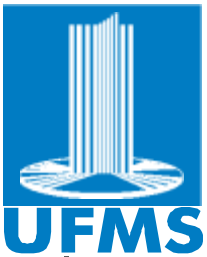


# **Ecological Sanitation for food and water security**

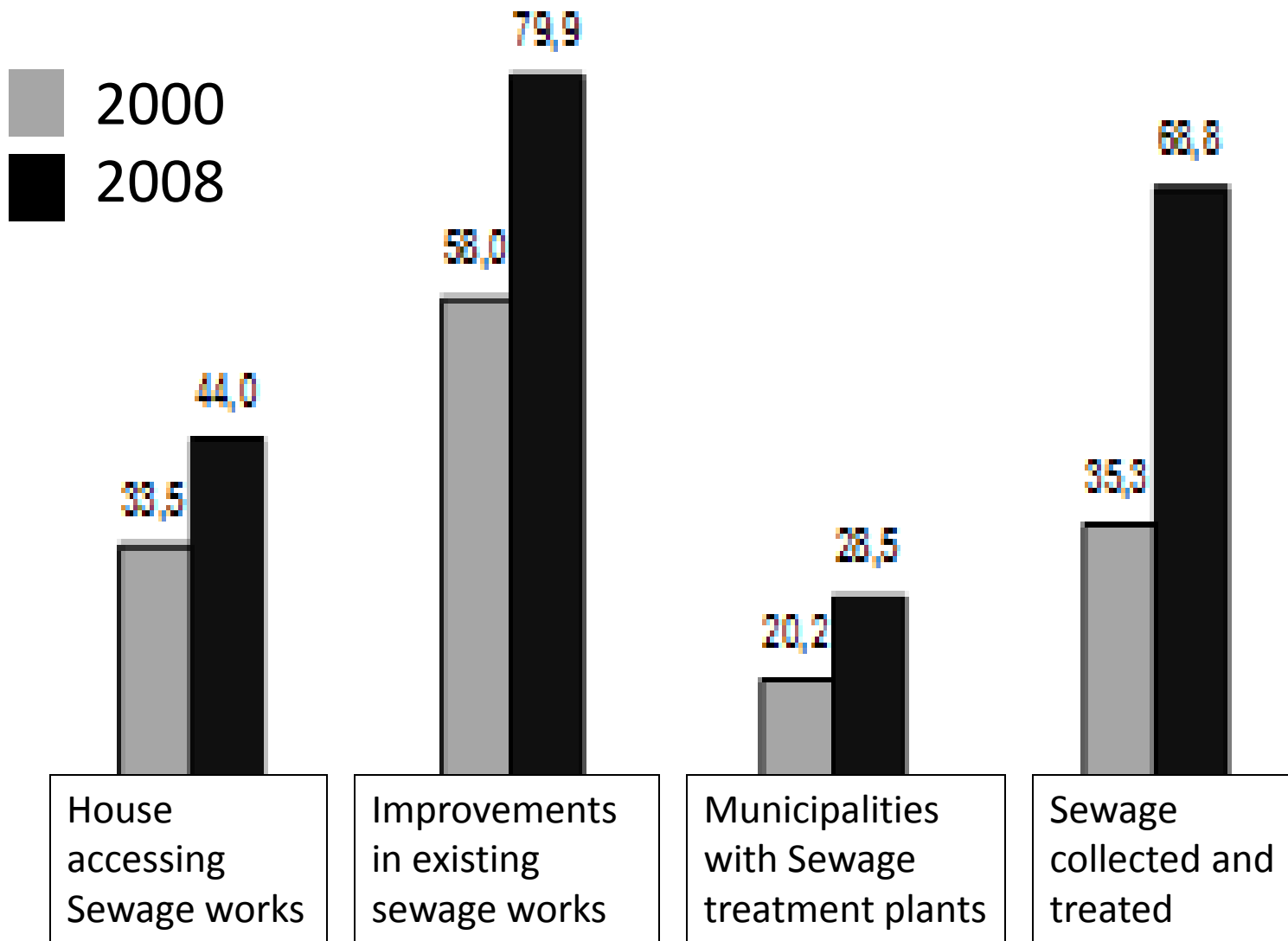
**Paula Loureiro Paulo, PhD**

**Federal University of Mato Grosso do Sul - UFMS  
Brazil**





# Overview of sewage works situation in Brazil



# Sanitation situation in Brazil

- National average may hide huge differences on service delivery: regional, social, and urban and rural areas.
- **Brazil: more than 5000 municipalities:**
  - 70% are under 20.000 inhabitants
    - hardly have conditions for investing in sanitation
    - even less have conditions to worry about regulations and to invest on environment protection
- **Brazil has good and strict legislation, but, in practice, to comply with it depends on local government.**

