# Integrated process for biogas production from biomass

4th Dec 2011

Francisco Romero

Cranfield UNIVERSITY

ATWARM

QUESTOR CENTRE

MARIE CURIE ACTIONS

PEOPLE

http://www.cranfield.ac.uk

Shuvrqd#Surib


**Francesco Ometto**

Padova, Veneto (North-East Italy)

**Environmental Engineering** (BS and MSc)
University of Padua – Italy, March 2010

Wastewater treatments
- *biological/chemical treatment*
- *design of wastewater treatment plan*

Solid waste management
- *classification*
- *treatment facilities*
- *design landfill*

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Education and Culture DG

Lifelong Learning Programme

Lifelong Learning Programme Erasmus
Feb.-Sep. 2009

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University of Padua - Cranfield University

MSc Thesis
“Biological degradation of fats, oils and greases”

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Surmfw#ryhuyhz

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# Integrated process for biogas production from algal biomass (2.6)

Start date: 2 August 2010 End date: 2 August 2013

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# School of Applied Sciences (SAS)

## Department of Environmental Science and Technology

**Raffaella Villa**
Lecturer in Bioprocess Technology
*Centre for Energy and Resource Technology*

**Bruce Jefferson**
Professor in Water Treatment Processes
*Cranfield Water Science Institute*

In collaboration with a Stream EngD project:

stream
The Industrial Doctorate Centre for the Water Sector

anglianwater

SEVERN TRENT WATER

Scottish Water
Always serving Scotland

EPSRC
Engineering and Physical Sciences Research Council

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## R emfwlyhv#

- Influence of **wastewater algal species** on the performance of **biogas production** after nutrient removal in the anaerobic digestion (AD) process.

- Viability of an **integrated process** for producing algae for nutrient removal in a wastewater treatment system and, subsequently, using their biomass in digester to produce biogas.

- Complete **training programme.**

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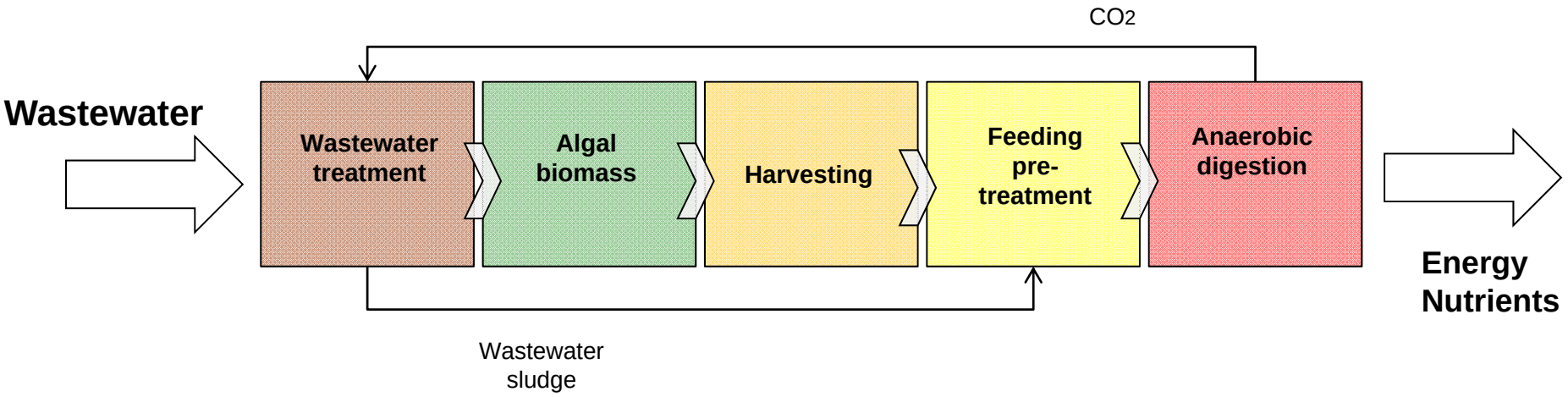
## Iqwhjudwhg#surfhvv#

