

## Theme

### Decentralised Waste-Water Systems

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## Informing you on....

- The theme
- The work-packages and it's integration
- Research
- Demonstrations
- Joint learning and Up-scaling
- Next two years



## Decentralised waste water systems, was thematically under ...

4: Water use in sanitation and waste management

→ 4.1 & 4.2

5: Urban water environments and planning (ecological, landscape and livelihood functions)

→ 5.2



## Work packages

WP 4.1 Eco-sanitation and decentralised wastewater management in an urban context

WP 4.2 Emission reduction / cleaner production in the tannery industry

WP 5.2 Use of urban water for urban agriculture (and other livelihood opportunities)



## Integration in SWITCH..... Identified themes:

- Sustainable Urban Drainage
- Natural Systems for Treatment
- Water Sensitive Urban Design
- Decentralised Wastewater Systems
- Institutional Systems and Financial Instruments



## Urban Challenges

- Urbanisation: By 2030 > 60% live in cities
- Only demographic, usually not infrastructural
- Urbanisation of Poverty
- Rising urban food demand
- Water scarcity (insufficient or polluted sources, capacity for treatment limited/expensive)
- Insufficient sanitation facilities,
- Generation of wastewater, often discharged untreated: health and env. risks
- Recycling not high on the political agenda



### Conventional systems of sanitation and treatment

- Removal of an important source of water
- Destruction of nutrients
- Uncontrolled discharge of waste water in urban water (overflows)
- Production of polluted municipal sludge
- Emission of chemical substances
- Expensive treatment, and
- Posing threats to health, environment and livelihoods

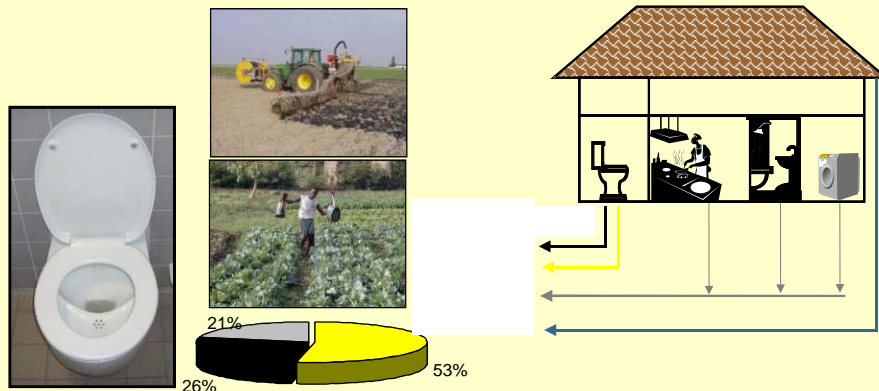


### Theme Response to challenges

- Link to city pressures (*Coping with Realities*) and opportunities, a.o search for alternative water sources
- Re-thinking source separation, treatment, use of waste water and use ecological sanitation
- Closing loops of supply and demand **at local level**
- Link technological innovation and organisational innovation to institutional innovations in the city
- Involving policy makers in action research influences decision-making and researchers



Keywords: Separation at source, Valorisation of nutrients, biogas and water, Decentralised treatment, links with (urban) use



  
**SWITCH**

WUR



## Objectives

→ **Develop and Demonstrate** pollution prevention and re-use *technologies and approaches* to handling of waste water and storm water on a **decentralised** scale.

*Separation at source, valorisation of nutrients and water, decentralised treatment and use, valorisation:*

→ To **Integrate** safe treatment and productive use (urban agriculture and greening) into **urban planning** and decision-making frameworks

*Working groups, Learning Alliances, Awareness, Lobbying and Advocacy.*



## SWITCH

→ **Demand-led Research**

Learning Alliance, working groups, strategic planning

→ **Sustainable, robust and flexible technologies**

Diversity, Flexible urban water cycle

*Relevant New Science*

*Uptake / Upscaling*



## Research to date

1. Assessment of innovative sanitation systems in cities around the world: source separation
2. Development of treatment processes for removal of organic micro pollutants (pharmaceuticals, hormones)
3. Inventory of demand, logistics and regulations for the application (agricultural use) of recovered nutrients (ecosan fertilisers) (in Lima, Accra)
4. Cleaner production of Tanneries (in around Bogota)



