

COPYRIGHT NOTICE

All rights reserved. The contents of this presentation (a. o. texts, graphics, photos, logos etc.) and the presentation itself are protected by copyright. They have been prepared by Fraunhofer UMSICHT. Any distribution or presentation of the content is prohibited without prior written consent by Fraunhofer UMSICHT.

Without the written authorization by Fraunhofer UMSICHT this document and/or parts thereof must not be distributed, modified, published, translated or reproduced, neither in form of photocopies, microfilming nor other – especially electronic – processes. This proviso also covers the inclusion into or the evaluation by databases. Contraventions will entail legal prosecution.

© Copyright Fraunhofer UMSICHT, 2017

In case of any questions, please contact:

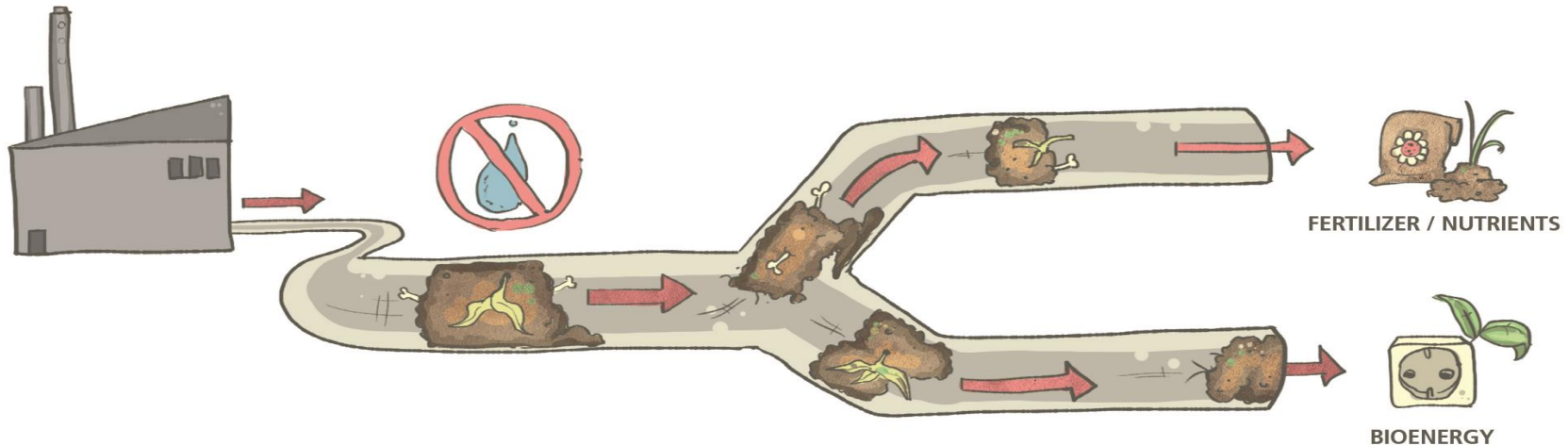
Fraunhofer Institute for Environmental, Safety, and
Energy Technology UMSICHT
Osterfelder Strasse 3
46047 Oberhausen
GERMANY

© Fraunhofer UMSICHT

Dr.-Ing. Christoph Glasner
Biomass and Residues Utilization
Tel.: +49 208-8598-1133
E-Mail: christoph.glasner@umsicht.fraunhofer.de

Water savings, cost savings and other benefits by separation of mass flows

Dr. Christoph Glasner



BioSuck facts

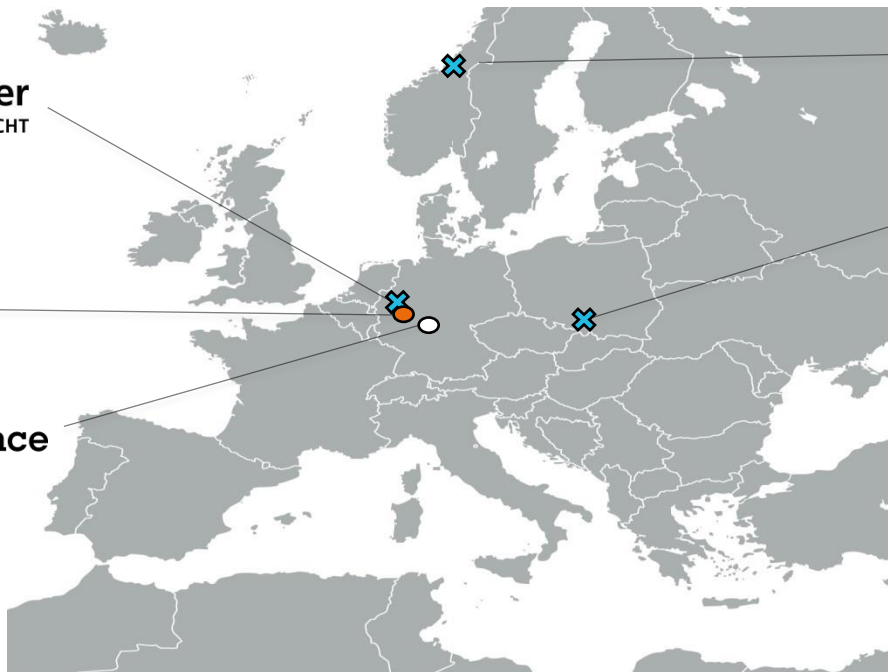
- Duration: 1/09/2014 – 31/12/2017
- Funded by: National agencies of Germany, Norway and Poland within the ERA-Net SUSFOOD
- Idea: Installation of vacuum technology as sewage system...
 - ...can separate (waste)water streams
 - and makes them usable for bioenergy production

