COASTAL BIOGAS

Cluster **O**n **A**naerobic digestion environmental **S**ervices and nu**T**rients remov**AL**

2nd COASTAL Biogas Conference

November 13th-14th, 2019

Roskilde, Denmark

Partners

Funded by

The contents of this report are the sole responsibility of the COASTAL Biogas consortium and can in no way be taken to reflect the views of the European Union, the Managing Authority or the Joint Secretariat of the Interreg South Baltic Programme 2014-2020.

Background and goal of the conference

As part of the COASTAL Biogas project, conferences are organised in order to spread the knowledge on the project as well as collaborate with other projects. The second conference was held in Roskilde, Denmark. Information on the future conferences will be available on the website: https://www.coastal-biogas.eu/events/

Eutrophication in the Baltic Sea

Eutrophication affects 97% of the Baltic Sea. Combined with other problems, such as noise, pollutants and litter it creates a dangerous 'cocktail' of negative effects, which put stress on the species living in the Baltic Sea, which are already under stress since they have to cope with the living in the brackish water.
Coastal areas are the most valuable and vulnerable maritime habitats at the same time. Effects in the coastal areas are felt throughout the water. With the South Baltic Regional Nutrient Recycling Strategy (SBRNRS), which will start in 2020, HELCOM aims to reduce nutrient input to the Baltic Sea by increasing nutrient use efficiency and circulation of available nutrients.
A summary of the effects of Eutrophication and further information can be found on the HELCOM (Baltic Marine Environment Protection Commission - **Hel**sinki **Com**mission) website: http://www.helcom.fi

