The WAB-project

Wetlands
Algae
Biogas

– A Sustainability in practice project

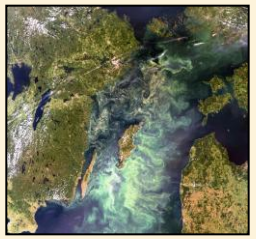
Linda Wolski
Department of Environment, Trelleborg Municipality

An interrelated complex of problems

-demands integrated solutions for counteracting

- Eutrophication
- Climate impact
- Species loss
- Air emissions

Source:www.skanetrafiken.se



Source: SMHI

WAB- An eutrophication counteract project

- Partially EU-financed within the South Baltic Programme
- Budget 1,5 million Euro for 11 partner organisations in Poland and Sweden
- Project duration February 2010-December 2012

Aim: to establish a nutrient reduction cycle based on a holistic approach to extract nutrients from the sea.
This is acheived by combining the reconstruction of wetlands, collection of algae from shores and utilization of the biomass for biogas production

Project partners

- Municipality of Trelleborg
- Municipality of Sopot
- Institute of Oceanology Polish Academy of Science (IOPAS), Sopot
- Pomeranian Agricultural Education Center (PAEC, Gdansk)
- River Basin District Authority for the Southern Baltic Sea River Basin District (Kalmar)
- Linneaus University (Kalmar)
- The Skåne Association of Local Authorities (Biogas Syd)
- Community Union Dolina Redy i Chylonki (Pomorze region)
- Pomeranian Center for Environmental Research and Technology (POMCERT)
- Associated partners: Royal Institute of Technology (Stockholm) and Selfgovernment of Pomorze (Gdansk)

Co-operation with Sopot

- Spa resort, hotspot for tourism
- Reoccuring algal blooms – several million € in lost incomes

Sopot and Pomorze region participation:

- Increase tourism attractiveness
- Utilize collected biomass for biogas and fertilizers in agriculture
- Biogas –one alternative for reducing coal dependency