## Research to date 2

5. Assessment of treatment and re use systems: development of guidelines and legislation (in Lima)
6. Selection and testing of on farm improved treatment systems and proper use of wastewater (in Accra)
7. Current and future transports systems for using ecosan products (urine in Accra)
8. Potential of various sources of water for agriculture and monitoring of rain water collection and re-use of high value crops (in Beijing)





## Demonstrations

**Accra:** On farm treatment and use of waste water, participatory monitoring and improvement, use of ecosan, social inclusion, increased awareness.

**Beijing:** Improving water harvesting system using greenhouses, diversification of production and link with agro-tourism, Cooperative organisation

**Chengdu:** Treatment and re-use of grey-water at institutional level

**Lima:** Neighbourhood wastewater treatment and re-use for agriculture and greening, community mobilisation

**Bogota:** Development of Sustainable Tanneries and participative monitoring



*Action Research with Demonstration*

## Accra

Technological and  
Organisational Innovation



at :

Catchment (research: *Odaw Korle Basin*) and  
Plot level (research/demo at Dzorwulu - Roman  
Ridge)





## Accra

### Research:

- Pollution control and awareness raising at catchment: interrelationship livelihood activities and stakeholder interventions.
- On farm, low cost, water treatment options
- Capacity building on safe vegetable handling; both production as marketing: FFS/Awareness
- Social Inclusion
- Nutrient recovery
- Sustainable Sanitation



## Accra

*Plot level: Dzorwulu - Roman Ridge*

→ Safe use of waste water and minimisation of health risks at selected areas (Open Space Vegetable Farming)

### Low cost treatment technologies

- Settling Tanks
- Waste Stabilisation Ponds (range of ponds)
- Floating Macrophytes / Hydroponics



## Urine harvesting, transport and use



Frederick Tetey-Lowor

## Accra

*Link WP 4.1 / 5.2*

- Studies Accra, Lima of potential application
  - Could Urine serve as a source of a cheaper and readily available fertilizer
  - Will this improve urban agriculture in Accra
  - And also reduce the nutrient loads to the city drains and the ocean.
- Focus on financial costs and benefits.



## Research in use...



## Accra WG / LA



Action Research to involve and inform decision-making

→ WG members are involved in research

→ In WP and LA information provision

and link to scenario's

Coping with Reality:

- Reduction of Pollution
- Use of open space
- Available food
- Livelihood opportunity
- Example of **D**ecentral wastewater Management



## Beijing

Development of Peri-urban areas:

- Intensification (niche products)
- Diversification (agro-tourism)
- Cooperatives

- Water shortage
- Alternative Sources
- Use of rainwater and waste-water



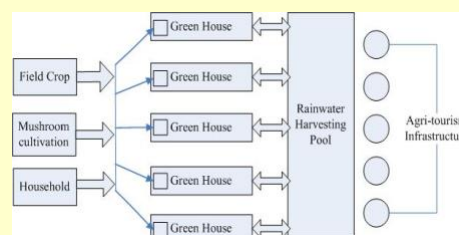
## Beijing



*Huairou, peri-urban Beijing*

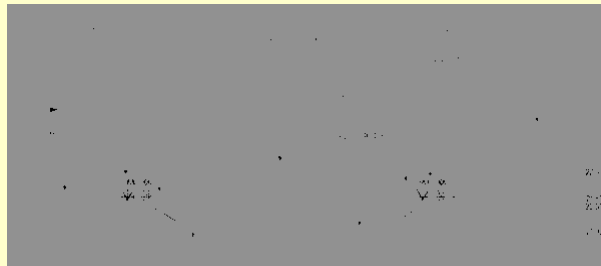
MODEL

- Rainwater Harvesting
- (treated) waste water, groundwater replenishment
- Agro Tourism
- Diversification
- Cooperative Development



