Project: CB264 NutriTrade

DELIVERABLE T6.1
MAPPING THE LOCATION OF POTENTIAL SUPPLIERS AND CONSUMERS OF NUTRIENTS

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Nutrient Offsetting for the Baltic Sea

INTRODUCTION

The aim of this report is to identify potential partners for nutrient exchange within project NutriTrade. Biogas production plants are considered potential suppliers and forest industry companies as potential consumers of recycled nutrients.

Geographically, the mapping focuses on 7 countries in the Baltic Sea region, namely Denmark, Estonia, Germany, Latvia, Lithuania, Poland and Sweden. Finland was left out from the analysis because of an existing initiative for nutrient exchange. For Germany, only states located in the Baltic Sea catchment area are included.

POTENTIAL SUPPLIERS

In biogas plants, digestate treatment has become an increasingly relevant alternative to conventional land application. Separating the solids from the liquids facilitates land application and storage through mass reduction and also enables further processing of the solid fraction.

The most popular application of the liquid phase is the recirculation in the biogas plant, where it is very helpful for reaching the desired dry matter content when feeding the plant with fresh substrate. Another alternative, particularly in regions with a high nutrient concentration, would be to utilise it as a source of recycled nutrients for the biological treatment of pulp and paper industry wastewaters.

In reality, however, digestate treatment is currently only feasible for a minority of biogas plants. Especially small and medium sized agricultural plants will struggle to see an economic benefit from further treatment beyond direct land application. Therefore, the search for potential suppliers of nutrients is limited to large scale agricultural biogas plants and to wastewater treatment-based (WWTP) and industrial biogas production, where the separation technology is more likely to be applied.

The search for biogas production plants was carried out in 2017 based on available literature and contacts to research organisations in the region.

Denmark

Currently, only one agricultural biogas plant (Måbjerg BioEnergy) separates the digestate. Moreover, there is sewage-based biogas production in 51 plants, but only 9 have energy output of at least 0.6 MW.

Estonia

In Estonian agricultural biogas plants, the liquid and solid fractions of the digestate are not separated. In WWTP –based biogas production, liquid digestate is directed back to the aerobic treatment process of wastewater. In industrial biogas plants, liquid digestate is treated in aerobic digestion tanks after anaerobic digestion process and the nutrient content in reject water is measured before releasing the purified reject water to the watercourses. Altogether six large-scale WWTP-based and industrial biogas plants were identified .

Germany

The Baltic Sea catchment area overlaps the territory of only four states, namely Brandenburg, Schleswig-Holstein, Sachsen and Mecklenburg-Vorpommern. Altogether 41 plants have separation technology or are large-scale plants (installed electric power or thermal power >1 MW).

Latvia

Over 90% of agricultural biogas plants do not separate solid digestate from liquid. The only large-scale plants with separation technology are ZS "Vecsiljāņi" (0.98 MW) and SIA "Egg Energy" (1.996 MW). Other large-scale plants include wastewater sludge feedstock-based SIA "Rigens" (1.998 MW) which dries their digestate and SIA "Biodegviela" which utilizes other organic matter as substrate.

Lithuania
The largest biogas plants are Kaunas WWTP, Kurana and UAB Psenergija. There is no information on digestate treatment technologies, however.

Poland
41 large-scale plants (installed electric power or thermal power >1 MW) were identified for Poland.

Sweden
In Sweden, digestate from co-digestion plants and farm installations is usually not treated. In WWTP-based biogas production, the digestate is dewatered and the liquid fraction (reject water) is returned into the system. According to energy statistics, there are 137 biogas plants treating sewage sludge, but unfortunately, there was no information on installed capacities. Therefore, population was utilized as a proxy for capacity and plants in municipalities with more than 60 000 inhabitants (in total 28 plants) were selected for mapping, together with 2 industrial plants.

POTENTIAL CONSUMERS

Microorganisms in the biological wastewater treatment plants of pulp and paper mills need a sufficient N and P supply to break down the dissolved organic substances in the wastewater. Effluents from pulp and paper mills mostly contain only low concentrations of N and P. Thus, for the effective operation of the biological wastewater treatment plant, nutrients are added to the system. Otherwise the removal rate of the plant declines.