# Sanitation situation in Brazil

- PAC – Programme for development Acceleration (Federal Government)
- Sanitation investments:
  - USD 12.3 billions (2007 to 2010)
    - Water collection and treatment
    - Sewerage system and sewage treatment
    - Solid waste
    - Urban drainage

# PLANSAB – Nacional Plan for Basic Sanitation

(Basic Sanitation Law - 11445/2007).

## Objectives:

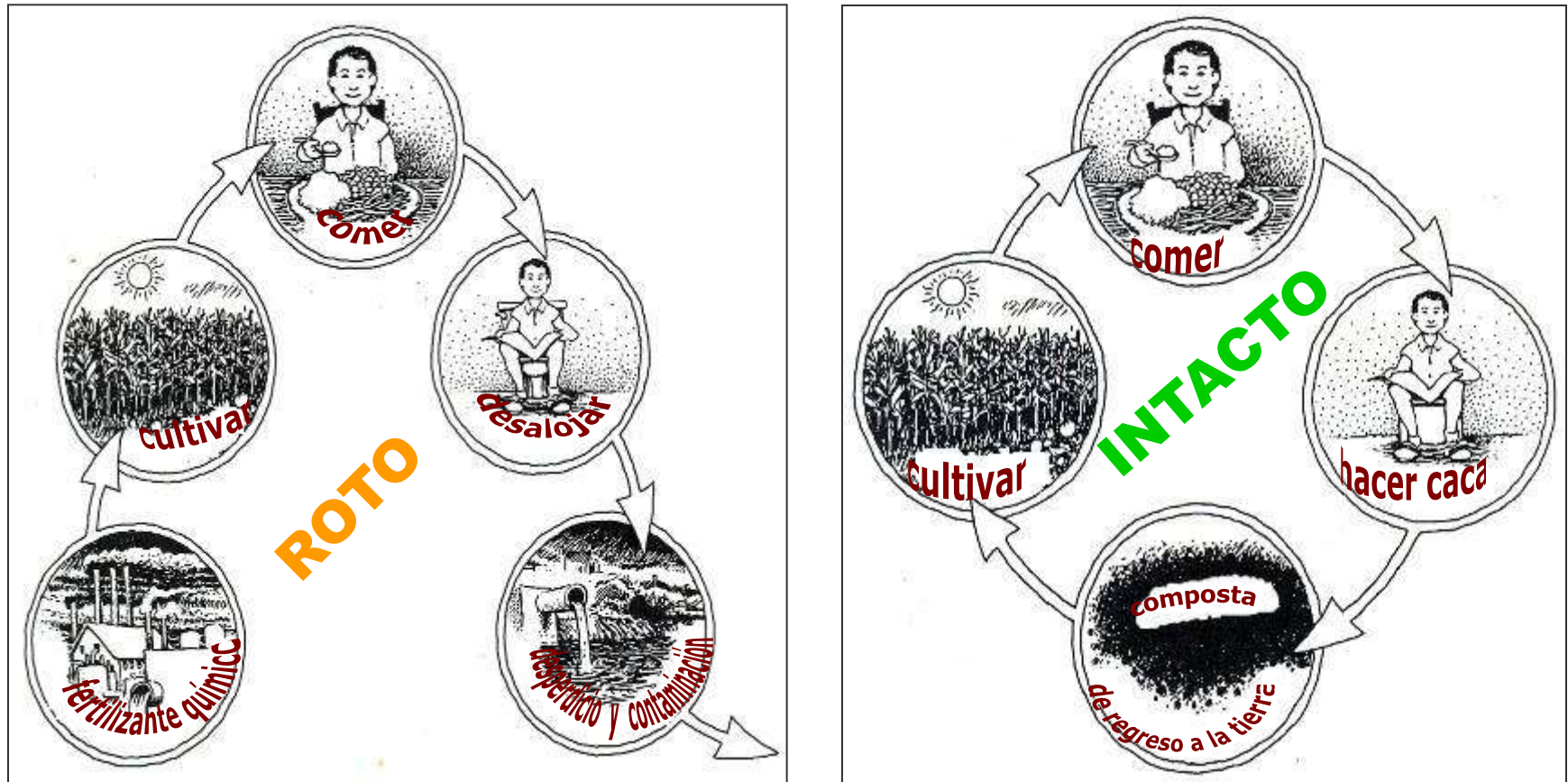
- Universalisation of sanitation services
- Promoting health and quality of life
- Promoting environmental sustainability
- Improving the management, quality and sustainability of delivered sanitation services
- Establishing procedures and rules for regulation and fiscalisation
- Rights for the city