## Demonstration project at University complex in Chengdu

- Grey water treatment in an improved constructed wetland
- Rain water capturing in ponds and use for recreational purposes in the urban environment



## Source separation in Tannery Industry: Bogotá

1. Definition emission limits
2. Investigate possibilities for eliminating emissions
3. Conditions for involvement of relevant parties in an industrial community
4. Testing of Cleaner Production approach in selected enterprises.
5. Demonstration to Bogota





## Lima

- < 25 mm rainfall: Surface and subsurface water
- High prices vendors
- 9% treatment of total wastewater, rest ends up in surface water
- Legislative vacuum** on use of (treated) wastewater
- LA= two level platforms**
- Min.of Housing/IPES/Villa El Salvador demo



## Lima

### Assessment of technologies and a revision of laws....

- 1) Analysis of (37→6) cases:
  - Wastewater treatment options (5)
  - Use of treated water for urban agriculture and parks and gardens in urban and peri-urban areas
- 2) **Development of guidelines and update of regulatory framework** in Lima/Peru.
- 3) **Demo** of **de-centralised** treatment pond and community garden



## High potential, known challenges

- Increased attention for sanitation and urban agriculture: offers opportunities → need of good cases

I....

- Lack of awareness and knowledge
- Legal frameworks missing, needs revision
- Practical considerations, like economic viability, using market (incentives), esp. for storage and transport important: willingness to pay?



## Messages



- Nutrient value of human products is high and should be recovered
- City is a source and market
- Reduction in water use and cost can be achieved.
- Decentralised systems favour Integrated planning and allow Social inclusion
- Technological and Institutional Innovations are necessary and can be developed using LA approach





## Deliverables

Knowledge documents on:

- Technical Standards for source separation, waste water treatment, and monitoring of quality.
- Guidelines and suggested changes in legislation and policy for integrated systems of treatment and reuse of waste water
- Knowledge and Awareness material
- Training packages and E-learning course



## Deliverables...Scaling up

- Institutions involved raised knowledge and cap.
- Working groups established
- City Learning alliances (at different levels)
- National committees (Safe Water in Lima, Beijing CAS: other mega cities, National policy in Ghana)
- RUAF Network, IWMI, CGIAR, IDRC, World Bank, FAO, UN Habitat,
- SuSanA, LATINOSAN



## Parallel Session 5c

- 7 Interesting papers, 4 presentations
- Linkages and Integration, in WP, in Theme and to wider SWITCH (themes and cities)
- Objective to Output.
- Next 2 years PoW.



Thank you



## Title

Text



Parallel session 5c

## Decentralised Wastewater Systems

- Intro: 10 min.
- 16:10 – 17:30
- Winkler: 30 min
- Castro: 20 min
- Beijing: 10 min
- Rashid: 20 min.
- 17:30-18:30 Discussion



## Parallel Sessions

- Integration of individual research in and between work packages
- Prevent overlap / maximise knowledge development
- Coherent Story (check presentation/paper):  
disseminate through SWITCH.. In IUWM and City LA's
- What are we going to do in **the next 2 years**



## Parallel Sessions 2

- Most Significant Science
- Key Deliverables
- Integration in SWITCH

What are we doing now

What are we going to do in the next two years

What needs to be changed



## SWITCH main aim

**Development of Sustainable and Effective Water Management Schemes in the City of the Future**

- IUWM : robust and flexible technologies
- Integrated Assessment of Risks and Sustainability (with LA)



## SWITCH Objectives

- 1) Develop: overall strategic approach to achieve sustainable UWM
- 2) Develop: **Effective Sanitation and Waste Management Options**
- 3) Develop: Innovative, Effective, Institutional, arrangements along the water cycle
- 4) Develop: Effective storm water management options
- 5) INTEGRATE: urban water services (ecological and other productive functions).