Overview of BioSuck partners

 **Fraunhofer**
UMSICHT





 **IWR**

 **Aqseptence**
Group



 **NTNU**
Norwegian University of
Science and Technology



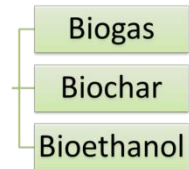
 RTD	 Industry
Fraunhofer	IWR
NTNU	Aqseptence (associated partner)
IETU	
 SME	
 no SME	

Importance of BioSuck for a Circular Economy

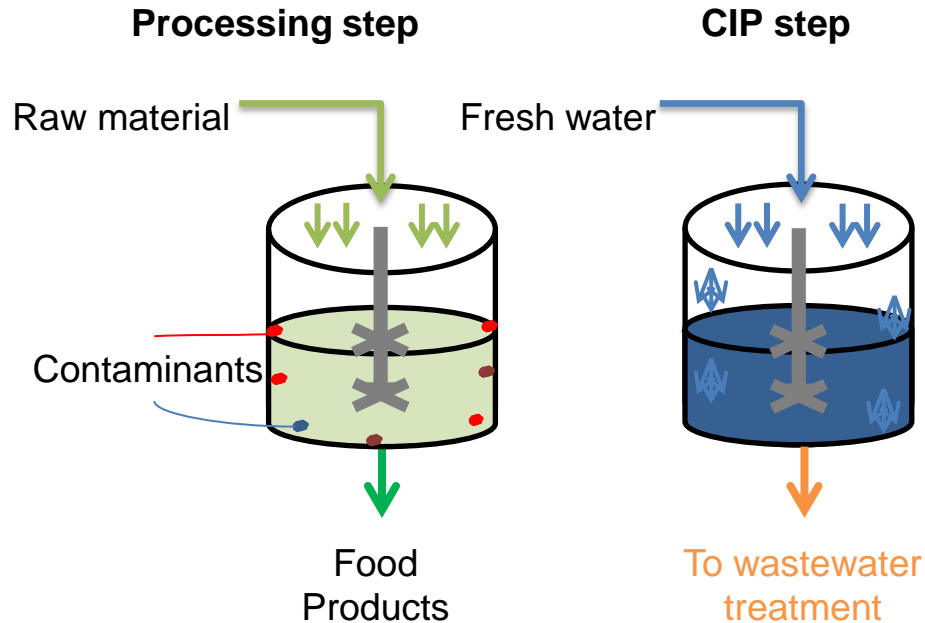
- The food processing industry consumes huge amounts of water
 - corresponding amounts of wastewater are produced
- These amounts will increase,
 - because the global food demand is expected to rise by 50 % by 2050
- **Conclusion:** New/innovative solutions are needed to redesign this sector

Goal of BioSuck

- Goal: Development a decision support system to predict benefits
 - The DSS analyzes the current situation based on characteristic parameters
 - Is a vacuum waste collection system a potential feasible option?
 - Can collected wastes be used for bioenergy production?



Introduction - Food processing industry



- Contaminants
 - Organic matters (DM, Fats, etc.)
 - Pollutants (COD, BOD, TS, etc.)
- Clean in Place (CIP)
 - Water rinse (1st step)!!!!
 - Other CIP steps

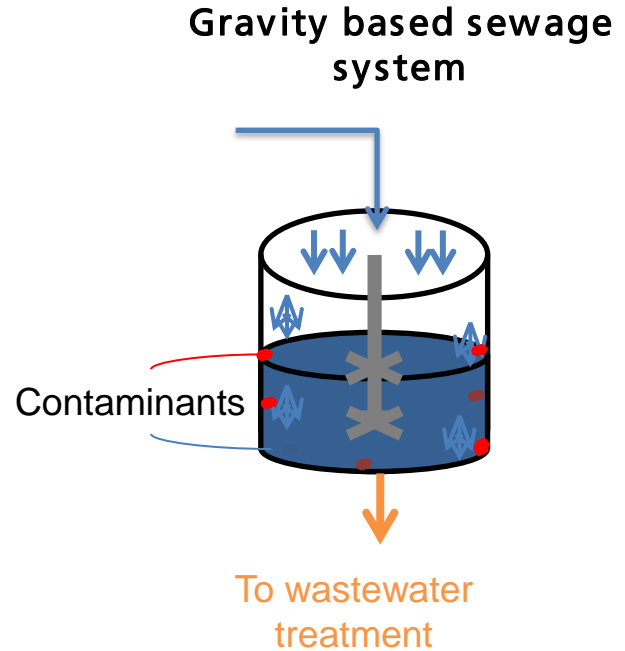
Issues and effects

Issues with conventional sewage systems

- Multiple waste streams with multiple characteristics
- Mixing of multiple streams