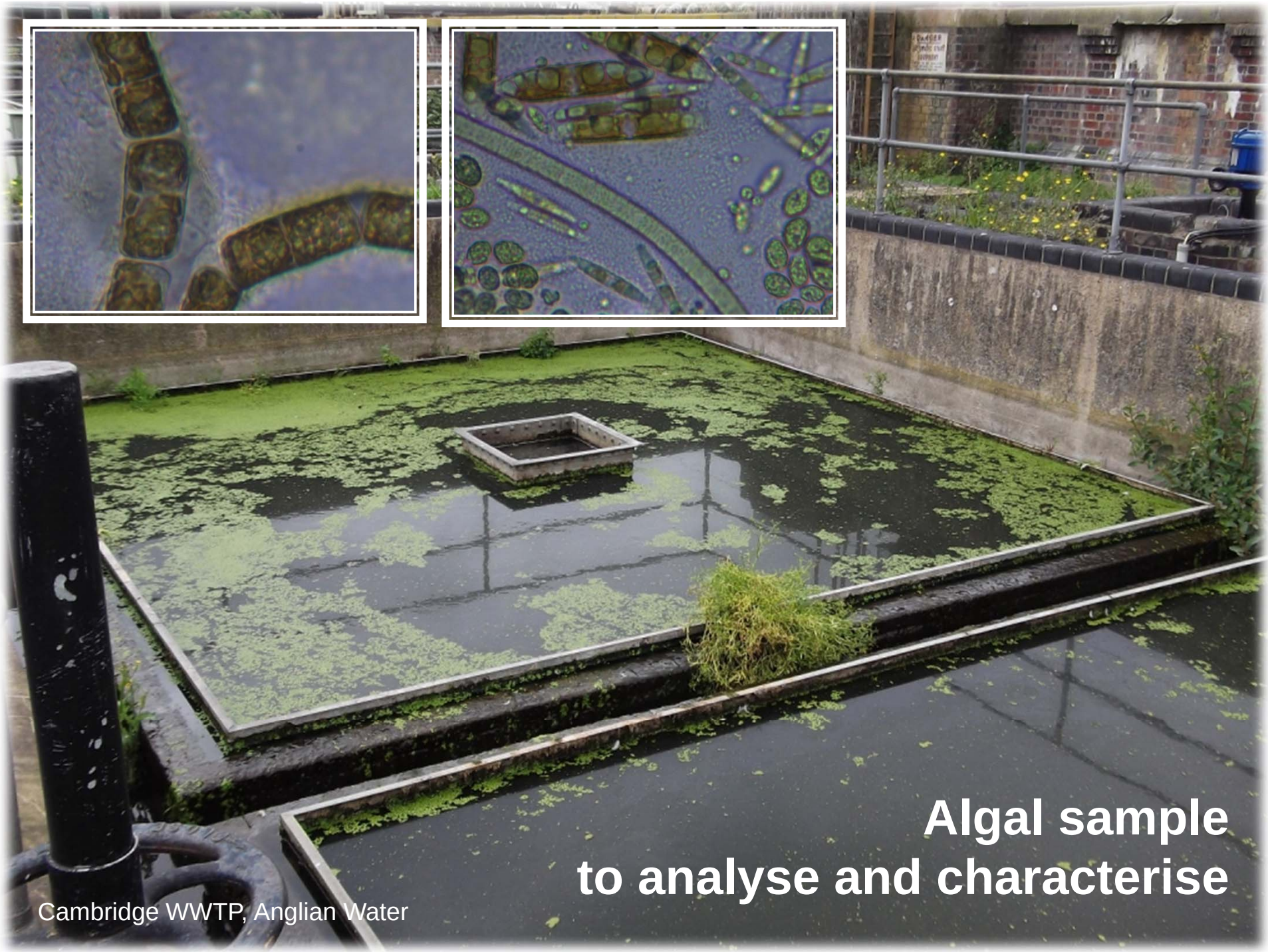


# Novel challenges

*Untegrated processes for biogas production from algae*

**Only a few microalgae strains have been tested for wastewater treatment and biogas production**

