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Executive Summary

Goal

The overall scope of this project is to develop and scale-up a new, high performance, biochemical reactor specially designed to produce fuel ethanol by fermentation. We call it the “Stirred Catalytic Basket Reactor-SCBR and it works with immobilized cells.

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Basket Reactor-SCBR project 2022

Challenges of sustainable industrial transformation:

We want to go from research to sharp applications with new standard industrial products that are on the market today.

Small-scale biorefinery processes can be beneficial, not only socially and ecologically, but also economically.

Project definition.
Create a scalable measurable production unit with Stirred Catalytic Basket Reactor with Immobilized Cells and Biogas

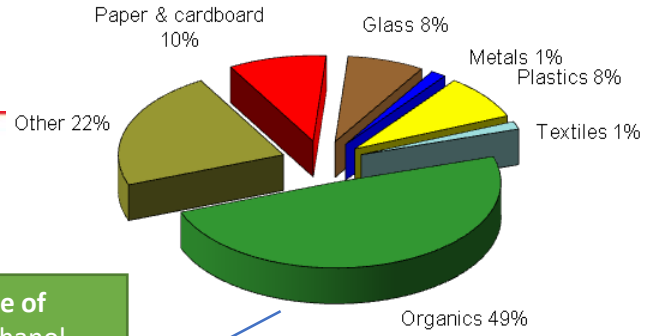
Purpose.
Introduction to Development of a New small scale Technology for the Production of Fuel Ethanol and Biogas at High Rates with a Stirred Catalytic Basket Reactor with Immobilized Cells.

Goal
Evidence that we can now offer a scalable industrial production process that provides an ethanol and Biogas production with very interesting results: a fermentation time of only 4 hours is an absolute record.

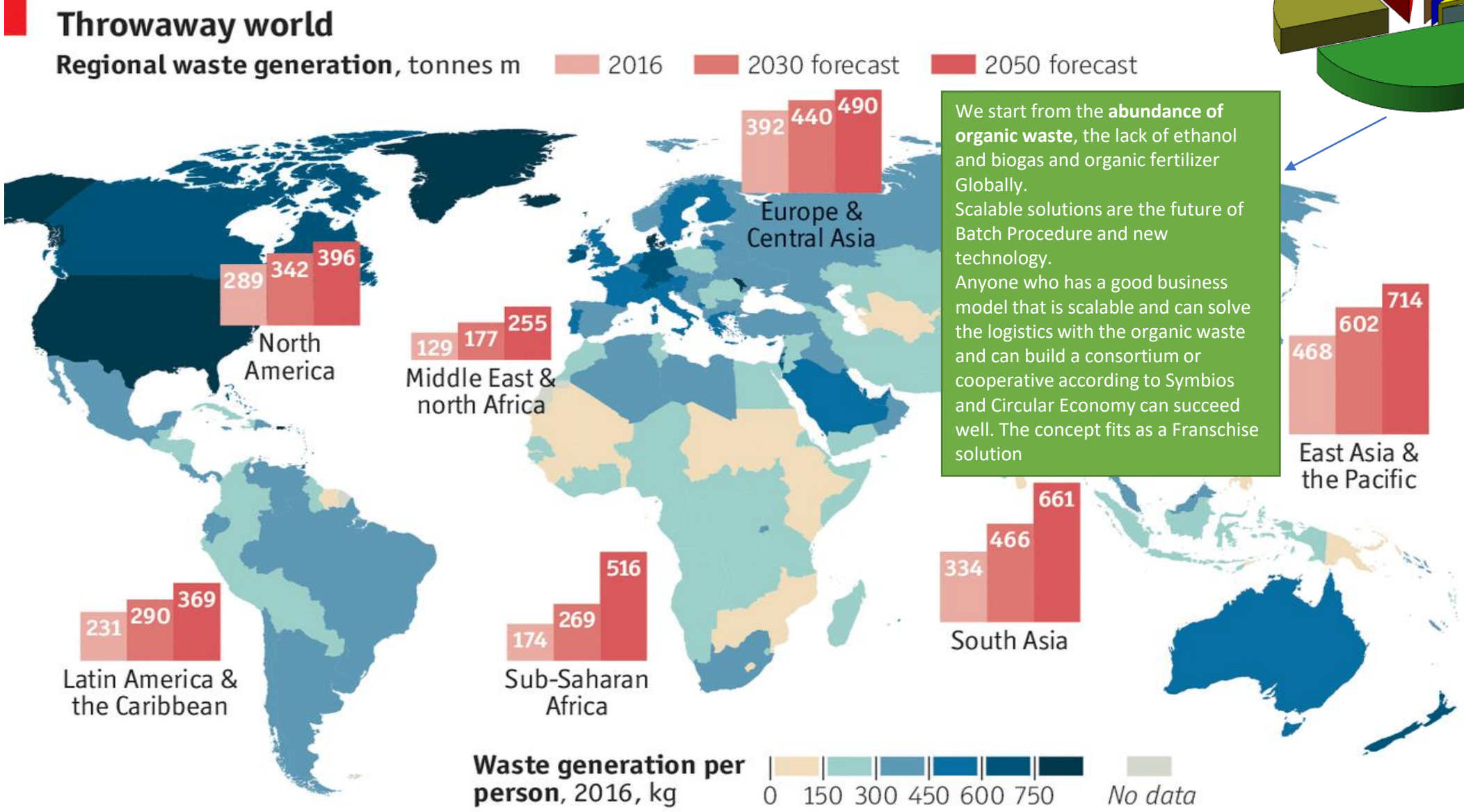
We are looking for investors and end users of our business concept who see the value of a scalable circular organic waste process.

