



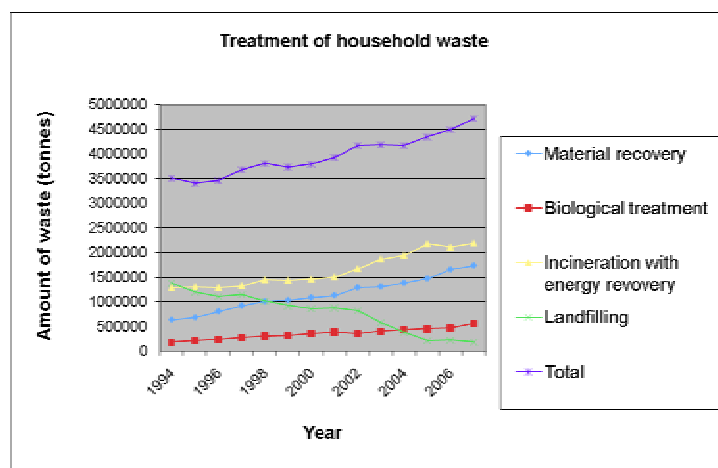
## Challenges of the Scandinavian countries

Simon Lundeberg

Swedish Environmental Protection Agency



## Management of MSW in Sweden (9 million inhabitants)





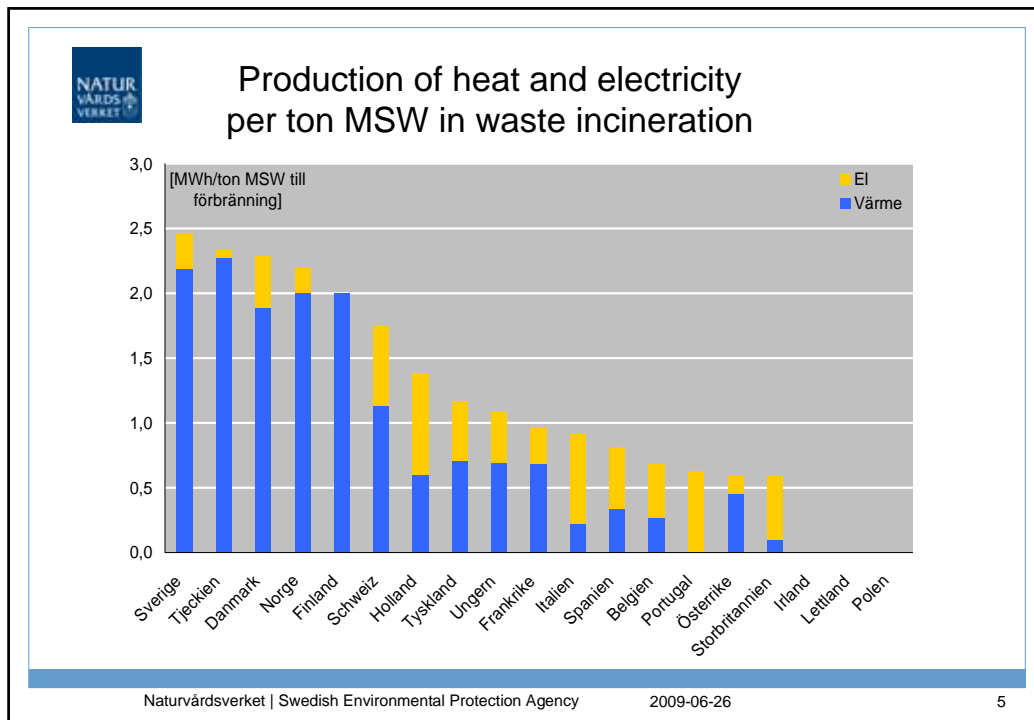
## Soil related aspects

- Focus on nutrients (P as a limited resource)
- High organic matter content in soil and rarely soil erosion
- Liquid manure and digestate established in agriculture (SE, DK)
- Compost as carbon sink or improving soil rarely considered in LCA or policies.



## Energy related aspects

1. Well established district heating systems is a precondition for high recovery of both heat and electricity in Scandinavia.
2. Large reduction of CO<sub>2</sub> and gate-fees compared to el-production only. Waste often competes with other biofuels in district heating systems.
3. Biogas as vehicle-fuel (common in SE) replaces fossil fuels. Is given double CO<sub>2</sub>-reduction in the renewable energy directive. More energy efficient than ethanol as vehicle fuel.
4. Digested manure also reduces N<sub>2</sub>O, as much CO<sub>2</sub>-eqv as the replaced fossil fuels. Digestion of BW and manure is cost-effective. Env-goal of DK farmers to have 50% of manure to AD.



