

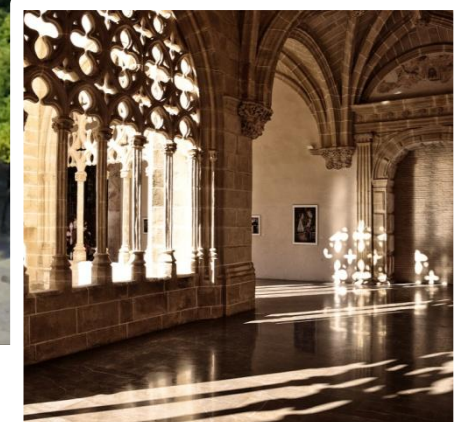
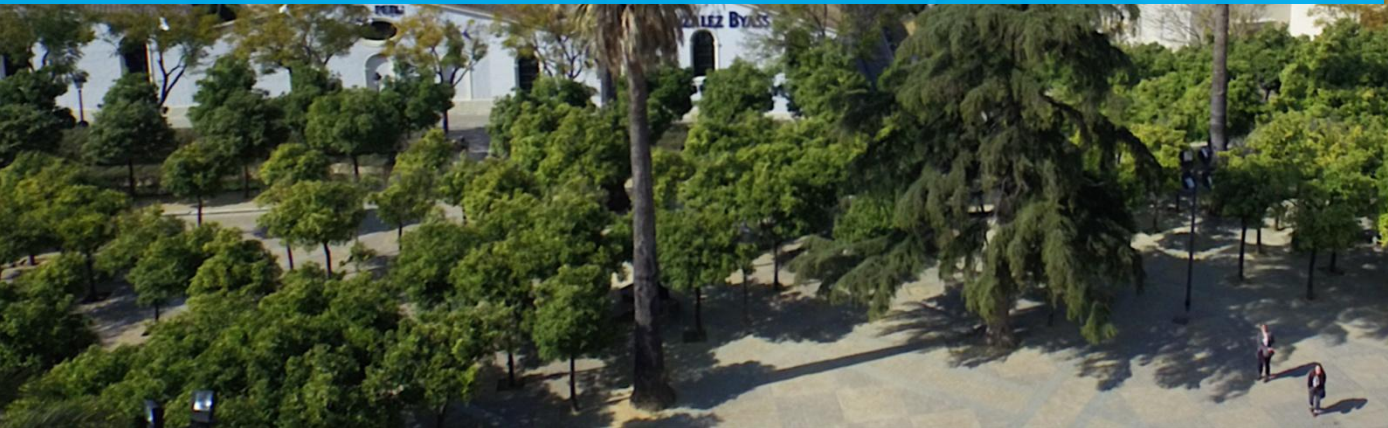
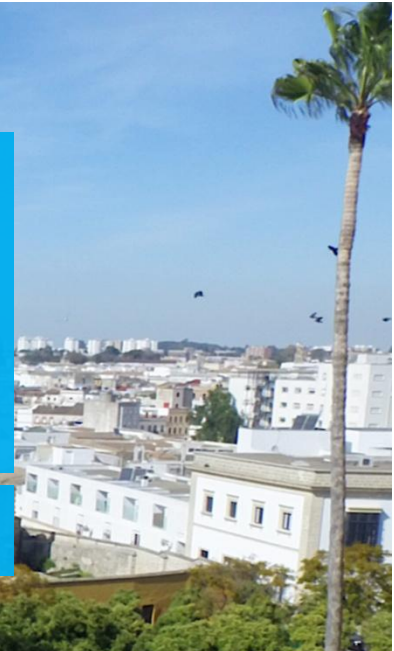
The 13th IWA Leading Edge Conference on Water and Wastewater Technologies



Workshop 6 Microalgae Based Wastewater Treatment Facilities: Progress, Experiences and Perspectives for the Next Years

HARVESTING IN A SUSTAINABLE WAY?