The need for nutrients varies between mills. As a maximum theoretical demand, a ratio of BOD:N:P of 100:5:1 is required. In practice, ratios of 100:2.3 – 2.5:0.5 are also successfully applied in a number of treatment plants.

The addition of nutrients is carried out with readily available nutrient compounds, preferably ammonium (NH_4 +) and phosphate (PO_4 3-). In practice, nutrients are added e.g. in the form of urea and phosphoric acid bought from chemical producers. In the future, however, some environmentally conscious pulp and paper companies could use recycled nutrients as a source of additional N and P for their wastewater treatment.

Denmark
The only paper mill in Denmark is Skjern Papirfabrik A/S.

Estonia
There are three small mills in Estonia: one pulp mill, one paper mill and one integrated mill.

Germany
In the states of Brandenburg, Schleswig-Holstein, Sachsen and Mecklenburg-Vorpommern, there are 25 mills with paper capacity and 10 integrated pulp and paper mills. The largest paper mills are located in Schwedt and Eisenhüttenstadt, and the largest pulp mills in Schwedt and Eilenburg.

Latvia
There is no chemical forest industry in Latvia.

Lithuania

Poland
In Poland, the largest mills are located in Swiecie and Kwidzyn. Altogether there are 6 integrated mills and 42 paper mills.

Sweden

Sweden hosts altogether 51 mills: 14 produce paper, 12 pulp and 25 are integrated mills. The largest paper mills are located in Skoghall, Ortviken, Gävle, Piteå, Husum, Borlänge and Grums. The largest pulp mills include Ortviken, Borlänge, Mönsterås, Husum, Skoghall, Hyltebruk, Gävle, Norrköping and Väröbacka.

CONCLUSIONS

In total, 135 plants were identified as potential suppliers of nutrients and 142 plants as potential users of nutrients. Their location is shown in Figure 1 and Figure 2.