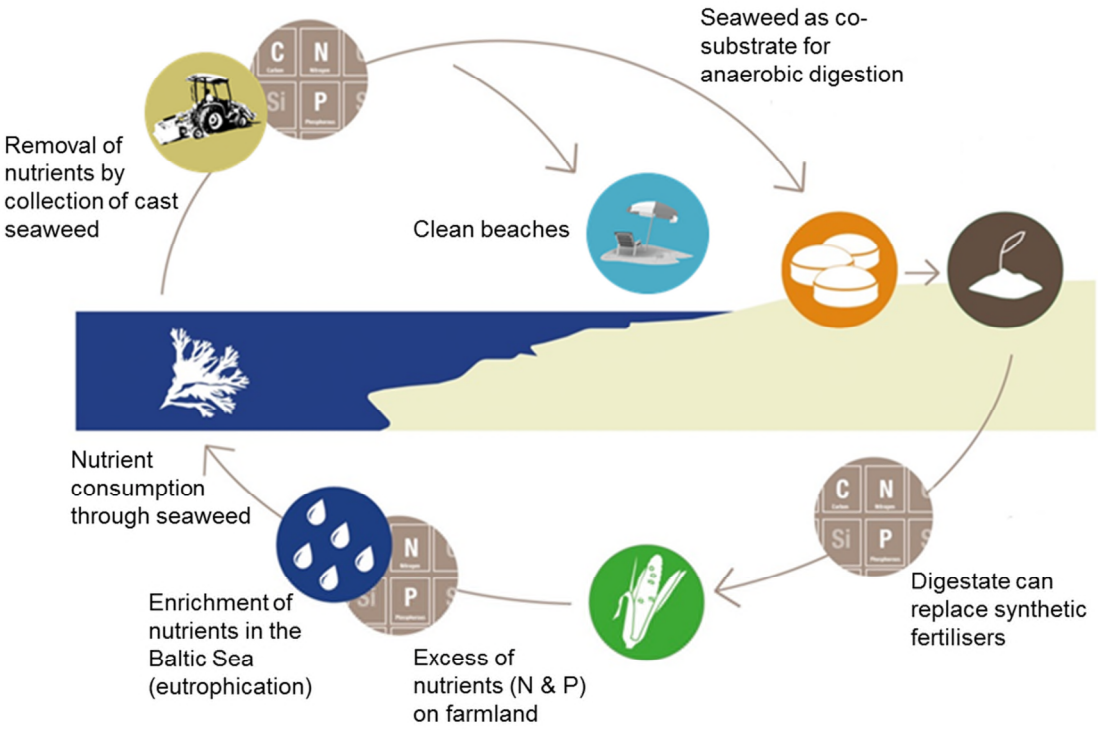
The COASTAL Biogas Project

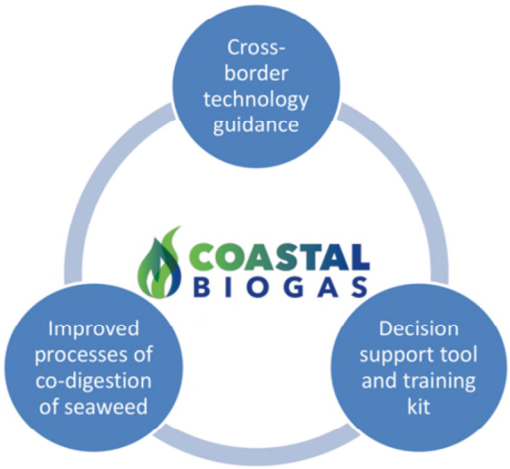
The COASTAL Biogas project aims to build on information gained in past EU projects, such as WAB (Wetlands, Algae, Biogas) (South Baltic Cross-Border Co-Operation Programme, 2010-2012) and collaborate with newer projects, such as CONTRA (Conversion of a Nuisance to a Resource and Asset, Interreg Baltic Sea Region, 2019-2021) and GRASS (Growing Algae Sustainably in the Baltic Sea, Interreg Baltic Sea Region, 2019-2021). The result: turning problems into potential for the Baltic Sea region and environment - reducing eutrophication, creating renewable energy and high-quality organic fertilisers from unwanted waste, making it easier to keep beaches clean and inviting for the region's vital tourism industry and at the same time contribute to the transition to a circular bio-economy.

The three-year project (07/2018 – 06/2021) is funded by the Interreg South Baltic Programme and consists of 6 partners from 5 countries around the Baltic Sea (DE, PL, DK, SE, LT). Sustainable potential for each region will be identified and policy framework overview along with suggestions for policy adaptations will be provided.

Roskilde University, one of the COASTAL Biogas partners, aims at reducing the sand content of the collected seaweed by developing new collection methods. The current solution is to collect the seaweed and 'wash' it in the shallow water before letting the water drain and transporting the biomass to the biogas plant, but it still needs improvement. Another challenge with seaweed utilisation in biogas plants is that the substrate needs to meet technical and legal requirements and depending on the season and species composition, especially Cadmium levels can be problematic.

At Gdansk University of Technology the co-digestion of seaweed and the biogas potential of various seaweed species are tested in lab-scale. To add up to 25% of seaweed to cattle manure can bring benefits for the anaerobic digestion process and therefore increase methane yield.





Target Groups

- Biogas plant operators
- Municipalities
- Local authorities
- Waste management companies
- Farmers
- Cleaning companies