Effects

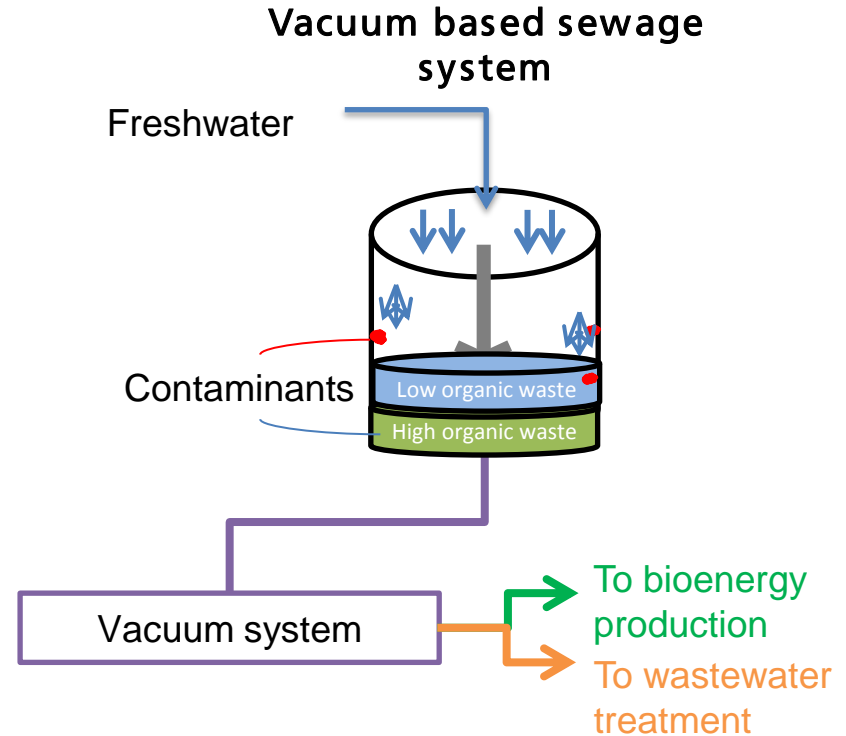
- Loss of organic materials
- High wastewater treatment cost



Solution for the food processing industry

Advantages

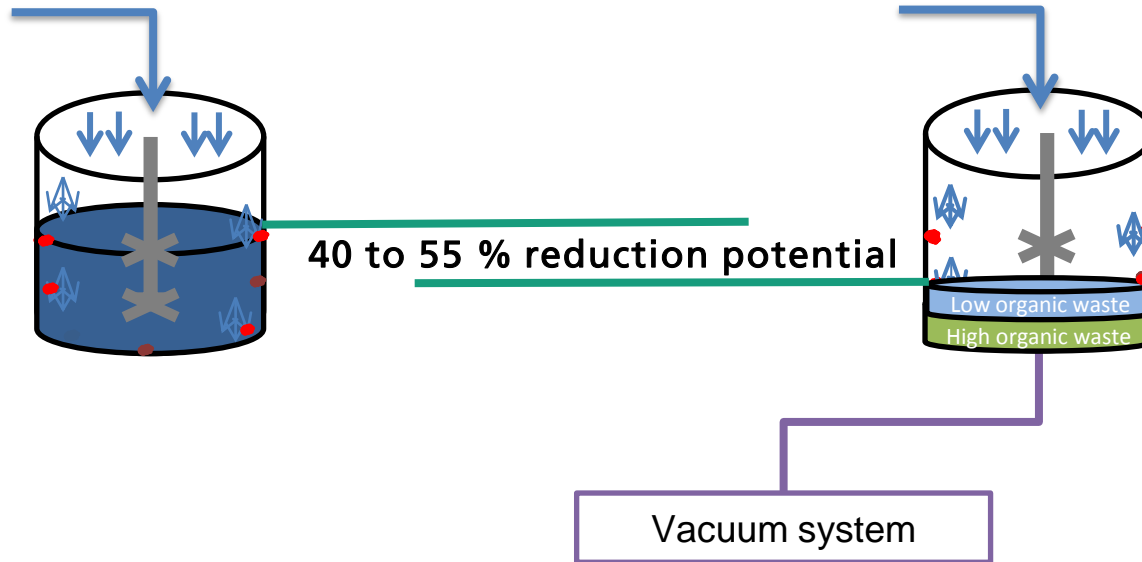
- Separation of waste streams
- Waste concentration (high organic load)
 - Bioenergy