Figure 1. Potential suppliers of nutrients

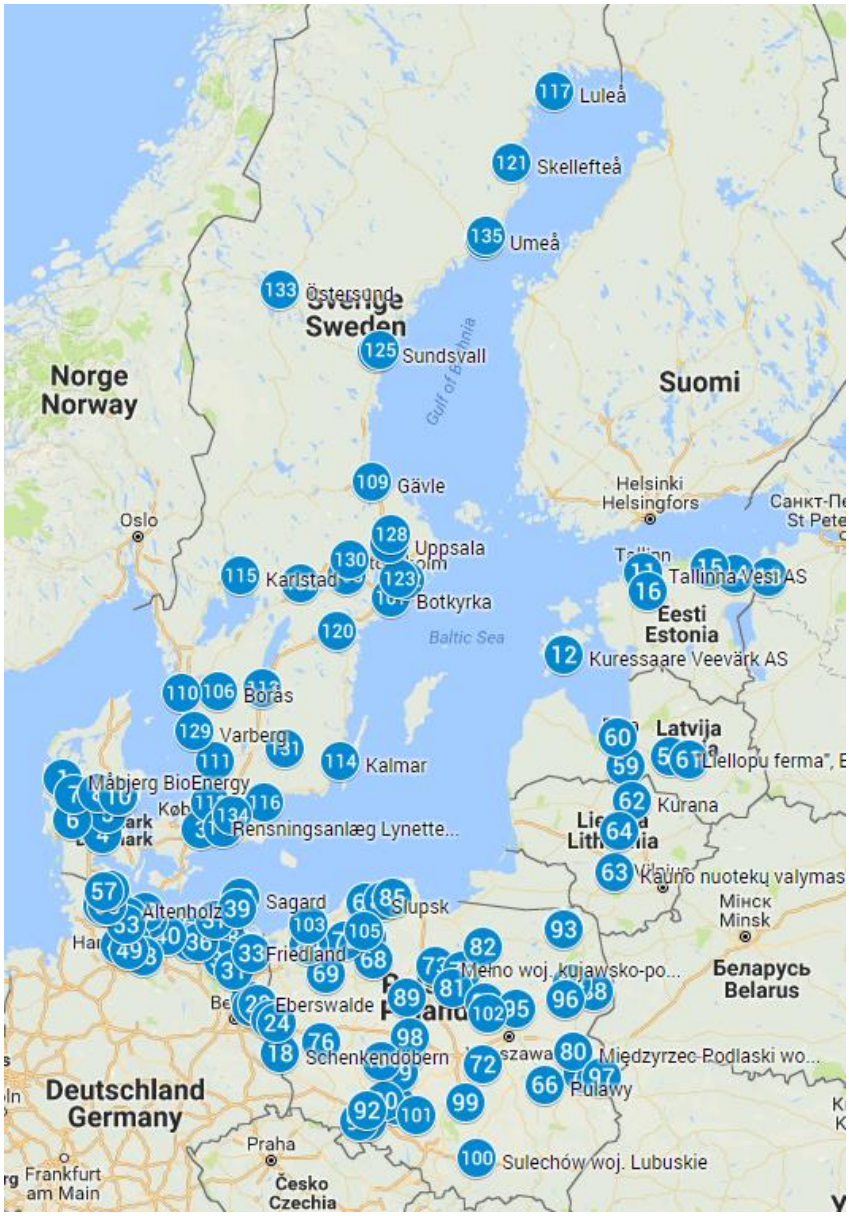

Figure 2. Potential demand for nutrients

Matchmaking seems possible for all countries except Latvia because there is no pulp or paper industry in the country. Consequently, the most prominent plants for nutrient exchange are next identified for 6 countries: Denmark, Estonia, Germany, Latvia, Poland and Sweden.

Sources

Awasume E & Pettersson T (Chalmers University of Technology), 2017. Final report of risk assessment of biogas production in the Baltic Sea region from a nutrient management perspective.

Gajewska, M & Kołecka, K (Gdańsk University of Technology) & Kowalczyk-Juśko A & Jóźwiakowski, K (University of Life Sciences in Lublin), 2017. Draft report of risk assessment of biogas production. Poland

Gruszkos, T, Kayser, K & Trombin G (IBBK Fachgruppe Biogas GmbH) 2017. Risk assessment of nutrient discharges from biogas production - Report Germany

Møller, H B (Aarhus Universitet) 2017. Risk assessment of nutrient discharges from biogas production - Report Denmark

Oja, K, Oja, M, Oja, A & Trink, T (Estonian Biogas Association) 2017. Risk Assessment of Biogas Production in the Baltic Sea Region from the nutrient management perspective – Estonia

Pöyry pulp and paper mill database (8/2017)

Ruģele, K, Gruškeviča, K, Rubulis, J & Kalniņa, I (Riga Technical University), 2017. Risk assessment of nutrient discharges from biogas production.

Suhr, M, Klein, G, Kourti, I, Rodrigo Gonzalo, M, Santonja, G, Roudier, S & Delgado Sancho, L 2015. Best Available Techniques (BAT) Reference Document for the Production of Pulp, Paper and Board

