus, which is essential for food production.

The '*At the End of the Pipe*' recommendations were distributed to policy makers at CSD-13 in New York, between 11-22 April, 2005. These recommendations for policy makers were distributed to participants in the form of a pamphlet. A booklet was also developed covering all the programme recommendations.



Pamphlet At the End of the Pipe?



At the End of the Pipe?

Sanitation practices today contribute to the exhaustion of:

- **Water resources**
Sewerage and sewage treatment methods use large amounts of water in the transportation and treatment of human excreta. Water is required to ensure good hygiene, but not necessarily good sanitation. Alternative practices that do not demand large volumes of water are therefore very valuable for water stressed regions and regions with vulnerable water resources.
- **Nutrient resources**
Current sanitation practices lead to the loss and destruction of nutrients that are necessary for food production, in particular phosphorus. Alternative sanitation practices provide opportunities to “close the loop” returning nutrients back into the soil.
- **Energy resources**
Conventional sanitation practices involve high levels of energy consumption in wastewater transportation and treatment. Alternative sanitation practices do not rely on high-energy consumption for the treatment of human excreta.

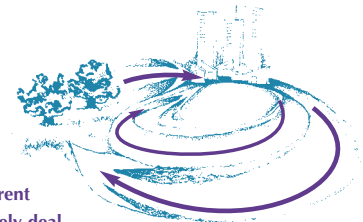
Most sanitation practices threaten:

- **Public health and the environment**
Two-fifths of the world's population (2.4 billion people) still don't have access to improved sanitation. The direct discharge of sewage into water bodies and the discharge of poorly treated effluent from wastewater treatment plants mean that potentially lethal chemicals, hormones and traces of medicines are released into surface waters. In addition, leaking sewers and latrines cause widespread ground water pollution.

*“We cannot solve our problems with the same thinking we used when we created them”,
based on Albert Einstein*

At the End of the Pipe is organised by WASTE in collaboration with NCDO, Habitat Platform, Netherlands Water Partnership (NWP) and Partners for Water, and is financed with the programme “Learning for Sustainable Development 2004-2007” of the Dutch Government.

WASTE www.waste.nl – NCDO www.ncdo.nl – Habitat Platform www.habitatplatform.nl – Netherlands Water Partnership (NWP) www.nwp.nl – Partners for Water www.partnersforwater.nl



The question is whether current sanitation practices adequately deal with the problem of handling human excreta.

Are the dominant end-of-the-pipeline or down the pit sanitation options still the best and only options available to us?

A sustainable sanitation approach will benefit from the following recommendations:

- Give equal importance to waste and excreta management as water supply and treatment. Decision-makers need to demonstrate leadership in this discussion.
- Allow for resource recovery from human waste through the development of appropriate national and international sanitation regulations and guidelines. (See also the announced publication of the WHO Guidelines on Safe Use of Human Excreta and Grey Water.)
- Farmers are potential ‘consumers’ and the agricultural sector provides a ‘market’ for nutrient rich products recovered from human excreta.
- Avoid waste mixing and sewage generation as far as possible. Strive to use the shortest material cycles based on an understanding of water, nutrient and pathogen cycles.
- Demonstrate new approaches and technologies now. Valuable time will be wasted if we wait until the private sector is forced to deal with the mounting problems resulting from traditional sanitation practices. We can anticipate these problems and highlight economic opportunities of alternative sanitation options.
- Demonstrate the relationship between sanitation and the challenge of food security through awareness raising with key stakeholders.
- Recognise and promote new viable sanitation options and anchor these within institutions and institutional memory. The implementation of these options should not depend on the participation of specific individuals and should move beyond the limits of individual organisations and their responsibilities.

These visions have been expressed during expert meetings held in the Netherlands (2005) with invitees from India, the Philippines, China, South Africa, Kenya, Germany, Sweden and the Netherlands in which the need for a shift in the sanitation paradigm to meet the ambitious targets presented by the Millennium Development Goals (MDGs) was discussed. Proceedings of these meetings can be found on www.waste.nl or requested from office@waste.nl

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WASTE www.waste.nl – NCDO www.ncdo.nl – Habitat Platform www.habitatplatform.nl – Netherlands Water Partnership (NWP) www.nwp.nl – Partners for Water www.partnersforwater.nl

7 Analysis of the statements of 13th meeting of commission for sustainable development

How did the recommendations of *'At the End of the Pipe'* contribute to the decision adopted by CSD-13? The decision contained the following practical measures related to the recommendations derived from the *'At the End of the Pipe'* programme.

- Establishing an institutional home for sanitation, prioritising sanitation in national development plans, and incorporating sanitation in integrated water resources management plans; and
- Promoting and supporting on-site sanitation infrastructure, especially in rural areas.

Among the measures to ensure access to culturally appropriate, low-cost and environmentally sound sanitation technologies the following measures are mentioned:

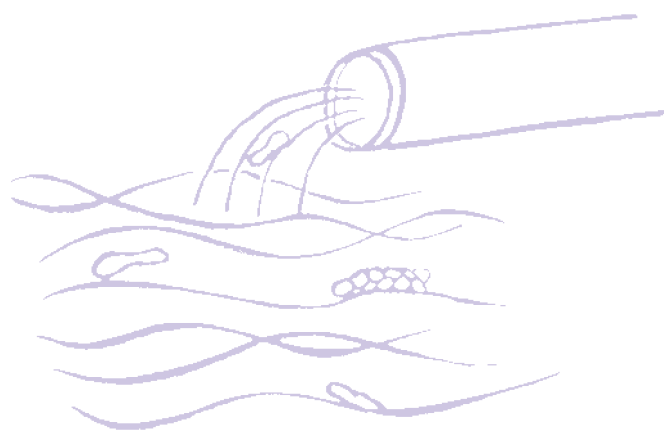
- Promoting research, development and dissemination of information on low-cost sanitation options; and
- Investing in research and development projects including in applications of indigenous technologies and ecological sanitation and the providing for technology transfer for sanitation, waste water treatment, reuse and residuals management.

The promotion of wider wastewater re-use and the capture for use of other by-products of treatment processes was mentioned in the first summary text but almost completely dropped from the final version. However, an opening remains to work on and explore new sanitation options. In addition, in one of the side events, Arno Rosemarin gained a lot of interest from participants when he raised the issue of the effects of phosphorus depletion on global food production.

In conclusion, the CSD-13 decision serves to broaden the concept of sanitation planning and implementation and provide a basis for the further development of new sanitation approaches. Nevertheless, the decision fails to fully

embrace the integrated vision of sanitation proposed by *'At the End of the Pipe'*. This may be felt as an important shortcoming in future CSD meetings especially when tasked with resolving issues such as the rapid depletion of phosphorous stocks and its potential affect on global food security.

The full statement of CSD-13 is presented in Annex 22.



List of annexes proceedings

At the End of the Pipe?

Annex 1	Presentation Moses Ocholo Otieno – WASTE – IHE, Nakuru	2
Annex 2	Presentation of Aussie Austin – CSIR Building and Construction Technology, South Africa	5
Annex 3	Presentation of Adriaan Mels – Lettinga Associates Foundation, the Netherlands	7
Annex 4	Presentation of Harm Baten – Water Control Board District Rijnland, the Netherlands	10
Annex 5	Participant list 20 January 2005	12
Annex 6	Presentation of Harald Hiessl – Fraunhofer ISI, Germany	13
Annex 7	Presentation of Anton Peter-Fröhlich – Berliner Wasserbetriebe, Germany	16
Annex 8	Presentation of Viju James - Pragmatix Research & Advisory Services Pvt. Ltd., India	19
Annex 9	Presentation of Dan Lapid – CAPS-Centre for Advanced Philippine Studies, the Philippines	21
Annex 10	Participant list 27 January 2005	25
Annex 11	Presentation of Pascal Karlsson – Municipality of Göteborg, Sweden	26
Annex 12	Presentation of Lin Jiang – Guangxi Committee JiuSan Society, China	32
Annex 13	Presentation of Caroline Schönning – Swedish Institute for Infectious Disease Control, Sweden	36
Annex 14	Participant list 3 February 2005	40
Annex 15	Opening speech of Joep Bijlmer, DGIS ~ Dutch Ministry of Foreign Affairs	41
Annex 16	Presentation of Anna Tsvetkova – Mama 86, Ukraine	44
Annex 17	Presentation of Ron Sawyer - Sarar Transformación SC, Mexico	47
Annex 18	Presentation Arno Rosemarin – Stockholm Environment Institute, Sweden	52
Annex 19	Closing speech of Joep Bijlmer, DGIS ~ Dutch Ministry of Foreign Affairs	55
Annex 20	Participant list public debate 3 March 2005	56
Annex 21	Main outcome on Sanitation during CSD-12	57
Annex 22	Decisions adopted by CSD-13	58

Annex 1 Presentation Moses Ocholo Otieno – WASTE – IHE, Nakuru

The role of households in planning of sanitation systems in Nakuru-Kenya.

Otieno, Moses Ochola
M.Sc student
UNESCO-IHE & WASTE
January, 2005

Outline of presentation

- Background
- Current water and sanitation situation
- Associated Problems
- Factors in sanitation selection and implementation
- The way forward
- conclusions
- Questions and comments.

Background

Nakuru :

Fourth largest city in Kenya
(after Nairobi, Mombasa and Kisumu)

serves as provincial administrative capital and agricultural centre.

Current Population estimate 400,000 (NMC estimates)
Population growth rate 5.6%
(map)

Location of Nakuru Town- Kenya



Current Water and Sanitation situation.

WATER

Only 67% of the daily water demand (estimated at 75,000 m³/d) is achieved
Reduces to 40% for the low income areas.

Per capita consumption is 40-200 l/c.d

Generally there is insufficient water supply

Current Water and Sanitation situation.

SANITATION

- Only 19% of the municipal area is connected to sewer which represents 40 % of the population.
- The rest of the population (60%) is served by alternative means e.g septic tanks, conservancy tanks and pit latrines.
- There are two waste water treatment plants (WWTP) with a total joint capacity of 16,000m³/d

Annex 1 (2) Moses Ocholo Otieno

Associated problems

- Due to these limitations, problems arise that pose;
 - Risks to Health
 - Environmental pollution

Resulting from;

- Blockage of sewer mains
- Illegal connection of house sewer to storm drains
- discharge of Solid and Human waste into open drains
- In some parts of the municipality, pollution of ground water resources

HOW CAN PLANNING AND SELECTION OF SUITABLE TECHNOLOGIES HELP TO REDUCE THESE PROBLEMS?

What governs sanitation technology selection

- Water availability.
- Population Density
- Climate
- Topography
- Geology

But there are other factors to consider at household level

Demand factors for sanitation in Nakuru

At individual level, people consider the following in selection of sanitation technology

Cost	cheap
Technology	Easy to use, replace broken parts, robust
Hygiene	Easy to clean, no smell, flies
Convenience	Can be used by anyone at anytime
Affordability	No additional operating costs eg water bills

Factors that hinder Sanitation Coverage in Nakuru

Financial ability

for sustainability, Sanitation should be affordable to the poorest in the community
Average monthly Minimum wages(2003) for Nakuru is € 51 per month or € 2.6 per day
(Source economic survey, 2004)

For the Low income area, survey shows that
(Source:ITDG,2003)

	% of population	€/day
Earn	58%	<5
Spend	93%	<5

Lack of awareness of Sanitation & Hygiene

Higher literacy levels associated with demand for safer methods of excreta disposal.

Lack of skills on Toilet construction and Maintenance

Results in poor quality construction and poor maintenance.

Geology and hydrological conditions

Weak soils lead to collapse of pit latrines and septic tanks . May result in ground water contamination.

In Nakuru the south western zone is a geologically weak area prone to ground subsidence.

Socio-cultural

Cultural beliefs e.g. fear of handling sanitized human waste or refusal to share toilet facilities can hinder development of sanitation. Cultural views should be taken into account at planning stage.

Institutional support

Enforcement(or lack it) of laws by responsible institutional organs is a hindrance factor.

Example: Nakuru municipal council does not vet new development plans on sewer/sanitation requirements resulting in defective systems being constructed.

Annex 1 (3) Moses Ocholo Otieno

Way forward

Past planning / implementation procedures did not directly consider consumer/ households opinion.

To solve current sanitation problems require a demand responsive approach .

Demand response = participatory approach
+ money needs.

Or

What people desire + what they can afford.

- Use of strategically placed demonstration units as promotional means is encouraged.
- Will create familiarity and enable people to learn more about new technologies and hence break down barriers caused by hindrance factors.
- Fast track means to achieving MDG goals on sanitation

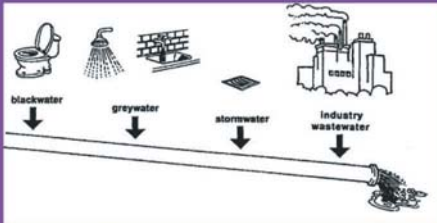
conclusion

- Need to understand consumer needs in planning and implementation of improved sanitation technologies.
- In this way affordable and convenient system relevant to community needs can be realised

THANK YOU

Annex 2 Presentation of Aussie Austin – CSIR Building and Construction Technology, South Africa

At the end of the pipe..... what next?



Aussie Austin
CSIR, Pretoria, SA



If you had to do it over, what would you do differently?

- In SA we base our sanitation policy on:
 - society
 - health considerations
 - environmental considerations
 - the water cycle



Aims of sanitation provision in SA: The priorities

- Improve health and quality of life
- Protect the environment



Criteria for good sanitation in SA

- Reliability
- Acceptability
- Appropriateness
- Affordability
- Sustainability



Why create sewage?

- The problem is not "sewage disposal", but rather disposal of human faeces and urine
- Mixing faeces and urine creates a problem.



Myth of Western sanitation systems

- Designed on the premises that:
 - human excreta are waste products suitable only for disposal; and
 - the environment is capable of assimilating the waste.
- These premises are outdated!
 - Current sanitation "solutions" contribute to water pollution, food insecurity, and loss of soil fertility.



Annex 2 (2) Aussie Austin

Rather consider ecological sanitation

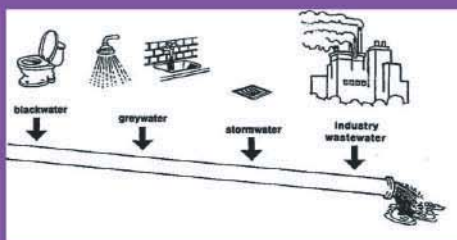


Why do we need ecological sanitation?

- Many environments are already seriously polluted, or rapidly becoming so
- Resource conservation
- Recycle nutrients to agriculture.



So instead of this.....



Do this



Annual excretion of nutrients by humans

Fertiliser	500 L urine	50 L faeces	Total
Nitrogen (N)	5,6 kg	0,1 kg	5,7 kg
Phosphorus (P)	0,4 kg	0,2 kg	0,6 kg
Potassium (K)	1,0 kg	0,2 kg	1,2 kg
TOTAL N+P+K	7,0 kg (94%)	0,5 kg (6%)	7,5 kg (100%)



This fertiliser is enough to grow 230 kg of cereal crops



Some conclusions

- Sanitation is not just a matter of building toilets and laying pipes
- Environmental aspects of sanitation are very important
- Soil fertility and food security are major problems in many countries.



Annex 3 Presentation of Adriaan Mels – Lettinga Associates Foundation, the Netherlands

'Afvalwaterketen ontketend'

Perspectives for wastewater management in the 21st Century

Adriaan Mels, Grietje Zeeman,
Lettinga Associates Foundation / Wageningen University

Harm Baten
Water Board Rijnland

STOWA, research organisation water boards



WAGENINGEN

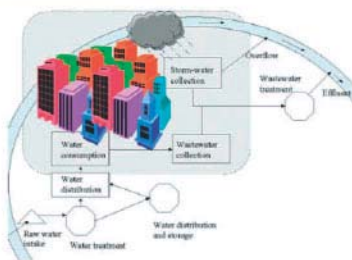
Outline

- ⊖ The wastewater chain
 - ⊖ Developments in the wastewater chain anno 2004
 - ⊖ Sanitation systems based on separate collection of flows
 - ⊖ Potential of these systems
 - ⊖ Recommendations
 - ⊖ Planning and acceptance
- ⊖ Demonstration project near Leiden



WAGENINGEN

Urban Water Infrastructure



WAGENINGEN

Why do we have wastewater infrastructure

- Public health protection: removal of hazardous wastes
- Protection of the environment through prevention of emission of pollutants to water systems
- Transport of excess water (storm water, infiltration water) out of urban areas



WAGENINGEN

Components of wastewater infrastructure: sewer and treatment plants



Wastewater chain developments anno 2005

Sewers

- ⊖ Large-scale sewer renovations are at hand
- ⊖ Sewer overflows during storm water events cause diffuse pollution (expected to increase due to climate change)
- ⊖ Sewer is always leaking – effects ground water quality
- ⊖ Increasing affords to separate wastewater and storm + drainage water
- ⊖ Municipality frequently lacks capacity to manage the sewer system
- ⊖ Increasing annual costs (5-8% rise in taxes per year)



WAGENINGEN

Annex 3 (2) Adriaan Mels

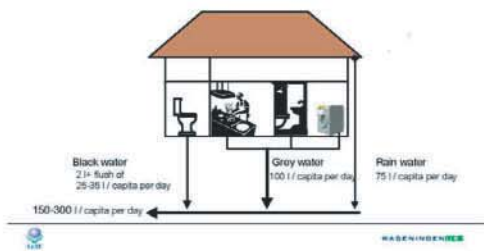
Wastewater chain developments anno 2005

Treatment plants

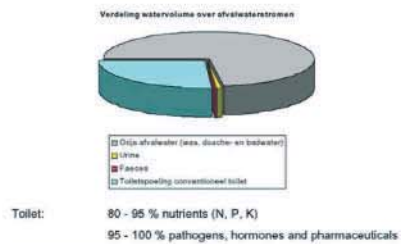
- Effluent of treatment plants are still discharging nutrients and micro pollutants
- European Water Directive in 2015 will increase costs by at least 25%
- Discharge of drug residuals and endocrine disruptors
- Disposal of polluted sewage sludge (350 kton per year)
- Potential valuable nutrients are lost

Why not consider system change ?

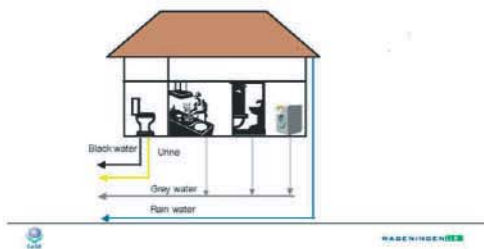
Current sanitation: dilution of concentrated flows



Household wastewater streams



Separate collection and treatment of wastewater flows



Why separate collection?