Conventional vs Vacuum system

Gravity based sewage system

Vacuum based sewage system



Relevance of BioSuck for a circular economy



Environmental benefits

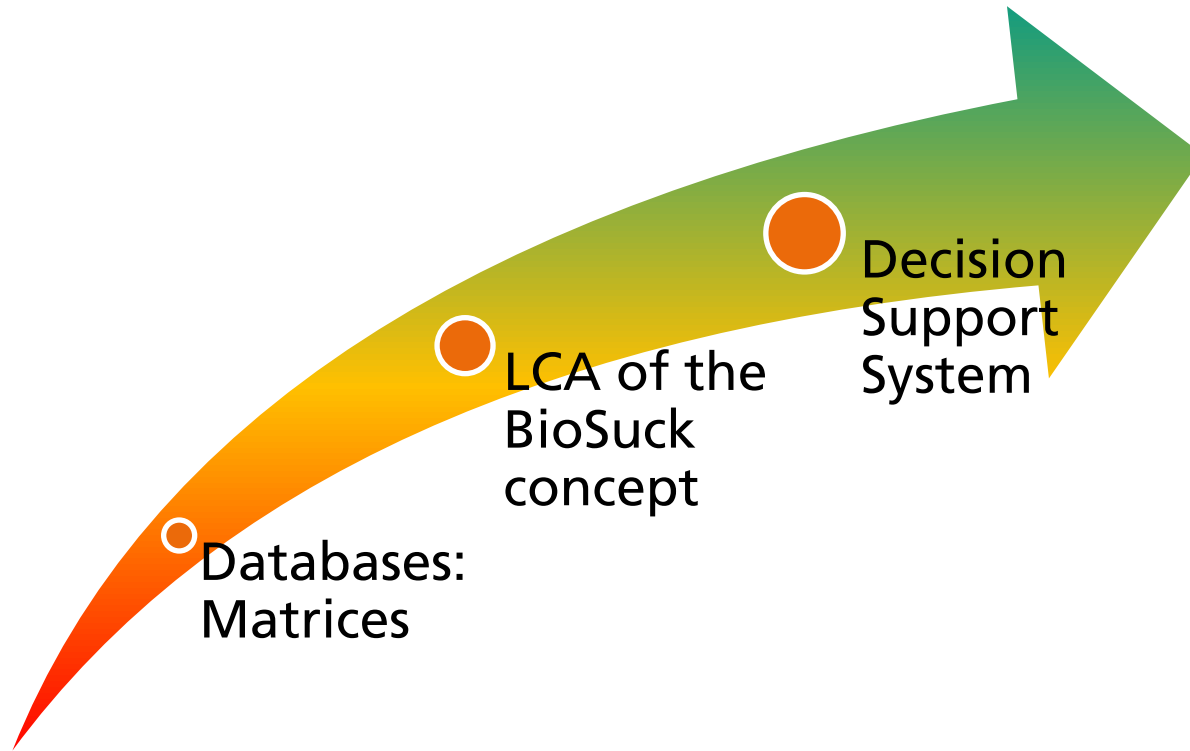
- Fresh water reduction
- Wastewater reduction
- Closing of cycles (bioenergy, animal feed, nutrients)



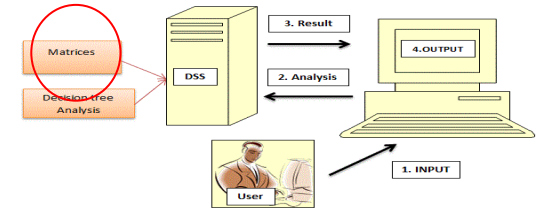
Economical benefits

- Cost savings for fresh water
- Cost savings for wastewater treatment
- Added value by selling or using concentrated mass flows