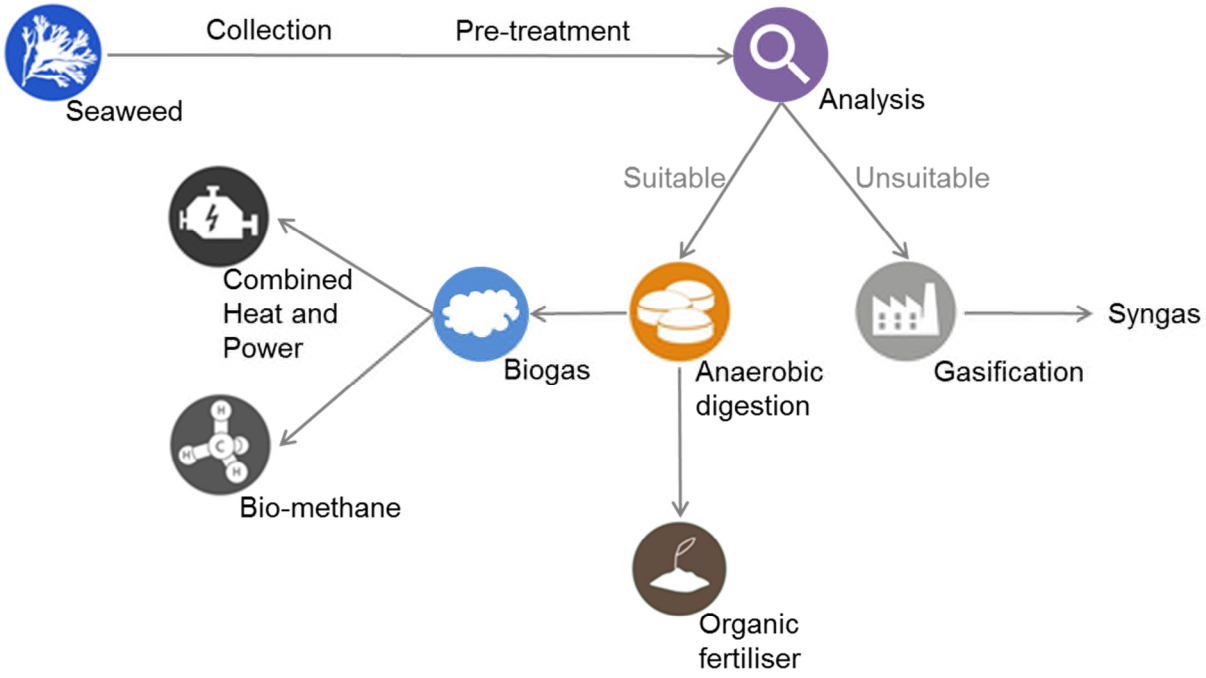


Figure 1: Overview of the COASTAL Biogas project with its outputs and target groups. Source: Presentation from COASTAL Biogas coordinator, Anne Roßmann (FNR), available at https://www.coastal-biogas.eu/events/conference-denmark/

Approaches from other initiatives – The GRASS project, Guldborgsund Municipality and Samsø Municipality

The SUBMARINER network is working on various topics, such as marine cultural heritage, marine litter or mussel cultivation and coastal biomass production. Their vision for 2030 is to develop a smart Baltic Sea region and to combine blue and green solutions. In the GRASS project, the consortium wants to enhance the capacity of public authorities to unlock the potential of macro-algae as a sustainable biomass in the Baltic Sea region.

In Guldborgsund Municipality the question of how to make some value from the cast seaweed led to the idea to feed larvae in the fish feed production with the marine biomass. Unfortunately, at the moment this practice is not approved by the Danish Food Administration.

Knud Tybirk from Samsø Municipality reminded the audience about the recommendations from the Baltic Manure project. He stated that biogas is a key recommendation for energetic use of manure and can be combined with other substrates. In Samsø a feasibility study was created around ferries with dual fuel engines using liquefied biogas to re-circulate slurry, straw and deep litter.

Digestate management and regulations

In his presentation, Bruno Sander Nielsen (Danish Biogas Association) said that biogas covers 15% of Danish natural gas consumption (end of 2018). Limited resources, such as Phosphorus, have to be re-circulated to optimise livestock manure and to meet the challenges in N and P regulations. Biogas plants can be seen as a major tool to achieve these goals.

The possible advantages of digestate processing were presented by Bernhard Drosg (IEA Bioenergy Task 37): Costs for transportation and storage can be reduced, fossil fertilisers can be replaced and P reserves

saved, further the loss of N can be decreased and process water can be reused. General strategies for digestate processing are:

- Partial processing
  - Reduction of quantity
  - Separation into individual fractions that can be handled or stored more easily
- Complete purification
  - Separation and concentration of valuable nutrients
  - Purification of the remaining liquid fraction permitting reuse or direct discharge

The main reason for investing in digestate processing technology is the lack of available agricultural land for application, but most processing technologies are only feasible in large-scale biogas plants.