- Black water (2 l per cap per day) contains most nutrients, pathogens and drug residuals
- Dilution of concentrated flows – not very efficient
- More water, more risks of emissions
- Conflicts with "Ladder of Lansink": prevention, reuse, incineration, land filling.
- Metals of all sources end up in polluted sewage sludge

Quality of the sludge compared to sewage sludge

Metal	Sib digester system (mg/kg d.s.)	Sewage sludge (mg/kg d.s.)	Dutch agricultural standards
Cu	74 - 77	424 (100 - 600)	75
Cr	3 - 5	86 (30 - 500)	75
Zn	335 - 340	1094 (500-3000)	300
Pb	2 - 4	206 (250 - 800)	100
Cd	0,4	3,8 (2 - 20)	1,25
Ni	6 - 7	36 (20 - 150)	30
Hg		1,9	0,75
Ar		7,3 (1 - 20)	25

Generaliseerde projecten in Nederland, Duitsland en Zweden

Naam en jaar van aanleg	Typering					
	Lokale grijze water herbenutting	Zwart water, compost toilet	Zwart water, duurzaamheid	Zwart water, herbenutting	No black sludge	Lokale regenwater-afwatering
Historie						
Lietburgsplein, Leiden, Dordrecht en Amsterdam (1870-1918)				X		
Huidige projecten						
Groene Dak, Utrecht (1993)	X	X				X
Driebergen, Groeningen (1995-1997)	X					X
Polderdijk, Arnhem (1998)	X					X
Lansmeer, Culemborg (1999-2003)	X		X			X
Schutterstraat 1, Delft (1998)	X	X			X	X
Waterplan, Den Haag (1998)	X					X
Rijkswaterstaat Ternaarden (2000)	X		X			X
Watermuseum in Arnhem (2003)					X	X
Hoofdkantoor Hoogheemraadschap van Rijnland (2008)					X	X
Projecten in voorbereiding						
EcoPark, Emmeloord (2003-2005)	X					X
Volkerburg Leiden (2007-2010)	X		X		X	X
Meppel (2009)					X	X

Annex 3 (3) Adriaan Mels

Name an jaar van aanpak	Type(s)				
	Indiv. opz. water- en afvalwater-afvoer	Zelf. water- en afvalwater-afvoer	Zelf. water- en afvalwater-afvoer met afvalwater-afvoer	Indiv. afvalwater-afvoer	Indiv. water- en afvalwater-afvoer
Publiek					
Biofield/Waldwalle (1996)	X	X		X	
Oro-Technik-Plan, Hannover (1996)	X	X	X	X	
Mobilprojekt 'Wohnen & Arbeiten', Freiburg (1999)	X	X	X		X
Oekologische Wohnsiedlung Filbertstraße (2000)	X	X	X		X
Lambertstraße, Bielefeld (2002)	X			X	X
Karlsruher NW-Beckengraben (Kondensat für Wiederverfahren), Frankfurt (2004)	X		X		
Hof/Banloc QTZ (Deutsche Gesellschaft für Technische Zusammenarbeit GmbH), Frankfurt (2004)					X
Projecten in voorbereiding					
DEUS 31, Nottulgen (2005)	X		X		X
Berliner Wasserbehälter, Berlin (2005)	X		X		X
Zeeën					
Biofabriek/Innovatie Mynsteden, Toomp (1992)	X	X		X	X
Valer Holiday Village Birkens, Göteborg (1994)			X	X	X
Palmarmalen, Stockholm (1997)				X	X
Uddenströmsliden, Stockholm (1998)				X	X
Ekopollen, Nottulgen (1999)		X		X	X
Gåsen, Stockholm (1999)		X		X	X
Isopstera, Göteborg (2004)			X		X

Two concepts

1 Separate collection and treatment of urine within existing water infrastructure

2 Complete system with separate treatment of black and grey water and storm water

Evaluation of STOWA programme

- The required technologies are available
- New systems can comply with primary sanitation objectives: protection of public health and the environment
- Storm water and city drainage requires a separate system
- Cost efficient at scale of 5,000 – 10,000 cap (various studies)

Evaluation of STOWA programme

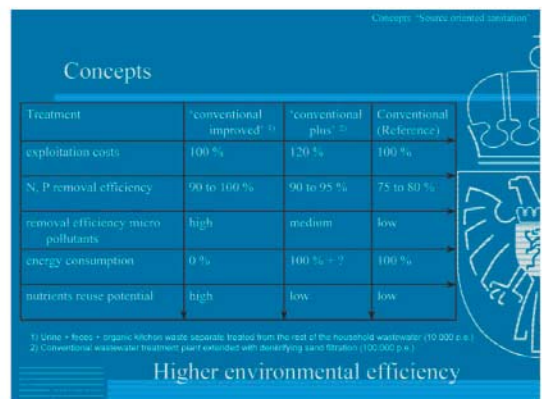
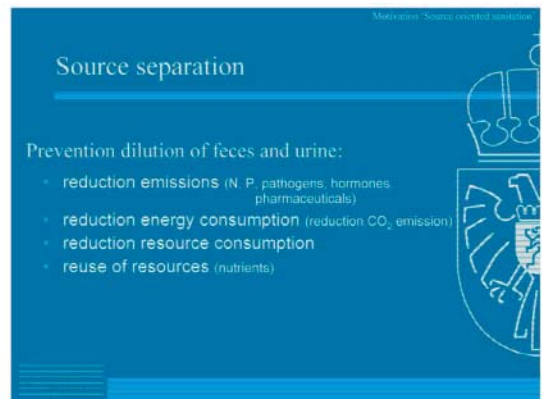
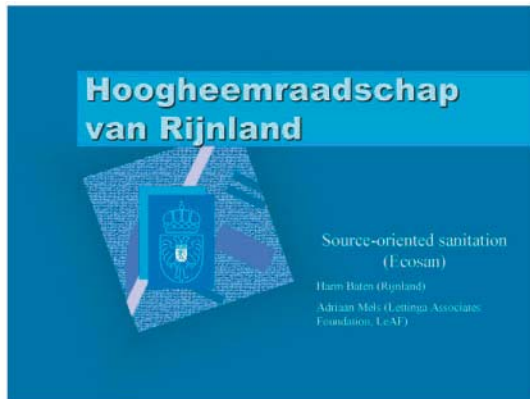
Most important advantages for Netherlands anno 2004:

- Improved waste control: absence of environmental emissions through storm water and effluents
- Cleaner sewage, possible reuse for the future?
- Reuse of nutrients (esp. P)
- Flexible system

Recommendations

- New approach has large potential
- Full scale experience is still limited
- It is recommended to start a number of demonstration projects in The Netherlands
- Parallel a programme to monitor and exchange experiences

Annex 4 Presentation of Harm Baten – Water Control Board District Rijnland, the Netherlands



Annex 4 (2) Harm Baten

Conclusions

Short term: conventional 'plus'

(Middle-) long term: transition to other concepts with a higher environmental efficiency

The (middle-) long term starts today by demonstration projects




Challenges

Case Valkenburg: new settlement (800 houses, 2007)

Partners: municipality, waterboard, project developer, architect, consultants

Risk spreading (case):


- project developer: 80%
- city: 10%
- waterboard: 10%



Conclusions

Demonstration project Valkenburg should be embedded in a national context (information exchange – 'learning', support, risk management)

Rijnland and municipality Valkenburg would like to invite some participants of this seminar soon to consider participation



Annex 5 Participant list 20 January 2005

Nr	Name, first name	Organisation
1	Austin, Aussie	CSIR Building and Construction Technology
2	Batterink, Marlies	Dutch Ministry of Agriculture, Nature and Food Quality
3	Boon von Ochssee, Ton	Dutch Ministry of Foreign Affairs
4	Bruijne, Gert de	WASTE
5	Diepeveen, Aleid	Waterleidingmaatschappij Drenthe
6	Enk, Peter Gijs van	Habitat Platform
7	Frijters, André	Directorate-general for Public Works and Water Management from the Dutch Ministry of Transport and public works
8	Guchte, Cees van de	UNEP
9	Klundert, Arnold van der	WASTE
10	Koning, Edwin	Dutch Ministry of Housing, Environment and Planning
11	Kuiken, Atti	Netherlands Water Partnership
12	Luttikhuijs, Aloys	Water Control Board District Regge en Dinkel
13	Meer, Rien van der	Municipality of Gouda
14	Mels, Adriaan	LeAf
15	Munzala, B. K.	Embassy of the Republic of Kenya
16	Otieno, Moses Ochole	IHE-WASTE
17	Roborgh, Arthur	Dutch Ministry of Housing, Environment and Planning
18	Rodic, Liliane	UNESCO-IHE
19	Spreekmeester, Ron	Habitat Platform
20	Veldhuizen, Caroline	NCDO
21	Zon, Henk van	NAHI

Annex 6 Presentation of Harald Hiessl – Fraunhofer ISI, Germany

The AKWA Project - Long-term Options for Sustainable Urban Water Infrastructure Systems

Harald Hiessl
Fraunhofer Institute for Systems and Innovation Research ISI
Karlsruhe, Germany

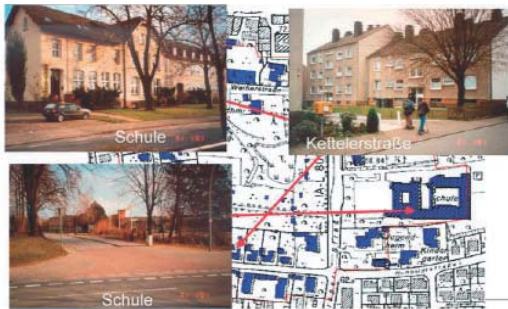
"At the End of the Pipe" Workshop
RIKZ, The Hague
January 27, 2005



- Provide **strategic support** to municipal decision makers to implement sustainable urban water infrastructure systems (UWIS)
- Identify **long-term options** to renovate our UWIS (time horizon: year 2050+; "brownfield"-situation)
- Apply the approach to two **case studies** (Selm-Bork, Dortmund-Asseln) and involve municipal decision makers
- **Assess the sustainability** of various UWIS-concepts
- Derive suggestions for **system transition**



Goals of AKWA 2100 project

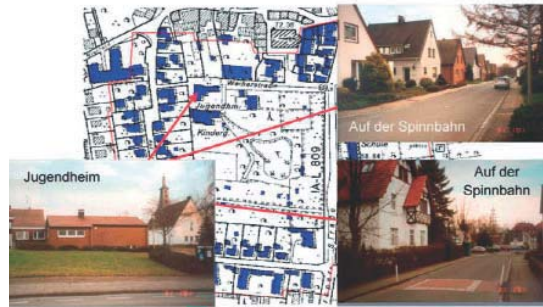


AKWA 2100: Selm-Bork

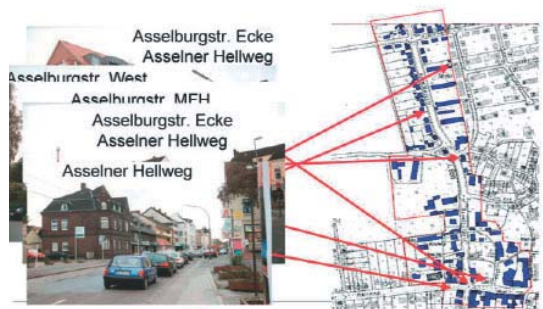
- Leaking sewer systems require **rehabilitation**
- **"New" pollutants in sewerage:** Pharmaceuticals and metabolites (e.g. endocrine disruptors, anti-biotics, cytostatics, other micro-pollutants)
- More stringent **quality requirements** for wastewater (w.r.t. nutrients, disinfection, disposal of sewage sludges, ...)
- Combined sewer overflows (**CSO**) cause ecological stress in receiving waters
- Adaptation of water supply and sewer systems to **climate change**
- Reduced water consumption:
 - **Hygienic problems** in water distribution networks
 - **Sedimentation problems** in sewers
- Safety of urban water services from **terrorist attacks / sabotage**



Need for action



AKWA 2100: Selm-Bork

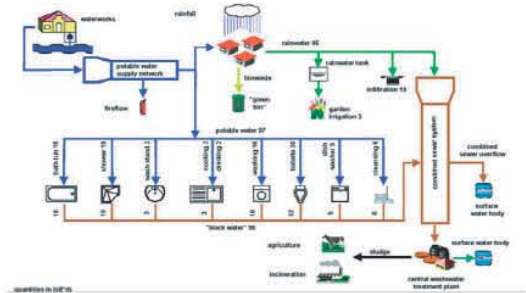


AKWA 2100: Dortmund-Asseln

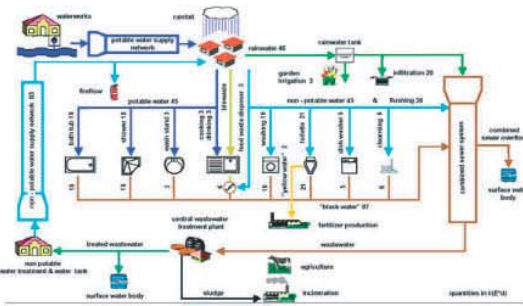
Annex 6 (2) Harald Hiessl

Driving factors	Value	Scenario 1	Scenario 2	Scenario 3
Degree of regulation	Regulated	X	X	
	Unregulated			X
Degree of centralization	Centralized	X	X	
	Decentralized			X
Degree of differentiation of wastewater streams	Small	X		
	Medium		X	
	High			X
Degree of closure of anthropogenic water and material cycles	Small	X		
	High			X
Name of the scenario		Continuation	Municipal Water Reuse	Local Recycling

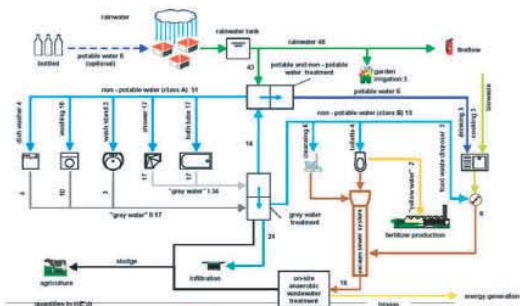
Fraunhofer Institute Systems and Innovation Research
Scenario Drivers in AKWA 2100



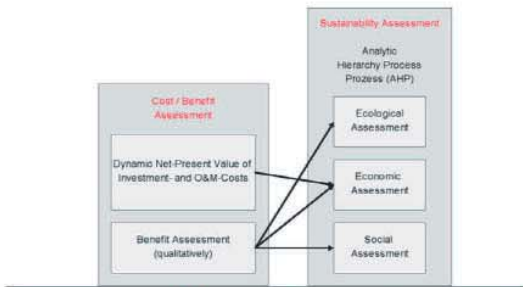
Fraunhofer Institute Systems and Innovation Research
AKWA 2100-Scenario „Continuation“



Fraunhofer Institute Systems and Innovation Research
AKWA 2100-Scenario „Municipal Water Reuse“



Fraunhofer Institute Systems and Innovation Research
AKWA 2100-Scenario „Local Recycling“



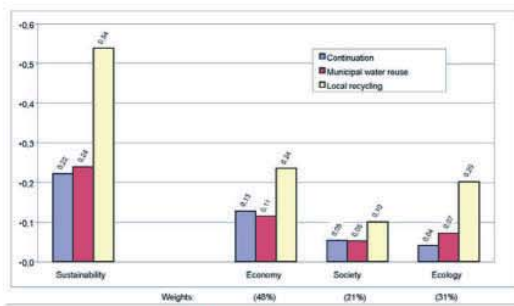
Fraunhofer Institute Systems and Innovation Research
Assessment and evaluation of the scenarios

Case	Scenario / Concept	Additional costs as compared to reference scenario „Continuation“	
		Dortmund-Asseln	Selm-Bork
A: „green field“	Municipal Water Reuse	23 %	22 %
	Local Recycling	11 %	5 %
B: „step-by-step“ Transition	Municipal Water Reuse	27 %	26 %
	Local Recycling	15 %	11 %

Fraunhofer Institute Systems and Innovation Research
Comparison of NPV of scenarios

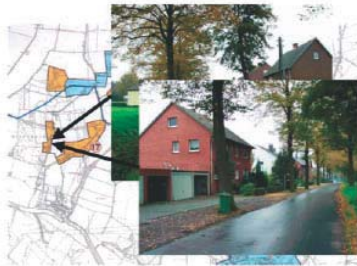
Case	Scenario / Concept	Additional costs compared to reference scenario „Continuation“			
		Distribution of costs public / private			
		Do-Asseln		Selm-Bork	
A: „green field“	Municipal Water Reuse	23 %	33,4% / 66,6%	22 %	42,2% / 57,8%
	Local Recycling	11 %	5,3% / 94,7%	5 %	8,9% / 91,1%
B: „step-by-step“ Transition	Municipal Water Reuse	27 %	33,4% / 66,6%	26 %	40,1% / 59,9%
	Local Recycling	15 %	5,8% / 94,2%	11 %	8,8% / 91,2%

Fraunhofer Institute Systems and Innovation Research
Comparison of NPV of scenarios



Fraunhofer Institute Systems and Innovation Research
Overall result: Sustainability assessment

Annex 6 (3) Harald Hiessl



- 26 houses (mostly single family)
- 40 accommodation units
- 100 inhabitants
- On-site water supply from wells (partially problems with iron, manganese, nitrate...)
- On-site sanitation with septic tanks and cesspits: most systems urgently need rehabilitation / replacement
- Duty for sanitation transferred from municipality to owners
- Goal: improvement in sustainability of water services in Dahler Feld (DF)



AKWA Dahler Feld (1)



AKWA Dahler Feld (2)

- Identification of alternative UWIS concepts for Dahler Feld:
 - 9 basic technical clusters: w/o water supply
 - Sub-varieties acc. to treatment technology (SBR, MBR, trickling filter, constructed wetland)
- Estimation of investment and O&M costs of each alternative system (for each household & for service area)
 - based on detailed bill of quantities / materials
- Results:
 - Water supply: individual on-site supply is most economic (and the only solution accepted by the population of DF!)
 - Sanitation: decentralized SBR-technology is most cost efficient however; MBR-technology is far more effective than SBR-technology



AKWA Dahler Feld (2)

How to convince homeowners to choose MBR?
How to lower cost for MBR?

- "centralization w.r.t. purchasing, construction, operation, ownership of decentralized deployed equipment": economies of scale (= no. of systems)
- 3 alternative offerings to homeowners:
 - a. every home owner is solely responsible for his / her system (reference)
 - b. Prerequisite: Final costs of MBR-systems for homeowners should not exceed cost of reference.
 - I. EGLV-river association bundles procurement and operates the MBR-systems owned by homeowner; 10 year service agreements; individual fee
 - II. As in b-I, but EGLV also owns the systems and enters in 10 year contracting agreements; slightly higher fee
- About 80% of the homeowners decided for option b-II



AKWA Dahler Feld (3)

- Existing UWIS require large investments for rehabilitation
- Innovative water-efficient technologies become available continuously
- Due to the long life time of UWIS a long-term perspective is essential to improve the sustainability
- Scenario approach is a suitable tool to develop long-term perspectives
- Technological and organizational alternatives to the conventional UWIS-concept are available
- There are alternatives which are comparable to conventional UWIS w.r.t. cost but which are more sustainable
- Municipalities / utilities need strategic visions for their UWIS
- We need municipalities and utilities ready to lead the way and initiate the transition to sustainable UWIS!

"We cannot solve our problems with the same thinking we used when we created them."