13-JUN-2016



inspiring change

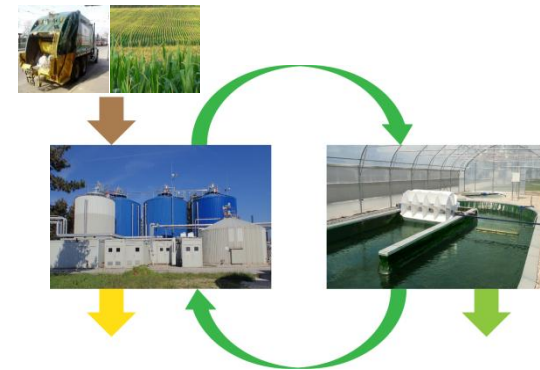


Robert Reinhardt

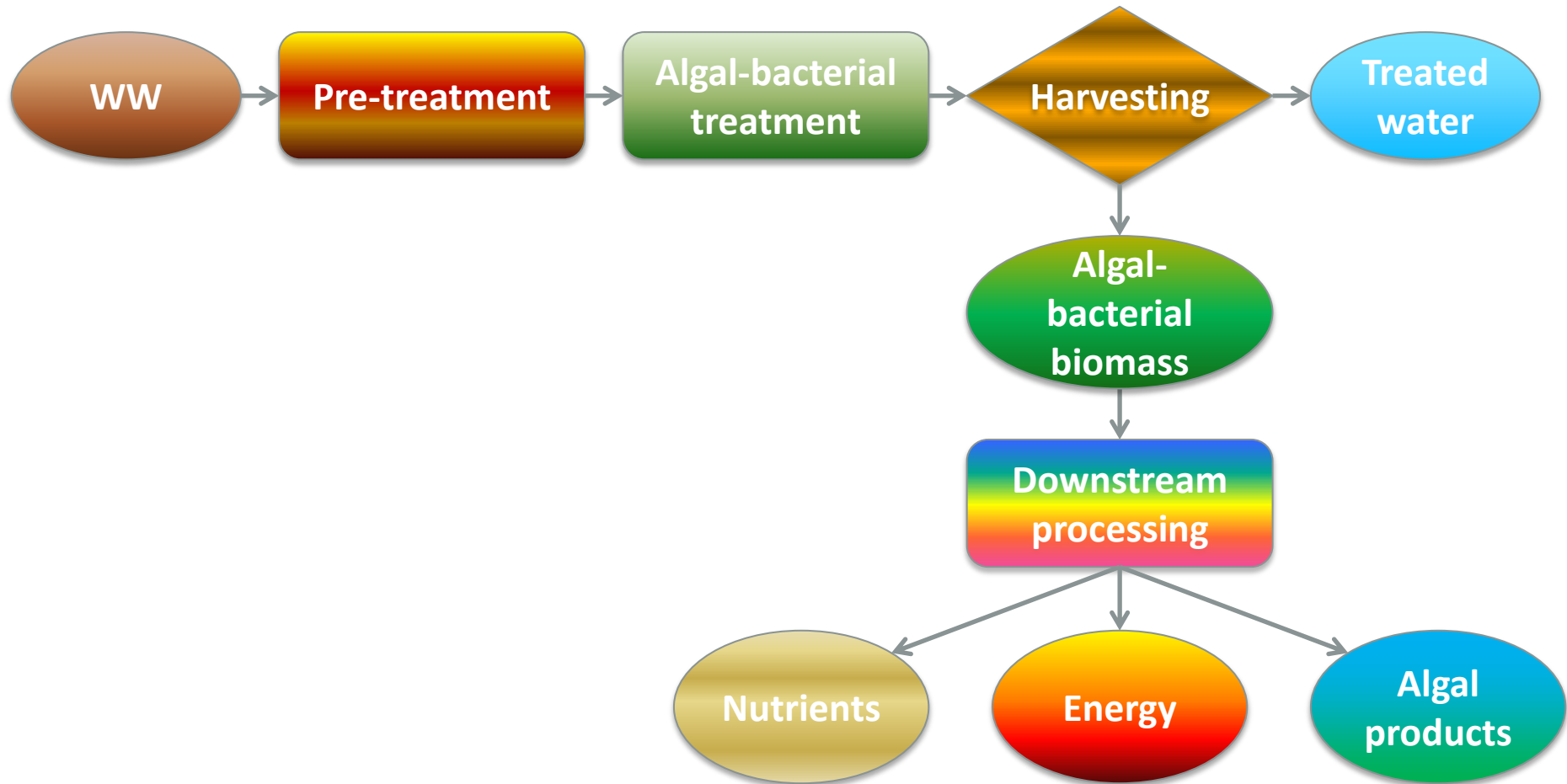
Algen, algal technology centre, Slovenia