Summary of main BioSuck results



Main BioSuck results: Databases



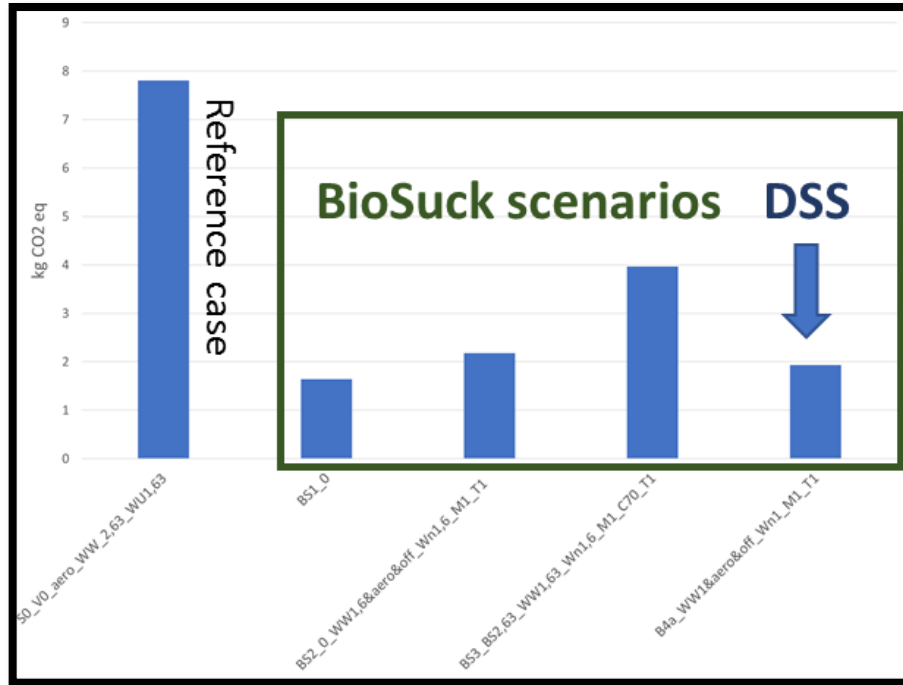
Vacuum
system

- Waste stream characteristics matrix
- Vacuum system performance database

Bioenergy
production

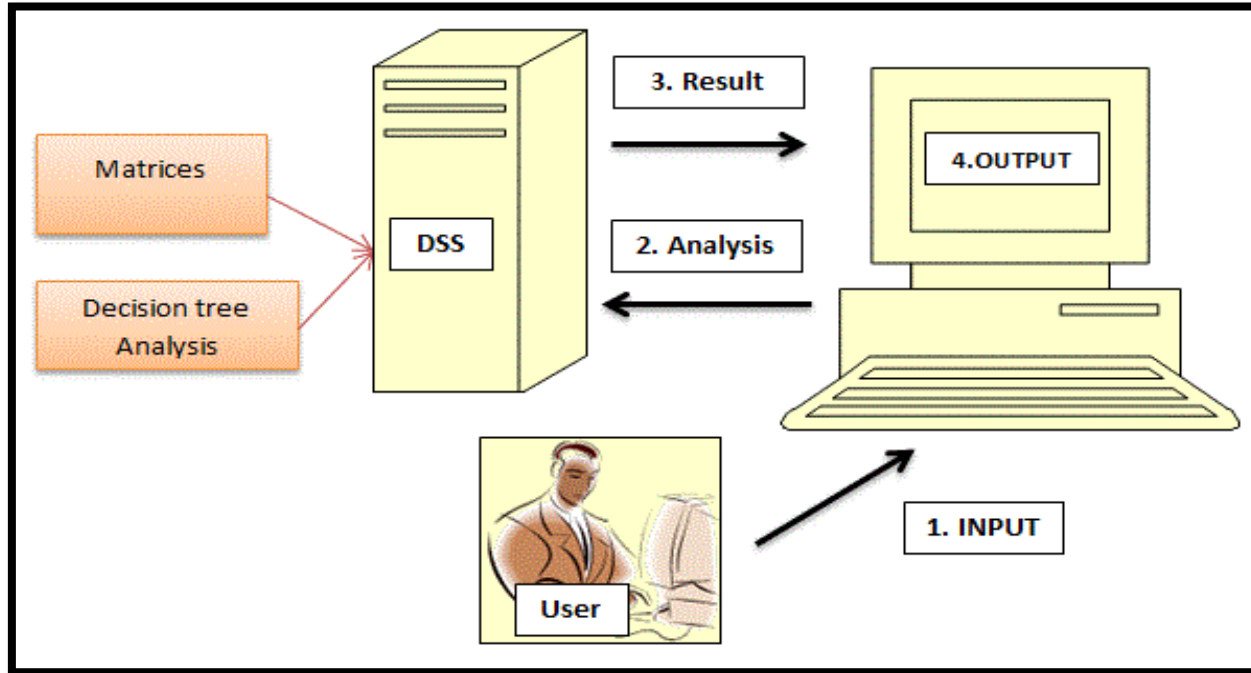
- Bioenergy utilization matrix
- Bioenergy estimation matrix