## Discuss...

- Title of theme
- Main Challenges and responses (our story)
- Main Objectives (link WP-Theme-SWITCH)
- Main Deliverables
- Modifications



ok



## Title...

- Decentralised
- Wastewater
- Systems



## Challenges and Responses

- Urbanisation: By 2030 > 60% live in cities
- Only demographic, usually not infrastructural
- Urbanisation of Poverty
- Rising urban food demand
- Water scarcity (insufficient or polluted sources, capacity for treatment limited/expensive)
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## Response to challenges

### *Coping with Realities*

- Link to city pressures (challenges) and opportunities, a.o search for alternative water sources (but also other)
- Re-thinking separation, treatment, use of waste water and use ecological sanitation
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- Decision support system for decentralised waste water options
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## Modifications

- Joint Policy Brief
- Link to theme in each deliverable (brief)
- Training Package(s)
- ....
- ....



## Modifications

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- ....
- ....



## 2009 -2010

### **In the next 2 years...**

Finalise research, demonstrations

Develop products (guidelines, standards, KIM materials DL)

Develop/input in training packages

Short term: make Policy Brief on this theme



## Title

Text



## Beijing

Development of Peri-urban areas:

- Intensification (niche products)
- Diversification (agro-tourism)
- Cooperatives



- Water shortage (600mm)
- Reforms
- New Water Sources



## Beijing Improving water efficiency

- Water Management Reforms: Beijing Municipal Water Authority
- Integrated Urban/Rural Water Management
- Municipality, District, Water-Station, Farmer level
- 2006: over 3300 village water use associations
  
- Water use efficiency
- Water Price reforms



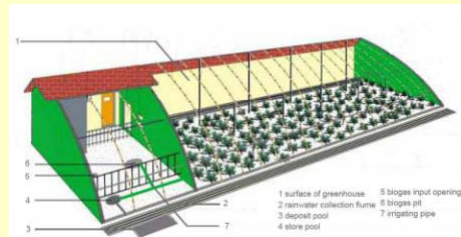
## Beijing New Water Sources

- South North Water Transfer
  - ongoing, not for agricultural use
- Waste water treatment and re-use.
  - In 2007 20% of agriculture by treated ww.
  - Not access everywhere, Slow development of decentralised ww treatment
- Rain(storm) water use
  - Intra urban: 2006 > 300 projects of rainwater capture and re-use
  - Peri-urban/for agriculture promoted since 2005



## Beijing Capturing Rainwater

- Agr. Sector using >90% groundwater
- Rain water harvesting using Greenhouse model
- Beijing Agr. Bureau & Water Water Authority.
- Govt. Demonstrations; Huairou
- 85 m. \* 8 m. , plastic roof: +/- 200m3 potential
- 2/3 times irrigation

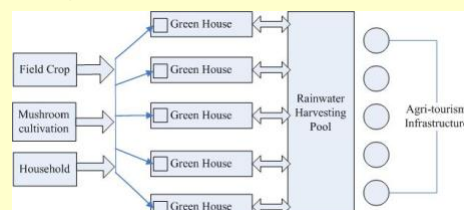


## Beijing

*Huairou, peri-urban Beijing*

### MODEL

- Rainwater Harvesting 5 units
- Open Pond system with:
  - groundwater replenishment
  - Agro Tourism
  - Diversification of crops
  - Cooperative Development
- Change in design
  - 4\*135 M3 underground storage
  - 2008: 80% rw.
  - From Grape to Mushroom






Title

Text




Sustainable sanitation



<i>UNDP 2000</i>	<i>General PP/year</i>	<i>W-Africa PP/year</i>	<i>CREPA/ SEI 2005 2008</i>
	4,5 kg    N	2.8 kg	
	0,5 kg    P	0.45 kg	
	1.2 kg    K	1.3 kg	

- Most NPK in urine, but high C in Feaces (soil)
- Sufficient for growing a persons grain yearly supply
- Potential high (multiply x. 4-7-16 M. inhabitants.....)
- In BF: \$ 8 value → If total population would produce = national chemical fertiliser import (\$100 M./year)