Annex 1

List of identified biogas production plants

#	Country	Biogas plant
1	DNK	Måbjerg BioEnergy
2	DNK	Rensningsanlæg Lynetten
3	DNK	Spildevandscenter Avedøre
4	DNK	Fredericia Spildevand
5	DNK	Horsens Centralrenseanlæg
6	DNK	Grindsted Renseanlæg, Billund Energ
7	DNK	Herning Renseanlæg
8	DNK	Søholt Renseanlæg, Silkeborg
9	DNK	Marselisborg Renseværk
10	DNK	Viby Renseanlæg, Århus
11	EST	Tallinna Vesi AS
12	EST	Kuressaare Veevärk AS
13	EST	Narva Vesi AS
14	EST	Kohtla-Järve
15	EST	Jaama 21, Kunda
16	EST	Salutaguse Pärmitehas AS
17	GER	Altenholz
18	GER	Schenkendöbern
19	GER	Eberswalde
20	GER	Heckelberg-Brunow
21	GER	Bad Freienwalde OT Altranft
22	GER	Bad Freienwalde
23	GER	Seelow
24	GER	Podelzig
25	GER	Wolde
26	GER	Friedland
27	GER	Friedland
28	GER	Siedenbrünzow OT Vanselow
29	GER	Altkalen /Lüchow
30	GER	Penzlin (Klein Lukow)
31	GER	Dolgen
32	GER	Rostock
33	GER	Wilhelmsburg OT Mühlenhof
34	GER	Selpin
35	GER	Güstrow
36	GER	Schlieffenberg
37	GER	Oebelitz
38	GER	Sagard
39	GER	Putbus
40	GER	Hornstorf
41	GER	Lübeck
42	GER	Cismar
43	GER	Oldenburg
44	GER	Bad Oldesloe
45	GER	Bad Oldesloe
46	GER	Wesenberg
47	GER	Bargfeld Stegen
48	GER	Klein Zecher
49	GER	Wentorf
50	GER	Tüttendorf
51	GER	Gettorf
52	GER	Lebrade
53	GER	Nehmten
54	GER	Ahlefeld-Bistensee
55	GER	Holtsee
56	GER	Kappeln
57	GER	Süderbrarup
58	LAT	"Liellopu ferma", Bebru pagasts, Kokneses novads
59	LAT	"A/S Balticovo", Iecavas novads
60	LAT	Dzintara iela 60, Rīga
61	LAT	Rūpnīcas iela 15, Kalsnavas pagasts, Madonas novads
62	LIT	Kurana
63	LIT	Kauno nuotekų valymas
64	LIT	UAB Psenergija
65	POL	Slupsk
66	POL	Pulawy
67	POL	Koczała woj.
68	POL	Debrzno woj.
69	POL	Kalisz Pomorski
70	POL	Grzmiąca woj.
71	POL	Dębowa Kłoda woj. Lubelskie
72	POL	Rawa Mazowiecka woj. Łódzkie
73	POL	Mełno woj. kujawsko-pomorskie
74	POL	Zbiersk woj. Wielkopolskie
75	POL	Mroczno woj. Warmińskomazurskie
76	POL	Nowe Kramsko woj. Lubuskie
77	POL	Domaszowice woj. Opolskie
78	POL	Strzelin woj. dolnośląskie
79	POL	Parczew woj. lubelskie
80	POL	Międzyrzec Podlaski woj. Lubelskie
81	POL	Rypin woj. kujawsko-pomorskie
82	POL	Gietrzwałd woj. Warmińskomazurskie
83	POL	Potęgowo woj. Pomorskie
84	POL	Resko woj. zachodniopomorskie
85	POL	Lębork woj. Pomorskie
86	POL	Glinojeck woj. mazowieckie
87	POL	Olecko woj. Warmińskomazurskie
88	POL	Zabłudów woj. podlaskie
89	POL	Złotniki Kujawskie woj. kujawsko-pomorskie
90	POL	Bierutów woj. dolnośląskie
91	POL	Łagiewniki woj. Dolnośląskie
92	POL	Żórawina woj. Dolnośląskie
93	POL	Olecko woj. Warmińsko-mazurskie
94	POL	Jeżewo woj. kujawsko-pomorskie
95	POL	Psary woj. Wielkopolskie
96	POL	Szepietowo woj. Podlaskie
97	POL	Włodawa woj. Lubelskie
98	POL	Konin woj. Wielkopolskie
99	POL	Masłowice woj. Łódzkie
100	POL	Sulechów woj. Lubuskie
101	POL	Olesno woj. Małopolskie
102	POL	Płońsk woj. Mazowieckie
103	POL	Drzonowo woj. Zachodniopomorskie
104	POL	Koźmin Wielkopolski woj. Wielkopolskie
105	POL	Miastko woj. Pomorskie
106	SWE	Borås
107	SWE	Botkyrka
108	SWE	Eskilstuna
109	SWE	Gävle
110	SWE	Göteborg
111	SWE	Halmstad
112	SWE	Helsingborg
113	SWE	Jönköping
114	SWE	Kalmar
115	SWE	Karlstad
116	SWE	Kristianstad
117	SWE	Luleå
118	SWE	Lund
119	SWE	Malmö
120	SWE	Norrköping
121	SWE	Skellefteå
122	SWE	Stockholm
123	SWE	Stockholm
124	SWE	Sundsvall
125	SWE	Sundsvall
126	SWE	Umeå
127	SWE	Uppsala
128	SWE	Uppsala
129	SWE	Varberg
130	SWE	Västerås
131	SWE	Växjö
132	SWE	Örebro
133	SWE	Östersund
134	SWE	Eslöv
135	SWE	Umeå