# Ecosan – concepts and strategies

- Does not promote a specific technology
- It is an approach based on a whole view of the natural cycle of resources
- Considers wastewater and human excreta as a resource and not as a residue
- Uses the basic principles of nature to close the water and nutrient cycles using modern and safe technologies.

# The cycle of human nutrients



2 paradigms— what to choose?



# Source segregation– the colours of water

Greywater  
Light or  
dark

All wastewater produced in a household – except from the toilet

Urine/  
Yellow  
water

Coming from urinals and urine diverting toilets (with or without flushing)

Faeces /  
Brown  
water

Coming from urine diverting toilets (dry ones – faeces or flush-toilets – brown water)



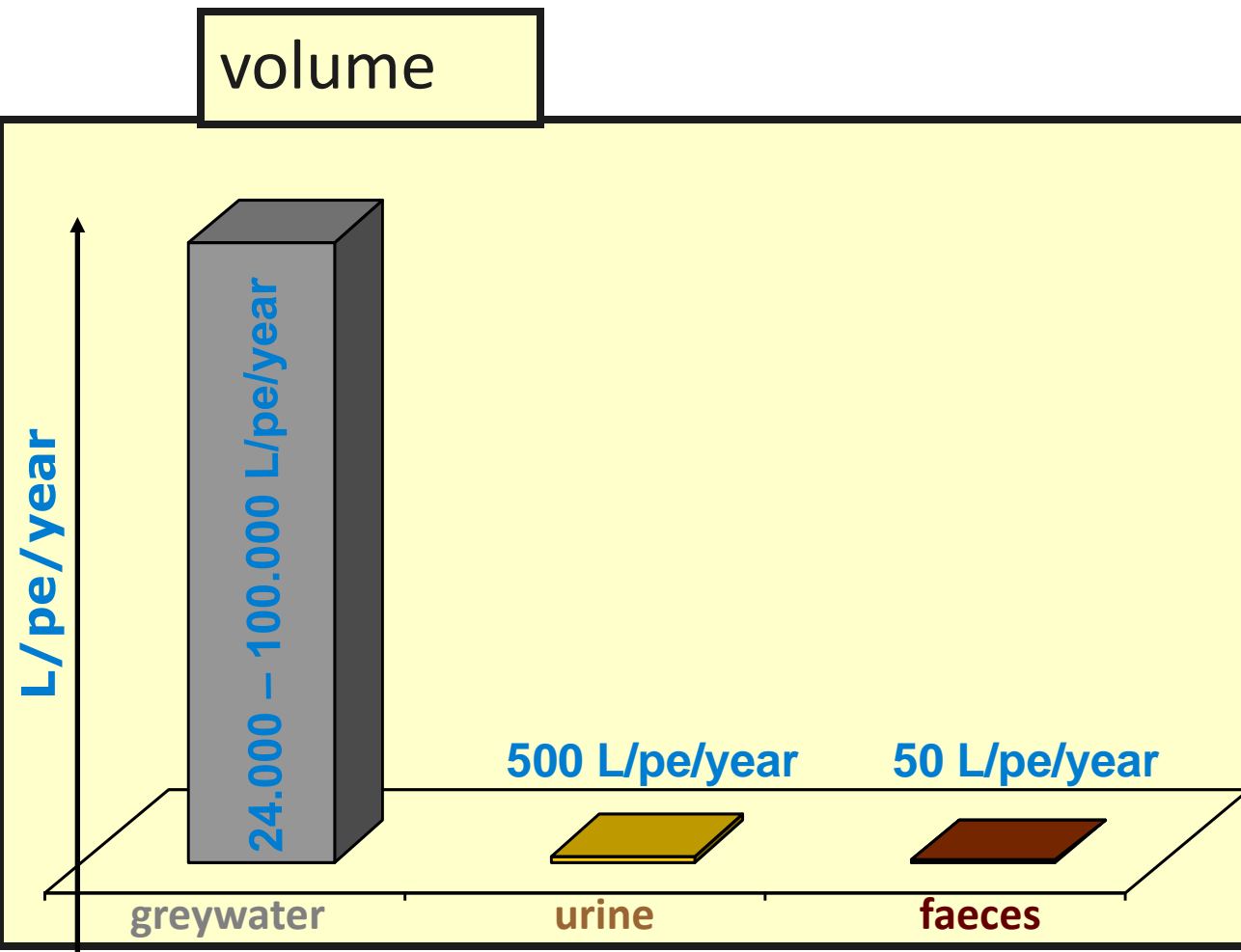
+



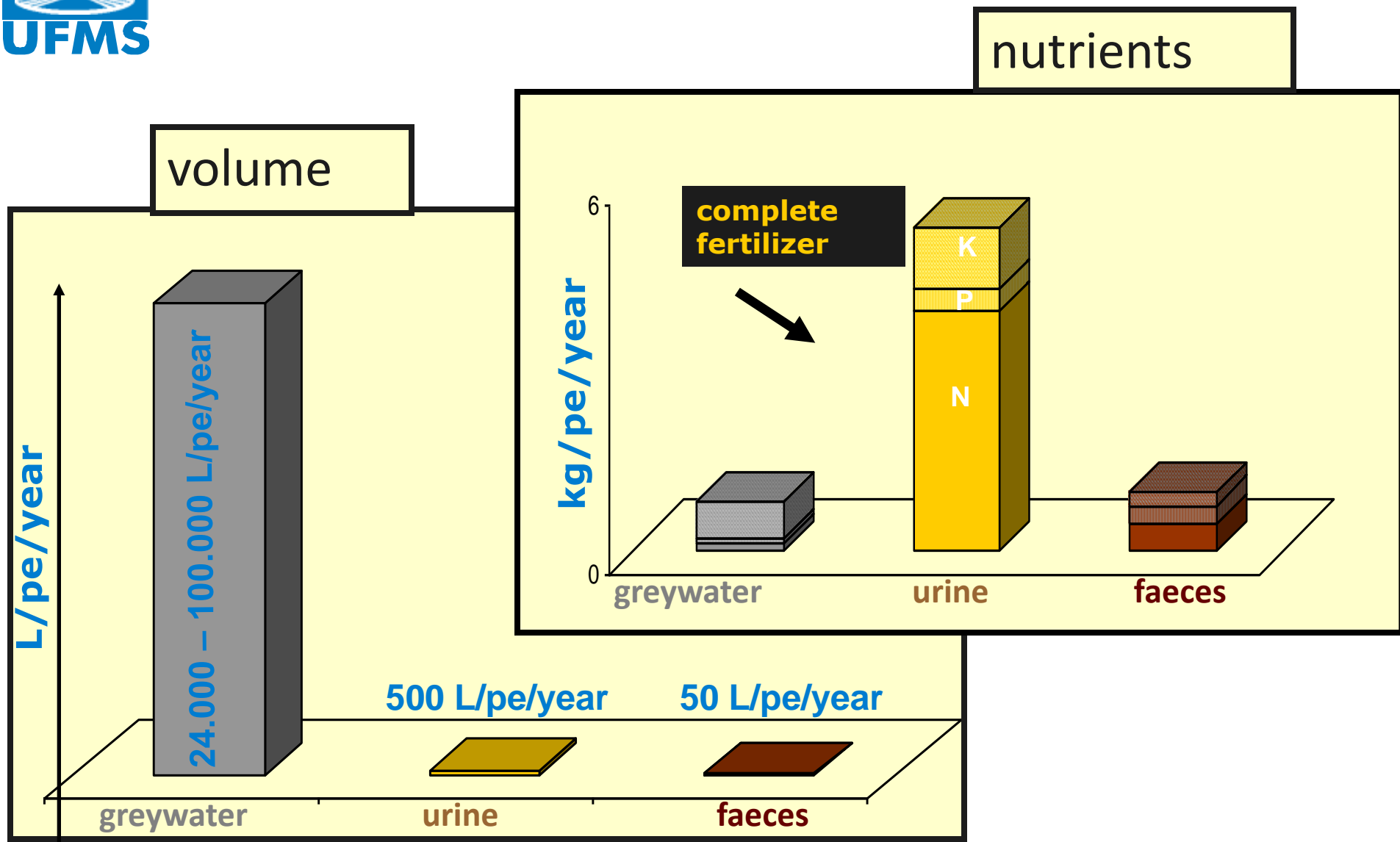
= black water

Conventional or  
vacuum toilets

# Greywater, urine and faeces



# Greywater, urine and faeces



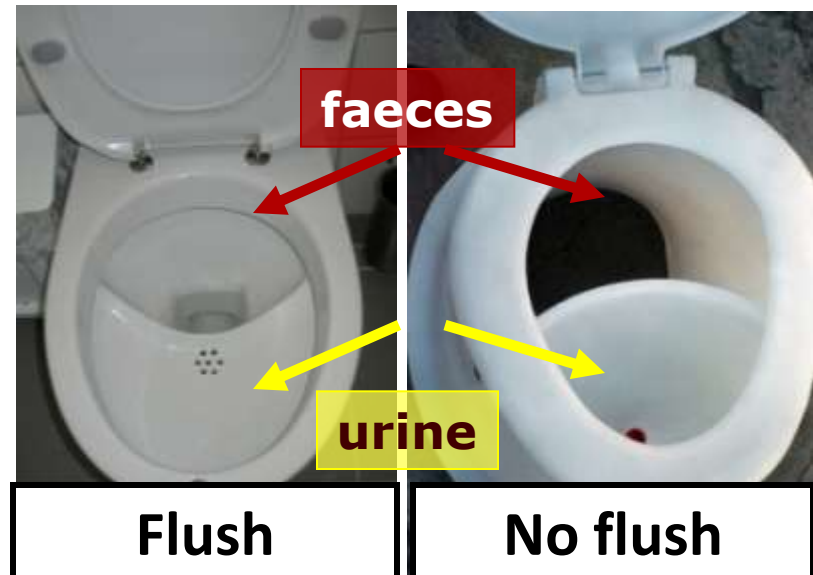
# Ecosan – concepts and strategies

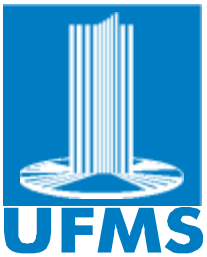
*...so, shall we  
split up???*



- Find the right option
- Case by case solution

*Illustration: unknown source (taken from Elisabeth von Munch lecture material (IHE, Delft))*



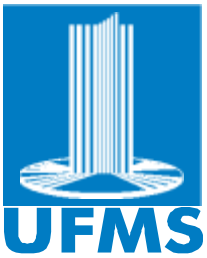


# Ecosan and the Millenium Development Goals (MDGs)

- Directly linked to 3 out of 8 of the United Nations MDGs to be achieved by 2015:
  - Eradicate extreme poverty and hunger
    - (ecosan market, food security - fertilizer)
  - Reduce child mortality
    - By providing food security, sanitation
  - Ensure environmental sustentability
    - To save natural resources by reusing and recycling, no waste disposal in water bodies

# Perspectives and challenges for the implementation of ecosan in Brazil

- **Some opportunities...**
  - Low coverage of sewerage system
  - MPS – Municipal plans of sanitation. (future neighbourhoods)
  - PAC – Programme for development Acceleration (Federal Government investments)
  - More treatment options
- **Some needs...**
  - Financial support for the development of research and project implementation on Brazilian's conditions
  - To incorporate the topic “Ecosan” in sanitation related disciplines in (post) graduation courses
  - Population acceptance

