



**Duckweeds and sewage  
sludge co-digestion in  
Swarzewo WWTP**

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Annual biogas production	1 502 000 Nm <sup>3</sup>
Cogeneration unit MWM	2 x 400 kW
electricity and heat (1:1)	
Annual electrical energy production	3770 MWh
Annual heat energy production	2535 MWh



**Digestive chambers**

**2 x 3.600 m<sup>3</sup>**

It is estimated that there is about 200 Mg of wet aquatic plants on the surface of the ponds, the largest share of which is duckweed and water milfoils







Animal plankton develops significantly in the treated sewage

Zooplankton keeps water transparent

The biogas potential was checked in the model of fermentation chamber in the laboratory





Freshwater algae - green algae have the greatest biogas potential







Duckweed has a slightly worse biogas potential



Biogas potential of plant biomass harvested from sea and artificial pond in WWTP was checked in the model of fermentation chamber in the laboratory



Freshwater algae



Green and Brown algae  
Algae biomass from the beach





# Biogas potential of plant biomass harvested from sea and pond water

Plant biomass	Month	d.m. [%]	VS [%d.m.]	Biogas Potential [m <sup>3</sup> /Mg]	Biogas Potential [m <sup>3</sup> /Mg VS]
Freshwater algae	06.2018	4,4	81,8	12,5	347
Water milfoils and duckweed	08.2018	7,2	64,5	11,3	243
Green and Brown algae	08.2018	15,3	48,7	12	162
Algae biomass from the beach	06.2018	6,2	56,3	3	86
Seagrass	09.2018	19,7	38,0	4,8	65



The treatment plant accepts significant amounts of various wastes for fermentation and composting