Annex 2

List of identified pulp and paper mills

#	Country	Company	#	Country	Company
1	Denmark	Skjern Papirfabrik A/S	71	Poland	Paper Mill Malta-Decor S.A.
2	Estonia	AS Estonian Cell	72	Poland	Metsä Tissue S.A.
3	Estonia	Horizon Pulp and Paper	73	Poland	Mikolowskie Zaklady Papiernicze
4	Estonia	Räpina Paberivabrik AS	74	Poland	Mondi Swiecie S.A.
5	Germany	Ahlstrom Germany GmbH	75	Poland	Packprofil Sp. z o.o. j.v.
6	Germany	CeDo Papierprodukte GmbH	76	Poland	Packprofil Sp. z o.o. j.v.
7	Germany	Pappen- und Kartonagenwerk Colditz	77	Poland	Polska Wytwornia Papierow Wartosciowych S.A.
8	Germany	Feldmuehle Uetersen GmbH	78	Poland	Zaklad Produkcji Papieru Toaletowego 'Paptol'
9	Germany	Glashütter Pappen- und Kartonagenfabrik GmbH	79	Poland	WEPA Professional Piechowice S.A.
10	Germany	Glatfelter Gernsbach GmbH & Co. KG	80	Poland	PPHU Rolls Sp. z o.o.
11	Germany	GrünPerga Papier GmbH	81	Poland	Schumacher Packaging Works Grudziadz Sp. z o.o.
12	Germany	Papierfabrik Hainsberg GmbH	82	Poland	SCO-PAK Sp. z o.o.
13	Germany	Pappen- und Kartonagenwerk Hirschleithe Rudolf Bräuer GmbH	83	Poland	Stora Enso Narew Sp. z o.o.
14	Germany	Krempel GmbH & Co. Presspanwerk KG	84	Poland	Stora Enso Poland S.A.
15	Germany	Krempel GmbH & Co. Presspanwerk KG	85	Poland	PPH 'Tartex' Papier Ekologia
16	Germany	Kübler & Niethammer Papierfabrik Kriebstein AG	86	Poland	Tektura Opakowania Papier (TOP) S.A.
17	Germany	LEIPA Georg Leinfelder GmbH	87	Poland	Tektura Opakowania Papier (TOP) S.A.
18	Germany	LEIPA Georg Leinfelder GmbH	88	Poland	Velvet CARE Sp. z o.o.
19	Germany	Papierfabrik Louisenthal GmbH	89	Poland	Warter Spolka Jawna
20	Germany	Lunzenauer Papier- und Pappenfabrik GmbH & Co. KG	90	Poland	Welmax, Zaklad Produkcyjno Handlowy Adamowicz Wieslaw
21	Germany	Papierfabrik Meldorf GmbH & Co. KG	91	Poland	Zywieckie Zaklady Papiernicze Solali S.A.
22	Germany	Mitsubishi HiTec Paper Europe GmbH	92	Sweden	ABB AB Figeholm
23	Germany	Neu Kaliss Spezialpapier GmbH	93	Sweden	Arctic Paper Grycksbo AB
24	Germany	Neukölln Spezialpapier NK GmbH & Co. KG	94	Sweden	Arctic Paper Munkedals AB
25	Germany	Kartonfabrik Porstendorf GmbH	95	Sweden	BillerudKorsnäs AB
26	Germany	Propapier PM1 GmbH	96	Sweden	BillerudKorsnäs AB
27	Germany	Propapier PM2 GmbH & Co KG	97	Sweden	BillerudKorsnäs AB
28	Germany	Reinsberger Spezialpapier GmbH	98	Sweden	BillerudKorsnäs AB
29	Germany	Hamburger Rieger GmbH & Co. KG	99	Sweden	BillerudKorsnäs AB
30	Germany	Schoeller Technocell GmbH & Co. KG	100	Sweden	BillerudKorsnäs AB
31	Germany	Schoeller Technocell GmbH & Co. KG	101	Sweden	Crane AB
32	Germany	Schönfelder Papierfabrik GmbH	102	Sweden	Domsjö Fabriker AB