BACKGROUND

- Albaqua Cornet project – pilot scale treatment of paper mill wastewater
 - Excellent results in 6 month operation
- AlgaeBioGas Eco-innovation project – algal treatment of biogas digestate
 - Demonstration plan operating for 2 years
 - Liquid phase
 - Algal bacterial biomass used for biogas
- Saltgae H2020 project – treatment of salty wastewater from food industry (Algae, AD, RO)
 - Just starting
- Hydrocyclone preconcentraion



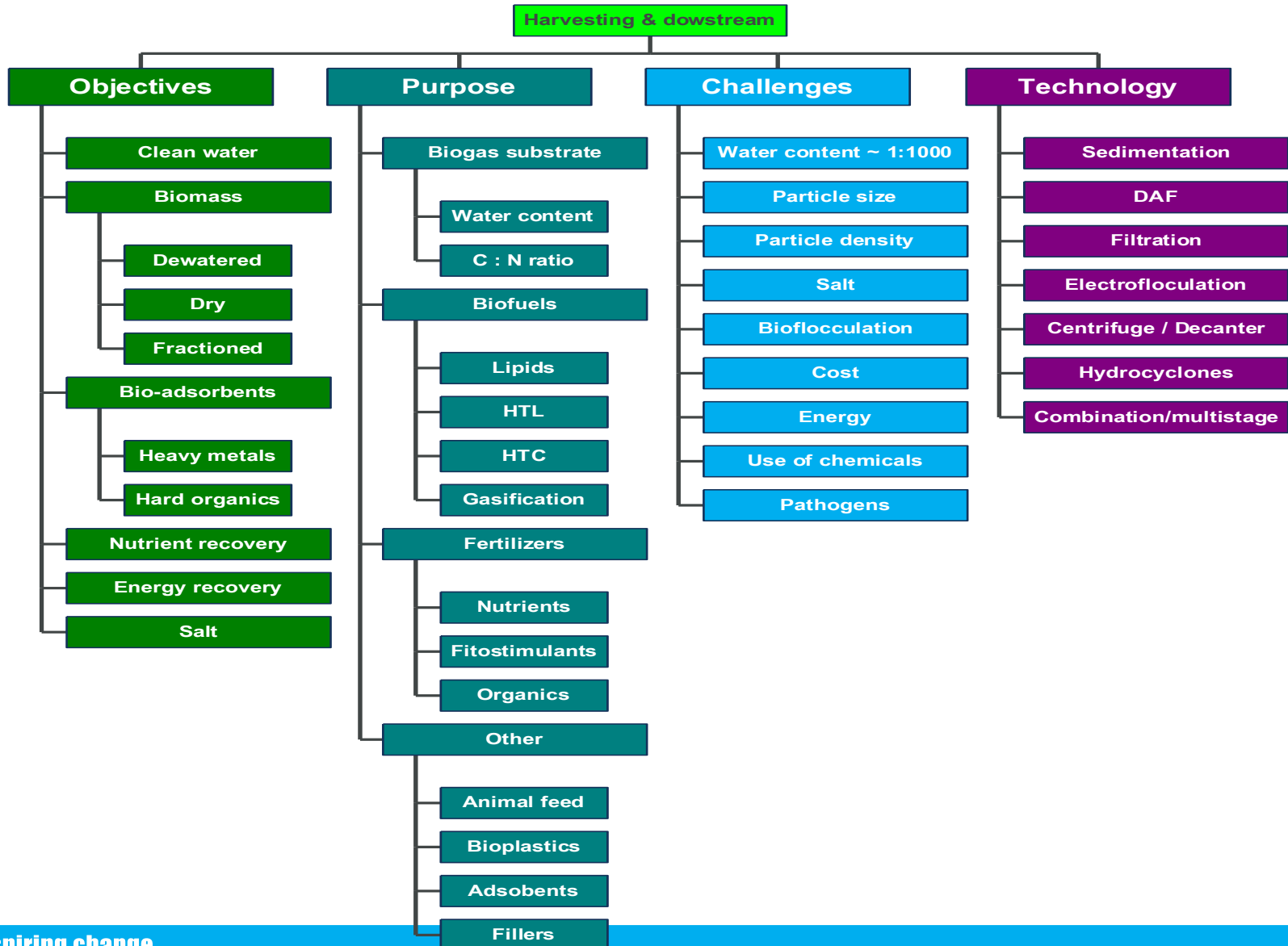
PROCESS CONTEXT



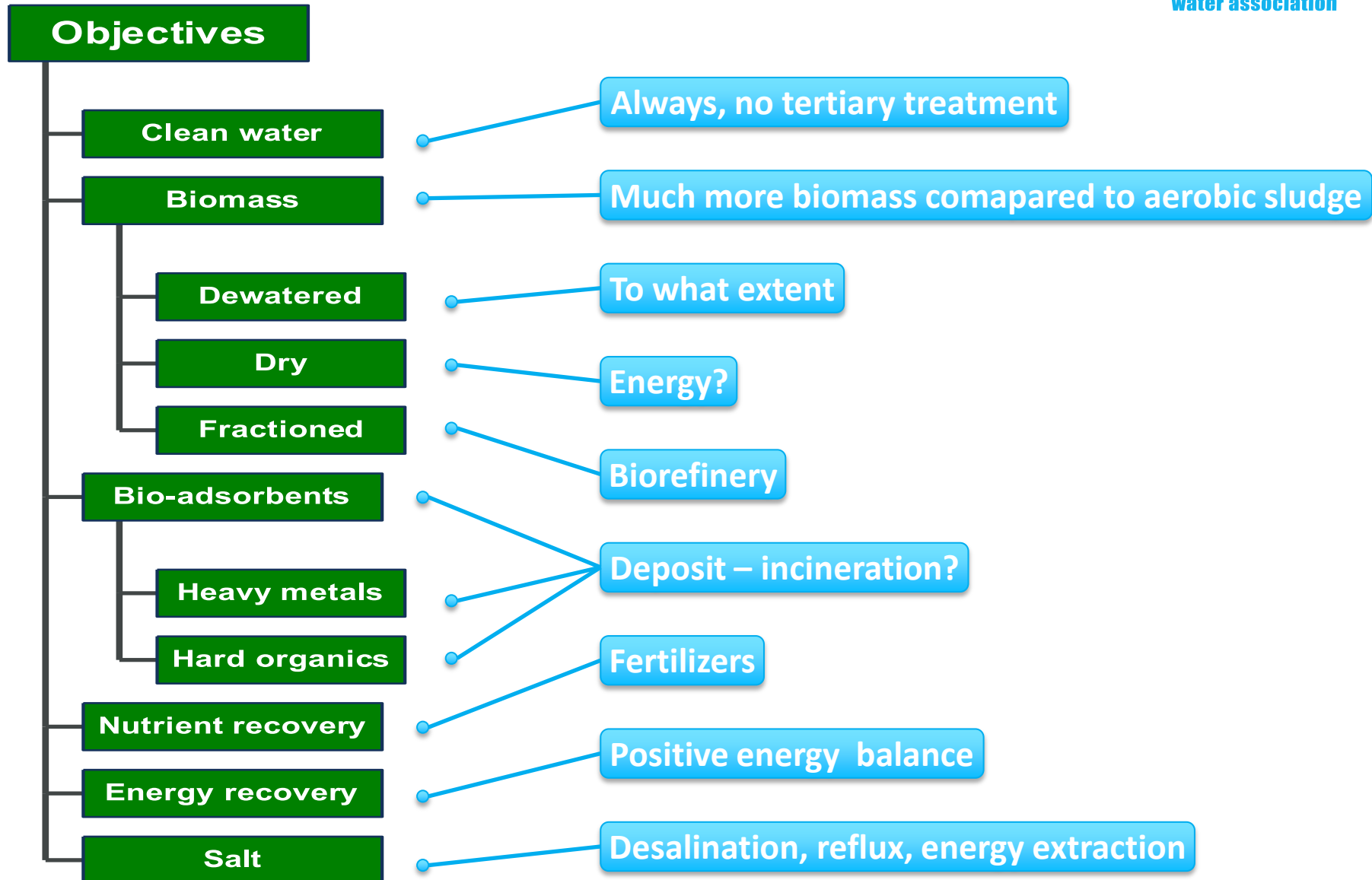
PROCESS OBJECTIVES

- Energy recycling – positive energy balance
- Eliminate aeration cost & energy consumption
- Nutrient recycling
- One stage for secondary & tertiary treatment
- Avoid conversion of COD to GHG
- Consume CO₂ instead of releasing it
- Heavy metals & “heavy” organics
- Produce useful biomass
- Salt-tolerant treatment

