# Greenhouse Gas mitigation and local heat supply with biomass from paludiculture

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## Biomass for heat supply

Biomass from wet peatland can be used as renewable energy to supply local communities with heat. Since 2014 about 1.200 t hey bales (Sedges, Reed canary grass) from rewetted fens are used to produce 4000 MWh heat every year which are provided to about 500 households and a number of public buildings in the town of Malchin. By substituting natural gas the use of biomass mitigate about 1.000 t of $CO_2$ annually. Additionally the utilisation of biomass from landscape management sustains the agricultural use of 250 ha rewetted peatland.

To define additional locations for local heat delivery through biomass from rewetted peatlands we have (1) specified the heat demand of several locations, (2) identified potential sites for the production of paludiculture biomass and (3) brought relevant stakeholders together.

(1) For the heat demand the peak load and the total annual heat demand are important. Additionally the density of households and the availability of an heating grid is of relevance. With these parameters the feasibility (amount of MWh per year for profitability) and site demand (hectare of rewetted peatland for biomass production) were estimated.

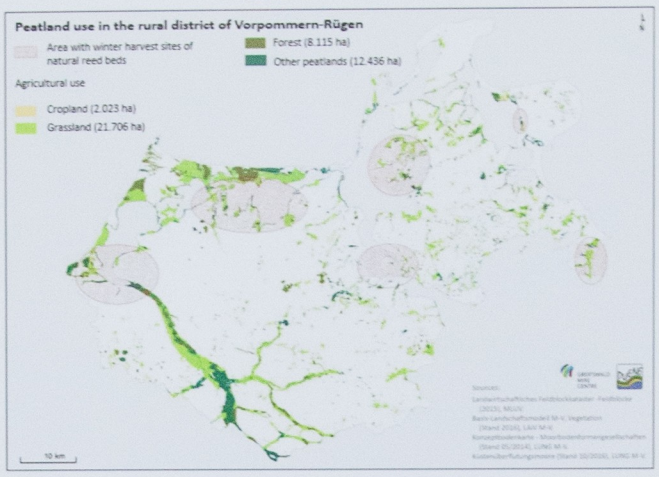
(2) The amount of potential production sites for the biomass was estimated within a radius of 10 and 20 km. The agricultural used peatlands are categorized into sites (a) without restriction by nature conservation, (b) with restrictions by nature conservation and (c) sites within the agri-environmental scheme "conservation management grassland".

These three categories are chosen because:

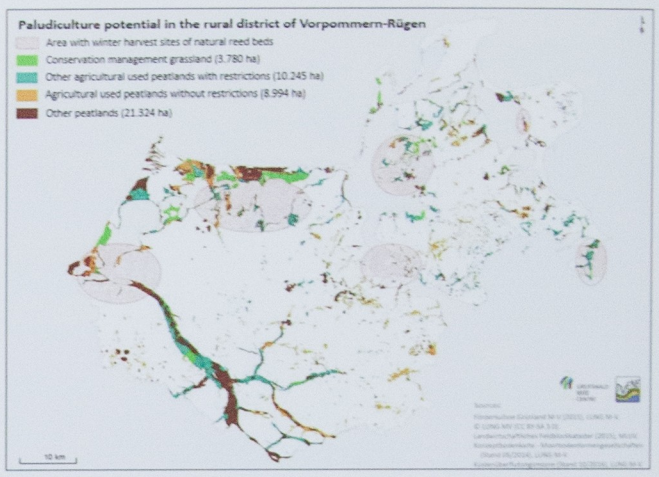
- No utilisation of biomass from drained peatlands. The emission of drained sites is larger than the mitigation of substituting fossil fuels.
- Agricultural sites without restrictions could also be used to cultivate paludiculture crops for material utilisation (energy utilisation would also be possible). The site are available for paludiculture biomass production in at least 5-10 years, as water level have to be raised.
- On agricultural sites with restrictions only wet meadow paludiculture can be realized. The biomass could be used for energy utilisation. The sites are already wet but water level can still be optimized. The site availability is maybe less than 5 years.
- Sites of the agri-environmental scheme "conservation management grassland" are already in extensive use. Nevertheless assessments of further water level raise are necessary but fortunately maybe only marginal adjustments are needed. Utilisation of biomass in short-term should be possible. With respect to the local biodiversity 50% of these sites should be grazed!