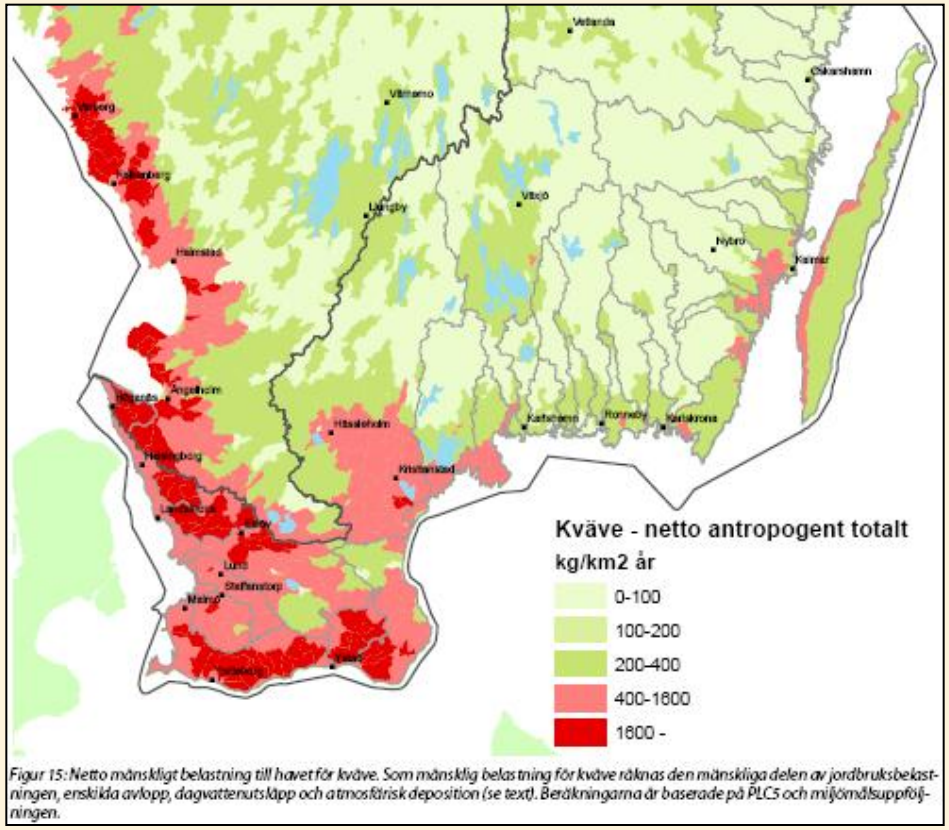
Wetlands

Project activities

- Optimization and contruction of pilot wetlands for cultivation of macro algae in Tullstorp stream (Cladophora)
- Workshops for farmers – wetland construction as a means for counteracting eutrophication
  (Tbg and Pomorze)
- Biological and chemical analysis of effects of constructed wetlands
- Analysis of land suitable for cultivation of limnic algae in Pomorze and Tbg

Prioritized areas for nitrogen leakage

Phosphorous – Trelleborg on average



Figur 15: Netto mänskligt belastning till havet för kväve. Som mänsklig belastning för kväve räknas den mänskliga delen av jordbruksbekastningen, enskilda avlopp, dagvattenutsläpp och atmosfärisk deposition (se text). Beräkningarna är baserade på PLC5 och miljömålsuppföljningen.

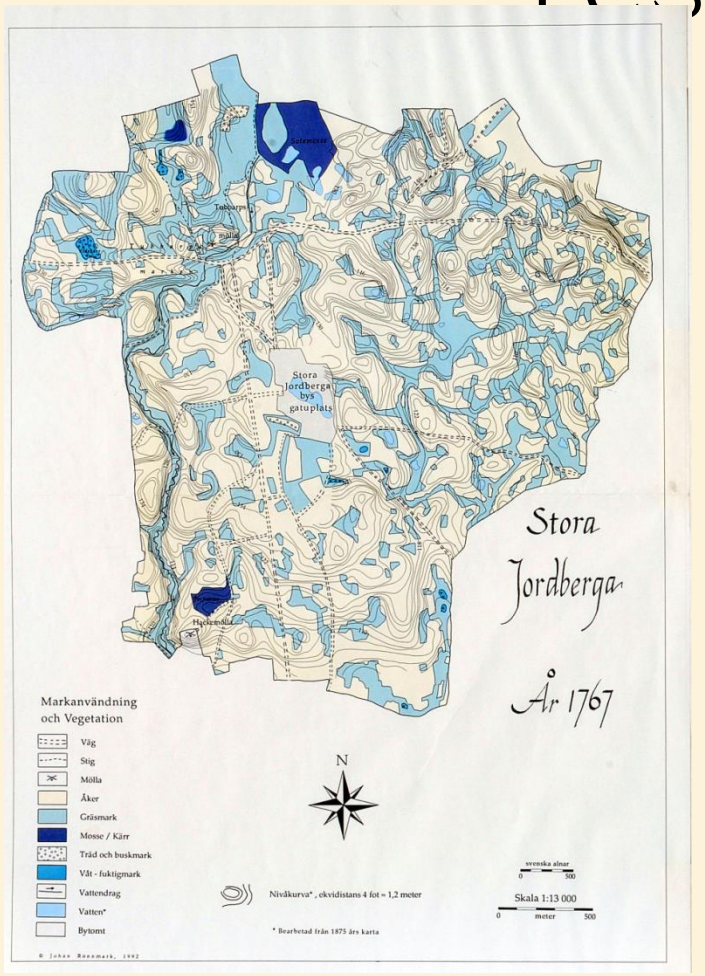
Source: Finn de områden som göder haven mest, Vattenmyndigheterna