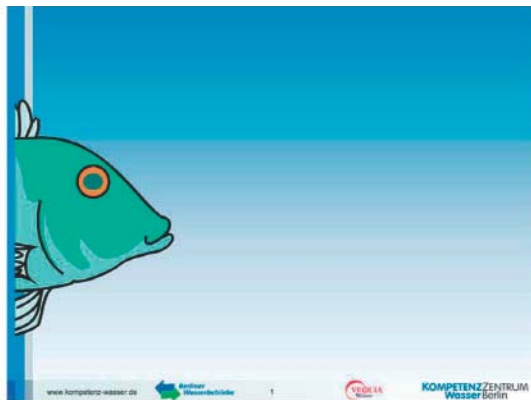
A. Einstein



Conclusions



Annex 7 Presentation of Anton Peter-Fröhlich – Berliner Wasserbetriebe, Germany



Sanitation Concepts for Separate Treatment of Urine, Faeces and Greywater, Demonstration Project in Berlin, Germany

Technical Project Manager:
Anton Peter-Fröhlich (Berliner Wasserbetriebe)

Administrative Project Manager:
Francis Luck (Kompetenzzentrum Wasser Berlin)

Isabelle Kraume (Berliner Wasserbetriebe)
Regina Gnirs (Berliner Wasserbetriebe)
Rolf-Jürgen Schwarz (Berliner Wasserbetriebe)
Boris Lesjean (Veolia Water)
Jens Meinhold (Veolia Water)
Lucie Patra (Veolia Water)

Kooperation mit OtterWasser GmbH, TUHH, TUB und HUB

With the contribution of the LIFE financial instrument of the European Community

Content

- Objectives
- Motivation
- Pre-study
- Demonstration-project
- First Results
- Conclusion

Objectives

The *new sanitation concepts* should be relevant solutions for:

- remote areas, where the connection to a central system wouldn't be technically or economically interesting
- rapidly growing conurbation's in developing countries
- countries with scarce water resources
- a sustainable development with the recycling of nutrients and water

Motivation

World-wide water scarcity

■ physical water scarcity
■ economical water scarcity
■ little or no water scarcity
■ not assumed

Source: International Water Management Institute (2001)

in 2025 more than 10 % of corn will be imported

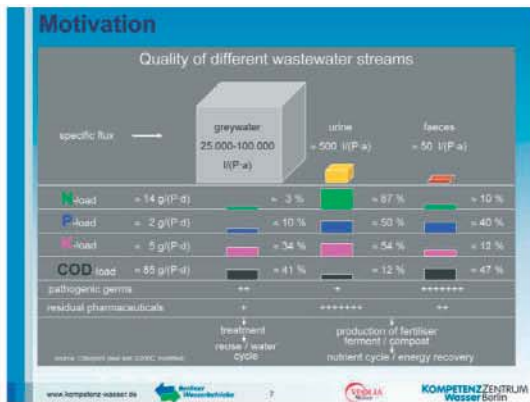
Motivation

Degree of Phosphor Reserves

based on reserves of 7,000,000,000 t P₂O₅

Source: Steen, Kemira Agro (1998), altered

Annex 7 (2) Anton Peter-Fröhlich

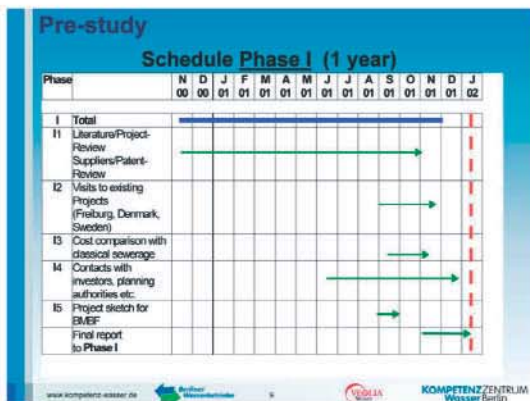


Pre-study

Project exists of two phases:

Phase I: Pre-study

Phase II: Demonstration-project



Pre-study

Results from Phase I

- about 17 *new sanitation projects* are existing in *Western Europe* already
- activities are strong increasing world-wide
- first cost-comparison showed that *new sanitation concepts* may have cost advantages

Pre-study

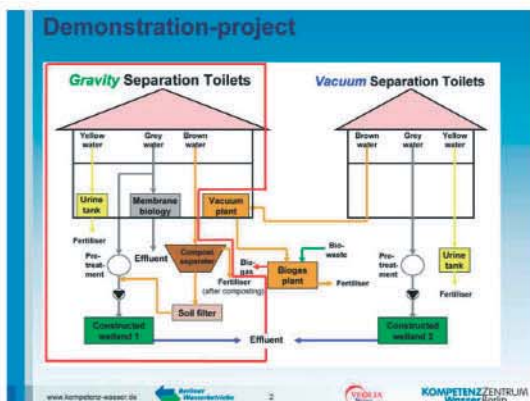
Results from Phase I

- about 17 *new sanitation projects* are existing in *Western Europe* already
- activities are strong increasing world-wide
- first cost-comparison showed that *new sanitation concepts* may have cost advantages

Pre-study

Conclusion from Phase I

- *new sanitation concepts* (*gravity*- und *vacuum*-separation toilets) should be tested !



Annex 7 (3) Anton Peter-Fröhlich

Demonstration-project

Roediger Vacuum Separation Toilet at WWTP Stahnsdorf

vacuum for faeces

gravity for urine

www.kompetenz-wasser.de KOMPETENZ ZENTRUM Wasser Berlin

Demonstration-project

Office building WWTP Stahnsdorf

www.kompetenz-wasser.de KOMPETENZ ZENTRUM Wasser Berlin

Demonstration-project

Apartment house WWTP Stahnsdorf

www.kompetenz-wasser.de KOMPETENZ ZENTRUM Wasser Berlin

www.kompetenz-wasser.de KOMPETENZ ZENTRUM Wasser Berlin

First Results

Infl.- and effluent Values Constructed Wetland (29.3. - 26.7.2004)

Parameter	Unit	Influent	Effluent
Flow (designed)	l/d	4.580	
Flow (actual)	l/d	1.321	820
SS	mg/l	17.8	3.4
COD	mg/l	85	28
NH ₄ -N	mg/l	7.1	0.08
NO ₂ -N	mg/l	0.06	0.06
NO ₃ -N	mg/l	0.30	7.2
P-Total	mg/l	2.9	0.23
Total coliforms	CFU/100 ml	10 ⁶	< 10
Salmonella (100 ml)		detection of Salmonella Gr. B and Gr. C	negative
Clostridium perfringens	CFU/100 ml	≤ 180	negative

www.kompetenz-wasser.de KOMPETENZ ZENTRUM Wasser Berlin

First Result Gravity Separation Toilets vs. Conventional Toilets

Category	worse (%)	no difference (%)	better (%)	no statement (%)
design	20	60	15	5
toilet flush	45	40	10	5
seating comfort	5	60	25	10
hygienic feeling	15	65	15	5
flush noise feeling	15	55	20	10

www.kompetenz-wasser.de KOMPETENZ ZENTRUM Wasser Berlin

Conclusion

- Demand for **New sanitation concepts** is high world-wide
- Activities increasing world-wide
- Operation of **gravity separation toilets** started in October 2003
- Test of **vacuum separation toilet** (Prototype)
- Increasing knowledge (designing, installation etc.)
- Operation experience with new sanitation concepts

www.kompetenz-wasser.de KOMPETENZ ZENTRUM Wasser Berlin

www.kompetenz-wasser.de KOMPETENZ ZENTRUM Wasser Berlin

Annex 8 Presentation of Viju James - Pragmatix Research & Advisory Services Pvt. Ltd., India

Ways Ahead in Urban Sanitation in India

A. J. James, PhD (London)

Environmental & Natural Resource Economist
Director, Pragmatix Research & Advisory Services
WESnet India Core Team Leader

27 January 2005
The Hague, Netherlands

Structure of the Presentation

- I. **Status of urban sanitation**
How bad is it?
- II. **Ongoing Initiatives**
Who's doing what?
- III. **The way ahead**
How do we do things better?

STATUS OF URBAN SANITATION IN INDIA

The sheer weight of numbers

- **Population** of 1 billion plus – around 30% in urban areas
- **MegaCities**: New Delhi, Mumbai, Kolkata, Chennai, Bangalore, Hyderabad – *others fast growing*
- **Class I cities**: Over 30 of 1 million plus population

HUMAN WASTE

- **Poor coverage** (not growing fast) - *Politically low priority*
- **Even if toilets constructed, low use** **Low use of constructed toilets for defecation** (57%) – *Many disincentives to use govt-constructed toilets (dirty (inside and outside), no water)*

OTHER SOLID WASTE

- Solid waste management, absent in almost all cases, where it exists, done with negligence and no scientific perspective
- Poor coverage and collection, outmoded technology, large vacancies among municipal workers – *Low investment & interest among municipal authorities (except during elections); staff are low paid, unmotivated*
- **Low awareness** of people – of need for safe sanitation, for solid waste management, segregation of waste at source, etc

LIQUID WASTE

- **No sewers** in several smaller towns (above 50,000)
- **Sewage Treatment Plants** only in big cities, or near big rivers (part of river clean up programmes). But, don't work after initial period – *Investment not priority; Where done, only for main plant – not for O&M*
- **ULBs unwilling to take up** sewerage schemes, for financial reasons (no separate financing arrangement for sewerage systems; operates as part of urban water supply)

Annex 8 (2) Viju James

ONGOING INITIATIVES: *Government*

- Doing it all –mechanized collection, segregation of waste, sanitary landfills, incineration... *but quality of implementation is a big question mark*
- Some excellent cases – e.g., *Kolkata*
- Regular investment in infrastructure – *but dependent on available budgeted funds and political visibility of problem* (e.g., Ganga Action Plan, Yamuna Action Plan)
- Larger the better – *but more investment, less O&M*
- BUT WB's TNUDP found WSS for urban local bodies, not sustainable without cross-subsidy or external finance

ONGOING INITIATIVES: *NGOs*

- Lots of small efforts in almost all mega and major cities – either NGOs on their own or in partnership
- *Bhagidhari (Sharing) Programme* in New Delhi
 - *SPARC* in Mumbai and Pune
 - *Exnora* in Chennai
 - *So Clean* in Baroda

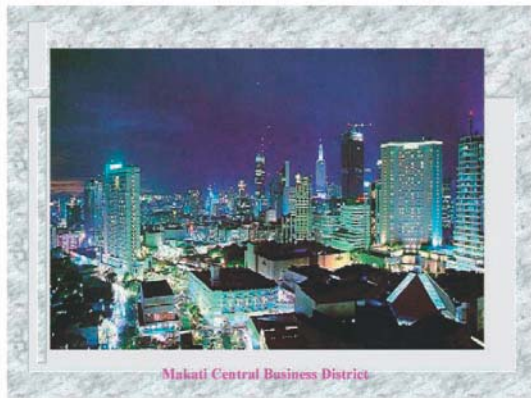
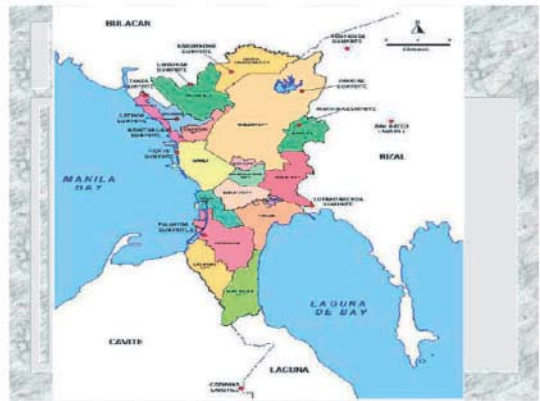
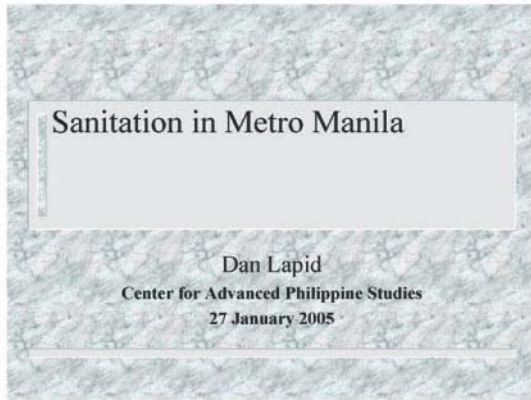
WAYS FORWARD

1. **A clear vision among major stakeholders:** *what does a sustainable local water supply and sanitation system look like?* Need conceptual clarity & awareness among SHs:
 - Government: central, state, district, local (policy makers)
 - District level line department staff (who implement)
 - NGOs (who facilitate)
 - Private sector (who provide consultancy services)
 - Communities (who run, use, maintain & pay for them)
2. **A thorough review of existing information:** *what is available (tech., institutions), what has been tried, where has it worked & why, what has not worked and why.*
3. **'Large scale' pilots:** *Small scale not taken seriously by governments – need to 'pilot at scale'*

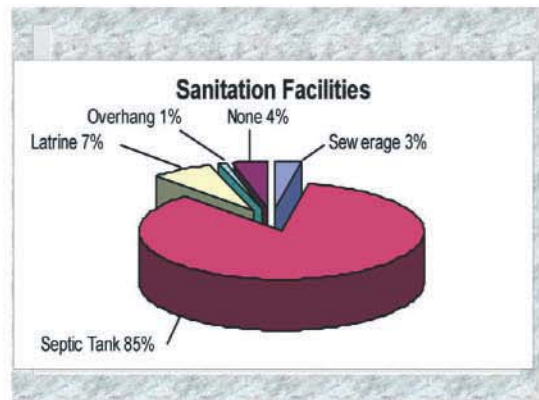
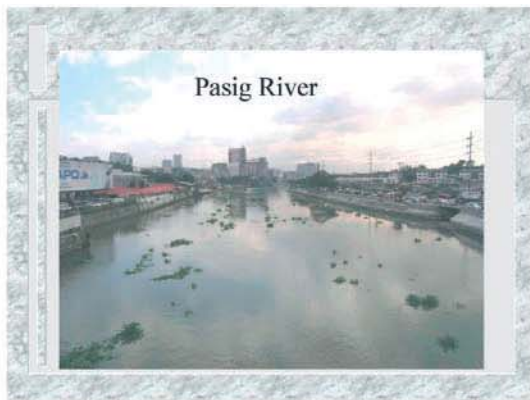
WAYS FORWARD 2

4. **Make the right connections:** *Donor agencies < 10% of finances available; need to approach the 'right' people for the right job; e.g., need to make politicians & bureaucrats take 'ownership' of schemes, campaigns and programmes ...*
5. **Use whatever works best:** *Economic arguments, pilots, lobbying power, media, social connections...*
6. **Co-ordinated multi-stakeholder effort:** *owned by govt, facilitated professionally & financially supported by donors with a clear vision, strategy and action plan.*
Information networks for sensible decision-making!

Annex 9 Presentation of Dan Lapid – CAPS-Centre for Advanced Philippine Studies, the Philippines

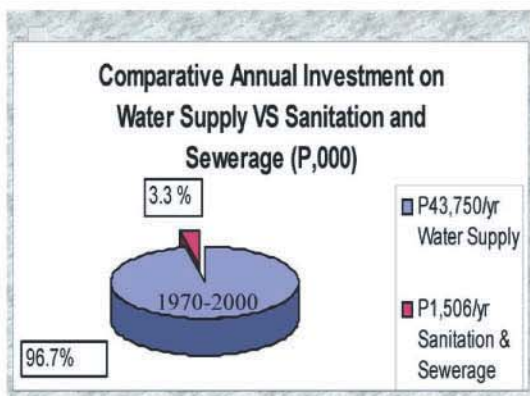
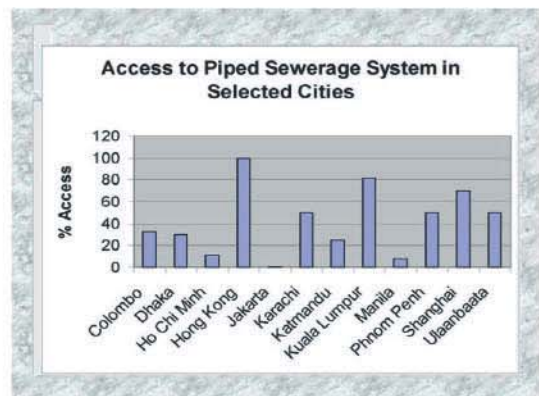
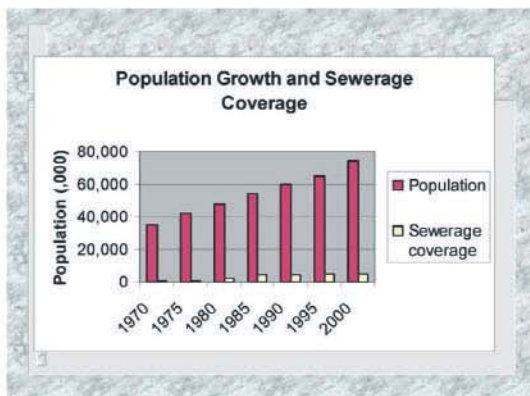
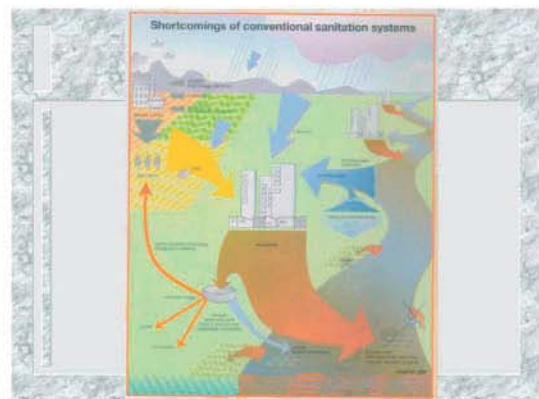


Annex 9 (2) Dan Lapid



Sanitation Conditions in MM

- Polluted waterways
- 70% of pollution loading to major inland waterways come from domestic wastewater
- Congested landscape
- Treatment facilities are severely lacking



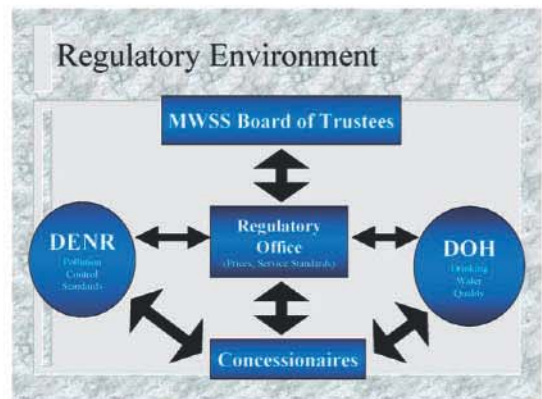
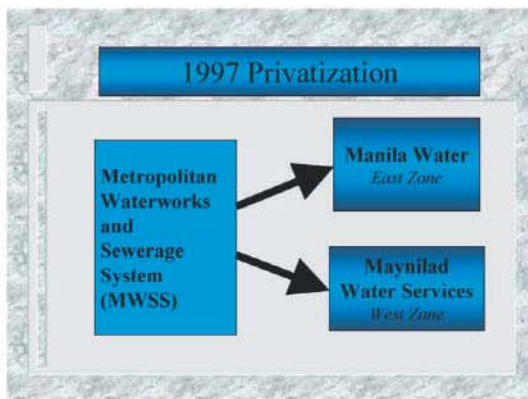
Law/Policy	Policy Statement
1964 RA 2931 An Act creating the National Water and Air Pollution Control Commission	Prohibits depositing into waters and air any polluting substance.
1974 DOH Circular No. 220	Sewage from household shall be connected to public sewerage or septic tank
1975 PD 856 Sanitation Code	Provides guidelines on sewerage/ excreta collection and disposal
1976 P984 The Pollution Control Law	Requires subdivisions, hospitals, public buildings to provide sewerage treatment facility

Annex 9 (3) Dan Lapid

Law/Policy	Policy Statement
1977 PD 1152 The Philippine Environmental Code: Revised in 1982	Polluters to be responsible to contain, remove and clean-up pollution incidents. Sets the EIA/EIS requirements
1994/96 NEDA Resolution No. 5 & 6 National Policy on Urban Sewerage and Sanitation	Provides for a national policy, strategy and action plan for urban sewerage and sanitation; and increased role of the LGUs
2004 RA 9275 The Clean Water Act	Sets the water quality standards and regulates transport and disposal of effluents, sewage and septage.

Institutions

Function	Agencies
Policy making	DENR, DOH, NEDA
Policy formulation, technical standards and guidelines	LWUA, DPWH
Public awareness	DENR, MWSS
Technical assistance	LWUA, MWSS, DENR
Enforcement Environment Code Sanitation Code	DENR/EMB DOH and LGUs

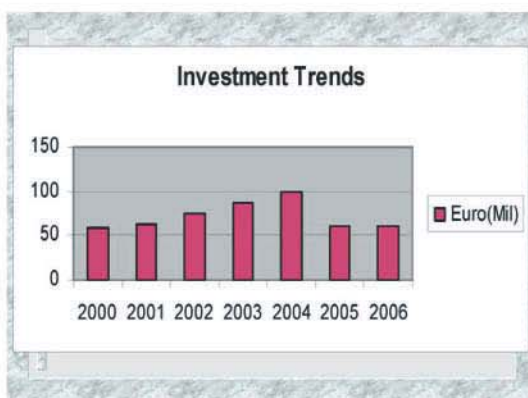


Challenges to Sewerage Expansion

<ul style="list-style-type: none"> ■ Congestion <ul style="list-style-type: none"> - lack of land for STPs - disruption due to pipe laying ■ Acceptance <ul style="list-style-type: none"> - most HH have been using septic tank - low willingness to accept new system 	<ul style="list-style-type: none"> ■ Sewer rates and cost <ul style="list-style-type: none"> - huge capital cost - additional cost to consumers ■ Wastewater Regulations <ul style="list-style-type: none"> - concessionaires have no mandate
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Decentralized Approach

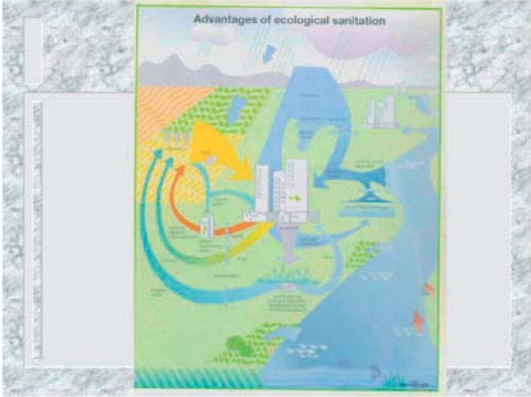
- Package sewage treatment system**
 - underground STPs to maintain use of space
 - use existing ST and sewer systems
 - 23 project sites planned
- Septic tank emptying and septage treatment**
 - desludging services
 - construction of STPs
 - production of biosolids as soil conditioner
- Community sanitation projects**
 - communal septic tanks



Capital Investment Required

- As per World Bank estimate:
- a 10-year programme (2005-2015) for a piped system in the urban areas would require a capital cost of P158.40 billion (E2.11billion) and an operating cost of P11.12 billion (E0.15billion) a year.