33	Germany	Julius Schulte Trebsen GmbH & Co. KG	103	Sweden	Essity Hygiene Products
34	Germany	Schumacher Packaging GmbH	104	Sweden	Fiskeby Board AB
35	Germany	Spreemühle Pappen- und Kartonagenfabrik GmbH	105	Sweden	Holmen Paper AB
36	Germany	Steinbeis Papier Glückstadt GmbH & Co. KG	106	Sweden	Holmen Paper AB
37	Germany	Stora Enso Sachsen GmbH	107	Sweden	Iggesund Paperboard AB
38	Germany	Presspanfabrik Untersachsenfeld GmbH	108	Sweden	Lessebo Paper
39	Germany	WEPA Papierfabrik Sachsen GmbH	109	Sweden	Metsä Board Husum
40	Lithuania	CJSC Eseira	110	Sweden	Metsä Board Husum
41	Lithuania	AB Grigeo Grigiskes	111	Sweden	Metsä Tissue AB
42	Lithuania	AB Grigeo Klaipedos Kartonas	112	Sweden	Metsä Tissue AB
43	Lithuania	Pabrades Kartono Fabrikas	113	Sweden	Metsä Tissue AB
44	Poland	A & B Paper Ltd.	114	Sweden	Mondi Dynäs AB
45	Poland	P.W. Apis Partnership Fijalkowski & Bloch	115	Sweden	Munksjö Aspabruk AB
46	Poland	P.W. Apis Partnership Fijalkowski & Bloch	116	Sweden	Munksjö Paper AB
47	Poland	P.W. Apis Partnership Fijalkowski & Bloch	117	Sweden	Munksjö Paper AB
48	Poland	Arctic Paper Kostrzyn S.A.	118	Sweden	Nordic Paper Åmotfors
49	Poland	Fabryka Papieru i Tektury Beskidy S.A.	119	Sweden	Nordic Paper Bäckhammars
50	Poland	Fabryka Papieru Czerwonak Sp. z o.o.	120	Sweden	Nordic Paper Seffle AB
51	Poland	Fabryka Papieru Sp. z o.o. w Dabrowicy	121	Sweden	Rexcell Tissue and Airlaid AB
52	Poland	Delitissue Sp. z o.o.	122	Sweden	Rottneros Bruk AB
53	Poland	WPT 'Eko-Klan' Sp. z o.o.	123	Sweden	SCA Graphic Sundsvall AB
54	Poland	Elpap	124	Sweden	SCA Graphic Sundsvall AB
55	Poland	Filar S.C. FPHU	125	Sweden	SCA Munksund AB
56	Poland	Glucholaskie Zaklady Papiernicze Sp. z o.o.	126	Sweden	SCA Obbola AB
57	Poland	Glucholaskie Zaklady Papiernicze Sp. z o.o.	127	Sweden	Smurfit Kappa Kraftliner AB
58	Poland	Hanke Tissue Sp. z o.o.	128	Sweden	Södra Cell AB
59	Poland	ICT Poland Sp. z o.o.	129	Sweden	Södra Cell AB
60	Poland	International Paper - Kwidzyn S.A.	130	Sweden	Södra Cell AB
61	Poland	Izopaper Sp. z.o.o.	131	Sweden	Stora Enso Fors AB
62	Poland	Jack-Pol sp. z o.o.	132	Sweden	Stora Enso Hylte AB
63	Poland	Jack-Pol sp. z o.o.	133	Sweden	Stora Enso Skoghall AB
64	Poland	Fabryka Papieru Kaczory Sp. z.o.o.	134	Sweden	Stora Enso Kvarnsveden AB
65	Poland	Fabryka Papieru Kaczory Sp. z.o.o.	135	Sweden	Stora Enso Nymölla AB
66	Poland	PPHU 'KARAS'	136	Sweden	Stora Enso Pulp AB
67	Poland	Fabryka Papieru Konstans Sp. z o.o.	137	Sweden	Svanskog Bruk AB
68	Poland	PPPH Lamix	138	Sweden	Svenska Pappersbruket AB
69	Poland	Firma W. Lewandowski	139	Sweden	SwedPaper AB
70	Poland	Paper Mill Malta-Decor S.A.	140	Sweden	Swedish Tissue AB
			141	Sweden	Waggeryd Cell AB
			142	Sweden	Vallviks Bruk AB