**Native wastewater algae investigation required**


Algal sample
to analyse and characterise
Cambridge WWTP, Anglian Water

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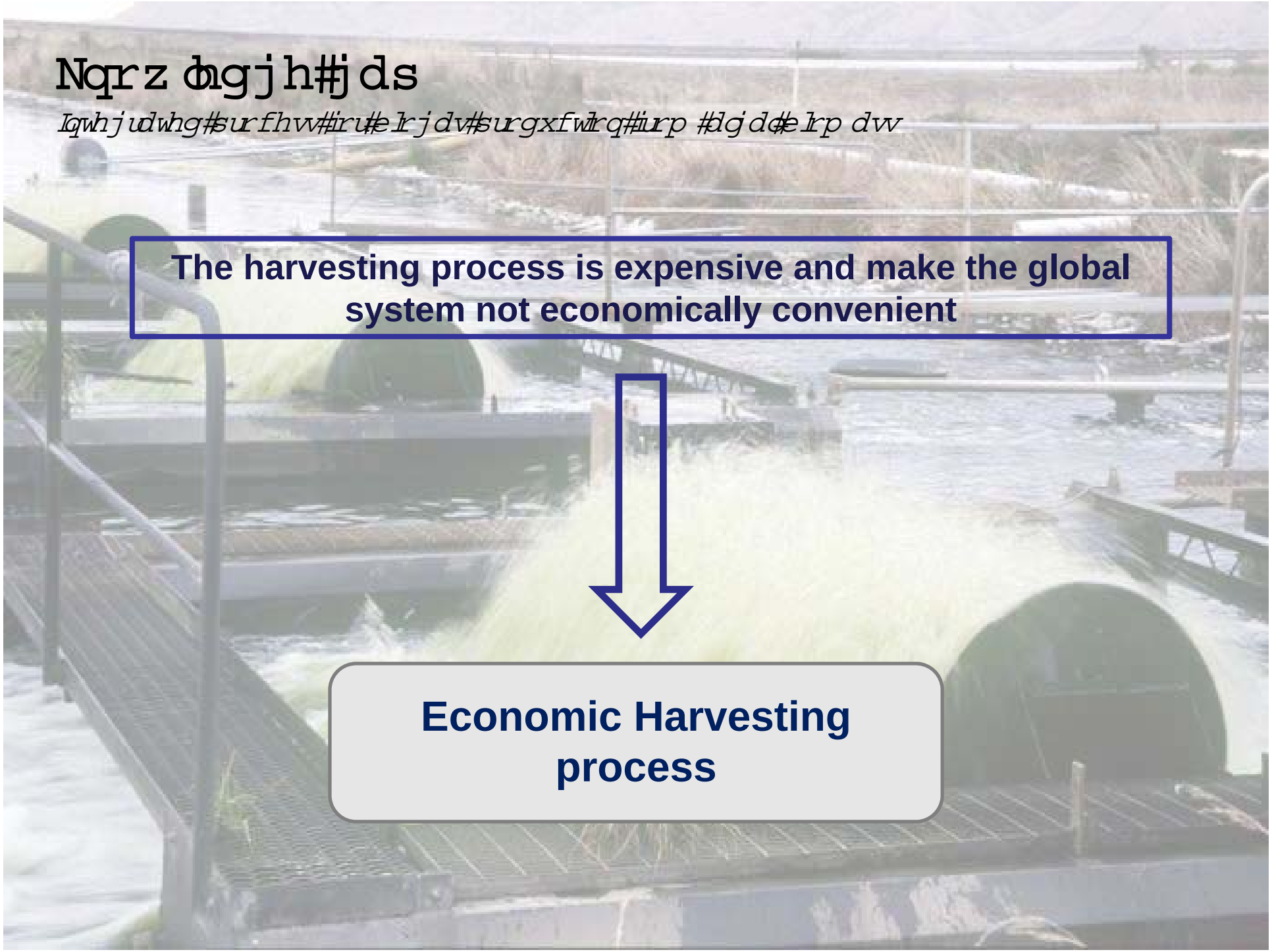