Annex 9 (4) Dan Lapid



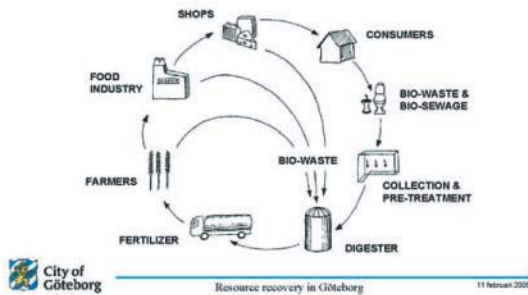
Thank you very much!

Annex 10 Participant list 27 January 2005

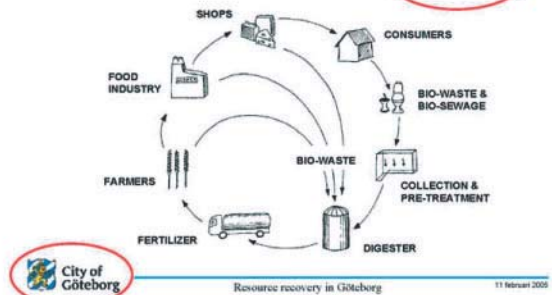
Nr	Name, first name	Organisation
1	Adimola, Beatrice	National Environment Management Authority, Uganda
2	Baten, Harm	Hoogheemraadschap van Rijnland
3	Bruijne, Gert de	WASTE
4	Diepeveen, Aleid	Waterleidingmaatschappij Drenthe
5	Herbergs, Marjolijne	Partners voor Water
6	Hiessl, Harald	Frauenhofer ISI, Germany
7	James, Viju	Pragmatix Research & Advisory Services Pvt. Ltd., India
8	Kemink, Erik	Netherlands Water Partnership (NWP)
9	Kwakkel, Jan	Waterschap Regge en Dinkel
10	Lapid, Dan	CAPS-Centre for Advanced Philippine Studies, the Philippines
11	Maessen, Stan	WASTE
12	Meer, Rien van der	Gemeente Gouda
13	Mwakali, Jackson	Makerere University, Uganda
14	Peter-Fröhlich, Anton	Berliner Wasserbetriebe, Germany
15	Smeets, Nienke	VROM
16	Smet, Jo	International Water and Sanitation Center (IRC)
17	Spankeren, Trudi van	Vereniging van Leveranciers van Milieuapparatuur en -Technieken (VLM)
18	Spreekmeester, Ron	Habitat Platform
19	Veening, Wouter J.	Institute for Environmental Security
20	Vereijken, Tom	Paques Water Systems BV
21	Vliet, Bas van	Wageningen University (WUR)
22	Vreede, Verele de	WASTE

Annex 11 Presentation of Pascal Karlsson – Municipality of Göteborg, Sweden

Resource recovery in Göteborg -Our Vision!



Resource recovery in Göteborg -Our Vision!



Göteborg, 2:nd City of Sweden

BASIC FACTS:

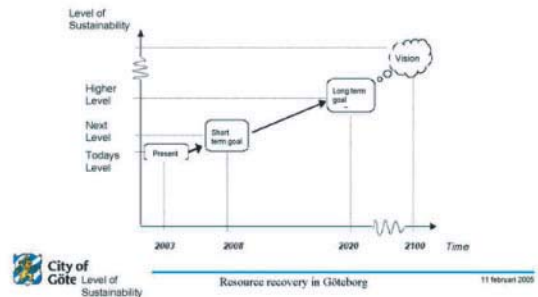
- Founded in 1621, with a Dutch canal system
- Inhabitants: 600.000 people
- Industries: Volvo, SKF, Ericsson, The Harbour,...
- Labour: Green & Left parties in Majority for >10 years
- www.goteborg.se

SOME SEWAGE FACTS:

- 1/3 Combined sewer (1856-1955), 2/3 Separate sewer (1955,...)
- 99% of households connected to the Public system
- Cost household/year approx. 150 € for Sewage, 100 € for Water
- One central Sewage treatment plant, with collection tunnels
- Many hills => a lot of pump stations



Göteborg Recycling Plan 2003: The Vision for Sustainable Water & Waste handling in Göteborg



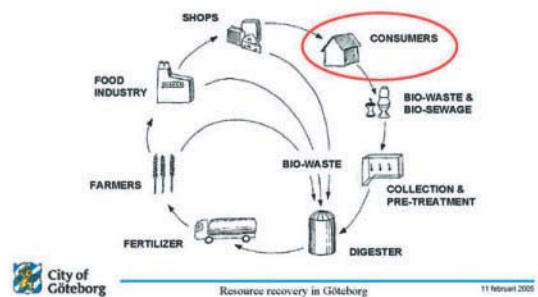
Is the vision shared at national level?

The Swedish Government:

- Have decided upon 15 environmental goals
- Has produced an Action plan for recovery of fosphor from sewage
- Has proposed a national goal of no organic material to landfill
- Is reviewing the legislation



Resource recovery in Göteborg -Our Vision!



Annex 11 (2) Pascal Karlsson

Is Swedish legislation adapted to Nutrient recycling?

YES? Water & Sewage law (1970), §24:

Water and sewage fees can only be charged for necessary costs.

YES? Environmental Code (1999) Chapter 2, §5:

Everyone who do an activity shall apply good resource management

YES! New Swedish Law Proposal (2004): Law about Public Water and Sewage Services 17§:

A public water- and sewage works shall fulfill the requirements regarding:

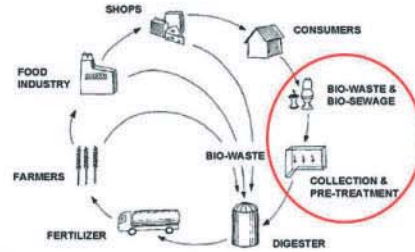
- environmental protection
- health protection
- resource management (New!!)



Resource recovery in Göteborg

11 februari 2005

Resource recovery in Göteborg -Our Vision!

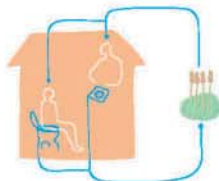


Resource recovery in Göteborg

11 februari 2005

Pilot projects with Source separation: BLACK WATER SKOGABERG

- **Basics:**
- 130 new houses in Göteborg
- One "Black Water System" for collection of Biowaste (from Kitchen Waste Disposers) & Bio-sewage (Ordinary WC).
- Gravity Sewers
- Concentration and treatment
- Fertilizer to farmers
- Measurements, Research



Resource recovery in Göteborg

11 februari 2005

Pilot projects with Source separation: URINE COLLECTION SYSTEM

Basics

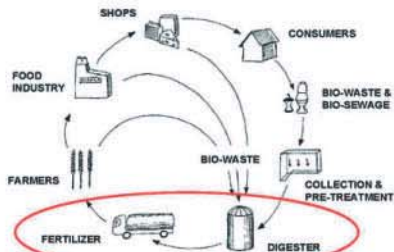
- 30 appartments + 2 exposition centers (700 000 visitors/year)
- Totally 300 m³ urine-liquid/year
- Septic tank, overflow to sewage pipe
- Collection by truck
- Reduced Sewage bill
- Fertilizer to farmer



Resource recovery in Göteborg

11 februari 2005

Resource recovery in Göteborg -Our Vision!



Resource recovery in Göteborg

11 februari 2005

Resource recovery from Sewage by "End of pipe solutions" in Göteborg

Situation Today 2005:

- Sewage is used for heat production with heat pumps.
- Biogas from digester used for cooking etc.
- Sludge is used to produce soils for green areas.

Situation Tomorrow?:

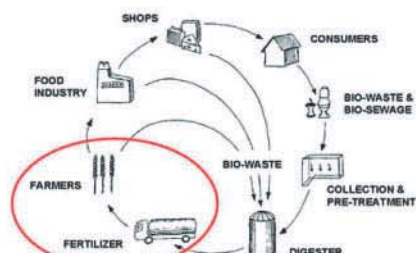
- No need for heat pumps?
- Biogas used as vehicule fuel?
- Sludge used for production of Fertilizer for farmers?



Resource recovery in Göteborg

11 februari 2005

Resource recovery in Göteborg -Our Vision!



Resource recovery in Göteborg

11 februari 2005

What do the farmers require of Fertilizer from recycled Bio-waste?

- Enough concentration of nutrients,
 - Easy to handle with standard equipment,
 - No visible trashes like plastics,
 - Not to much odours, etc...
 - No bacteria or virus!
 - Limited amounts of heavy metallar
 - Not to much organic man-made pollutants
 - Quality certification system
 - Attractive price
 - Acceptance from purchaser
- = Attractive product

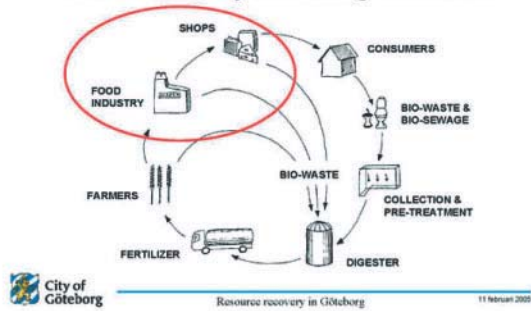


Resource recovery in Göteborg

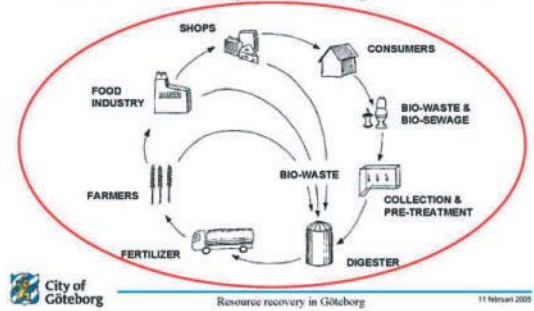
11 februari 2005

Annex 11 (3) Pascal Karlsson

Resource recovery in Göteborg -Our Vision!

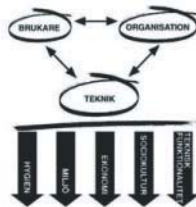


Resource recovery in Göteborg -Our Vision!

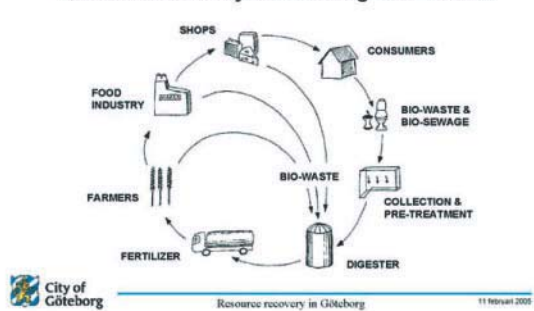


How to reach success in Recycling of Nutrients?

- A Comprehensive view:
- System Analysis for the Sewage System & Biowaste.
- Forum for all important Stake Holders.
- Common picture of problem and possibilities.
- At least some motivated and Pushing Stake-holders.
- Many years



Resource recovery in Göteborg -Our Vision!



Annex 11 (4) Pascal Karlsson

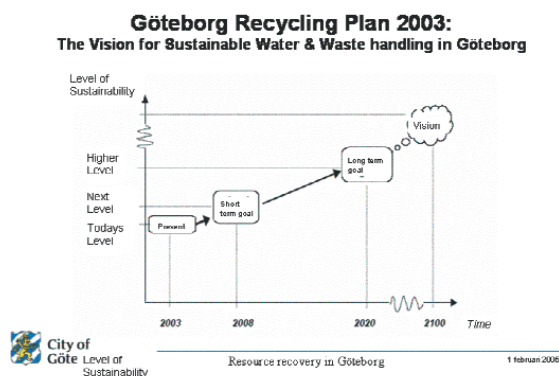
Sustainable Nutrient Recycling in Göteborg, Sweden

Ours vision

The all-over Vision for the City of Göteborg in the City Budget for 2005 includes that the city shall be based on *solidarity* and *sustainability*. In the future *segregation* shall be shifted to *integration*. We use the definition of sustainable development that considers the three dimensions:

- Ecological dimension
- Economical dimension
- Social dimension

When it comes to Water, Sewage & Waste, a specific "Recycling Plan" has been decided upon in 2003. We consider that our systems are relatively good today, but we want to reach "a higher level" of sustainability.



Based on this vision, we have selected the 8 Challenges, that we consider most important and for which we see a great potential of improvement. They are:

- 1 Preventive actions,
- 2 Sustainable Water supply,
- 3 Sustainable Nutrient Recycling,
- 4 Management of hazardous Substances in Sewage & Waste,
- 5 Efficient reuse and recycling of waste,

- 6 Do deposit of resources,
- 7 Increased knowledge of Substance Flows
- 8 Increased co-operation,

For Each of this Challenges, long-term and short goals has been settled as well specific actions to be taken.

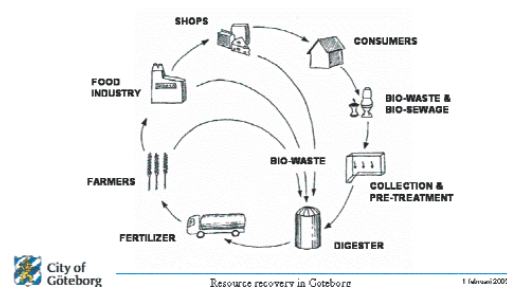
The Challenge: Nutrient recycling

Each day large amounts of nutrients are brought to the food industry, restaurants, and shops in the city. At each step, nutrient-rich bio-waste is generated. However, most of the nutrients reach the consumers and will end up in the water closet or the bio-waste of the households. In Göteborg today, at best these nutrients will be used for production of soils that will be used for grass areas, but not for agriculture. The main reason, why these nutrients aren't recycled to arable land in Sweden, is that they have been mixed with pollutions. Based on the precautionary principle, the farmers organisation have a policy not to use sewage sludge on farming land. At the same time a good deal of artificial fertilizer is spread at farming land to compensate for the harvested nutrients and increase the yield. This results in a non-optimised management of resources.

Our Long-term Goal (within one generation): The nutrients that are taken away from arable land should;

- preferably be recycled to food production, without risks for health or environment,
- otherwise be used in other ways that mineral fertilizer could be replaced.

Resource recovery in Göteborg -Our Vision!



Annex 11 (5) Pascal Karlsson

Which are the possibilities to recycle these nutrients from the cities back to the farming land, in a sustainable way? The picture above illustrate a Nutrient Recycling system based on a digester plant as a “hub” for the non-polluted bio-waste fractions in the region, coming from, for example; agriculture itself, food industry, shops & restaurants. An idea is that the same plant also could be used for non-polluted sewage fractions like human urine or “black water”. This will make relatively large volumes of bio-waste fertilizer available for the agriculture locally. An integrated planning of the entire food chain gives the possibilities to optimise the systems for collection and treatment of these fractions. The picture can be seen as an illustration of the vision we have in Göteborg. However we haven’t yet decided what system that shall be used: source-separation or end-of-pipe-treatment, or both? To find out which solution that will be best in Göteborg, we have just started a System Analysis for our Sewage system, aiming at a sustainable system in 2050. The analyse will include, health, environment, energy, nutrients and other resources, social aspects, risks and robustness etc. and is executed in cooperation with the Technical University of Chalmers.

Make it happen

At least one Key stake holder must take the initiative

In Göteborg environmental issues have been on the top agenda for about 10 years. The politicians want us to reach “a higher level of sustainability”. Therefore the City has decided to invest in some Sanitation pilot projects. City employees are allowed to spend some time on these questions. Water & Waste fees are constructed in a way to motivate the customers to select the environmental solution etc. In Göteborg the same department is managing both Water, Sewage & Waste. This facilitates to find synergies between “bio waste” and “bio sewage”.

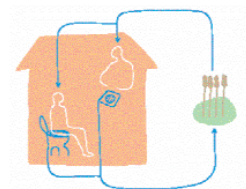
This long-term support from the decision-makers of an organisation is necessary if it shall be possible to reach a change.

Get all Major local stake holders together –try to understand each other

To reach success representatives from all major local stakeholders in the food chain have to sit down together. We had a start-up-meeting in 2003. We started by checking if we had the same vision about a sustainable development, and it was impressing to see how all stake-holders could agree upon that. A recommendation is therefore to not focus on the problem when starting such a dialog, but to focus on the vision and the challenge. An other factor is that all main stakeholders are also generators of bio-waste. They also want to have a sustainable management of their own bio-waste. If all stakeholders are cooperating a “win-win” concept is achieved which will increase the understanding of the principle of recycling for all parts involved. The stakeholders that should be represented in the co-operation are at least: Farmers, Food industry, Shops, Restaurants, Consumers, House Owners & Municipalities.

Pilot projects with Source separation: BLACK WATER SKOGABERG

- Basics:
- 130 new houses in Göteborg
- One “Black Water System” for collection of Biowaste (from Kitchen Waste Disposers) & Bio-sewage (Ordinary W/C).
- Gravity Sewers
- Concentration and treatment
- Fertilizer to farmers
- Measurements, Research



City of Göteborg

Resource recovery in Göteborg

1 februari 2006

Black Water Skogaberg. One source separation example from Göteborg.

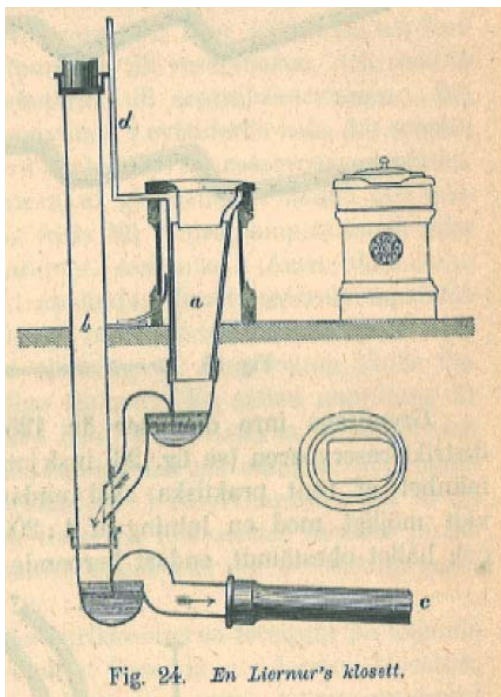
Many small steps

The road to a sustainable nutrient recycling is long, and it is of great importance that steps are taken, even if we cannot reach the vision in one step. For

Annex 11 (6) Pascal Karlsson

instance, we must accept that bio-fertilizer, if not accepted by farmers, for example could be used in parks or other applications where it would replace artificial fertilizer. Another point is that new systems must be tested at pilot plant scale to get experience. Every project cannot be successful. But it's important that testing of ideas is allowed by decision makers. Otherwise no development will happen.