We can now offer a production process that provides a production of ethanol with very interesting results: a fermentation time of only 4 hours is an absolute record.

The Waste situation worldwide



We start from the **abundance of organic waste**, the lack of ethanol and biogas and organic fertilizer Globally.
Scalable solutions are the future of Batch Procedure and new technology.
Anyone who has a good business model that is scalable and can solve the logistics with the organic waste and can build a consortium or cooperative according to Symbios and Circular Economy can succeed well. The concept fits as a Franschise solution



Market Prediction

News from BRUSSELS 31 May 2022

RENEWABLE ETHANOL IS EU'S MOST COST-EFFECTIVE SOLUTION FOR REDUCING CAR EMISSIONS, NEW RESEARCH SHOWS

Full-life-cycle comparison of renewable fuel blends with hybrid and battery electric vehicles highlights importance of policies that promote more than one decarbonisation technology.

BRUSSELS, 31 May 2022 – Renewable ethanol fuel blends are the EU's current most cost-effective solution for decarbonising the petrol and hybrid cars that will continue to be prevalent on Europe's roads for a long time, according to new research.

A study from EU climate research consultancy studio Gear Up assessed various renewable fuel and drivetrain options for climate action in the passenger car segment, based on their greenhouse gas emission abatement costs. Among its key findings:

1) Currently, **renewable ethanol blends, ranging from E10 (with up to 10% ethanol) to E85 (with up to 85% ethanol), are the most cost-effective solutions** to decarbonise the petrol passenger car segment.

2) Considering the current GHG intensity of the EU electricity mix and conditions for battery production, **battery electric vehicles (BEVs) save less GHG emissions than a regular internal combustion engine car running on E85 fuel** on a full-life-cycle basis.

3) **The savings achieved by the introduction of electric vehicles are insufficient to reach 2030 climate targets**, and therefore additional measures are needed for the fleet of internal combustion engine vehicles that remain in the market well beyond 2030.

Read the full studio Gear Up study here.

Green chemistry, Biorefinery concept, Value added products

Green Chemistry and Biorefinery concepts are two approaches helping to develop new and more sustainable processes.

The implementation of both methodologies impels to fossil-independent future with bioeconomy based on natural feedstock like biowaste and industrial by-products. The development of technologies for valorisation of these resources is a key role of society in the creation of sustainable and more environmentally friendly future.