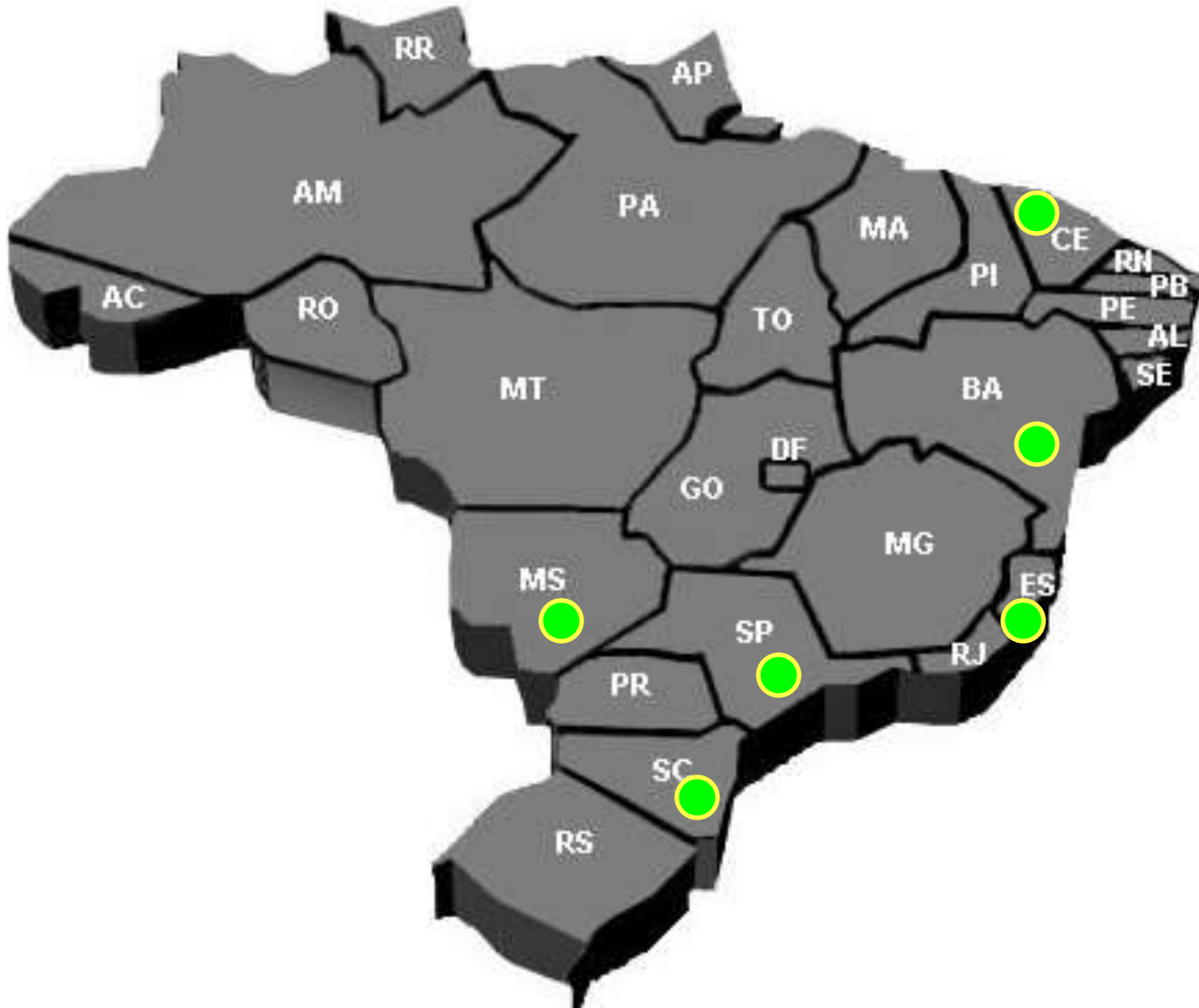


# Perspectives and challenges for the implementation of ecosan in Brazil

- Some difficulties...
  - Potable water is cheap
  - We need to develop specific legislation
- A possible barrier...
  - Law 11.445/2007 - National guidelines for basic sanitation and for the Federal Policy on Basic Sanitation
  - Art. 45. “... every permanent building will be connected to the public system (water and sewerage) available and subjected to pay tariffs ...”