**The harvesting process is expensive and make the global system not economically convenient**

**Economic Harvesting process**

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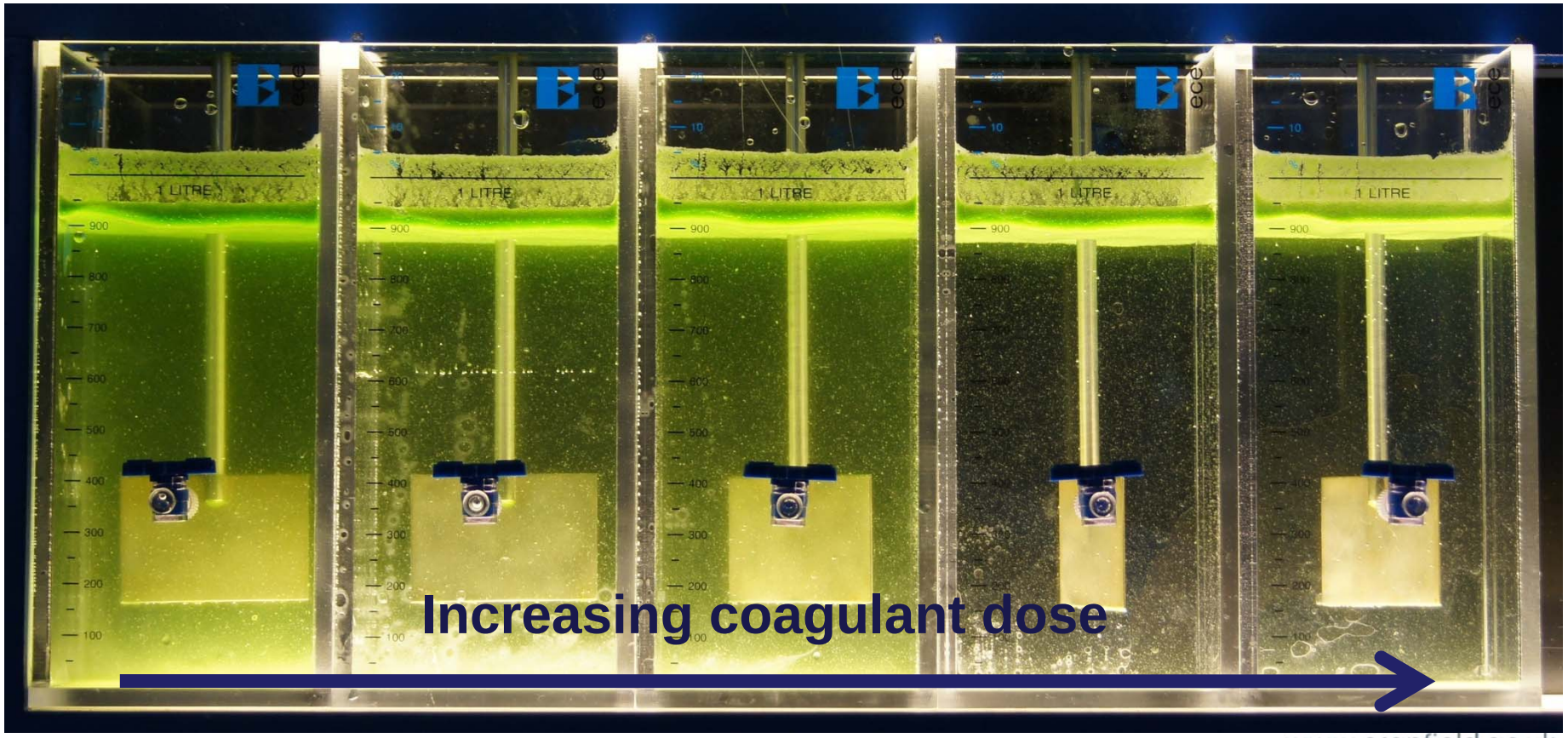
**DAF** - Dissolved Air Flottation
**BDAF** - Ballasted Flottation (20% energy less)
**posiDAF** (no coagulant, no contamination)



# Nqrzdqgjh#jds

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**Algal membrane are very difficult to break;**
**C/N ratio is a critical issue for AD;**

**Anaerobic digestion improvement**

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**Improvement of soluble COD after pre-treatment +58%**