## Vorpommern-Rügen

### Peatland use

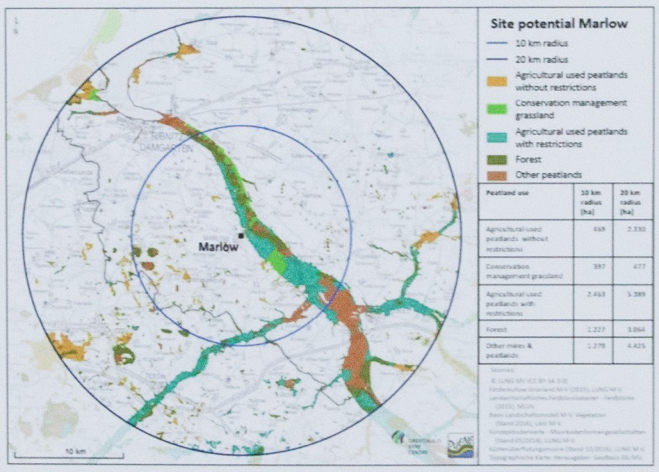



### Potential for paludiculture



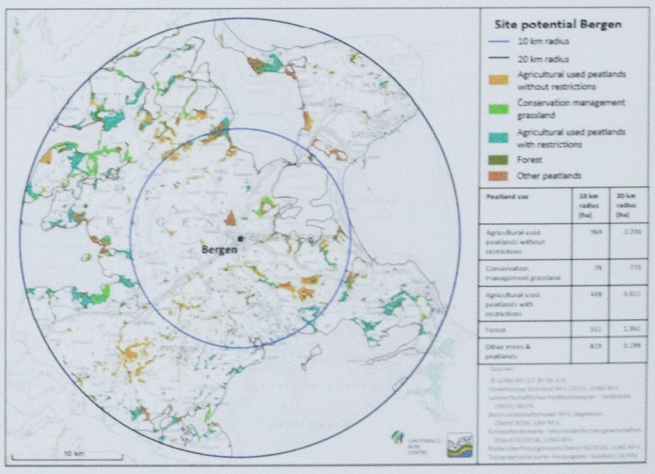

### Potential production sites

#### Marlow (Recknitz)




| Peatland use | 10 km radius [ha] | 20 km radius [ha] |
|---|---|---|
| Agricultural used peatlands without restrictions | 469 | 2.330 |
| Conservation management grassland | 397 | 477 |
| Agricultural used peatlands with restrictions | 2.463 | 5.389 |
| Forest | 1.227 | 3.064 |
| Other mires & peatlands | 1.279 | 4.425 |

#### Bergen (Rügen)




| Peatland use | 10 km radius [ha] | 20 km radius [ha] |
|---|---|---|
| Agricultural used peatlands without restrictions | 969 | 2.936 |
| Conservation management grassland | 78 | 775 |
| Agricultural used peatlands with restrictions | 668 | 4.821 |
| Forest | 551 | 1.361 |
| Other mires & peatlands | 829 | 3.199 |

## Contribution to climate change mitigation

- Substitution of fossil fuels: Emission reduction is about 0,243 t $CO_2$-eq $MWh^{-1}$.
- Land use change (water level raise): Emission reduction of 17,6 t $CO_2$-eq $ha^{-1}$ $a^{-1}$ could be achieved by converting (drainage based) grassland to wet meadow. This option would be realisable short-term.

**Possible sites for district heating plants in Vorpommern-Rügen**

| Location | Heat demand [MWh] | thereof heat from paludiculture biomass [MWh] | Necessary area [ha] | GHG reduction substitution of natural gas [t $CO_2$-eq $a^{-1}$] | GHG reduction land use change [t $CO_2$-eq $a^{-1}$] |
|---|---|---|---|---|---|
| Bergen | 17.300 | 5.000 | 369 | 1.215 | 6.490 |
| Franzburg | 3.700 | 3.500 | 258 | 851 | 4.543 |
| Grimmen | 5.000 | 4.000 | 295 | 972 | 5.192 |
| Marlow | 1.890 | 1.500 | 111 | 365 | 1.947 |
| Puttbus | 5.180 | 4.500 | 332 | 1.094 | 5.841 |
| Richtenberg | 2.000 | 1.800 | 133 | 437 | 2.336 |
| Ribnitz-Damgarten | 2.720 | 2.500 | 184 | 608 | 3.245 |
| Sassnitz | 5.300 | 4.500 | 332 | 1.094 | 5.841 |
| Ummanz | 3.680 | 3.500 | 258 | 851 | 4.543 |
| Total | | 30.800 | 2.272 | 7.484 | 39.978 |

## Conclusion

In the case of implementing additional heating plants, the substitution of natural gas would result in an emission reduction of 7,500 t $CO_2$-eq per year. If the erection of heating plants leads to a land use change and a rise of water level on the production sites, further emission reduction of 40,000 t $CO_2$-eq per year could be achieved. Thus little money is needed to achieve a large contribution for climate mitigation. The investment costs for a heating plant including a redundancy boiler (800 KW) are about 665,000 EUR. Additional costs for the construction of a heating network of 760,000 EUR (2000 m line) and 120,000 EUR for house connection stations (15 pts) have to be calculated.

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