Learn from Each other and History



It's not reasonable that each city invent the Wheel again. Many systems have been tested at different places and at different times. For example, in year 1884 about 60.000 persons (2000 houses) in Amsterdam and Leiden, were connected to the Liernur black-water system with vacuum pipes. The collected blackwater was treated and sold as fertilizer to farmers. This system was replaced with other system. Why? At the same time in Germany, a lot of the sewage was distributed on irrigation fields, where crops were cultivated. Now only a few of them are used. Why? In Göteborg the sewage system was built with start 1855, but it wasn't until 1907 that in

became allowed to connect water closets to the system. The bin latrine system was used. Why? The answers are too long for this short paper, but I want to make you interested in your own local sewage history, because there is so much to learn from that.

In Göteborg we try to contribute with our pieces to the puzzle.

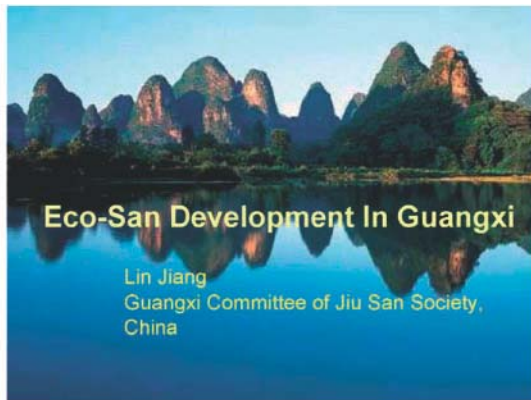
- We have invested in a black water pilot and research project, Black water Skogaberg.
- We are right now starting the collection of human urine from 4 buildings. The urine will be used as fertilizer by a farmer.
- Biological waste is collected to a central compost plant, but we have made a feasibility study about building a digesting plant with the concept on page 2.

Cooperation gives success

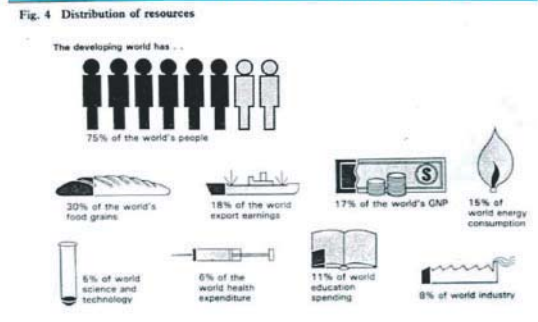
The vision of sustainable recycling of food nutrients is valid in all of Europe. Many sides of the problems and possibilities are also similar, but regional differences are also obvious; climate, need for irrigation, water resources available, requirement of fertilizers etc. Many cities in Europe have implemented source separation of waste. Only a few cities have experiences of source separating sewage systems. The exchange of experiences that has been done has so far often stayed at a national level. The City of Göteborg is interested in experience exchanging and cooperation with European partners.

If you have questions about future plans for the Sewage system or Sanitation projects in Göteborg, Sweden, you are always welcome to contact me by e-mail as below or by tel: +46 31 61 34 89 /Pascal Karlsson

Annex 12 Presentation of Lin Jiang – Guangxi Committee JiuSan Society, China



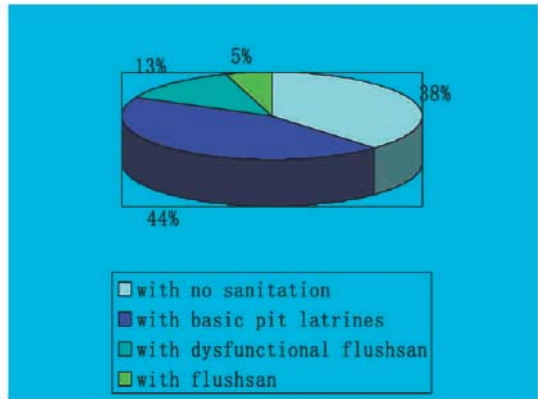
1. Background



1.2 The condition of sanitation in the world

Global Ecosan Challenge

- 2.6 billion with no sanitation
- 2.7 billion with basic pit latrines
- 0.8 billion with dysfunctional flushsan
- 0.3 billion with flushsan



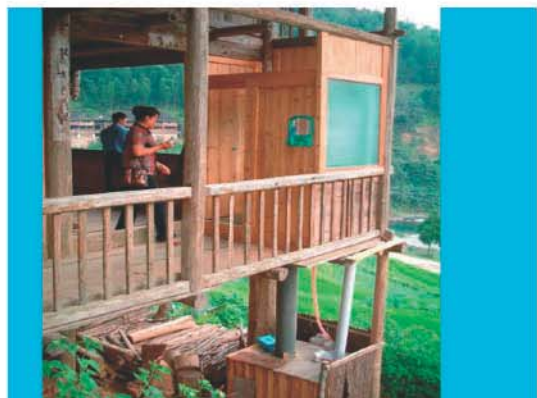
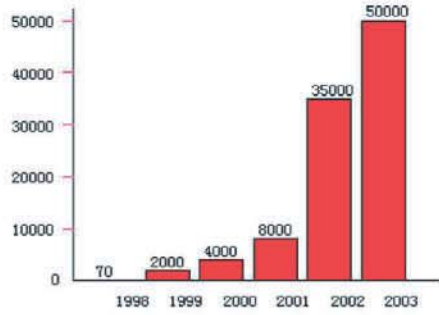
1.3 The condition of sanitation in China

According to the report on the condition of water supply and sanitation published by WHO Up to 2000 In China the coverage rate of sanitation was 38%; in that:

- urban areas--- 68%;
- rural areas--- 24%.

2. The development and application of ecosan in Guangxi of China

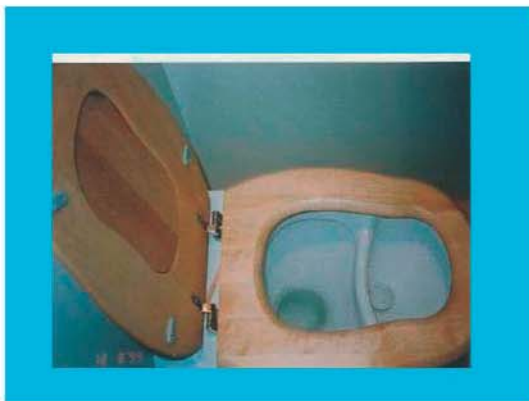
Annex 12 (2) Lin Jiang



Annex 12 (3) Lin Jiang



3. Introduce ecosan into urban areas



Annex 12 (4) Lin Jiang



4. What we going to do

- 4.1 Meet MDGs challenge
Ecosan integrate act (EIA) of Jiu San Society
- 4.2 Dianchi lake project in Kunming, Yunnan of China
- 4.3 Promote ecosan into tsunami areas



Annex 13 Presentation of Caroline Schönning – Swedish Institute for Infectious Disease Control, Sweden

Hygienic aspects in sanitation planning and urban development

- Swedish focus on risks, regulations and applications

Caroline Schönning

Swedish Institute for Infectious Disease Control (SMI)



Hygiene – an important criteria for sanitation systems

- Human excreta a resource - not a waste
- Criteria for a sanitation system (Swedish EPA, 1995):
 - Transmission of disease and sanitary conditions
 - Environmental impact and efficient use of resources
 - Technical and socio-economic criteria
- There are solutions available to secure hygiene
- Risks for transmission of disease do not have to be conclusive for if recycling of nutrients in "waste products" should be done
- Adaption of the systems is necessary
- Important to minimise risks by treatment, personal protection equipment, choice of crops etc.

Caroline Schönning – At the End of the Pipe, the Netherlands, 3 February 2005

Driving forces for a change

- Politics
 - definition of sustainability, environmental profile, afraid of back-lashes
- Legislation
 - a general environmental law, nutrient recovery goals suggested, new sludge legislation (Sweden, EU)
- Municipalities/Communities
 - alternatives needed (e.g. lack of water), wish for environmental profile
- People
 - wish for environmentally friendly living, high hygienic standard

Caroline Schönning – At the End of the Pipe, the Netherlands, 3 February 2005

SMI:s agenda

- National research on existing and future systems (e.g. Urban Water)
- Influencing national legislation by hygiene expertise
- The European level – research, legislation
- Advice and recommendations for developing countries

Caroline Schönning – At the End of the Pipe, the Netherlands, 3 February 2005

System alternatives

- Adapting existing systems
 - Reuse of wastewater, sludge etc.
 - Adding urine diversion
- Source-separating systems
 - Urine diversion
 - Blackwater collection
 - Dry faeces collection
 - Other alternatives, e.g. Aquatron
- Complementary, greywater still need to be treated

Caroline Schönning – At the End of the Pipe, the Netherlands, 3 February 2005

How should we approach the risks?

- Reuse/recycling of nutrients, not of pathogens
- No epidemiological evidence of disease transmission due to recycling – does not mean that there is negligible risk
- Direct and long-term consequences
- Risk assessments can be a helpful tool – considered along with other aspects in risk management

Caroline Schönning – At the End of the Pipe, the Netherlands, 3 February 2005

Swedish legislation

- A general environmental law – wide interpretation
- Responsibilities of water and wastewater industry?
- Regulations interact
 - no organic waste on landfill, recovery of nutrients, e.g. 60% P by 2015
- The new sludge regulation include other toilet waste fractions, e.g. urine, faeces?
- Bearings on recommendations for single households

Caroline Schönning – At the End of the Pipe, the Netherlands, 3 February 2005

The Swedish perspective - sludge

- Hygienic risks paid attention to (organic wastes)
- Health situation among animals comparatively good (e.g. *Salmonella*)
- Demand on safety introduced by other actors
- European regulation to be changed
- Other Nordic countries have generally stricter regulations
- Lack of information – suggested regulations also based on perception and experience

Caroline Schönning – At the End of the Pipe, the Netherlands, 3 February 2005

Annex 13 (2) Caroline Schönning

Proposed measures to decrease the hygienic risks

- Stricter regulations are proposed
- No untreated sludge allowed on land
- Other land than agricultural included in the regulations
- Including wastewater fractions containing faeces (not yet dry diverting systems)
- Special regulations for source-separated human urine suggested

→ Increase in reuse of nutrients?

Caroline Schönning – At the End of the Pipe, the Netherlands, 3 February 2005

Examples of how to design regulations

- Treatment
 - define processes
 - different levels (categories)
- Validation of the treatment process
- Microbiological/hygienic quality
 - presence of microorganisms
 - reduction of microorganisms
- Restrictions on usage
- Fertilising (irrigation) methods
- Handling of the product (e.g. transport, storage)
- Protection of workers
- Sampling
- Analytical methods



Caroline Schönning – At the End of the Pipe, the Netherlands, 3 February 2005

Acceptable risk

- Numbers discussed and proposed - e.g. 1 in 10 000 (drinking water), DALYs
- No additional cases
- Who should decide?
- Worst-case or average risk?
- Sensitive groups considered?

Caroline Schönning – At the End of the Pipe, the Netherlands, 3 February 2005

General hygiene recommendations

- Several **barriers** essential
 - The whole chain
 - Collection – treatment – distribution – (re)use
 - System adaptations (technical)
 - Personal protection, awareness
 - Restriction on use
 - Additional precautions
 - Information, documentation

Caroline Schönning – At the End of the Pipe, the Netherlands, 3 February 2005

Hygienic risks and recommendations for urine

- Urine relatively safe
 - Few diseases in developed regions
 - Special considerations in endemic areas in developing countries
 - Contamination by faeces constitutes the main risk
- Storage recommended (pH ~9)
 - Storage time depending on crop to be fertilised
 - Dilution should be avoided

Caroline Schönning – At the End of the Pipe, the Netherlands, 3 February 2005

Recommendations for the reuse of human urine (Höglund, 2001)

Storage temperature	Storage time	Pathogens in the urine	Recommended crops
4°C	>1 month	viruses, protozoa	food and fodder crops that are to be processed
4°C	>6 months	viruses	food crops that are to be processed, fodder crops
20°C	>1 month	viruses	food crops that are to be processed, fodder crops
20°C	>6 months	probably none	all crops

- For single households the urine mixture can be used for all type of crops without storage, provided that the crop is intended for own consumption, and that **one month** passes between fertilisation and harvesting.

Caroline Schönning – At the End of the Pipe, the Netherlands, 3 February 2005

Hygienic risks and recommendations for faeces

- Faeces (and faeces containing material) should be considered as infectious material
 - Treatment needed
 - Composting (Temperature >50°C)
 - Alkaline treatment (pH-elevation >9 and desiccation)
 - Storage (years)
 - Incineration
 - Not recommended for crops that should be consumed raw

Caroline Schönning – At the End of the Pipe, the Netherlands, 3 February 2005

Developing regions

- Less investments
- Lack of skill to run treatment
- Owner perspective
- Simple solutions to large problems
- Acceptance
- Advantages with dry source-separating systems

Caroline Schönning – At the End of the Pipe, the Netherlands, 3 February 2005

Annex 13 (3) Caroline Schönning

Developing regions, cont.

- WHO guidelines for wastewater, excreta (faeces and urine), greywater – new edition in preparation
- Recommendations for safe use of urine and faeces, EcoSanRes (SIDA)
- EcoSan (urine diversion, collection of faeces above ground) superior to pit latrines
 - less volume
 - less risk of leaching and transport of pathogens
 - less smell
 - safer and easier handling and use of excreta
- Urban development a challenge



Caroline Schönning – At the End of the Pipe, the Netherlands, 3 February 2005

Example: Recommendations for faeces – household level (EcoSanRes, 2004)

Treatment	Criteria	Comment
Storage (only treatment); Ambient temperature 2-20°C	1.5 - 2 years	Will eliminate most bacterial pathogens; regrowth of <i>E. coli</i> and <i>Salmonella</i> not considered if rewetted; will substantially reduce viruses, protozoa and parasites. Some soil-borne ova may persist.
Storage (only treatment) Ambient temperature 20-35°C	> 1 year	As above
Alkaline treatment	pH >9 during > 6 months	If temperature >35°C and moisture <25%. Lower pH and/or wetter material will prolong the time for absolute elimination.

Caroline Schönning – At the End of the Pipe, the Netherlands, 3 February 2005

Understenshöjden – an eco-village

- Initiative by inhabitants and housing companies
- Urine diversion
- Wastewater treatment in local system, small treatment plant, pond system
- Professionals handling but involvement from users
- "New" entrepreneurs – lower standard than a regular system



Caroline Schönning – At the End of the Pipe, the Netherlands, 3 February 2005

The toilet and the urine-diverting system



Understenshöjden – reuse of urine

- Collection of urine in housing area
- Storage of urine at the field (transport ~20 km)
- Stockholm Water Company involved in field trials
- Risks evaluated – highest risk attributable to viruses
- Risks from crop avoided by "wating periods" between fertilisation and harvest
- Reduction of microorganisms in wastewater treatment sufficient, protection for exposure to ponds



Caroline Schönning – At the End of the Pipe, the Netherlands, 3 February 2005

Microbial risk assessment

- Input: faecal contamination, prevalence of infection, excretion densities, excretion days, inactivation rates

- Scenarios:

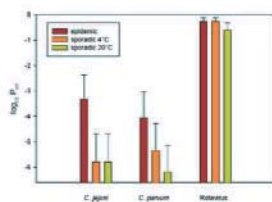
Exposure	Risk
Cleaning of blocked pipes	Ingestion of pathogens
Accidental ingestion when handling unstored urine	Ingestion of pathogens
Accidental ingestion when handling stored urine	Ingestion of pathogens
Inhalation of aerosols created when applying urine	Inhalation of pathogens
Consumption of crops fertilised with urine	Ingestion of pathogens

- Dose-response models

- Output: probability of infection

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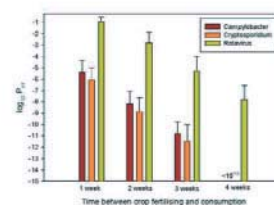
Risk from accidental ingestion of 1 ml unstored urine



- Unstored urine $P_{inf} < 1:1000$ except for rotavirus
- Storage for six months at 20°C all risks < 1:1000

Caroline Schönning – At the End of the Pipe, the Netherlands, 3 February 2005

Risk from ingestion of 100 g crop



- Inactivation will continue in the field
- Risk dependent on time between fertilising and consumption

Caroline Schönning – At the End of the Pipe, the Netherlands, 3 February 2005

Annex 13 (4) Caroline Schönning

The city of Uppsala – evaluation of possible changes of the sanitation system

- 4 alternatives
 - Reference, sludge composted to soil
 - Urine diversion (part of community)
 - Sludge to agriculture
 - Aqua Reci, advanced P-recovery method
- Multi-criteria analysis incl. environment, cost, users, organisation, **health**

Caroline Schönning – At the End of the Pipe, the Netherlands, 3 February 2005

Results hygiene (microbial risk assessment):

Number of infections per year (median values) attributable to the different system alternatives. Number of cases in parenthesis

Alternative	Salmonella	Giardia	Rotavirus	Total
1 Reference	0,031 (0,013)	18,2 (6,4)	23,7 (11,8)	41,9 (18,2)
2 Urine diversion	0,031 (0,013)	18,5 (6,5)	26,0 (13,0)	44,5 (19,4)
3 Sludge to agriculture	0,031 (0,013)	20,1 (7,0)	23,3 (11,6)	43,4 (18,6)
4 Aqua Reci	0,015 (0,006)	10,3 (3,6)	15,8 (7,9)	26,1 (11,5)

- Most infections attributable to work in the treatment plant
- No large differences in systems where a product is reused

Caroline Schönning – At the End of the Pipe, the Netherlands, 3 February 2005

Decision-making process with community representatives

- Sludge to soil most preferred
Sludge to agriculture & Aqua Reci similar
Urine diversion least beneficial
- Urine diversion preferred if only environmental criteria considered



Caroline Schönning – At the End of the Pipe, the Netherlands, 3 February 2005

Gebers – urban enclave



- Own initiative, hard work
- Urine diversion
- Dry collection of faeces, treatment by composting/storage
- Centralised treatment of greywater, composting of organic household waste
- Non-professionals handling waste products
- Perception less risk than average

Caroline Schönning – At the End of the Pipe, the Netherlands, 3 February 2005

Handling of faeces constitutes main risk

- No elevation in temperature – storage rather than composting
- Storage for years may inactivate pathogens



Caroline Schönning – At the End of the Pipe, the Netherlands, 3 February 2005

Risk assessment – dry handling of faeces

- Examples of exposure:
 - Emptying collection bin
 - In the compost
 - After application around housing area



Collection bins before emptying into compost



The former compost

Caroline Schönning – At the End of the Pipe, the Netherlands, 3 February 2005

A city alternative – Hammarby Sjöstad

- Politicians initiative
- Changes depending on who is in office
- High environmental goals, e.g. 95 % of P in urine, faeces and greywater to be utilised in agriculture
- Urine diversion no longer on the agenda - Large building companies do not want to take risks with new alternatives
- Anaerobic digestion of blackwater (together with organic household waste) is planned
- Priorities among the inhabitants



Caroline Schönning – At the End of the Pipe, the Netherlands, 3 February 2005

Concluding remarks

- Health and hygiene - a major sustainability criteria
- Sustainable systems - depend on local conditions
- Who is at risk and exposures vary depending on system
- Hygienic risks need to be managed by system adaptations and information
- The whole system need to be included

Caroline Schönning – At the End of the Pipe, the Netherlands, 3 February 2005

Annex 14 Participant list 3 February 2005

Nr	Name, first name	Organisation
1	Baten, Harm	Water Control Board district Rijnland
2	Bruine, Gert de	WASTE
3	Clarijs, Hans	Orgaworld
4	Diepeveen, Aleid	Waterleidingmaatschappij Drenthe
5	Hasselaar, B.L.H.	TU Delft
6	Hegger, Dries	WUR
7	Ijgosse, Jeroen	WASTE
8	Jiang, Lin	Guangxi Committee JiuSan Society, China
9	Karlsson, Pascal	Municipality of Göteborg, Sweden
10	Linde, Peter van der	Netherlands Water Partnership
11	Luttikhuis, Aloys	Waterschap Regge en Dinkel
12	Meer, Rien van der	Gemeente Gouda
13	Scheinberg, Anne	WASTE
14	Schönning, Caroline	Swedish Institute for Infectious Disease Control, Sweden
15	Smeets, Nienke	Dutch Ministry of Housing, Environment and Planning
16	Smout, Jaques	Branchevereniging voor Organische meststoffen (BVOR)
17	Spit, Jan	Senter/Novem
18	Spreekmeester, Ron	Habitat Platform
19	Swart, Bjartur	Grontmij
20	Veenhuizen, René van	ETC-UA (ETC-Foundation, Urban Agriculture Programme)
21	Veldhuizen, Caroline	NCDO
22	Warners, Jaap	Task Force Wind Energy

Annex 15 Opening speech of Joep Bijlmer, DGIS ~ Dutch Ministry of Foreign Affairs

Ladies and gentlemen,

Welcome to this public debate and final meeting, which concludes three informal sessions, which have yielded thought-provoking- ideas and messages on sanitation planning, sanitation management, and resource recovery management.