## Vegetable wastes

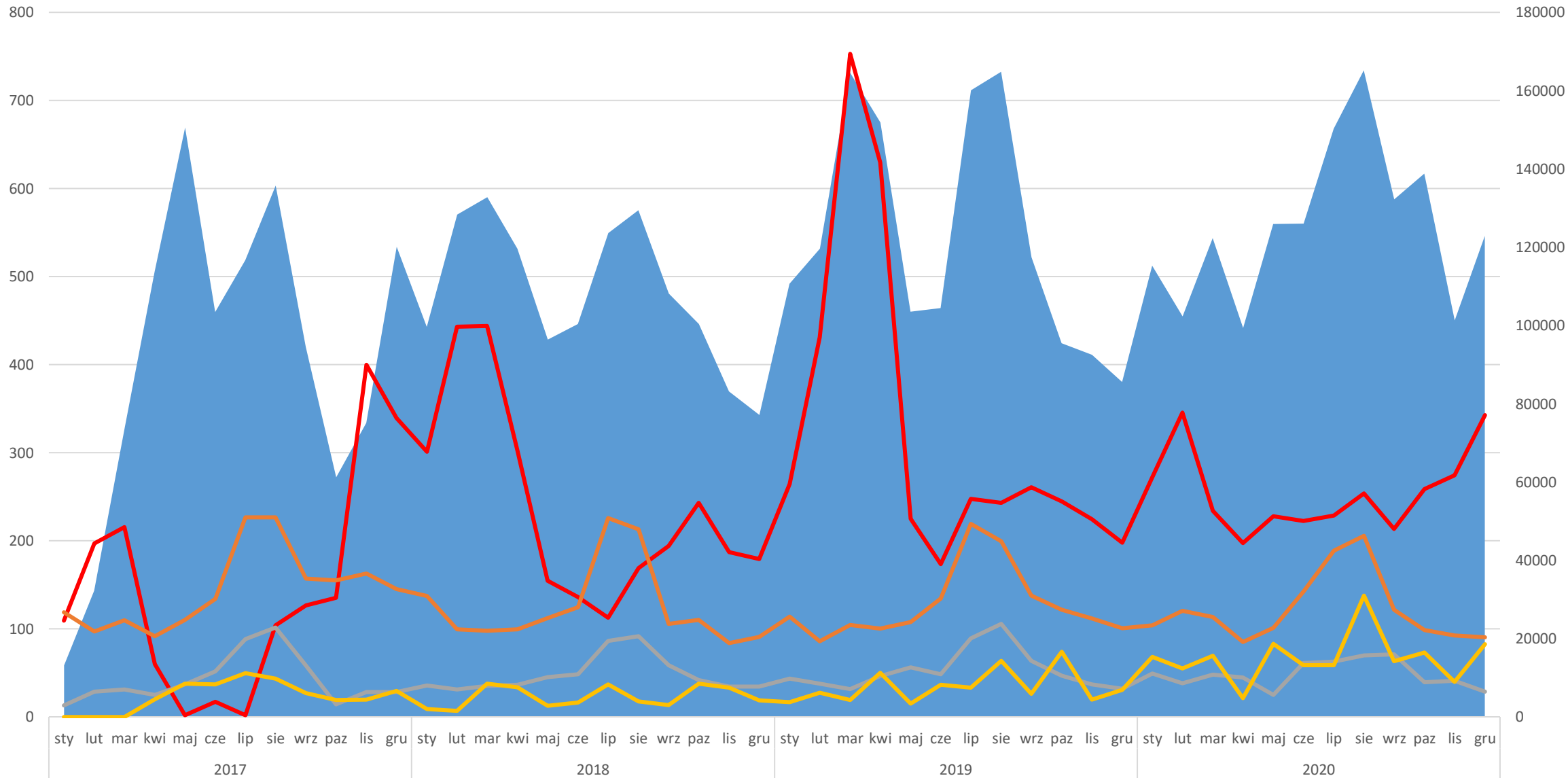




# Type of solid wastes /Biogas production

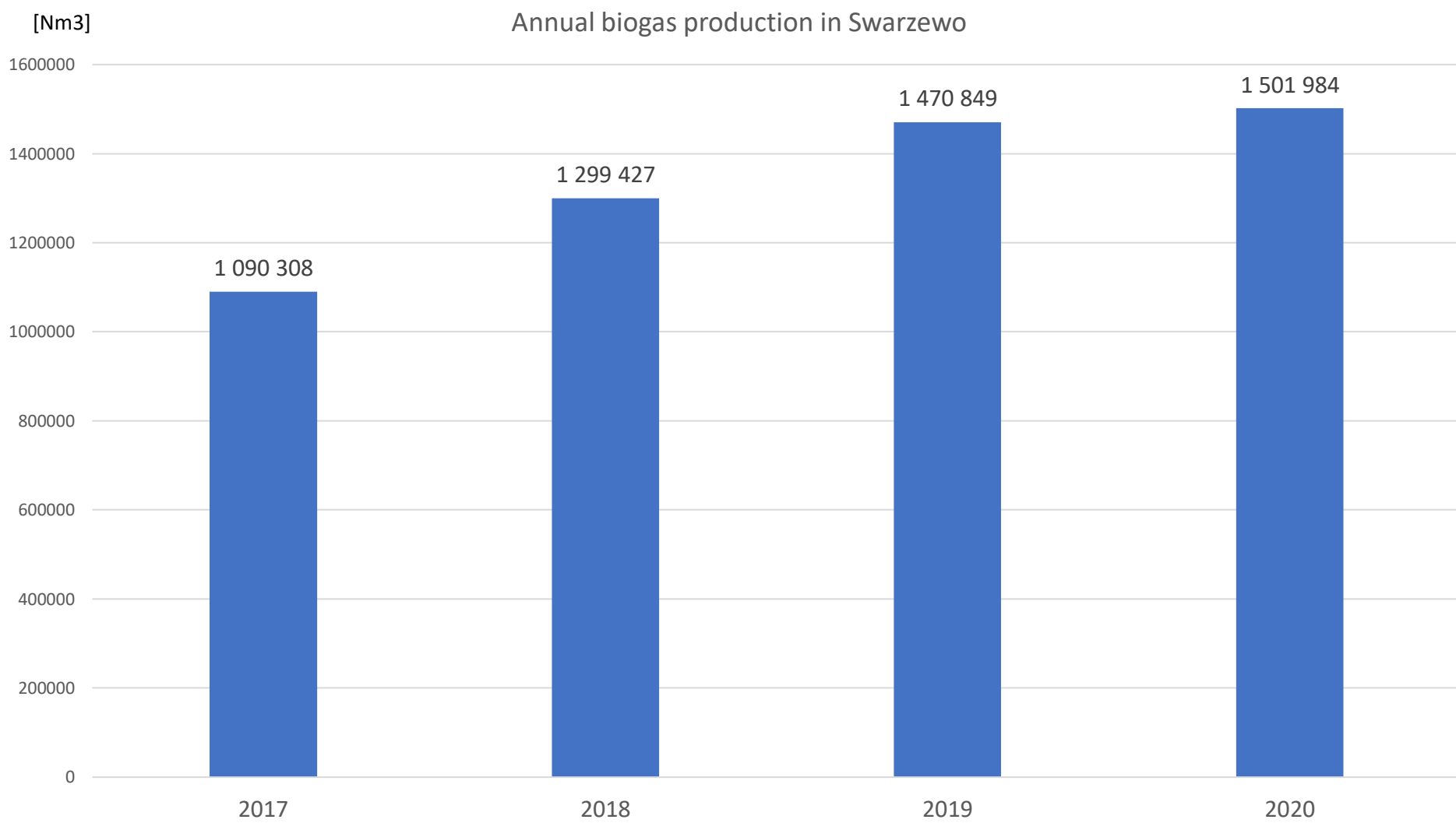
[Mg/month]

[Nm3]



■ Biogaz [Nm3]    
 — Solid waste 020204 [Mg]    
 — Solid waste 190805 Swarzewo [Mg s.m.]    
 — Solid waste 190805 delivered [Mg s.m.]    
 — Solid waste 190809 [Mg]







The most intense growth of duckweed in the ponds was observed in July and August





## RESULTS

It is estimated that there is about 200 Mg of wet aquatic plants on the surface of the ponds, the largest share of which is duckweed and water milfoils

Since duckweed has only 7.2% d.m. and each 1 Mg of duckweed can produce 11.3 m<sup>3</sup> of biogas, the potential increase of produced biogas from duckweed is 2260 m<sup>3</sup>.

During the harvest of duckweed, 1/10 of the amount was collected, i.e. about 20 Mg of duckweed, which, according to calculations, produced about 226 m<sup>3</sup> of biogas.

The amount of biogas obtained from duckweed is too small to be shown in a summary diagram.





# Conclusions

- The obtained results confirm the low value of biogas potential of the studied plants.
- In order to obtain more algae with less effort, it would be necessary to use more efficient floating equipment adapted to catch algae.
- Feeding the chamber with macroalgae did not negatively affect the condition of the sludge
- It is also necessary to estimate how large macroalgal waste resources are in the area and whether it would be profitable to treat them in the fermentation proces in WWTP



Thank You for attention