*Scenedesmus obliquus* before and after CAMBI pre-treatment

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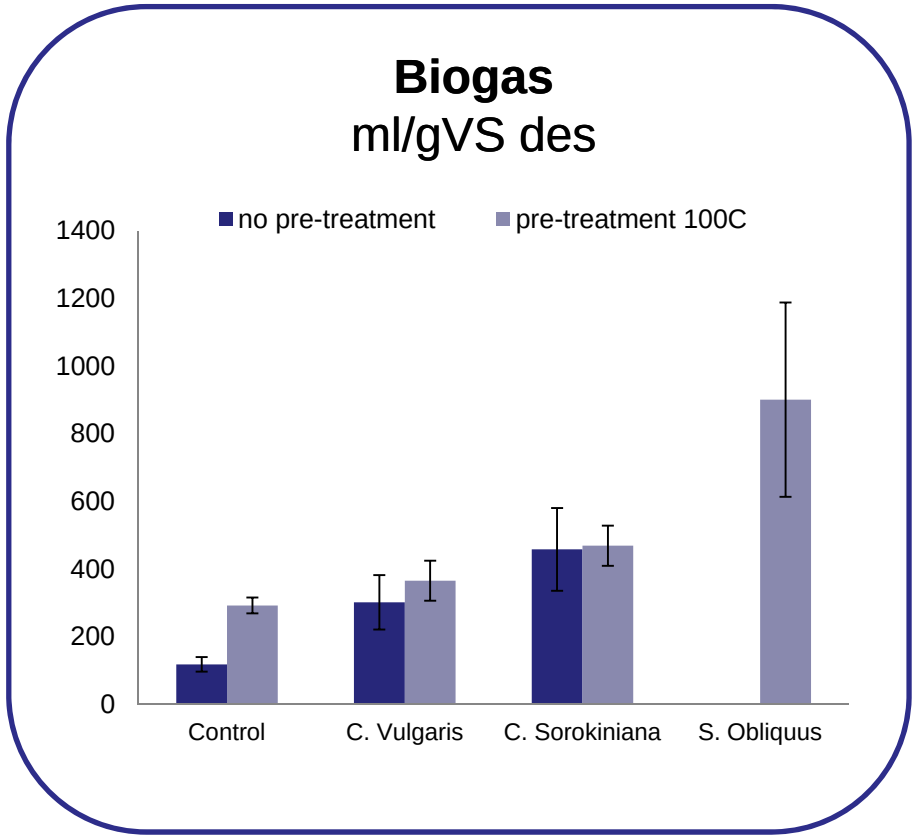