The title of this public debate is: "Are we connected" ? The title could also be: are we on the ball? I would say: "yes, definitely are, and at the right moment !" The aim of this final meeting is to come up with concrete recommendations for policy makers at the 13th session of the Commission for Sustainable Development on Water, Sanitation and Human Settlements and to come up with recommendations in order to achieve the Millennium Development Goals, in particular MDG 7 target 10 and 11.

I consider this debate as a real side event of the Intersessional CSD 13 meeting, which is now being held in New York, chaired by His Excellency Dr John W. Ashe. The aim of this CSD intersessional meeting is to prioritise policy and practical measures and to identify relevant actors who should implement these measures in the field of water, sanitation and human settlements and to contribute to the MDG Review Summit in September this year.

Ladies and Gentlemen,

In order to stimulate our discussions during this afternoon, I would like to refer briefly to three UN Millennium Project (UN-MP) reports which, I think, are extremely useful for our meeting:

- 1 Investing in Development; a practical plan to achieve the MDG's by Prof. Jeffrey Sachs, director of the UN Millennium Project;
- 2 Task report 7 on Water and Sanitation; and
- 3 Task Force report 8 on Improving the Lives of Slum dwellers.

1 In chapter 6, 7 and 8 of "Investing in Development" some key elements for a rapid scale-up are discussed. Organisations like yours and many other civil society organisations, NGOs and academia are very good at setting up pilot and demonstration projects, testing and documenting them. But, unfortunately, at the end they often prove to have only a very limited impact on national indicators. The authors, who call these pilots "Islands of excellence amidst a sea of inertia", propose several strategies for a national scale up. It is clear that the national and local governments should take the lead in this process, but what should be the role of civil society organisations in this respect?

In Chapter 8 of the report the role of organisations such as yours is highlighted. CSO's represent important segments of the population in a manner distinct from governments as they directly reflect - and respond - to the needs of a broad range of communities. Within countries, CSO's can contribute to MDG-based poverty reduction strategies at the local and national level in at least four ways, by:

- a Providing public advocacy for the MDG targets;
- b Helping to design policies and strategies to meet each target;
- c Working with governments to implement scaling up service delivery; and
- d Monitoring and evaluating the efforts to achieve the goals.

Annex 15 (2) Joep Bijlmer

National scale-up means bringing basic services to most or all the population quickly, equitably, and lastingly. Scaling up is a major managerial challenge for many developing countries. And, far more complex than planning and implementing a single project.

I can't go into too much details now, but I would strongly recommend you to read these noteworthy chapters.

2 **Now I turn** to the second report: task force report 7 on Water and Sanitation, and in particular to chapter 8. The title of the chapter is: "The way forward - Critical Actions at the national and international levels". This chapter contains 17 propositions out of which I have picked three highly relevant propositions. No doubt, that they will be quite familiar to practitioners like you:

Proposition 1

Sanitation must receive at least the same priority as water supply in planning, policymaking and budgeting. In practice however, sanitation and hygiene tend to disappear quickly when it comes to implementation. This reflects the often low political commitment to sanitation, low effective demand by users, cultural taboos, the lack of an appropriate institutional home for sanitation and the fact that expanding access to sanitation is often far more expensive and technically more complicated than expanding water supply.

Proposition 2

The power of social marketing should be exploited, particularly with regard to expanding access to sanitation and promoting hygienic behaviours. The low demand for sanitation throughout the developing world is in most cases the result of a limited understanding of the links with health. Education and social marketing aimed at both individuals and public authorities are keys to expanding access to sanitation services. It should respond to user preferences, beliefs, and practices demand for different technical options and for capacity to maintain the facilities in the long run.

Proposition 3

A wide range of technological options and service levels should be made available in order to facilitate the provision of safe and reliable services. A broad choice set of technologies allows communities with limited capacity to install the infrastructure they want and are willing to pay for and so, able to maintain them in the long run.

Well, though these propositions may sound very convincing, user friendly and even pro-poor, they are often disregarded in favour of more "sophisticated" technologies by local and national decision makers. A fact, you may have experienced frequently.

3 **I would now** quickly jump to task force report number 8 on "improving the lives of slums dwellers", (target 11). Slums are one of the areas where expansion of water and – especially - sanitation services are badly needed. The UN-MP reports propose that the Water and Sanitation targets should be set both for rural and urban areas. So, within each country and for each village, town or city the target will be to reduce by half the proportion of rural and urban people without sustainable access to safe water and basic sanitation by the year 2015. In the case of urban communities this will be a very challenging goal, since the practical problems will

Annex 15 (3) Joep Bijlmer

be far more complicated because of land use planning, security of tenure, density and last but not least because of the investments. The costs for basic sanitation in an urban setting are estimated at USD 60 to 75 per capita, which is about three times higher than in a rural setting.

I would like to hear suggestions from your side how the scaling up in slums may help to reduce the costs per capita.

Finally, I would like to point to a rather popular misunderstanding about target 11. It is generally believed that the target is “to improve the lives of at least 100 million slum dwellers by 2020. The target has been revised however by adding the provision of adequate alternatives to new slum formation. This means an additional number of 500 million potential slum dwellers between now and 2020. For these reasons, target 11 now is supposed to read:

“to halve the proportion of slum dwellers by 2020, through improving the lives of existing slum dwellers and providing alternatives to new slum formation”

After ample discussions, the operational definition of a slum household is: “ an entity” which lacks one or more of the following conditions:

- *Access to improved water;*
- *Access to improved sanitation;*
- *Durability of housing;*
- *Adequate living space, and*
- *Security of tenure.*

This means that apart from the water and sanitation targets, three additional criteria has to be met in order to qualify a household no longer as a slum household.

Well, the numbers are daunting, the targets, and tasks ahead enormous. I look forward to hearing your evaluations of existing sanitation approaches as part of the urban environmental infrastructure, your experiences with sanitation options in developing countries and your recommendations which can be used by policy makers at CSD 13, the Governing Council of UN-Habitat in Nairobi (also in April) and of course the MDG Review summit in September this year.

Thank you

Annex 16 Presentation of Anna Tsvetkova – Mama 86, Ukraine

sanitation demands and eco-sanitation solutions for Ukraine

Tsvetkova Anna, eco NGO

"At the End of pipe" Debates, Hague, 3 March 2005



Ukraine: background information

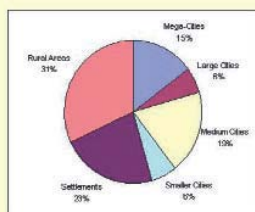
Eastern European country,
new neighbour of EU
territory of 603,7 thousands
km²

population about 47,6 mln
32,1 – urban population
15,5 – rural population
29 % of population is poor
people



Ukraine is water limited
country,
less then 1 thousand m³ per
capita per year.

Ukraine: Population Distribution



- Cities:
- Mega 15%
- Large 6%
- Medium 19%
- Smaller 6%
- Settlements 23%
- Rural areas 31%

COWI Report 2002

Ukraine: water sector

- 65% of population is provided by centralized water supply, in rural areas - 26%
- The main sources for drinking water is the surface waters, 75% of population is supplied from it.
- 53% population have access to sewage system/sanitation:
- 74% - in urban areas and 9% - in rural areas.

Rural areas: access to Water supply and sanitation

- 54% of the population live in rural areas & settlements with less than 20,000 inhab.
- 11 mln (74%) of rural population use wells, captages
- 800,000 use transported water
- 14.3 mln (91%) - pit latrines and septanks
- 1,8 mln wells are contaminated by nitrates, microorganisms, pesticides, fluorine, others
- As usual pit latrines and septanks are the sources of nitrates and biological contamination of ground water.



Water sector problems and their consequences

- Lack of water resources
- Contamination of water resources
- Isolate Infrastructures and inefficient treatment technologies
- Lack of self-financing and investments into the sector

Consequences:

- Low level of water supply and sanitation connections
- Low level of services provision
- health: water related diseases
- Water utility is a main polluter of Environment
- Water and energy wastage

Annex 16 (2) Anna Tsvetkova

Isolate infrastructures

Water supply:

- The total length of centralised water supply network is 180,000 km
- About 40,000 km of pipes are need replacement
- The number of reported pipe network breakdowns is 1-4 breakdowns per km of pipes per year, which is 5-40 times more than in Western Europe

Wastewater systems:

- 47,000 km of pipes
- 15,000km of pipes are in a state of emergency
- The number of serious emergency incidents recorded is on average 1.4 per km per year.
- an infiltration rate is of 20%

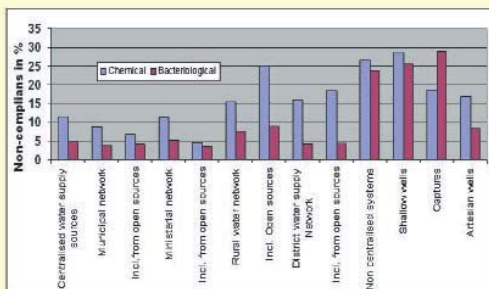
Investments are needed

The draft of "Drinking water of Ukraine" State Program for 2006-2020

It is requested for:

- | | |
|------------------------------|--------------|
| • WS&WW systems building | 45 mln Euro |
| • urban WS&WW rehabilitation | 347 mln Euro |
| • rural WS&WW rehabilitation | 334 mln Euro |

- Water Quality Compliances for Different Supply Structures (reference: COWI Report 2002)



Health situation related to Water supply and sanitation sector

According to WHO poor water quality poses a health hazard for 25% of the Ukrainian population.

Acute problems are connected with :

viral hepatitis A disease: 2003, Suchodolsk - 774 cases

rota viral infections: 2000, Odessa - 3143 cases

blue baby syndrome: till 2001 -10 -15 cases in rural areas of Poltava oblast

dental fluorosis: in Poltava region , Gozhuly village - 80% schoolchildren are suffering

Water utility is one of the main environment polluter

Wastewater:

Total discharge of wastewater amounts to 10.9 billion m³/year.

- 3.59 billion m³ - from wastewater treatment plants (35%), from industry (58%) and agriculture (7%).

The total discharge is 13% of the total run-off in the rivers. The major part of the discharged wastewater is not treated or poor-treated.

Sludge is a secondary contamination source

The sludge disposal is the main problem WW treatment plants.

Sludge pumped to large sludge lagoons in the outskirts of the cities.

The sludge volume is increased on 40 mln t/year for it's allocation it is needed additional 120 ha/year

Wastewater production

In 2000

A total of 4.5 billion m³ of wastewater was produced:

- 3.8 billion m³ was produced as a result of water consumption
- 0.7 billion m³ per year (20%) from other sources is the net result of infiltration and exfiltration due to poor and leaking pipes.
- 0.9 billion m³ of wastewater (20%) is every year discharged into septic tanks or disposed off in an uncontrolled manner.

Annex 16 (3) Anna Tsvetkova

Water and energy wastage

Water supply

- water losses only in the distribution systems amount to 30 - 50% of the total input to distribution network
- Energy costs 60-80% of the water supply service cost
- Estimated potential energy saving is 25-30%, corresponding to 1.2 - 1.5 billion kWh per year for Ukraine.

Wastewater systems:

- the potential energy saving on wastewater pumping systems can be estimated at 20-50%, and with a similar possible potential energy saving on wastewater treatment. The total potential energy saving is in the range of 0.5 - 1.0 billion kWh per year.

Ukraine: Sanitation demands

- To improve the citizens' access to adequate sanitation and safe water
- To introduce the efficient WW management by minimization of wastewater problems in volume and in quality
- To implement the low cost and efficient technologies and Water and energy saving in the sector
- To protect the Environment and Water resources from contamination
- To decrease the health risks related to water

Eco-sanitation approach provides:

- Promotes the integrated water supply and sanitation management
- Resources conservation and environment protection (minimization of water usage for wastes transport, stopping the infiltrations from pit latrines and septanks)
- Resources saving (water and energy saving),
- Water related health risks decreasing
- technically efficient and simple solutions for sanitation problem
- sustainable solution for rural water supply and sanitation,
- recycling nutrients (nutrients cycle closing)



MAMA-86's Drinking water campaign

MAMA-86 is a network of 17 NGOs initiated by mothers in 1990 to raise public awareness and to work with environment and health problems

Drinking Water Campaign was launched in 1997

It is women grass root initiative aimed to improve Ukrainian citizens' access to safe drinking water. 11 local organizations participate in the campaign activities



First eco-san toilet for rural school in Ukraine

October 2004:

- MAMA-86 and WECF in cooperation with experts of Hamburg Environment University implemented the first eco-san toilet pilot in v. Gozhuly, Poltava rayon.



Thank you

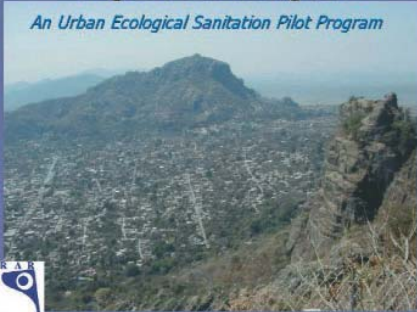

www.mama-86.org.ua



Annex 17 Presentation of Ron Sawyer - Sarar Transformación SC, Mexico


TepozEco Project

An Urban Ecological Sanitation Pilot Program






Tepoztlán, México




Where is Tepoztlán?



The cultural context


Ex-Municipal President

Local water and sanitation problems

- **Water:** >50% leaks in municipal water supply network; pumping costs = 80% of budget
- **Latrines:** flooding, infiltration, flies, genital infection and normally placed away from the house and hand washing facilities.
- **Septic tanks:** discharge to subsoil with strong risk of pollution of aquifers.
- **Sewage system:** Not yet connected to a treatment plant, therefore wastewater overflows into street and river.
- **Greywater drainage:** The inside corridors of some houses, along the streets, streams and rivers, causing pollution, pestilent odors, and insect proliferation.

Ecosan justification for Tepoztlán



All these practices generate health risks, which makes the Ecosan approach and it's "closed nutrient loop" concept extremely relevant.

Sustainability Criteria

- ➔ Clean water
- ➔ Nutrient flows:
 - Phosphorous
 - Nitrogen
- ➔ Energy (fossil fuels)
- ➔ Carbon cycle (greenhouse effect)

Conventional practices simply shift the problem from one medium to another.

"Civilization and sludge" - A. Rockefeller

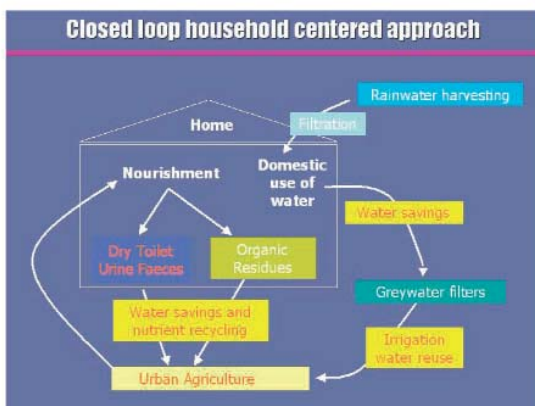
Annex 17 (2) Ron Sawyer

TepozEco Project Background

- Jan. '03 • Project begins
- Nov. '02 • Study visit to China
- Nov. '01 • Municipal government joins RedSeco
- Oct. '01 • RedSeco – Mexican Ecological Sanitation Network
- 2000 • "Closing the Loop" workshop, Mexico (UNDP/Unicef/Sasar)
- Oct 99

TepozEco Project Objectives

- To establish within 5 years an integrated urban ecosan demonstration system in Tepoztlán.
- To contribute to improve more sustainable water and sanitation services for the people of Tepoztlán.
- To establish an Ecosan model and resource center for Mexico and the rest of Latin America.



Partnerships

National Partners:	International Partners:
<ul style="list-style-type: none"> Ayuntamiento de Tepoztlán Tepoztlán Valle Sagrado El Taller Artes y Oficinas Centro de Innovación Tecnológica Alternativa - CITA Universidad Autónoma del Estado de Morelos – UAEM Centro Mexicano del Agua – CEMA Alliant International University / International Institute of Renewable Resources – IIRR Instituto Mexicano de Tecnología del Agua –IMTA Comisión Estatal de Agua y Medio Ambiente – CEAMA 	<ul style="list-style-type: none"> Sida EcoSanRes / SEI / Sida, Sweden UNDP / BDP / EEG National Center of Competence for Research North-South / NCCR EAWAG/SANDEC, Switzerland WASTE, Netherlands Peter Opsvik AS, Norway

TepozEco Internal Structure

<ul style="list-style-type: none"> Ariane Delmaire Fabiola Garduño Jacinto Buenfil Fortino Escalante 	<ul style="list-style-type: none"> Ariadna Urbina Micela Bozanegra Ismael Morales Adrian Carrasco
<ul style="list-style-type: none"> Ron Sawyer Laura Pérez Myriam Quiroz 	<ul style="list-style-type: none"> Paco Arroyo Maida Bulnes Aristeo Garcia

SUBPROJECTS

INTEGRATED WATER & SANITATION MANAGEMENT Support local authorities to develop an integrated municipal W&S program.
URINE HARVESTING Establish a urine collection, transportation, storage and application system.
ECOSTATION Establish municipal system for secondary processing for domestic and ecotoilet organic flows.
SAN JUAN TLACOTENCO Intensive community demonstration of integrated holistic ecosan systems.
TRAINING & DEMONSTRATION CENTER Demonstration and training on ecosan systems, to raise public awareness.

Annex 17 (3) Ron Sawyer

INTEGRATED WATER MANAGEMENT

Respond to local priorities and felt needs

Downtown sewage system??

Proposed treatment plant = Constructed wetland

Ecological alternatives : Choice → mixed systems

Urine-diverting dry toilets

Arboloo Fossa alterna

Greywater Management

Public "lavaderos"

Household bio-filters

URINE HARVESTING

COLLECTION → TRANSPORTATION → STORAGE → APPLICATION

ECOSTATION Municipal Composting Center

TRAINING AND DEMONSTRATION CENTER

- Information dissemination – printed & electronic materials
- Environmental education
- Hands-on workshops
- Demonstration Center Tours
- Materials development - Ecosan Promoter Kit
- Product development
- Community outreach

Annex 17 (4) Ron Sawyer

Involving the Community of San Juan Tlacotenco

Children Youth SARAR / PHAST Methodology

Diploma Course Hygiene education Community meetings

Urine diverting dry toilet construction in San Juan

Focus on hygiene aspects

Handwashing basin inside dry toilet room.

Covered waste basket for used toilet paper.

Container for dehydrating mixture.

Ventilation tube (for odor control).

Fly trap (for insect control)

One large dehydration chamber with 2 plastic containers.

Water sprayer to flush the urinal.

Illustrated poster explaining the proper use & maintenance of the UD toilet.

Applied research on pathogen control

- Effect of different dehydrating mixtures,
- Monitoring and analyses of contents of chambers at different stages of dehydrating process,

↓

To be able to generate the most appropriate recommendations

- **The pathogens disappear after six months of storage.**
- For increased security, TepozEco recommends secondary processing of "popost" in a compost pile.

Hygiene and greywater

Untreated greywater can represent a significant source of pathogens (according to analysis in situ)

TepozEco proposes to minimize these risks and maximize benefits, by encouraging well-managed on/off sight treatment and safe re-use of greywater.

Domestic greywater bio-filters

Facilitate Public Policy Reform

Regulatory and institutional framework.