Main BioSuck results: LCA and Sustainability

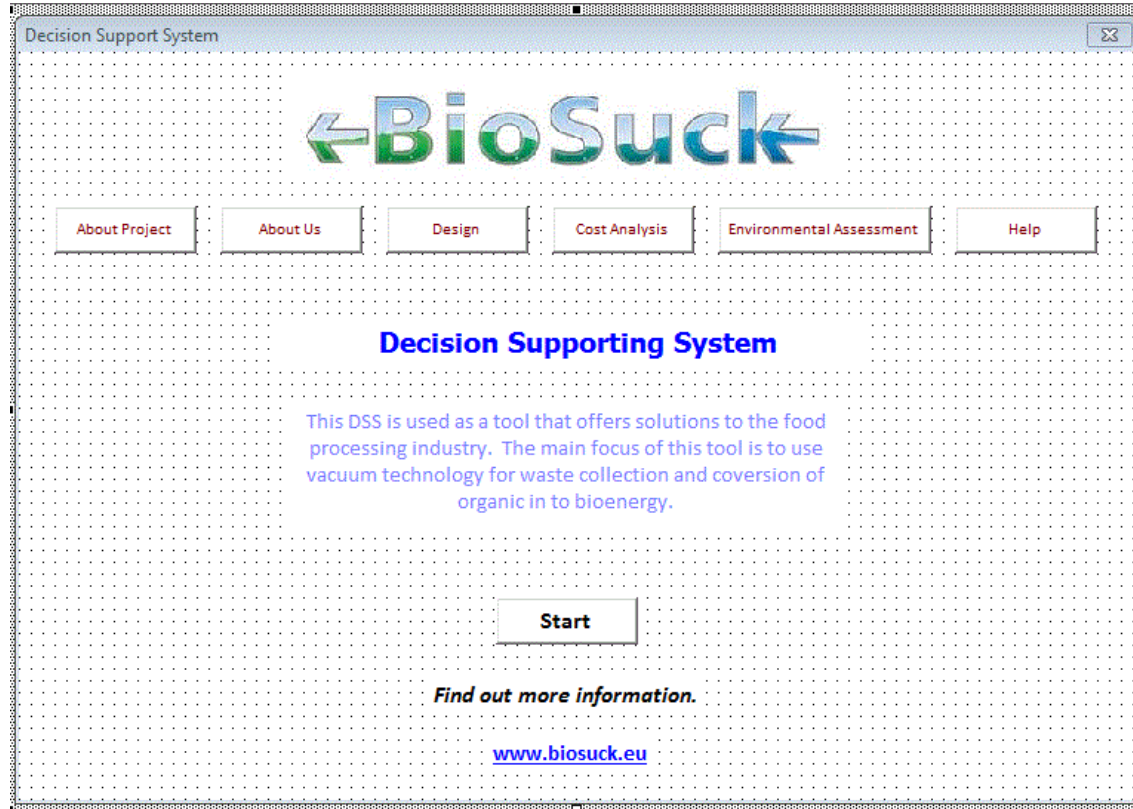


Aspect	Score
Economic	<p>Depends on facility related conditions</p> <p>Increasing costs for water and WW treatment will favour BioSuck</p>
Environmental	Highly positive
Social	Highly positive

Main BioSuck results: Decision Support System



Main BioSuck results: DSS



Main BioSuck results: DSS

Vacuum Waste Collection System- Input

Waste Stream Scenario


- 1) Type of Industry: Brewery
- 2) Type of product: Beer 1%
- 3) Production Capacity: 150 kg/d
- 4) Type of waste: Liquid
- 5) Total Wastewater generation: 200 m³/d
- 6) Total Freshwater consumption: 125 m³/d
- 7) Mode of Discharge: Intermittent
- 8) What is the current way of treatment?
Activated sludge treatment

Assumptions for vacuum waste collection system

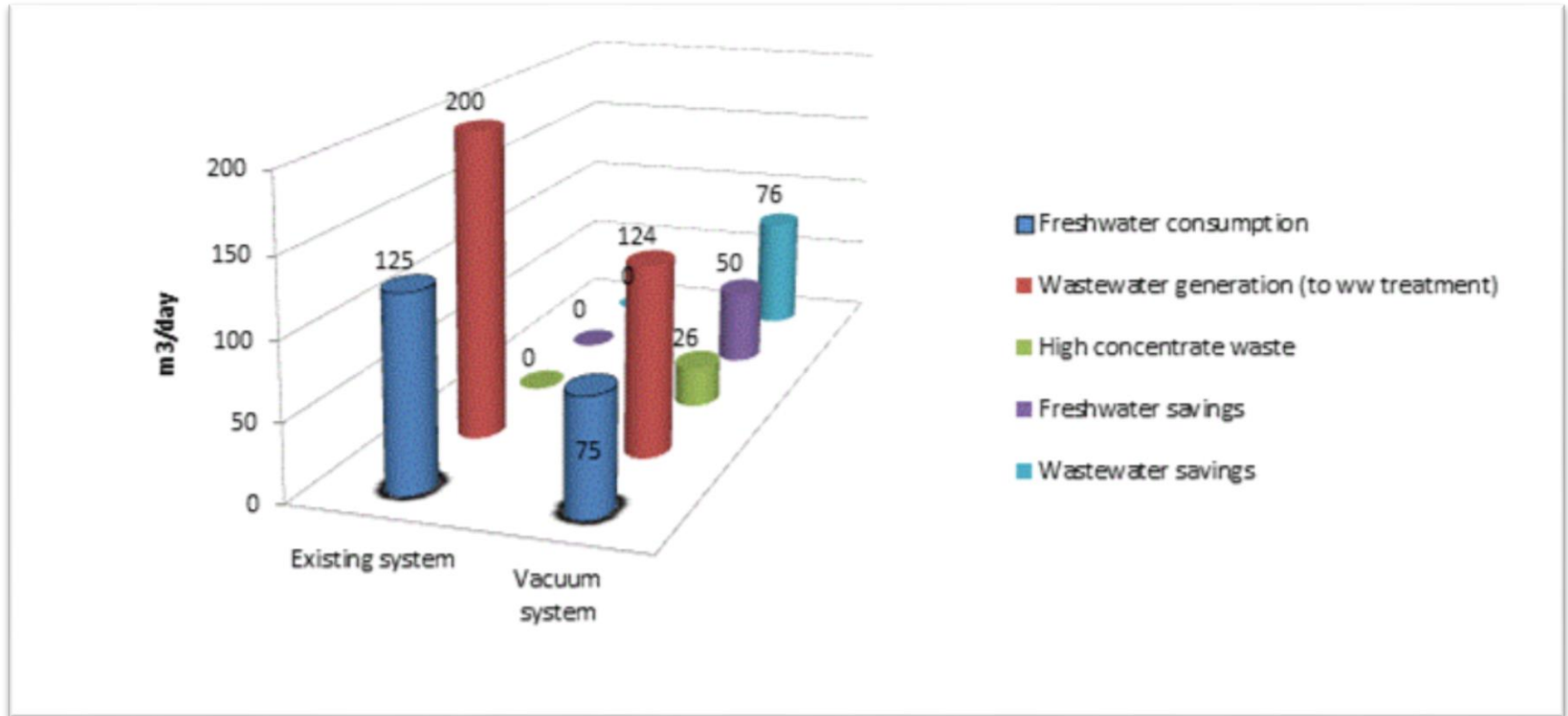
- 1) % Freshwater consumption reduction by VWCS: 40 %
- 2) % Wastewater belongs pre rinsing of cleaning/CIP WW: 35 %