When a material becomes very small, it can have completely new properties.

Nanotechnology is about taking advantage of these new properties by controlling material production right down to the atomic level. Nanotechnology is very broad and includes physics, electronics, chemistry, biology and medicine. This also applies to Bioenergy such as Biogas and Ethanol production. Together with AI linked to control processes, efficiency is increased in the various sub-processes that a Bioenergy solution consists of. From this, you can reduce the production time to approx. 4 hours for industrial ethanol production, take care of and increase Biogas production from residual products compared to old systems.

Researchers from many different fields collaborate. The goal is to develop new knowledge about nanoscience and how nanotechnology can contribute to solving major societal challenges in, for example, health or safe, clean and efficient energy.

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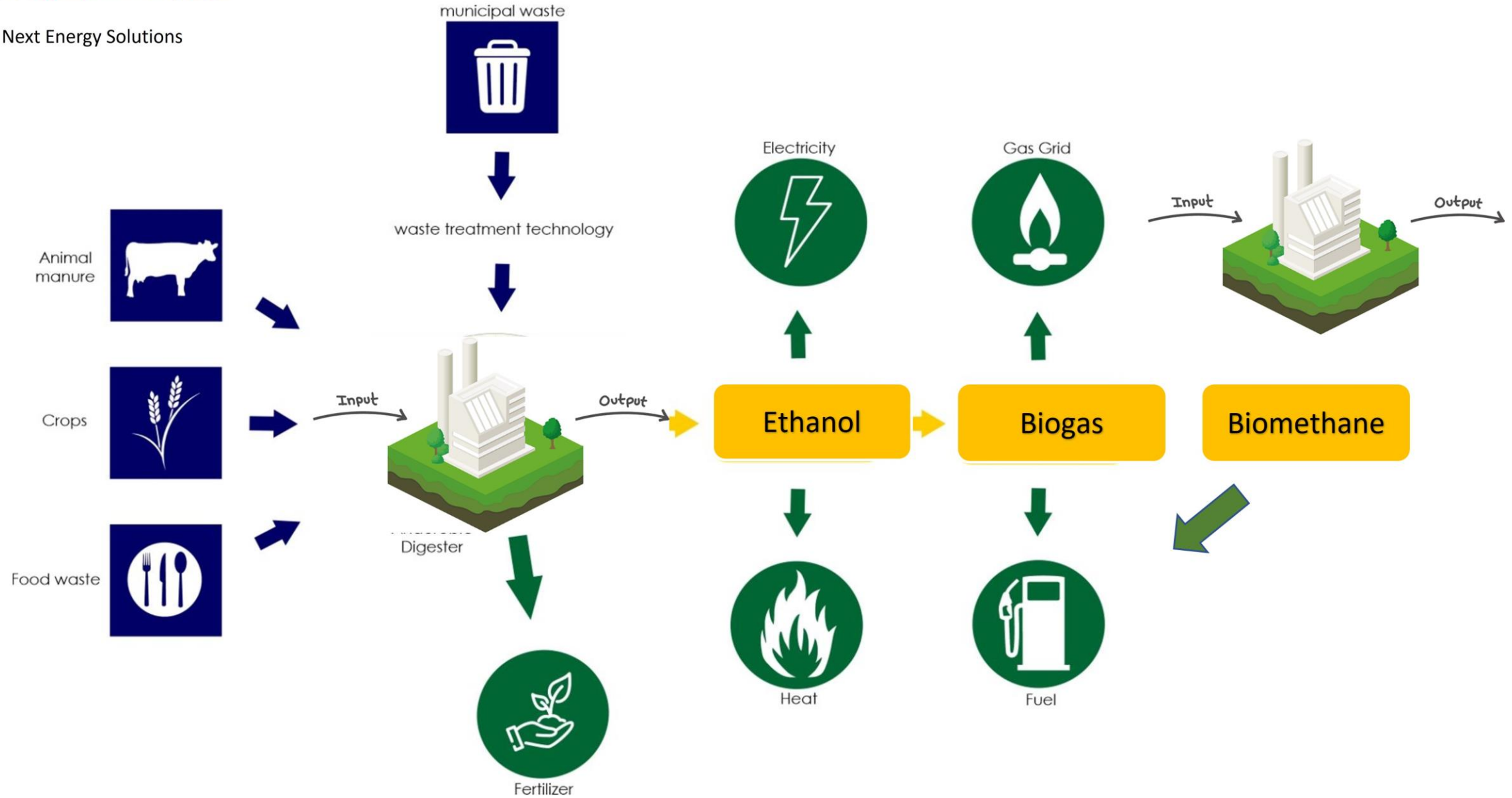
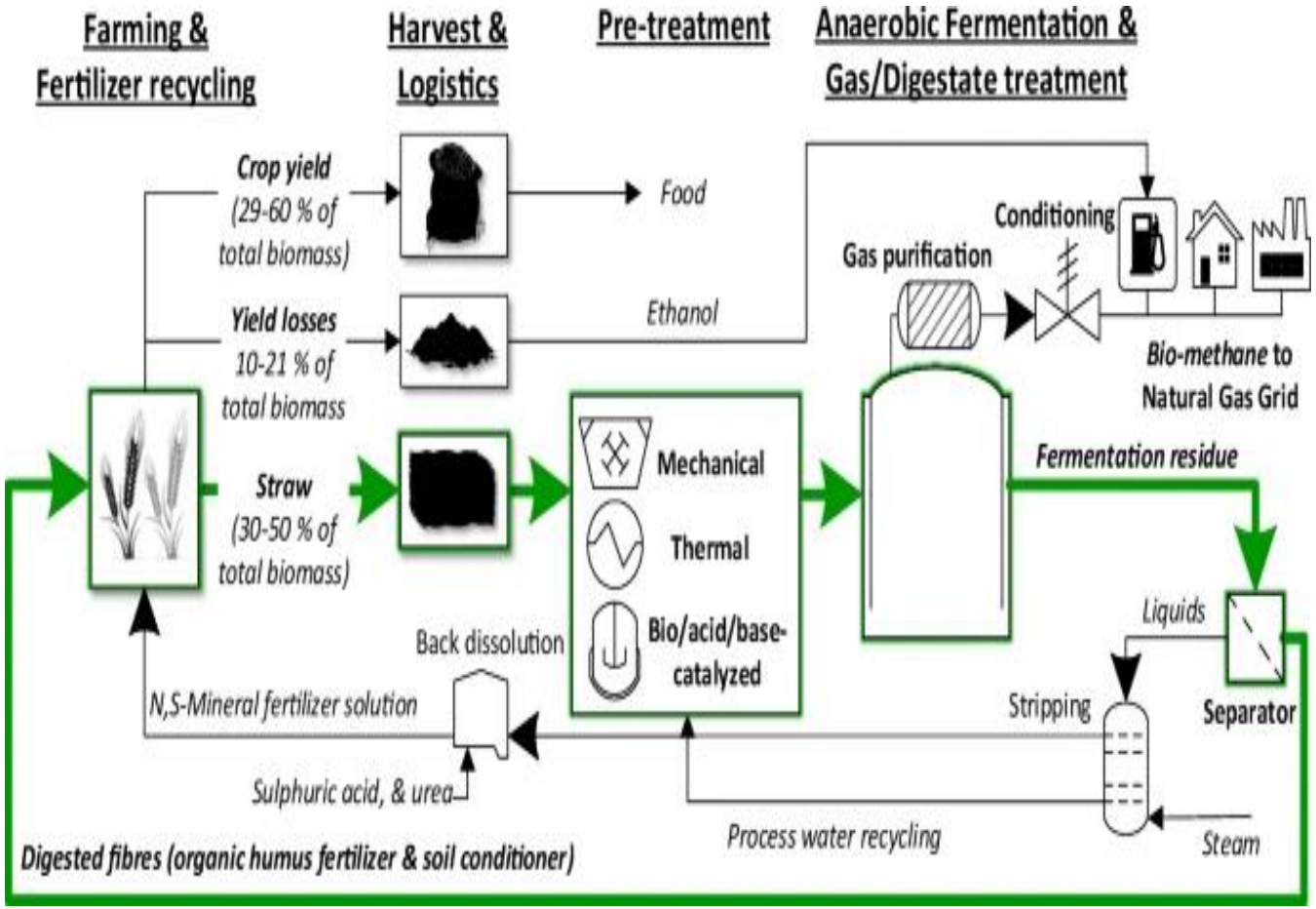
Organic waste model for valuable Circular products and services Business simulation