Sustainable development initiatives

Urban Development Plan Consultation

Annex 17 (5) Ron Sawyer

Lessons learned & confirmed

Sanitation Disincentive - Sanitation deserves the same status on the national agenda as water. *

Feeling relief - Public awareness, communication and a demand responsive approach are important aspects for starting the discussion.

Scientific approach - It will take several steps for a paradigm shift in the sanitation sector towards resource driven sanitation systems.

Economic Incentive - Change the perception why people want, and society needs good sanitation.

Gradualism in policy - Water is needed for good hygiene, but not necessarily for good sanitation.

Knowledge gathered, slow-down approach - Strive to make material cycles as short as possible.

Innovate and demonstrate - New approaches & technologies need to be demonstrated now.

* Summary of plenary discussion on sanitation planning - 20 January 2005.

THE ROAD AHEAD

- Design and implement regional, national & local policies
- Evolve a functional regulatory & institutional structures
- Support multidisciplinary research & development projects
- Support innovative alternative sanitation pilot programs
- Divert funding

"Recommendations for decision-making on basic sanitation and municipal wastewater services in Latin America and the Caribbean" - UNEP, June 2003 (DRAFT)



Annex 18 Presentation Arno Rosemarin – Stockholm Environment Institute, Sweden

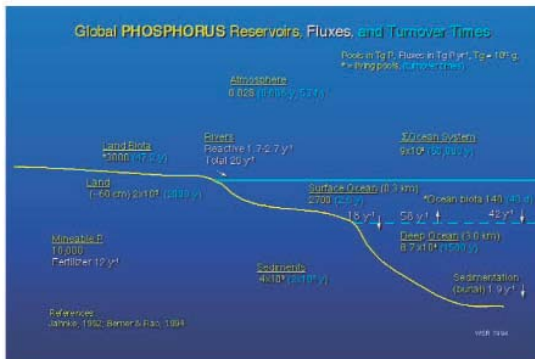
The Precarious Global Geopolitics of Phosphorus

Arno Rosemarin PhD
Stockholm Environment Institute



The Story Line

- Little is published on the risks and limitations of global supply and demand of phosphorus
- But after reviewing the available data there is cause for considerable concern
- The US will deplete its commercially-viable reserves within 30 years
- Most of the commercially-viable reserves are found in only two locations on the planet in Morocco/Western Sahara and in China
- And India is the largest country in the world that is most dependent on foreign sources of phosphate

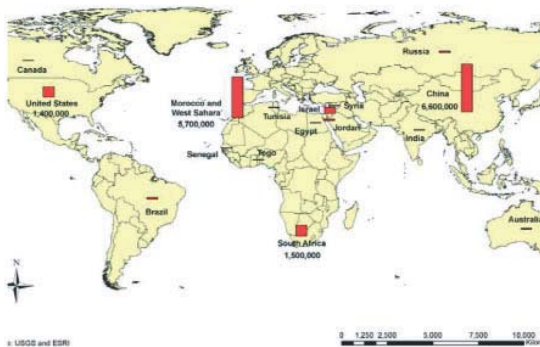


Non-renewable resource, created by oceanic luxury consumption in plants and animals
Igneous deposits are minimal; No replacement for P; 1 Tg = 1 M ton

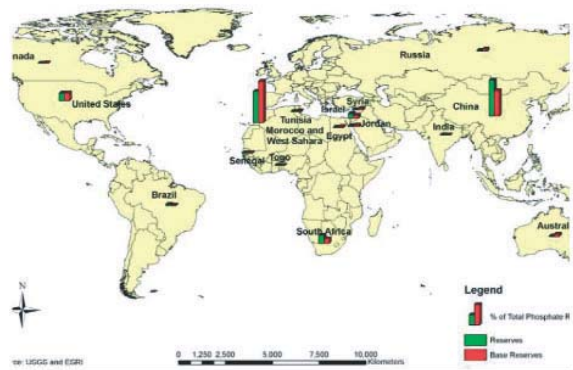
Phosphorus Use Since 1950

- Between 1950 and 2000, about 1 billion tonnes of P has been mined
- During this period, about 800 million tonnes of fertilizer P were applied to the Earth's croplands
- This has increased the standing stock of P in the upper 10 centimetres of soil in the world's croplands to roughly 1,300 million tonnes, an increase of 30%
- Close to a quarter of the mined P (250 Mt) since 1950 has found its way into the aquatic environment (oceans and fresh water lakes) or buried in sanitary landfills or *sinks*

Phosphate Rock - Worldwide Reserve Estimates (thousands of metric tons)

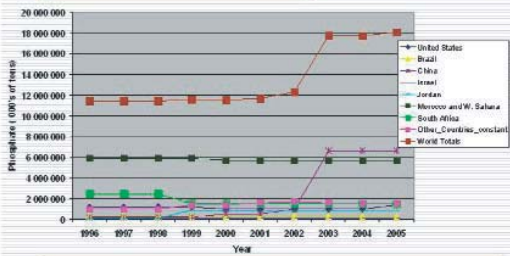


Phosphate Rock - Reserves and Base Reserves for 2005

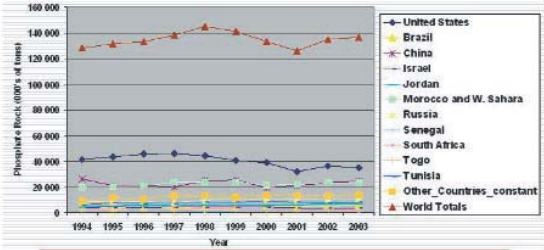


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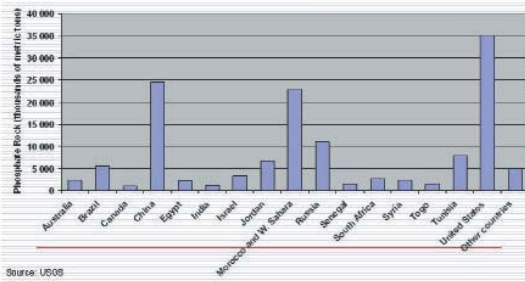
Phosphate Rock Reserves, 1997-2005 (from USGS summaries)



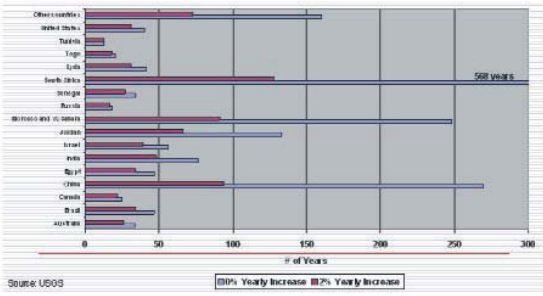
Mine Production of Phosphate Rock, 1994-2003 (from USGS)



Phosphate Rock - Extraction Rates for 2003



Phosphate Rock - Years of Extraction Remaining Based on Current Economic Reserves from 2005



The Battle for Phosphate in West Africa

- ❑ Western Sahara is the last African colonial state still to declare its independence. It was administered by Spain until 1976.
- ❑ Following this it was invaded by Morocco and occupied until 1988.
- ❑ An agreement was made between Morocco and POLISARIO to determine the peaceful future for Western Sahara.
- ❑ The United Nations Mission for the Referendum in Western Sahara (MINURSO) was set up in 1991 and since then plans for the referendum to determine whether Western Sahara will be independent or integrated into Morocco have been debated and postponed.



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Geopolitical Scene

- 30 yrs left of cheap reserves in the US
- China in 2003 reported a 10-fold increase in cheap reserves
- US signed free-trade agreement with Morocco in March 2004
- Western Sahara remains a colony of Morocco; independence stymied by UN inaction and lack of world opinion
- China predicts in 2005 that all exports are to stop
- Morocco now is the main long-term global export source
- India the largest importer will be the first indicator of market stress
- EU remains silent - "watch and see what happens"
- Increase in boom and bust mining ventures will indicate the upward value spiral is beginning

Food Security

- Meat consumption in Asia is increasing and by 2030 it will have increased 5-fold from 2000, increasing the demand for fertiliser
- As reserves dwindle and geopolitical positioning intensifies, the price of phosphorus will increase
- Food security will become the central issue in countries that cannot afford to keep pace

Phosphorus is lost to the soil

- Phosphate once applied to soil becomes bound and not easily recycled
- It transforms from highly available dicalcium- to less available octo-calcium-P, binds to soil particles and thus is rendered unavailable to plants
- Most of the phosphate we have applied as fertiliser remains bound to the upper soil layer of the world's arable lands but this is not available for plant production
- Biotechnology may be important in order to devise ways of extracting phosphorus
- E.g. white lupin (*Lupinus albus*) is a grain legume used for nitrogen fixation but which also excretes small amounts of organic acid from its rootlets
- gene-modified soil bacteria and plants in order to achieve higher plant availability and recovery
- But even if biotechnology can help, this is not going to make phosphate and the crops we grow any cheaper

Possible Scenarios by 2020

- Depletion of US cheap reserves are in site
- Global price hike in fertilisers and grain
- Morocco leads new OPEC for phosphorus
- Shift in US policy towards increased grain production and export capacity; similar action in Canada, Russia and Brazil
- China applies sustainable development policy – self sufficient in phosphorus and booming economy
- India's economy heavily stressed by global price of phosphorus

Possible Scenarios by 2020 (cont'd)

- With global oil depletion in site, world shifts to solar-hydrogen, with mammoth US and EU installations in the Sahel Region
- Global economy flips from oil- to phosphorus-based
- Innovations for phosphorus recycling developed
- Zero-waste source-separation in agro, solid waste and water-sanitation sectors
- Urine diversion becomes global standard
- Global convention on nutrient use and recycling signed
- Biotechnology gears up to develop root-nodule bacteria in legumes that extract phosphorus from agrosol – leads to global convention on GMOs
- Aquaculture increases, meat production decreases
- Poor countries use widespread slash and burn to release soil phosphorus creating regional atmospheric pollution

Conclusion

- At current rates of extraction (138 megatons per year) with no annual increase the commercially viable reserves will last 130 years
- The overall demand is forecasted to increase 1-2% per year thus reducing the time to less than 100 years
- At 3% rates of increase the world's commercially-viable reserves would be depleted by 2060
- The real concerns are the highly skewed distribution of phosphate reserves compared to where the needs are in the world and our complete lack of capacity to cope with regional scarcities
- By already 2020, rock phosphorite may be the keystone resource of the world economy
- The geopolitics of phosphorus make this one of the most precarious global resource questions requiring immediate attention

Annex 19 Closing speech of Joep Bijlmer, DGIS ~ Dutch Ministry of Foreign Affairs

After talking so much about goals and targets, you would of course like to know what the commitment of The Netherlands will be. Well, I can inform you that our minister for Development Cooperation, Ms Agnes van Ardenne, has announced during the FAO conference “Water for food and eco-systems” earlier this month that the Netherlands has committed itself to provide by 2015 50 million people with access to safe drinking water and basic sanitation” in a sustainable way.

To achieve this, our priorities will be for CSD 13 and onwards:

- *A powerful donor coordination;*
- *Identification of action owners: who is doing what;*
- *A participative and integrated approach, linked to national policy frameworks;*
- *Support for local initiatives from local governments;*
- *To use ODA as seed money for private investments;*
- *Accountable cost recovery mechanisms for water, sanitation and human settlements;*
- *Support for the EU Water Initiative;*
- *Special attention for integrated water management; and*
- *Attention for the consequences of climate change.*

Annex 20 Participant list public debate 3 March 2005

Nr	Name, first name	Organisation
1	Akimov, Viktor	Ecology and Health, Poltava Oblast State Administration
2	Balasoiu, Dimitri	
3	Berg, Sophie van de	CREM
4	Bijlmer, Joep	DGIS ~ Dutch Ministry of Foreign Affairs
5	Bracken, Patrick	GTZ
6	Bruijne, Gert de	WASTE
7	Cornelisse, Michaël	DHV Water BV
8	Danyuk, Iryna Ivanivna	
9	Deegener, Stefan	TUHH
10	Diepeveen, Aleid	NV Waterleidingmaatschappij Drenthe
11	Ennin, F.	WUR
12	Gabizon, Sascha	WECEF
13	Garduno, Luis	
14	Hasselaar, Bas	TU Delft
15	Herbergs, Marjolijne	Partners for Water
16	Klundert, Arnold van der	WASTE
17	Kovalyova, Olena	Mama 86 -Poltava
18	Leenen, Imke	Grontmij
19	Linde, Peter J.F. van der	Netherlands Water Partnership
20	Man, Hans M.D. de	
21	Mang, Heinz-Peter	Institute of Energy and Environmental Protection
22	Meinzinger, Franziska	TUHH
23	Mooiman, Sjaak	Water Control Board District Rijnland
24	Mudde, Heleen	Habitat Platform
25	Muller, M.S.	
26	Oude Vrielink, Erik H.H.	PRACTICA
27	Post, Valentin	WASTE
28	Rosemarin, Arno	Stockholm Environment Institute
29	Samwel, Margriet	WECEF
30	Samwel, Anna	WUR
31	Sandu, Ion	
32	Sawyer, Ron	Sarar Transformación SC
33	Schipper, Willem	Thermphos International
34	Spreekmeester, Ron	Habitat Platform
35	Stravato, Laurent	IRC
36	Tsvetkova, Anna	Mama 86
37	Tulei, Claudia	GEO-SAN
38	Vasilescu, Mihaela	
39	Warners, Jaap	Task Force Windenergy
40	Wendland, Claudia	TUHH
41	Wielinga, Ronald	Senter Novem
42	Wolters, Anneloes	
43	Zwetsloot, M.A.C.	Ision

Annex 21 Main outcome on Sanitation during CSD-12

Twelfth Session of the UN Commission on Sustainable Development

(14-30 April 2004)

Main outcome on Sanitation

225 Ministers emphasized the need to raise the visibility of sanitation and hygiene given its central importance to sustainable development. The high costs to societies of improper sanitation, and the significant economic, social and environmental benefits from investments in sanitation were recognized. They noted with appreciation that sanitation was for the first time being considered in a comprehensive way as a separate item on the agenda of the Commission.

226 Ministers emphasized that access to basic sanitation, coupled with hygienic behaviours such as hand-washing, can have significant positive impacts on privacy, dignity, security, health, education and economic growth. The importance of creating and maintaining public demand for sanitation services was noted. In view of the significant positive public health impacts, public subsidies for sanitation and awareness raising are justified. These subsidies need to be targeted to the poor.

227 Ministers acknowledged the importance of identifying and applying lowcost technologies well adapted to local social and physical environments in water supply, sanitation, and wastewater treatment, as alternative to waterborne sewerage. High-tech solutions and conventional sewerage networks may not necessarily be the best or most cost-effective solutions, but should be considered on a site-specific basis. Meeting the sanitation target would require particular attention to sanitation provision in rural areas.

228 Women and girls play an especially important role in household water supply, sanitation and hygiene and serve as agents of change. They are also particularly vulnerable to inadequate sanitation. Women should be involved in the planning, design and location of water supply and sanitation facilities. The importance of providing separate sanitation facilities for girls in schools was noted.

229 Ministers stressed the urgency of improving wastewater management, particularly in developing countries, to protect health and the environment, including both freshwater and marine ecosystems.

Annex 22 Decisions adopted by CSD-13

Advance unedited version 22 April 2005

Commission on Sustainable Development, Thirteenth Session Decision adopted by the commission

The Commission on Sustainable Development:

Reaffirming the Rio Declaration on Environment and Development, Agenda 21 and the Programme for the Further Implementation of Agenda 21, and the Johannesburg Declaration and Plan of Implementation,

Also reaffirming the Habitat Agenda, the Doha Declaration, the Monterrey Consensus of the International Conference on Financing for Development and the Hyogo Declaration and Framework for Action,

Further recalling the Mauritius Strategy for the Implementation of the Program of Action for the Sustainable Development of the Small Island Developing States,

Noting the NEPAD initiative, the Paris Declaration on Aid Effectiveness, Ownership, Harmonization, Alignment, Results and Mutual Accountability, the Millennium Ecosystem Assessment, and the Sirte Declaration on Agriculture and Water in Africa,

Reaffirming the commitment to achieving the internationally agreed development goals, including those contained in the United Nations Millennium Declaration, and in the outcomes of the major United Nations conferences held and international agreements reached since 1992, and recognizing the continuing urgent need for actions to achieve these goals,

Reaffirming further the continuing need for integrating economic development, social development and environmental protection as inter-dependent and mutually re-enforcing pillars of sustainable development, and that poverty eradication, changing unsustainable patterns of production and consumption and protecting and managing the natural resource base of economic and social development are overarching objectives of, and essential requirements for, sustainable development,

Recalling in particular paragraph 6 of the Millennium Declaration and paragraph 2 of the JPOI,

Recognizing the special needs of Africa, LDCs, LLDCs and SIDS,

Recalling ECOSOC resolution 2003/61 on the future programme, organization and methods of work for the Commission on Sustainable Development,

Annex 22 (2) Decisions adopted by CSD-13

Noting the outcomes of CSD-12 and the CSD-13 Intergovernmental Preparatory Meeting, in particular the identification of policy options and practical measures on the three thematic areas of water, sanitation and human settlements as contained in the Chairman's Summary of the IPM,

Recalling further GA Resolutions 58/291 of 6 May 2004 and 59/227 of 16 February 2005 and ECOSOC Resolutions 2004/44 of 22 July 2004 and 2004/63 of 23 July 2004, in which CSD was requested, without prejudice to the decisions adopted at its 11th session, to contribute through the Council to the high level plenary meeting of the GA in 2005, in accordance with the modalities set out by the Assembly at its 59th session,

1 Decides to submit the policy decisions of the 13th session of the Commission on Sustainable Development to ECOSOC as a significant contribution to the High-level Plenary Meeting, and recommends to the Council their transmittal to the High-level Plenary Meeting;

2 Emphasizes that:

(a) A substantial increase of resources from all sources, including domestic resources, official development assistance and other resources, will be required if developing countries are to achieve the internationally agreed development goals and targets, including those contained in the Millennium Declaration and the JPOI;

(b) The JPOI goals and the internationally agreed development goals, including those contained in the Millennium Declaration, are complementary and an integrated approach is necessary;

(c) Investments in water, sanitation and human settlements contribute to economic growth, sustainable development, better health and reduced poverty. The achievement of water, sanitation and human settlements goals, is critical to the implementation of the three pillars of sustainable development and the achievement of all the internationally agreed development goals;

(d) The policy options and practical measures for expediting implementation relating to water, sanitation and human settlements should be nationally-owned and integrated into poverty reduction strategies and/or national sustainable development strategies, whose implementation should begin by 2005, or national development plans;

(e) Governments have the primary role in promoting improved access to safe drinking water, basic sanitation, sustainable and secure tenure, and adequate shelter, through improved governance at all levels and appropriate enabling environments and regulatory frameworks, adopting a pro-poor approach and with the active involvement of all stakeholders;

(f) Efforts by Governments to achieve the agreed goals and targets on water, sanitation and human settlements should be supported by the international community through a conducive international policy environment, including through good governance at the international level, a universal, rule-based, open, non-discriminatory and equitable multilateral trading system as well as meaningful trade liberalization, including through urgent completion of the Doha Round with the realization of its development dimension, mobilization and transfer of financial resources, debt relief, including debt cancellation, where appropriate, public-public and public-private partnerships, technical cooperation and capacity building, and technology transfer consistent with international obligations including agreements acceded to;

Annex 22 (3) Decisions adopted by CSD-13

(g) Water, sanitation and human settlements are interlinked and complementary and should be addressed in an integrated manner, taking into account economic, social and environmental aspects, related sectoral policies and cross-cutting issues as identified at CSD-11, as well as national, sub-regional, and regional specificities, circumstances and legal frameworks, and bearing in mind that no one size fits all;

(h) All donors should coordinate, in consultation with recipient countries, their country-level support for water, sanitation and human settlements, for example by using a lead donor approach if mutually agreed, to increase the effectiveness of donor assistance;

(i) Education for sustainable development and access to a reliable system of economic, social and environmental information on water, sanitation and human settlements enables informed decision-making and accountability;