Assumptions for cost analysis

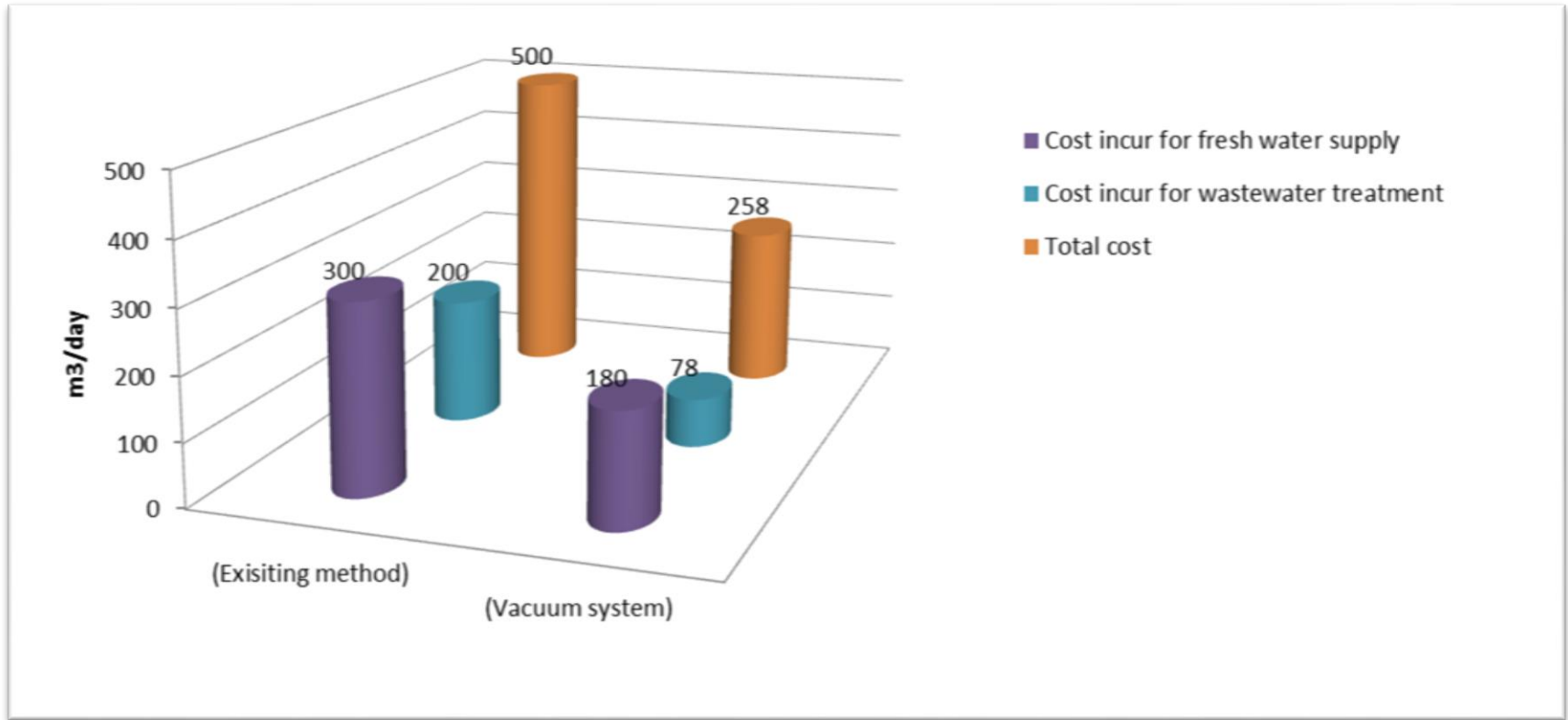
- 1) Cost of freshwater purchase / freshwater production: 2 €/m³
- 2) Cost of freshwater supply to units (pumps, heating etc.): 1 €/m³
- 3) Cost of wastewater treatment: 2 €/m³