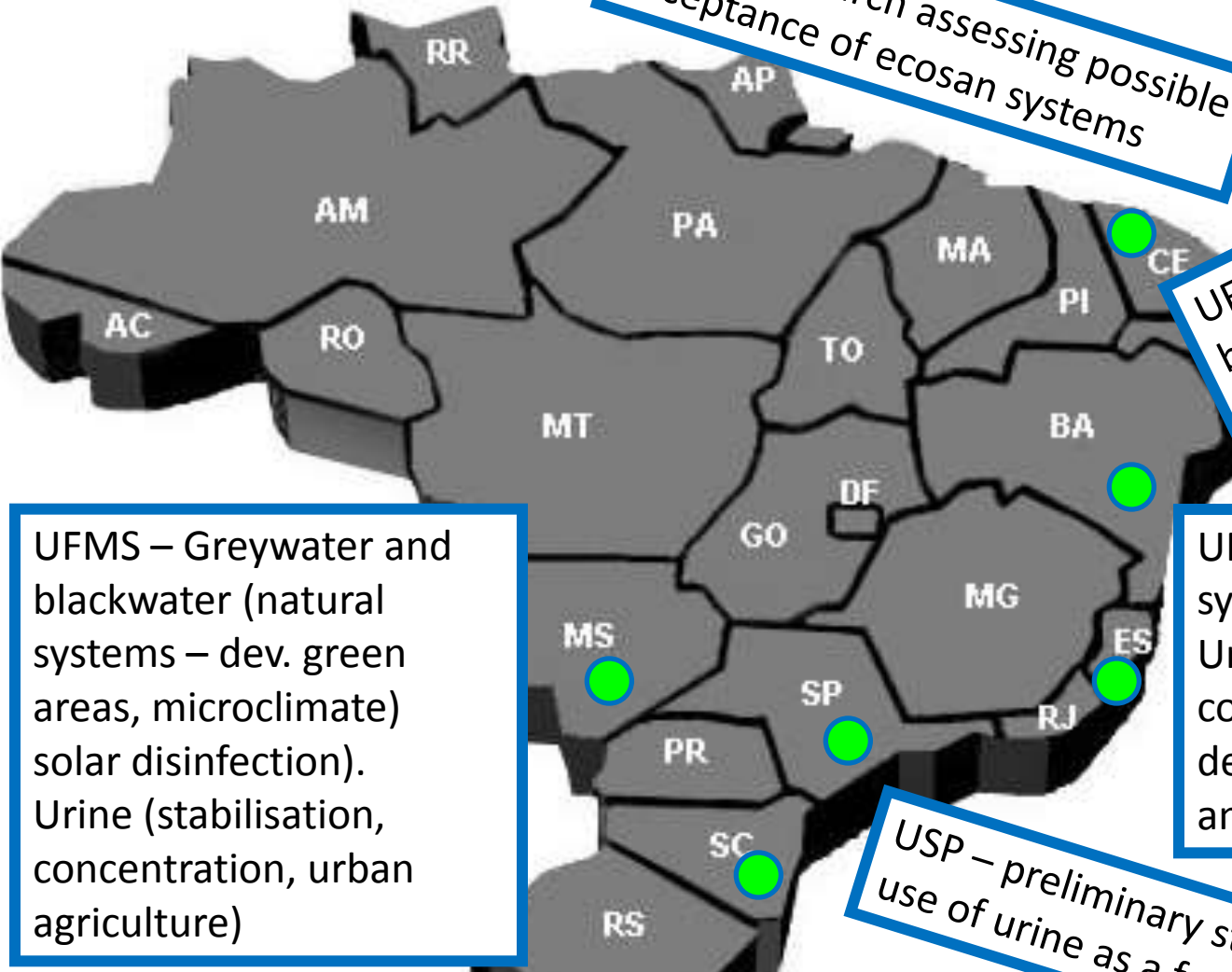
§ 1º Where the public services are not available, individual solutions for water supply and sewage will be admitted...<sup>14</sup>

# View of Ecosan Research in Brazil





# View of Ecosan Research in Brazil



UFC – Research assessing possible acceptance of ecosan systems

UFBA – dry urinals (users behaviour, acceptance - etc), hydroponics (ornamental plants, lettuce).

UFMS – Greywater and blackwater (natural systems – dev. green areas, microclimate solar disinfection). Urine (stabilisation, concentration, urban agriculture)