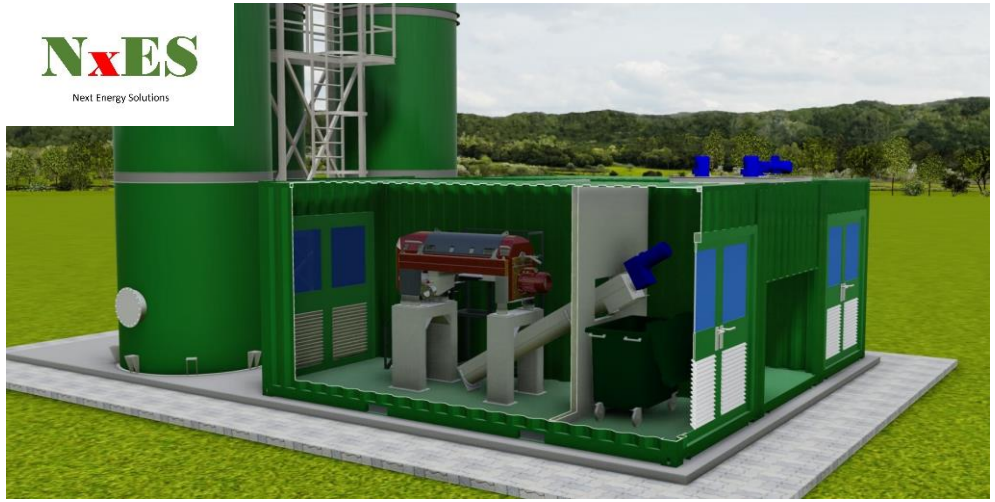


A smart and integrated process design

The current fossil-based economy is moving towards a more bio-based economy. To enable this transition, many different processes for biorefinery are being developed. **Small-scale biorefinery processes can be beneficial, not only socially and ecologically, but also economically.** The main motivation for smallscale biorefinery is local re-use of materials, like water, minerals, organic matter, CO2, and heat. This minimizes costs for recycling and transport. A smart and integrated process design can beat the advantages of economy of scale applied in large-scale processes. Examples of two fully operational small-scale systems that produce ethanol and starch are given to illustrate our theory. Specific design rules for small-scale biorefineries are defined. The focus in design for small-scale processes should be on minimizing capital costs.

Moreover, it is shown that separation of relatively simple pre-processing at small decentralized and more capital-intensive processing at large centralized factories, respectively, is advantageous. Integration with a biogas and combined heat and power (CHP) unit will furthermore allow usage of residual material to produce energy needed in the rest of the process.





Example of a facility for mixed organic waste in a small town in Norway

	DEATH FISH	FISH HATCHERY WASTES	DAIRY WASTES	BREWERY WASTES	CATTLE MANURE	WHOLE WASTES MIXTURE
WASTE AMOUNT (Ton/year)	1.062	2.942	1.000	100	8.198	**13.302**
DRY SOLID (DS) CONTENT (%)	41,0	9,0	10,0	25,0	7,0	**10,5**
DRY SOLID AMOUNT (Ton/year)	435,4	264,8	100,0	25,0	573,9	**1.399**
T-N RATIO OF DS (%)	6,5	5,6	6,0	3,0	6,0	**6,0**
T-N AMOUNT (Ton/year)	28,3	14,8	6,0	0,8	34,4	**84**
VOLATILE SOLID (VS) RATIO DS (%)	80,0	80,0	70,0	70,0	70,0	**75,0**
VOLATILE SOLID AMOUNT (Ton/year)	348,3	211,8	70,0	17,5	401,7	**1.049**
DESIGN BASIS					**WASTE MIXTURE AMOUNT (Kg/day)**	**40.000**
					DRY SOLID AMOUNT (Kg DS/day)	**4.000**
					VOLATILE SOLID AMOUNT (Kg VS/day)	**3.000**
					T-NITROGEN AMOUNT (Kg T-N/day)	**180**