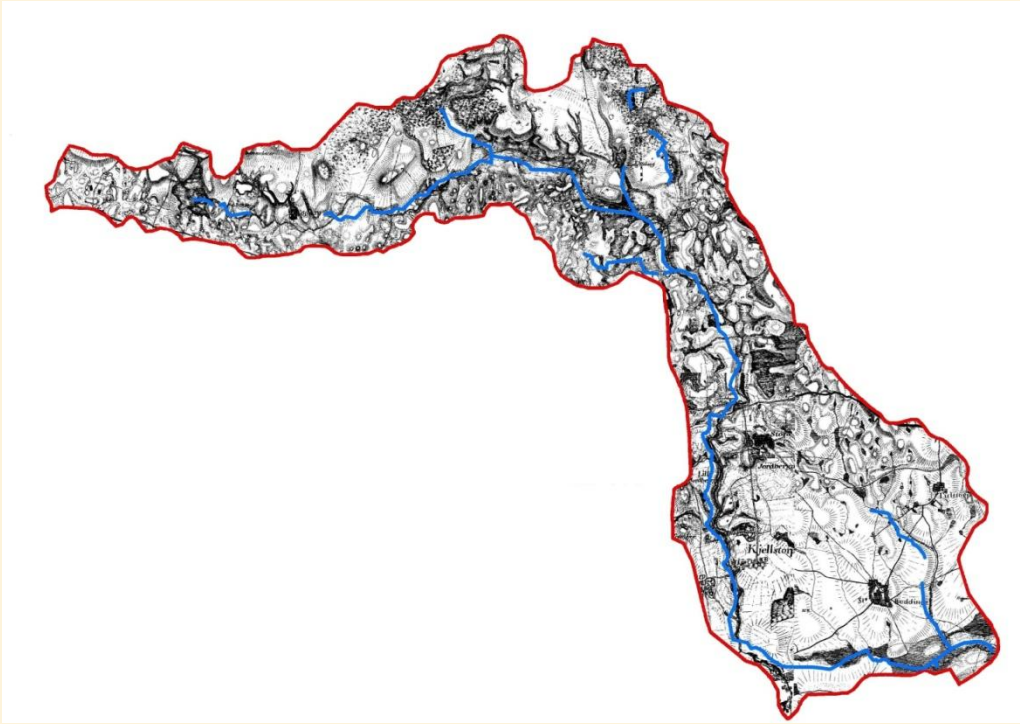
Wetlands Algae Biogas

South Baltic Programme

Trelleborg
2010-10-30

Tullstorp stream restoration





Algae

Eutrophication- filamentrous algae more dominant at the expense of e.g. bladderwrack (blåstång) and eel grass

Only detached, stranded or free floating algae are collected in the project

Project activities:

•Installation of monitoring station for algae forcasting and monitoring -Sopot

•Testing of machines and collection of algae- Tbg/Sopot

•Workshops on algae occurence and collection

•Inventories of biological effects of removing algae

Algae

Algae collection along Tbg coastline:
Estimation (Toxicon, KTH 2009)
70 000 m3 collectable algae fractions during 4 summer months (protected and inaccessable areas excluded)

- Renders possible direct nutrient reduction from BS
- Improves tourism values and boating
- Decreases GHG emissions from decomposing excessive algae masses
- Reduces odor
- Careful test clearings with EIA for estimating effects on the coastal ecosystem

Collection of blooming Cyanobacteria

Figure 1: *Nodularia spumigena* (Helcom, 2004)

- With oil booms for bunker oil spill
- Toxic Nodularia Spumigena – threat to recreation, tourism- and long term; economy
- Ressembles an oil spill: toxic substance – health risk for humans, animals and marine life

Harvest of algae- new innovation?

- Algae - historical use
  -fertilizer, building material
  and fuel
- Limited rights for algae collection- permit
- Until 1940's.