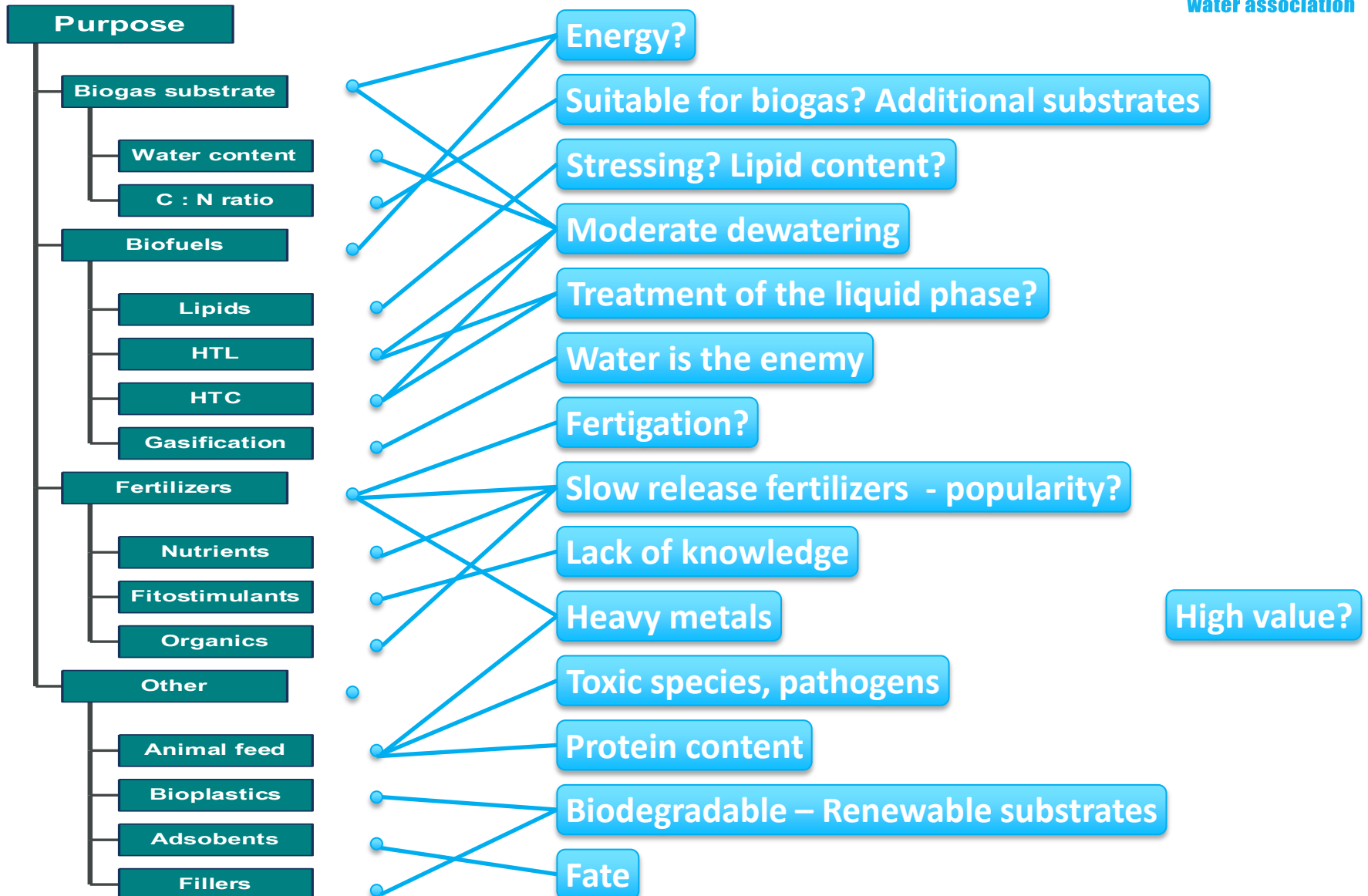
HARVESTING & DOWNSTREAM



OBJECTIVES



BIOMASS PURPOSE



CHALLENGES

Challenges

Water content ~ 1:1000

Move 1 ton of water to get 1 kg biomass

Particle size

Size & shape resist filtering

Particle density

Algal density = water density

Salt

Salt is not assimilated

Biofloculation

Species that bind to others – a dream

Cost

Compare to sedimentation

Energy