Main BioSuck results: DSS



Main BioSuck results: DSS



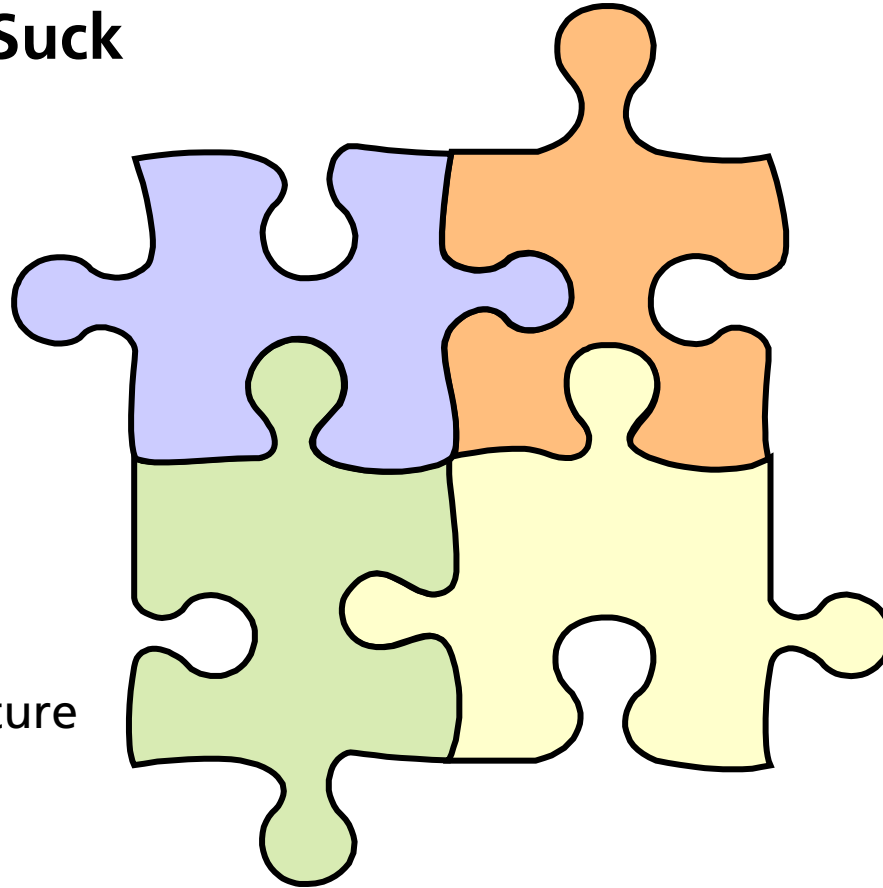
Impacts of BioSuck

R&I:

Transferability to many sectors beyond food processing

Economics:

- Resilient, safe and flexible infrastructure
- Save water
- Reduce costs



SDG 6: Ensure availability and sustainable management of water and sanitation for all

SDG 12: Ensure sustainable consumption and production patterns

Critical review of BioSuck



- Accomplished development of a decision support system



- **Missing:** early adopters



- **Feedback:** Cooperation of companies to deliver real life data is insufficient



- **Failure:** No food processing company as part of the consortium

R&I: Current standing

- Technology is already developed → ready to use
- Minor adaptations maybe necessary, depending on the media, that needs to be transported
- Implementation: Recognized showcase and a big demonstration unit

Implementation: Beneficial preconditions & barriers



Pro

- Necessity to reconstruct the sewage system
- Connected sewage plant reached its limits
- Tightened regulations
- Large distance to existing sewage infrastructure
- Wastewater streams of different composition



Contra

- High remaining depreciation costs
- Connected sewage plant has unused capacities
- Legal uncertainties
- Missing demonstration pilot plants (in the food processing industry)
- Low acceptance for new technologies

Policy support

- Put pressure on the (food) processing industry to save energy and water
- Cost savings are not attractive enough → set political framework
- Take up of vacuum sewer systems as **Best Available Technique (BAT)**
- More/additional funding to disseminate project results professionally

Summary, Conclusions & Recommendations

Summary:

- Matrices and Decision tree analysis
- DSS modelled for waste collection and bioenergy production

Conclusion:

- Further validation of the literature data
- Case study evaluation and implementation of results

Recommendations:

- A (big) pilot plant demonstration for a vacuum sewer system in the **food processing industry**
- Extensive acquisition of new customers and efficient marketing campaign

FRAUNHOFER UMSICHT

Division Processes

Department Process Engineering

**Thank you for your
attention!**

contact:

Fraunhofer UMSICHT

Osterfelder Straße 3

46047 Oberhausen

E-Mail: info@umsicht.fraunhofer.de

Internet: <http://www.umsicht.fraunhofer.de>



Source: photocase.de

Dr.-Ing. Christoph Glasner

Phone: +49-208-8598-1133

E-Mail: christoph.glasner@umsicht.fraunhofer.de