Biogas

Project activities

- Assessment of regional potential for biogas production from aquatic substrates in Pomorze region
- Feasibility study of wetlands-algae-biogas cycle in Pomeranian region (socio-economic perspective)
- Test of algae fermentation in mobile biogas plant
- Development of methods for algae detoxification and utilization of digestate
- Workshops and seminars on biogas production from algae and other substrates

- Promoting local test facilities for algae-biogas cycle

Biogas

Collection of
70 000 m3 of algae may generate
5,1 million Nm3 CH4
→ approx. 50,2 GWh

•Cd levels in Tbg algae limits utilisation of digestate

Alternatives for Cd reduction:
→ willow plantation for Cd-red. + incineration
→separation of Cd in ashes
→ Chemical separation of N, P and toxic substances after digestion

• Removing 70 000 m3 of algae would reduce N by 7 % and P by 50% of annually released nutrients from Tbg streams to the BS
• N- reduction: ca 100 tonnes
•P-reduction: ca 10 tonnes

(Swedish commitment in BSAP: N- red. 20,780 tonnes
P-red. 290 tonnes)

Collected algae today

Biogas potential ~0,7 GWh/year
N-reduction ~8 ton/år
P-reduction ~0,6 ton/år

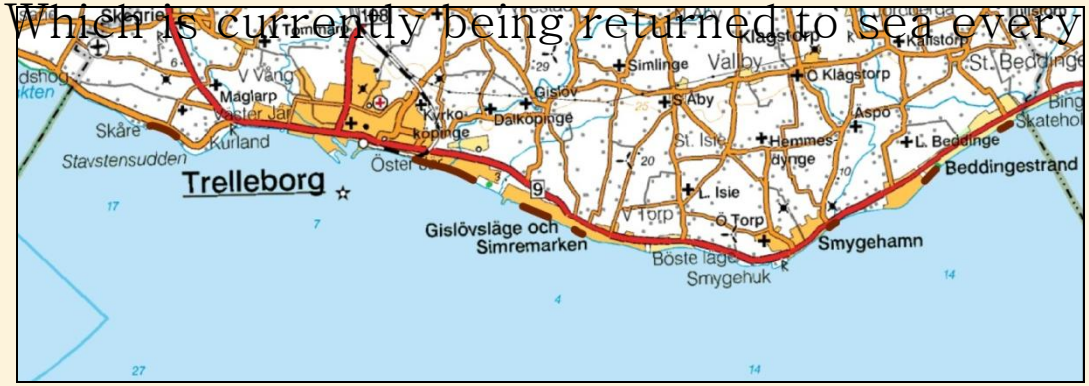
Swedish EPA spends:
100 kr/ removed kg N (10 €)
5000 kr/removed kg P (500 €)
Through wetland construction, restoration of riverbeds, tree plantation etc.

Collected algae today

Trelleborg municipality spends 50 000 € /year for beach clearings

Total ”reduction value” of nutrients in collected algae:
3 800 000 kr ≈ 400 000 €

Which is currently being returned to sea every year



Biogas potential ~100 GWh/year for collection along 70% of the south coast~10 milj. Nm3

-could replace 10 000 cars driving 15 000 km/year

N-reduction ~1100 ton/year
Compared to 20 780 tons - Sweden´s undertaking for the BSAP

P-reduction ~90 ton/year
Compared to 290 tons- Sweden´s undertaking for the BSAP

The biogas potential can be increased by adding additional subtrates

Biogas in Skåne

High demand for biogas in regional public transportation service
•Political resolution 2007 on phase-out of fossil fuels
→2015 all city busses
→2018 all regional busses
→2020 all vehicles

A 5 % increase of travels/year in Skåne=
Demand of 45 million Nm^3 of biogas by 2018

In 2008 the regional public transportation used 3,3 million Nm^3 biogas

Finally…

- Pilot project with potentials for an improved coastal and marine environment
- Spreading the principle ideas for further development and adaptation
- One of many necessary measures for nutrient reduction and fulfillment of the Baltic Sea Action Plan
- Stimulates innovative cleantech solutions in the BS Area

Thank You for Your attention