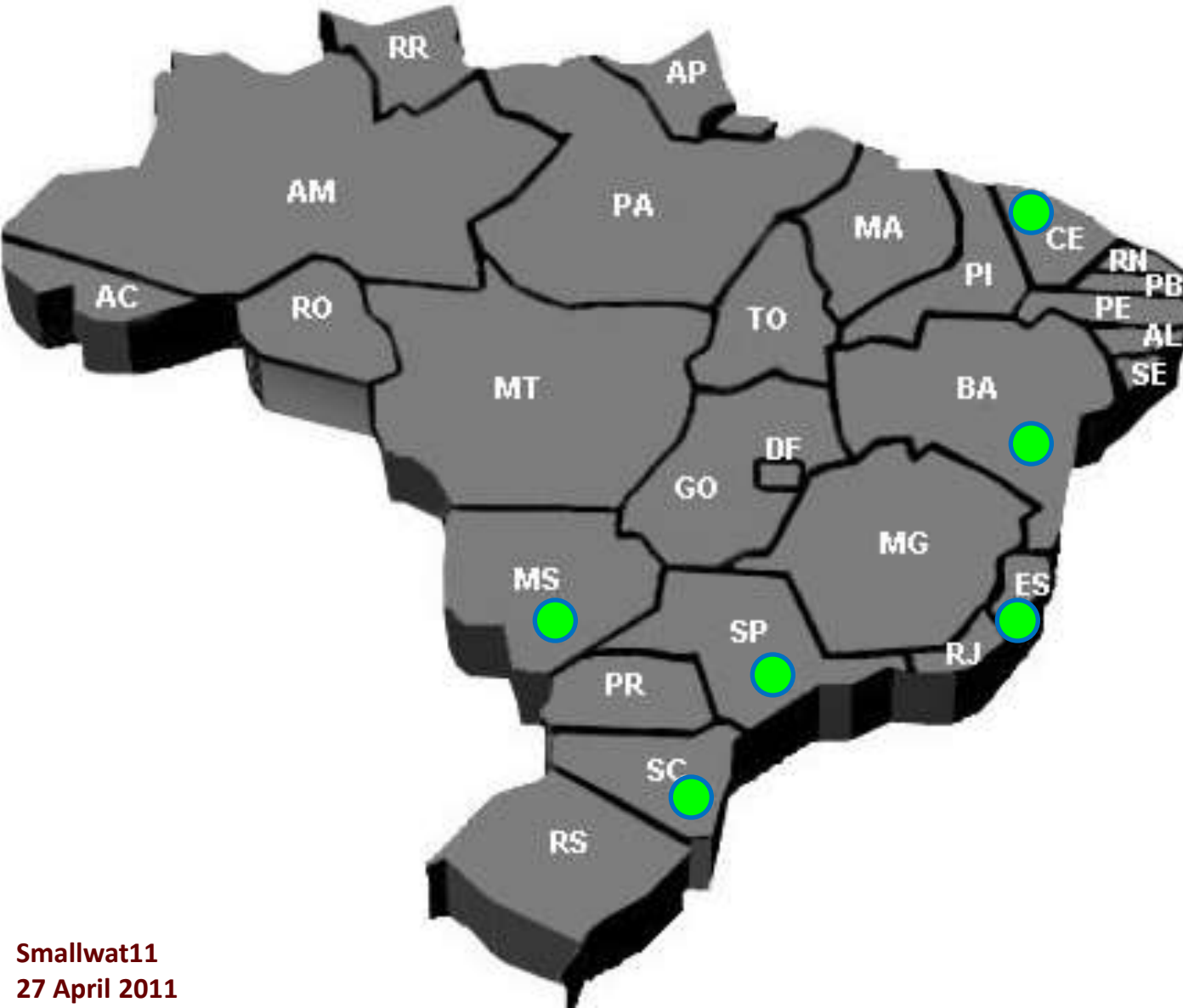
UFES – Greywater (compact systems)  
Urine (stabilisation, concentration, hydroponics)  
development of a female urinal and composting toilet

USP – preliminary studies on the use of urine as a fertilizer

UFSC – greywater (wetlands). Urine diverting dry toilet



# View of Ecosan Research in Brazil



## Some Aspects

- Robustness
- Efficiency
- Low O & M
- Acceptance
- Cost effectiveness
- Safety -
  - Micropollutants (hormones and pharmaceuticals)
  - Pathogens

## FINEP – New Research Network (2011-2013)

### All studies:

- Risk analysis
- Life cycle assessment
- Environmental and economic feasibility

# An inspiring example...



Dr. Roshan Shrestha's house  
(UN-Habitat)  
Katmandu, Nepal

# Eco-House

**House Without City Water Supply  
Reuse & Recycle of Waste**

**Built in 2002 occupies 135 m<sup>2</sup> Area**



Rainwater catchment

Rainwater catchment

Roof tanks

UDD toilet

Solar heater

Dug well for Ground water recharge

Garden

Greywater Treatment Plant

Water collection Tank

Biosand filter for water treatment

# Urine diverting dry toilet (UDDT)



# Greywater treatment and reuse



Treatment:  
Sedimentation +  
constructed *wetlands*

Reuse of toilet flushing

Car washing



# Use of urine and compost in his own garden





# Use of urine and compost in his own garden

Food production





# Use of urine and compost in his own garden



Food production





*Thanks for your  
attention!*

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