**Use of biogas in Sweden:**

**Today 1.2 TWh/a**

**Potentially 14 TWh/a**

**= 20 % of total traffic-consumption**

Naturvårdsverket | Swedish Environmental Protection Agency 2009-06-26 6



## Economical aspects on biowaste

- Municipalities regulating and financing infrastructure of biowaste (MSW)
- Separate collection of biowaste-MSW is the major cost-driver (SE). Treatment costs of food waste equal (incineration, digestion, composting)
- Landfill- and incineration taxes have pushed alternatives.
- Important in SE: investment grants (30-50%), tax-reductions (on biogas as fuel, on cars for biogas)
- Private-public partnership in AD-plants (munic, farmers, energy comp)



## Some common reasons for development in Scandinavia

- Reduced landfilling of BW is environmentally seen as most important.
- Energy recovery "LCA-equal" to biological treatment of sep collected BW from MSW. Focus on energy - less nutrients and compost as carbon sink.
- Separate collection (SC) a condition for "clean" recycling of BW. No need for SC for non-recycled BW, thus no binding requirement for SC of all BW.
- Economic benefits from increased energy-prices last 10-20 years have made incineration (with heat and el recovery) and biogas plants more interesting.
- Waste management is well developed, thus high recycling rates of other wastes have already been achieved.
- Compost as carbon sink is rarely considered (The Koyoto protocol includes accounting for soil sequestrated carbon).



## Scandinavian aspects on EU-initiatives on biowaste

1. Further reduction of biowaste to landfill environmentally most important.
2. BW-targets efficient in SE, who is in favour of target on EU-level. DK and FI questions economic and environmental motives for a target. DK believes that targets may reduce flexibility.
3. Separate collection a condition when recycling BW. Important not to require mandatory separate collection of all BW.
4. DK favours minimum req. for compost quality to keep high env. protection level. SE supports EOW-criteria for compost and digestate.
5. Digestion of BW and manure plus use of biogas for vehicle fuel efficiently reduces CO<sub>2</sub>. Regional-funds may support biogas-co-plants and biogas infrastructure.



## Management of MSW in Denmark (5.3 million inhabitants)

- Recycling of 65 % of all waste in 2007 (target 2012 is 65 %). Overall landfilling reduced to 6%.
- For biowaste quality criteria but no targets. Garden waste 120 kg/inh/year composted. BW from MSW and industry 35 kg/inh/year is recycled.
- Incineration tax replaced by tax on CO<sub>2</sub> outlets. BW considered CO<sub>2</sub> neutral.
- More energy from biogas – mostly based on manure. Incentives for electricity production (0,1 E/kWh for biogas).
- Recycling of fertilizer and organic matter is blocked in many agricultural areas by intensive production of animals, creating a surplus of nutrients.



## Management of MSW in Norway

- Landfill ban (10 % TOC) and end disposal tax approx € 50.
- Biological treatment 2008: 0,44 Mton of BW, composting predominating
- Criterias on organic fertiliseres and soil improvers (QA, limits metals, impurities, pathogens, 4 classes corresponding user restrictions)
- Planning for biogas production - investment program established 2009. Focus on use as vehicle fuel.
- Green certificates for renewable electricity in preparation (joint system with existing Swedish model)



## Management of MSW in Finland

- Considering a ban for landfilling of biowaste. Landfill tax in place.
- Separate collection of biowaste in most of the municipalities. Coverage about 35-40 % of the biowaste potential. Composting is dominating.
- Considering biogas plants. Feeding tariff for electricity from biogas is on the way.
- First plants for ethanol from biowaste are built.



## Drivers for biowaste in Sweden

- Investment grants for biological treatment 1998-2008
- Tax on landfilling of organic waste (45 E/t) 2000
- Environmental labeling of compost/digestate 2000
- Tax exemption for biogas as vehicle fuel 2003
- National targets for biowaste 2004-2010
- Ban on landfilling of organic waste 2005
- Tax on incineration of MSW (10-45 E/t) 2006



## Swedish targets on biowaste

- 2010: 50 % of MSW is recycled, incl. biological treatment
- 2010: 35 % of food waste from MSW is recycled by separate collection and biological treatment (61 kg/inh in 2007 including garden waste)
- 2010: 100 % of clean food waste from food industry is recycled by biological treatment
- 2015: 60% of phosphorus from waste water is recovered