Container-based biogas and water purification solutions have now been found on the market as a complement to larger plants and the upstream work of purifying as close to the source as possible. Now it's time to connect this in a system solution for a complete and scalable waste concept with the aim of creating Ethanol, Biogas, Heating, Electricity and Organic fertilizer etc. In addition, it creates a lot of jobs, better environment and economy.

Value Proposition & Roadmap

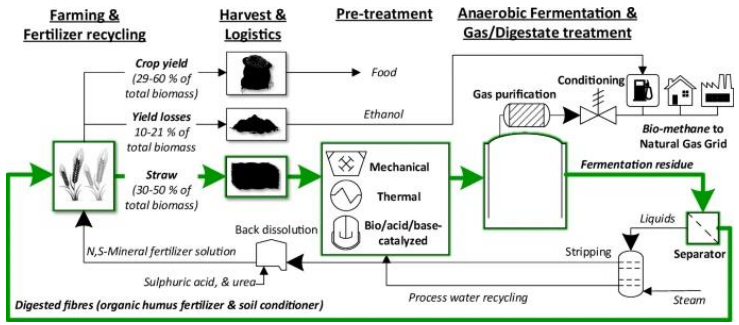
Structured product verification introduced by IEA OES

2020	2021	2022	2023	2024	2025
STAGE 1 (TRL 1-3)	**STAGE 2** (TRL 4-5)	**STAGE 3** (TRL 6)	**STAGE 4** (TRL 7)	**STAGE 5** (TRL 8)	**COMMERCIAL** (TRL 9)
XX	XX	300 000 Euro	XX	XX	Revenues & Licences
Concept Validation	1:6 scale prototype	1:5 scale prototype	1:1 scale pilot demo	Pre-commercial array	Commercial arrays

Various project applications Sweden, Scandinavia EU

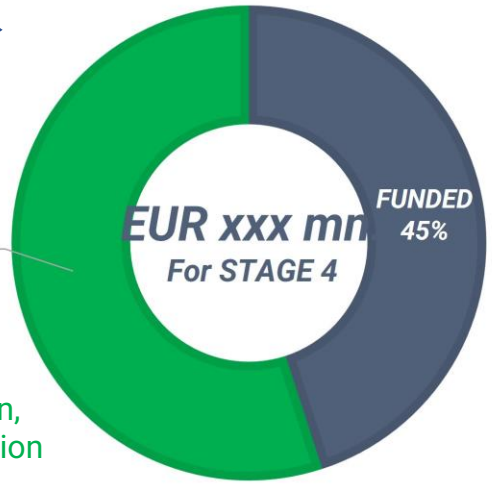
We are now looking for investors who can come in with seed money to take the development to the next step. We need 300,000 Euro for project management, documentation, project applications, travel and lab tests at various universities in Europe.
We offer co-ownership as well as options for the next step.

Basket Reactor-
SCBR project 2022



External financing

SEEKING
EUR xxx mn.
(55%)



For design, construction, deployment & certification of the first pilot unit

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Policy Implications

NxNano

HTF COMPACT® Nanotech Energy Savings Fluid

Also supporting:

- Renewable Energy Directive
- Policy framework for climate & energy in the period from 2020 to 2030
- Roadmap for moving to a competitive low carbon economy in 2050
- 7th Environment Action Program (EAP)
- Energy Efficiency Directive

For more information

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