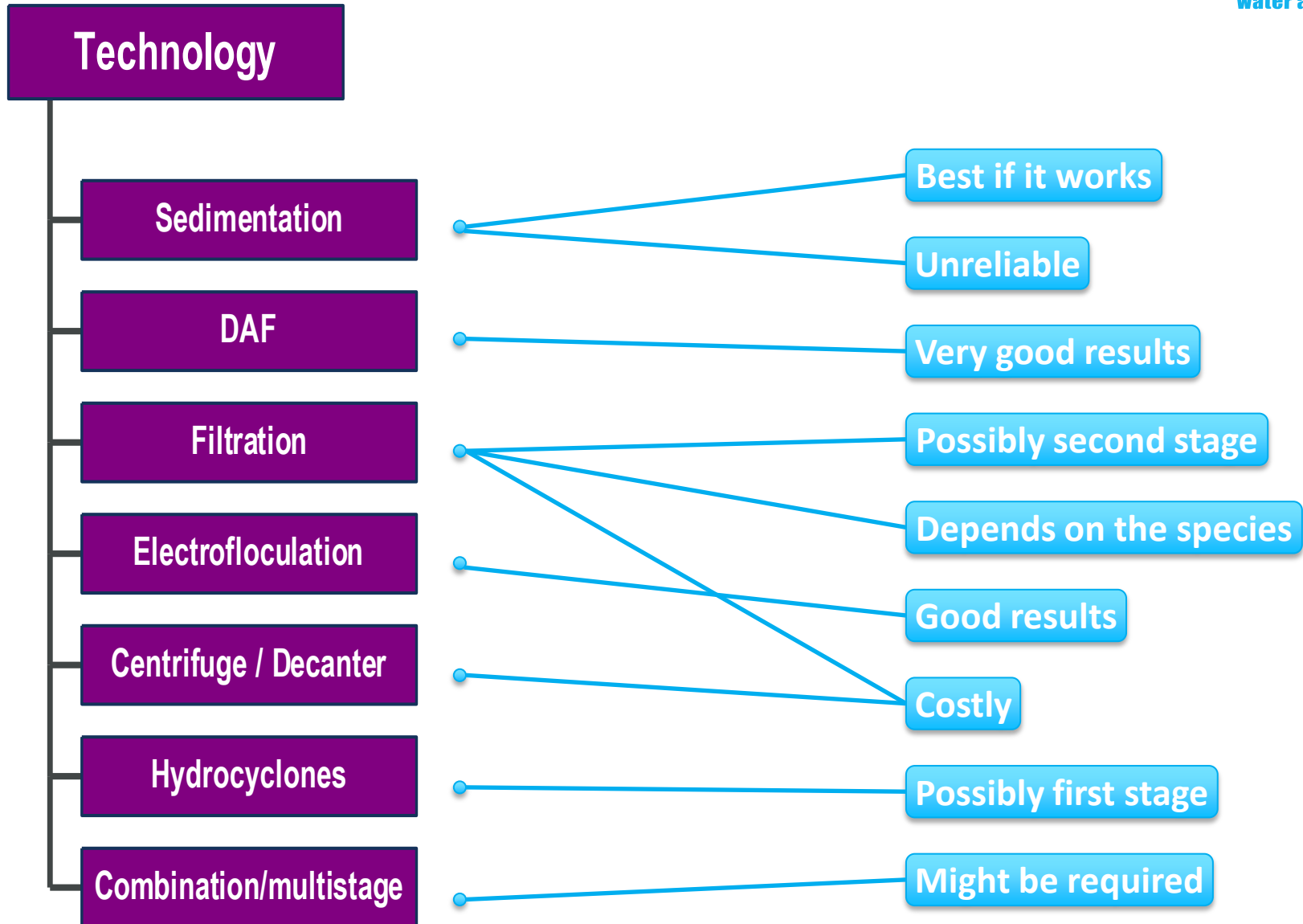
Interrelated

Use of chemicals

Pathogens

Same as aerobic treatment

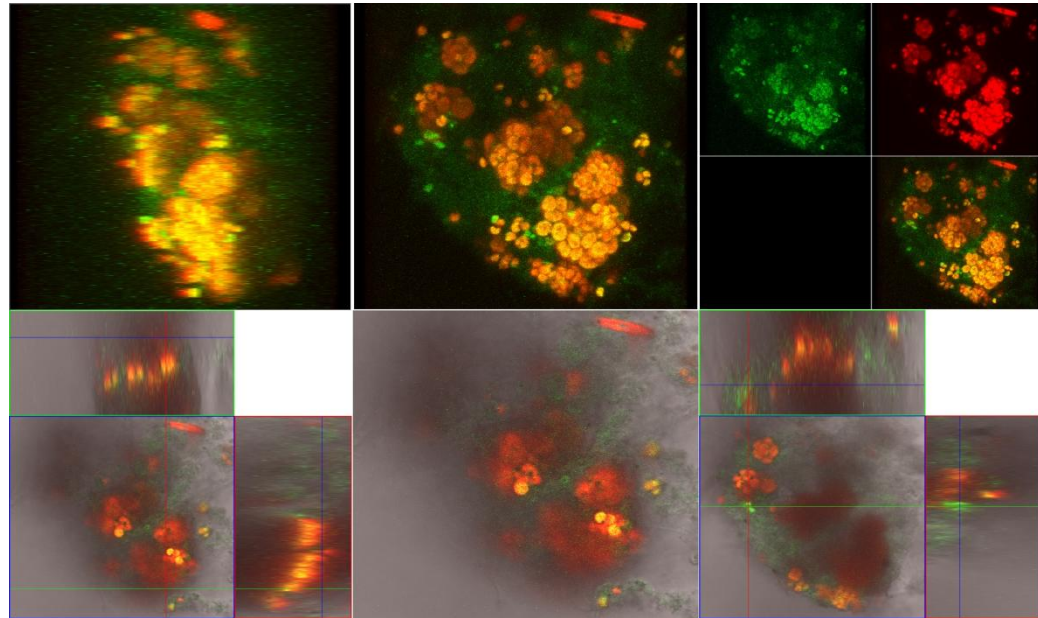
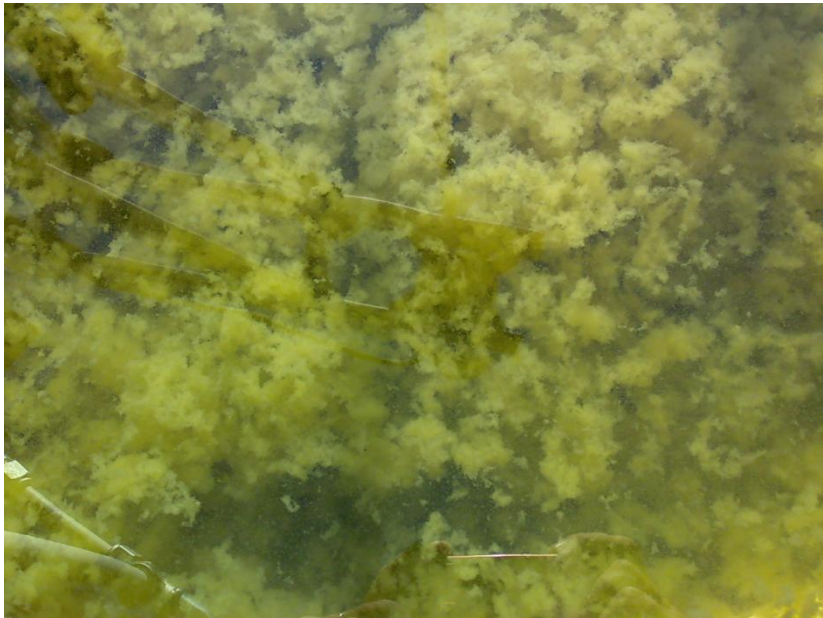
TECHNOLOGY



SEDIMENTATION



BIOFLOCCULATION



ELECTROCOAGULATION



DISCUSSION

- Energy and cost efficiency of harvesting
- Bio-flocculation – can we control it?
- How can we treat salty water?
- Can we release water with algae to the environment? Is C/BOD for algae a true C/BOD?
- Regulatory aspects of releasing algae.

Welcome to visit AlgaeBioGas demonstration centre in
Ljubljana, Slovenia



THANK YOU

- Robert Reinhardt
 - AlgEn, algal technology centre
 - Ljubljana, Slovenia
-
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 - <http://algaebiogas.eu/>
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