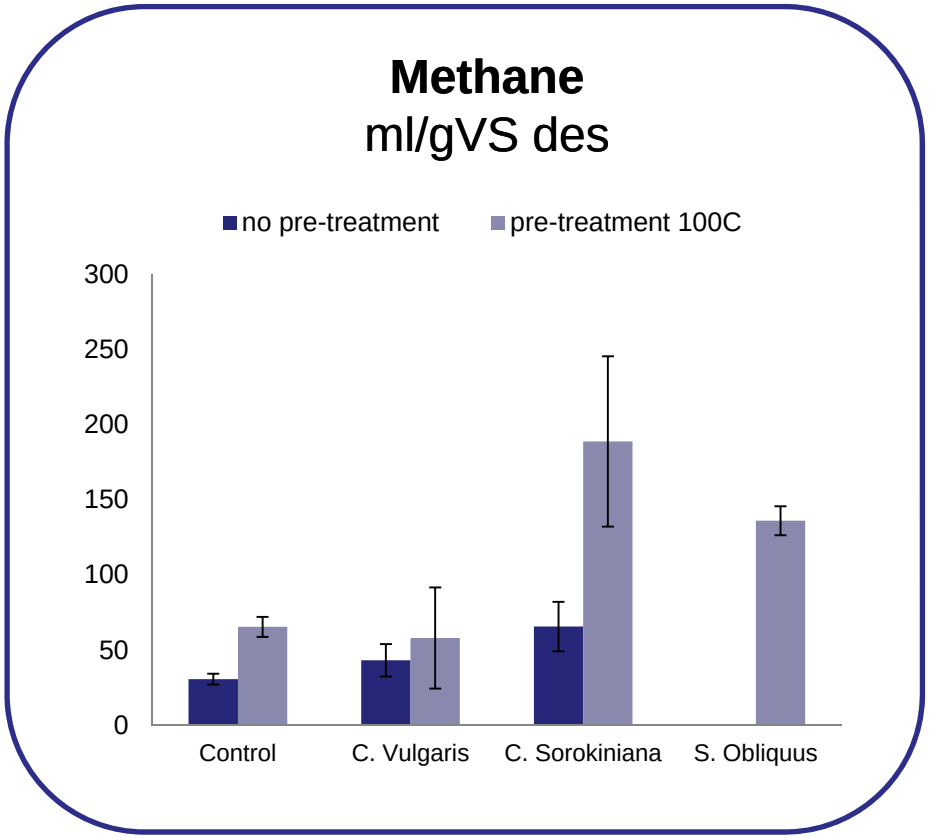

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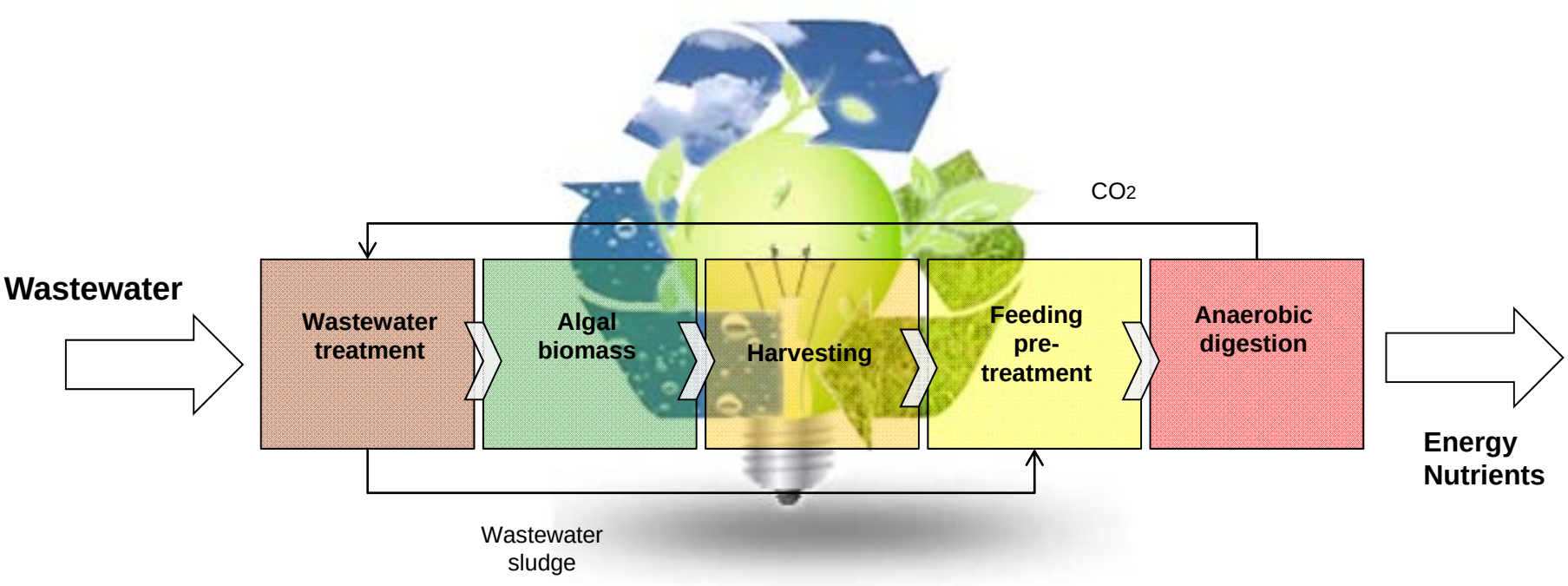
- Application of new low energy technologies
- Improve algal digestion efficiency
- Make the integrated process more sustainable and energetically balanced



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Qry1#44#Jhvhdufk#Vwxghqw#F rqihuqfh +srvwhu,

**DWZ DUP**

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Qry1#44 Xqlyhuvlw| riSdgxd/Sdgxd +IW,

Vhs1 #45 Lqwhuqdwrqdo F rqihuqfh rq Hqjlqhhulqj iru Z dvwh dqg Elrp dvv Ydoruldwrq/Sruwr +SW,

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# Wkdqn#|rx#

*“In life, there is nothing to fear and everything to understand.”*

*Marie Curie (1867-1934)*