(j) The role of the regional commissions and other regional and sub-regional institutions and bodies as defined in JPOI in pursuing the implementation of Agenda 21, the JPOI and the internationally agreed development goals including those contained in the Millennium Declaration should be recognized;

3 Decides to call on Governments, and the UN system, within existing resources and through voluntary contributions, and invites international financial institutions, and other international organizations, as appropriate, working in partnership with major groups and other stakeholders, to take action as follows:

A Water

Access to basic water services

(a) Sustain and accelerate progress toward the water access goal, supported by increased resources from all sources, including ODA, in response to countries' needs, with a focus on the following actions:

- (i) Prioritizing water in national development plans and facilitating access to water for all;
- (ii) Strengthening capacities of national and local authorities in resource allocation and management, quality control, development and implementation of water supply projects, and monitoring of service provision;
- (iii) Promoting support for water infrastructure planning and development;
- (iv) Involving all stakeholders, particularly women and youth, in the planning and management of water services and, as appropriate, decision-making processes;
- (v) Instituting economic incentives to encourage the participation of small-scale water service providers;
- (vi) Employing the full range of policy instruments, including regulation, voluntary measures, market and information-based tools and cost recovery of water services that contribute to the sustainability of services provision, without cost recovery objectives becoming a barrier to access to safe water by poor people;
- (vii) Targeting subsidies for the poor, including connection costs;

(b) Develop and strengthen human and institutional capacities for effective water management and service delivery, through:

Annex 22 (4) Decisions adopted by CSD-13

- (i) Building capacities of local communities in operation and maintenance of water systems, and training educators, managers and technicians in different aspects of water management;
- (ii) Tapping local and indigenous knowledge in project development and implementation;
- (iii) Promoting and strengthening commercial capacities of local suppliers;
- (iv) Improving monitoring and analytical capabilities of water information management agencies;

(c) Develop and transfer low-cost technologies for safe water supply and treatment, in accordance with countries' needs, with a focus on the following:

- (i) Promoting access to appropriate low-cost and environmentally sustainable water use and supply technologies through North-South and South-South cooperation and partnerships;
- (ii) Developing capacities in the area of water desalination, treatment of contaminants, rainwater harvesting and water efficiency through technology transfer and sharing of best practices;
- (iii) Investing in research and development projects;
- (iv) Addressing the special needs of countries with arid and semi-arid areas due to water scarcity;

Integrated water resources management (IWRM)

(d) Recognizing that the 2005 target on IWRM may not be met by all countries, accelerate the provision of technical and financial assistance to countries in preparing nationally-owned IWRM and water-efficiency plans tailored to country-specific needs, paying particular attention to economic development, social and environmental needs, supporting implementation through learning-by-doing, directed, *inter alia*, towards the following:

- (i) Improving water governance through strengthening of institutional and regulatory reforms, capacity development and innovation;
- (ii) Providing technical and management support to local authorities and community-based organizations, taking into account research, traditional knowledge and best practices, to improve water resources management within national policy frameworks;
- (iii) Providing additional resources, as appropriate, for regional and sub-regional initiatives, such as the African Water Facility;
- (iv) Encouraging effective coordination among all stakeholders in water-related decisionmaking;
- (v) Enhancing the sustainability of ecosystems that provide essential resources and services for human well-being and economic activity in water-related decisionmaking;
- (vi) Facilitating information exchange and knowledge sharing, including indigenous and local knowledge;

Annex 22 (5) Decisions adopted by CSD-13

- (vii) Strengthening the prevention of pollution resulting from wastewater, solid waste, industrial and agricultural activities;
- (viii) Developing preventive and preparedness measures, as well as risk mitigation and disaster reduction, including early warning systems;
- (ix) Protecting and rehabilitating catchment areas for regulating water flows and improving water quality, taking into account the critical role of ecosystems;
- (x) Raising awareness of the importance of water use efficiency and conservation;
- (xi) Involving all stakeholders, including women, youth and local communities, in integrated planning and management of land and water resources;
- (xii) Encouraging, where appropriate and within their mandates, the use of MEAs to leverage additional resources for IWRM;
- (xiii) Promoting higher priority and greater action on water quality;

(e) Support African initiatives in the area of water, within the framework of AMCOW, with particular reference to basin-wide initiatives in Africa;

(f) Enhance cooperation among riparian States through relevant arrangements and/or mechanisms with the consent of the States concerned, taking into account the interests of the riparian States;

(g) Develop and strengthen national monitoring systems on the quantity, quality and use of surface and groundwater resources at national and local levels, and for measuring progress towards internationally agreed goals and targets, as appropriate, as well as for assessing the impact of climate variability and change on water resources, through the following actions:

- (i) Establishing and managing water information systems;
- (ii) Installing networks for monitoring water resources and quality;
- (iii) Standardizing methodologies and developing monitoring indicators;
- (iv) Transferring monitoring technologies adaptable to local conditions;
- (v) Disseminating information to relevant stakeholders.

(h) Support more effective water demand and water resource management across all sectors, especially in the agricultural sector, by:

- (i) Using efficient irrigation and rain water harvesting technologies;
- (ii) Implementing irrigation projects with a focus on the poor, particularly in Africa;
- (iii) Training farmers and water user associations in efficient water use and sustainable agricultural land management;

Annex 22 (6) Decisions adopted by CSD-13

- (iv) Promoting the use of waste-water for certain irrigation purposes, subject to health and environmental standards;
- (v) Increasing the efficiency, and where appropriate, the use of rain-fed agriculture.

B Sanitation

(i) Provide adequate sanitation, recognizing the interlinkages among water, sanitation, hygiene and health, including water-borne disease vectors, as well as the positive impacts of access to sanitation on poverty reduction, privacy, dignity, security and education.

Access to basic sanitation

(j) Sustain and accelerate progress towards the JPOI sanitation target, supported by increased resources from all sources, including ODA, in response to countries' needs, with a focus on the following actions:

- (i) Establishing an institutional home for sanitation, prioritizing sanitation in national development plans, and incorporating sanitation in integrated water resources management plans;
- (ii) Allocating a specific and adequately resourced budget for sanitation;
- (iii) Prioritizing investments to areas of greatest need and greatest impact, notably in schools, work places and health centres;
- (iv) Employing cost recovery, where appropriate, to contribute to the sustainability of services, with targeted subsidies for the poor;
- (v) Instituting economic incentives to encourage the participation of small-scale sanitation and hygiene service providers;
- (vi) Conducting assessment of the health impacts of the lack of sanitation at community level;
- (vii) Supporting existing regional and inter-regional initiatives such as the Global WASH Programme for water and sanitation;
- (viii) Promoting and supporting on-site sanitation infrastructure, especially in rural areas;
- (ix) Supporting the provision and maintenance of sanitation services to refugees and refugee host countries;

(k) Ensure effective capacity for building, operating and maintaining sanitation and sewerage systems, including by:

- (i) Providing managerial and technical training to public utilities, community-based organizations and small-scale providers for development, operation and maintenance of sanitation systems;
- (ii) Strengthening the role of women in planning, decision-making and management of sanitation systems;
- (iii) Tapping local and indigenous knowledge in project development and implementation;

Annex 22 (7) Decisions adopted by CSD-13

- (iv) Promoting and strengthening commercial capacities of local suppliers in establishing sustainable sanitation delivery models;
- (v) Improving monitoring and analytical capabilities of information management agencies;

(l) Ensure access to culturally appropriate, low-cost and environmentally sound sanitation technologies, including by:

- (i) Promoting research, development and dissemination of information on low-cost sanitation options;
- (ii) Investing in research and development projects including in applications of indigenous technologies and ecological sanitation;
- (iii) Providing technology transfer for sanitation, waste water treatment, reuse and residuals management;
- (iv) Strengthening North-South and South-South cooperation in developing and applying sanitation technology;

Sanitation and hygiene education

(m) Support countries in promoting sanitation and hygiene education and awareness raising, focusing on the following measures:

- (i) Promoting gender-sensitive sanitation and hygiene education and awareness, including through social marketing and public information campaigns such as Water, Sanitation and Hygiene for All (WASH), and improve understanding of the linkages among sanitation, hygiene and health;
- (ii) With an emphasis on children and youth, incorporating gender-sensitive hygiene education in school curricula and ensuring the provision of separate sanitation facilities for boys and girls in all schools;
- (iii) Promoting the involvement of women, youth and community groups in sanitation and hygiene education programmes;

Wastewater collection, treatment and reuse

(n) Expand and improve wastewater treatment and reuse, with a focus on the following:

- (i) Financial and technical assistance to national and local authorities in deploying cost-effective and environmentally sound sewerage and waste-water treatment systems, including decentralized urban systems;
- (ii) Meeting operation and maintenance costs through an appropriate mix of measures including user charges, wastewater reuse and budgetary allocations;
- (iii) Establishing sustainable business models and financing mechanisms linked to capital markets such as revolving funds for sewerage services;

Annex 22 (8) Decisions adopted by CSD-13

- (iv) Education and training in building, operating and maintaining wastewater collection and treatment systems;
- (v) Research, development and dissemination of information on low-cost and efficient wastewater treatment technologies, including on water quality and reuse;
- (vi) Dissemination of information and guidelines on surface and ground water quality and the safe reuse of treated wastewater;
- (vii) Establishing regional project development facilities to provide seed capital, training and technical assistance;

(o) Support regional and sub-regional arrangements, to protect water resources from pollution, addressing the specific needs of arid, semi-arid and coastal countries;

C Human settlements

(p) Provide an enabling policy and regulatory environment and mobilize the requisite means of implementation, including through regional cooperation and international support, including increased financial resources to promote sustainable human settlements development in both urban and rural areas, in accordance with national priorities;

Integrated planning and management

(q) Support integrated planning and management of human settlements, incorporating land use, housing, water supply and sanitation, waste management, energy, employment and income generation, education and health care services, transportation and other infrastructure, giving due consideration to urbanization trends, in particular, to the needs of the urban poor in implementing the Millennium Declaration, with a view to preventing new slum formation, by:

- (i) Integrating urban-rural linkages into national planning processes and promoting further research to inform policies and measures to manage urbanization;
- (ii) Integrating slum upgrading and slum prevention into national development planning, taking into account social, economic, cultural and environmental aspects;
- (iii) Including natural disaster risk mitigation, early warning, preparedness and post-disaster considerations and related capacity building measures in human settlements planning and development, including at regional level;
- (iv) Establishing and strengthening regional and subregional initiatives for human settlements planning and development, and supporting such initiatives through capacity building and resource mobilization;
- (v) Strengthening capacities for waste management, including through implementation of the relevant international instruments including the Basel Convention;
- (vi) Promoting increased participation of all stakeholders, in particular women and youth as well as slum dwellers and their organizations in planning, implementation and where appropriate decision-making processes;
- (vii) Decentralizing responsibilities to local authorities depending on national circumstances, specificities and legal frameworks accompanied by capacity building and corresponding transfer of resources;

Annex 22 (9) Decisions adopted by CSD-13

- (viii) Promoting international networking for information exchange among local authorities and stakeholders, including for the implementation of Local Agendas 21;
- (ix) Resolving to take further effective measures to remove obstacles to the full realization of the rights of the peoples living under colonial and foreign occupation, which are incompatible with the dignity and worth of the human person and must be combated and eliminated;

Access to affordable land, housing and basic services

(r) Assist in providing access for the poor, in urban and rural areas, to decent and affordable housing and basic services, in accordance with the Habitat Agenda, through:

- (i) Achieving, by 2020, a significant improvement in the lives of at least 100 million slum dwellers, as proposed in the “Cities without slums” initiative;
- (ii) Designing pro-poor policies, with a focus on tenure security and access to affordable serviced land;
- (iii) Promoting stable and transparent land markets and strengthening land administration;
- (iv) Targeting subsidies to poor people for housing and basic services, including the consideration of loans and subsidies that reflect the payment capabilities of the poor for housing and basic services;
- (v) Improving equal access to basic services and land tenure, with particular attention to the equal rights of women to own and inherit land and other property and to access credit markets;
- (vi) Promoting public-private partnerships for financing and developing infrastructure and affordable housing;
- (vii) Strengthening enforcement capacity for building codes and laws in the housing sector;
- (viii) Promoting research, production and use of local construction technologies and building materials and integrating traditional knowledge and practices, as appropriate, in national housing policies;
- (ix) Facilitating transfer of technology for low-cost housing construction using local materials;
- (x) Strengthening the capital base and building the financial capacity of community savings and micro-finance institutions serving the poor;
- (xi) Encouraging donors and international financial institutions to provide innovative financing for low-income housing and community improvement, including through loan guarantees, seed capital for revolving funds, and facilitating access of local authorities to capital markets;
- (xii) Providing increased financial assistance, including by multilateral and regional development banks, for slum prevention and upgrading;
- (xiii) Providing support to refugee host countries in developing and rehabilitating infrastructure and environment, including affected ecosystems and habitats;

Employment and enterprise promotion

(s) Support national measures encouraging private sector investment, entrepreneurship and job creation, including the following:

Annex 22 (10) Decisions adopted by CSD-13

- (i) Incorporating employment and enterprise development policies into national planning and slum prevention and upgrading programmes;
- (ii) Facilitating the development of the micro-finance sector;
- (iii) Enhancing capacity in managerial, environmental and technical skills of small and medium sized enterprises, including in the informal economy, to improve their access to finance and marketing opportunities;
- (iv) Providing education and vocational training to women and youth, particularly the urban poor, to improve their access to decent jobs, combining provision of financial services with mentoring, business training, and counselling;

D Interlinkages and Cross-Cutting Issues

(t) Address water, sanitation and human settlements in an integrated manner, taking into account economic, social and environmental aspects, related sectoral policies and cross-cutting issues as identified at CSD-11, as well as national, sub-regional, and regional specificities, circumstances and legal frameworks, with particular attention given to the requirements of women, youth and workers, through a range of measures and approaches such as:

- (i) Interlinking measures on water, sanitation and human settlements to increase their synergy, efficiency and impact by developing integrated and inclusive policies of planning and management in water, sanitation, and human settlements;
- (ii) Improving national coordination efforts to address water and sanitation, to manage the competing demands for water, including those for agricultural production;
- (iii) Enhancing inter-ministerial coordination cross-sectoral coordination and planning mechanisms, as well as mechanisms for coordination between different levels of administration;
- (iv) In accordance with JPOI paragraph 14, promoting sustainable consumption and production patterns in all countries, with developed countries taking the lead and with all countries benefiting from the process, including through the Marrakech Process, in the areas of water, sanitation and human settlements;

(u) Devise water, sanitation and human settlements policies and actions taking account of the need to address the impacts of rapid urbanization, desertification, climate change and climate variability and natural disasters, including by:

- (i) Assessing the impact of natural disasters, climate change and climate variability on water resources, water supply, sanitation, human settlements;

Annex 22 (11) Decisions adopted by CSD-13

(ii) Supporting the implementation of monitoring and early warning systems and of relevant mitigation and adaptation technologies;

(v) Noting that the water and sanitation targets are to halve the proportion of people who lack access to safe drinking water and sanitation by 2015, and that the target for slum-dwellers is to improve the lives of at least 100 million slum-dwellers by 2020, support countries, including through UN HABITAT, in their ability to provide data and information on existing slums with a projection on new slum formation by 2020, and thereafter to adopt and implement plans to achieve these targets, linked to poverty reduction strategies, national sustainable development strategies or other relevant policy plans;

(w) Resolve to take further effective measures to remove obstacles to the full realization to the rights of people living under colonial and foreign occupation which are incompatible with the dignity and worth of human person and must be combated and eliminated;

(x) Concerning the means of implementation, mobilize adequate resources to meet the water, sanitation and human settlements goals and targets, tapping both domestic and international sources through a range of financing approaches, such as:

- (i) Increasing donor financial support, upon request, to water, sanitation and human settlements initiatives in developing countries;
- (ii) Identifying and promoting innovative and sustainable means of financing;
- (iii) Enhancing the sustainability of ecosystems that provide essential resources and services for human well-being and economic activity and developing innovative means of financing for their protection;
- (iv) Encouraging the Bretton Woods Institutions, GEF within its mandate, and the regional banks to enhance their assistance to the water, sanitation and human settlements sectors;
- (v) Establishing and promoting public-private and public-public partnerships;
- (vi) Increasing allocations from national and sub-national budgets;
- (vii) Developing and supporting local financial institutions and markets, including pooled financial facilities, revolving funds, loan guarantees and micro-credit facilities;
- (viii) Providing support to regional and sub-regional initiatives such as AMCHUD and MINURVI;
- (ix) Providing support for capacity building in developing countries;
- (x) Providing environmentally sound technology to developing countries in accordance with paragraph 105 of JPOI;

E International Institutional Arrangements for Monitoring and Follow-Up of CSD-13 Decisions on water, sanitation and human settlements

(y) Reaffirm that the Commission for Sustainable Development should continue to be the high-level commission responsible for sustainable development within the United Nations system;

(z) Reaffirm further the mandate of the Commission on Sustainable Development as stipulated in Agenda 21, General Assembly resolution 47/191 of 22 December 1992 and the Johannesburg Plan of Implementation

Annex 22 (12) Decisions adopted by CSD-13

as well as ECOSOC resolution 2003/61 on the future programme, organization and methods of work of the CSD;

(aa) Support, strengthen and implement voluntary monitoring, reporting and assessment of the thematic areas of water, sanitation and human settlements at the national and regional levels and through existing mechanisms at the global level to keep track of progress in achieving sustainable development, bearing in mind the specific needs of developing countries, by the following measures:

- (i) Improving data collection at all levels;
- (ii) Enhancing the comparability of data at the regional and global level;
- (iii) Facilitating the contribution of major groups to national reporting activities;
- (iv) Requesting the CSD Secretariat to update the policy options and practical measures contained in the Chairman's IPM Summary, on a regular basis to make it a living document, and to develop web-based tools to disseminate information on implementation and best practices;

(bb) Encourage Member States to continue to work on the development and application of indicators for sustainable development at the national level, including integration of gender aspects, on a voluntary basis, in line with their national conditions and priorities, and in this regard invites the international community to support the efforts of developing countries;

Follow-up on Water and Sanitation

(cc) Requests the UN-Water to give equal consideration to the CSD-13 thematic issues of sanitation and water in its terms of reference, and to promote, within its mandate, system-wide interagency cooperation and coordination among relevant UN agencies, funds and programs on these issues, and requests the Secretary General to include in his report to the CSD the activities of UN Water as they relate to the aforementioned thematic areas, including the roles and responsibilities of relevant UN agencies, funds and programs in implementing and monitoring the water and sanitation agenda, including identifying duplication, overlap and gaps;

4 Without prejudice to the programme, organization and methods of work of the Commission adopted at its eleventh session, *decides* to devote, in 2008 and 2012, a separate segment at the end of its review sessions, for a duration to be determined by the Bureau in advance, using one to two days as a benchmark, to monitor and follow-up the implementation of decisions on water and sanitation, and their inter-linkages, taken at CSD-13;

Follow-up on Human Settlements

5 Requests UN Habitat as the focal agency for human settlements, to facilitate – in close collaboration with relevant UN agencies and programmes as well as other partners – effective global monitoring of progress in the implementation of human settlements goals and targets, as well as measures agreed at CSD-13 concerning human settlements;

Annex 22 (13) Decisions adopted by CSD-13

6 Calls on Member states to strengthen the capacities of UN-HABITAT to provide, within its mandate, increased assistance to developing countries, and countries with economies in transition, including through the current pilot phase of the Slum Upgrading Facility;

Follow-up on Small Island Developing States (SIDS)

7 Recalling the CSD-11 decision that SIDS issues are to be considered both as cross-cutting issues at each CSD session and be included in the thematic cluster for CSD in 2014/2015, *decides* to devote one day of the review sessions of the CSD to the review of the implementation of the Mauritius Strategy for the further implementation of the Programme of Action for the sustainable development of SIDS (MSI) focusing on that year's thematic cluster, as well as on any new developments on SIDS' sustainable development efforts using existing modalities. In this regard, the SG is requested to submit a report to the CSD review session on progress and obstacles to sustainable development in SIDS and making recommendations to enhance its implementation.