

Project: CB264 NutriTrade

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

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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 "Rigans" (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 (NH₄⁺) and phosphate (PO₄³⁻). 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

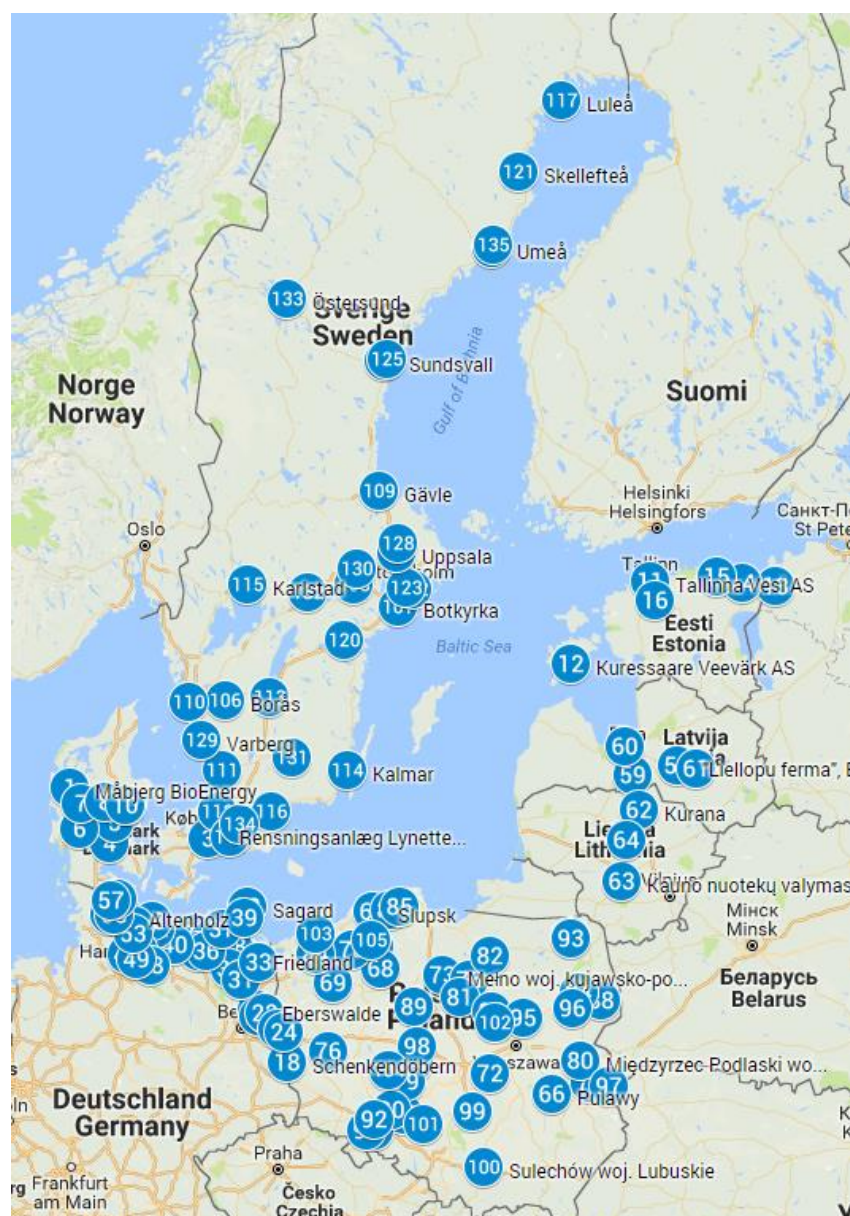


Figure 2. Potential demand for nutrients



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

Awassum 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.

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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)

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Annex 1

List of identified biogas production plants

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