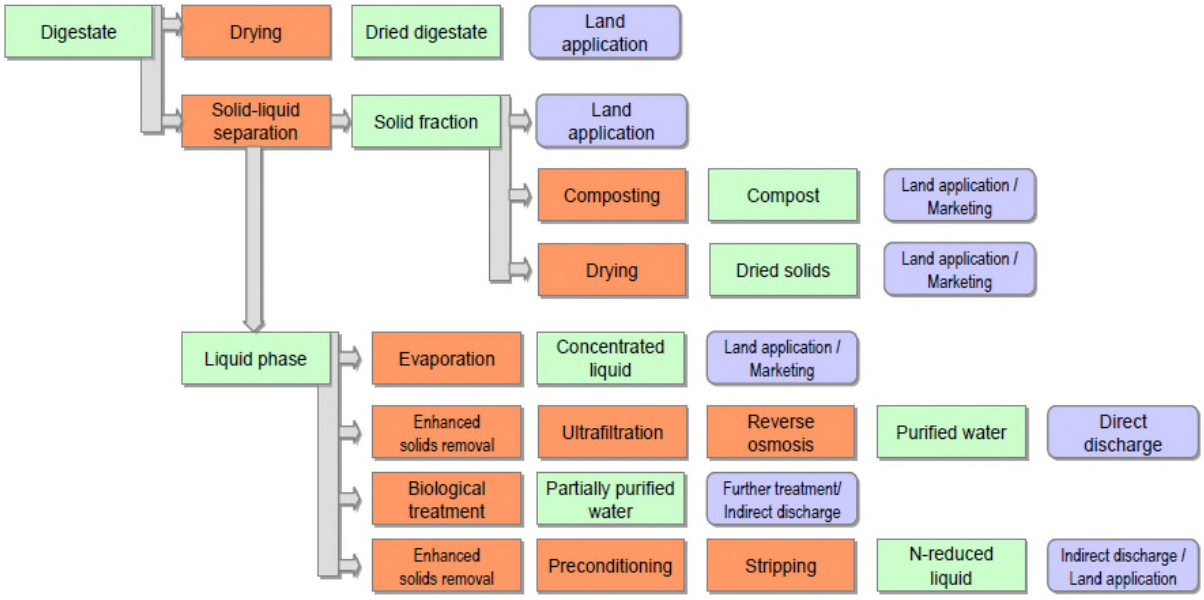


Figure 2: Overview of possible digestate processing combinations. Source: Presentation from Bernhard Drosg (IEA Bioenergy Task37), available at https://www.coastal-biogas.eu/events/conference-denmark/

Harm Grobrügge, president of the European Biogas Association (EBA), presented the association's work at the conference. The EBA advocates for recognition of bio-methane and other renewable gases as sustainable, on demand and flexible energy sources that provide multiple socio-economic and environmental benefits.

The social benefits of biogas include:

- Climate benefit
- Improved air quality
- Value of plant nutrients
- Increased employment
- Increased security of supply
- Increased resource of retentions with food supply

The EBA's policy recommendations are to promote the adoption of recycling targets for bio-waste, establish EU-wide End-of-Waste criteria for digestate and promote best practices for full utilisation of organic fertilisers under the Common Agricultural Policy framework.

Issues to be addressed for the collection and utilisation of cast seaweed in anaerobic digestion

In the final panel discussion with Susanna Kaasinen (HELCOM), Bernhard Drosg (IEA Bioenergy Task 37), Harm Grobrügge (European Biogas Association) and Bruno Sander Nielsen (Danish Biogas Association), the main topic were the challenges that need to be faced for the collection of cast seaweed and utilisation of digestate from cast seaweed as fertiliser:

One of the challenges about the utilisation of cast seaweed digestate as fertiliser is that seaweed is a natural resource and it might be difficult to meet thresholds of some heavy metals as concentrations vary throughout the year and among species. Another issue that needs solving is the fact that cast seaweed is categorised as a waste and therefore, the digestate will be waste as well. Biogas plants should be constructed in a way that allows removing sand continuously without having to open up the whole system. To assure a stable digestion process the feedstock properties need to be kept as constant as possible. As the amounts of seaweed that are washed ashore depend on season, currents and wind, the discontinuous supply with marine biomass is a challenge for biogas plant operators.

It is of high importance to evaluate and raise awareness for the environmental state of the Baltic Sea and its socio-economic benefits to help improve and protect this unique ecosystem.

Study Tour to Køge Bay and Solrød Biogas Plant

The conference participants visited the Køge bay and Solrød biogas plant (Denmark). The plant is the first to utilise cast seaweed as co-substrate for anaerobic digestion in industrial scale. It has a reception tank, where cast seaweed is stirred and mixed with other substrates. The contained sand will sediment at the bottom of the tank and the shredded biomass can be pumped into the fermenter.

Figure 3: Study tour to Køge bay – participants learning and discussing about cast seaweed. (Photo: Anne Roßmann)

Figure 4: Study tour to Solrød biogas plant – view from one of the fermenters. (Photo: Anne Roßmann)

ACKNOWLEDGMENTS

We would like to thank our speakers and contributors to the programme:
Keynote speaker, Susanna Kaasinen, *HELCOM*
Efthalia Arvaniti, *SUBMARINER Network for Blue Growth EEIG*
Mette Jørgensen, *Guldborgsund Municipality*
Knud Tybirk, *Samsø Municipality*
Bruno Sander Nielsen, *Danish Biogas Association*
Bernhard Drosg, *IEA Bioenergy Task 37*
Harm Grobrügge, *European Biogas Association*
as well as all participants for their contributions to the discussion!
A special thanks goes to **Preben Larsen**, *Solrød Strand Landowners Association*, who gave an insight into beach cleaning and cast seaweed collection during the study tour.

Further contributions were made by:

Tyge Kjær, *Roskilde University, COASTAL Biogas*
Robert Aranowski, *Gdansk University of Technology, COASTAL Biogas*
Iwona Cichowska-Kopczyńska, *Gdansk University of Technology, COASTAL Biogas*
Anne Roßmann, *Fachagentur Nachwachsende Rohstoffe (FNR), Lead Partner, COASTAL Biogas*