

rem^{ew}e

Regional Mobilizing of Sustainable Waste-to-Energy Production



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Waste-to-Energy in Remowe regions

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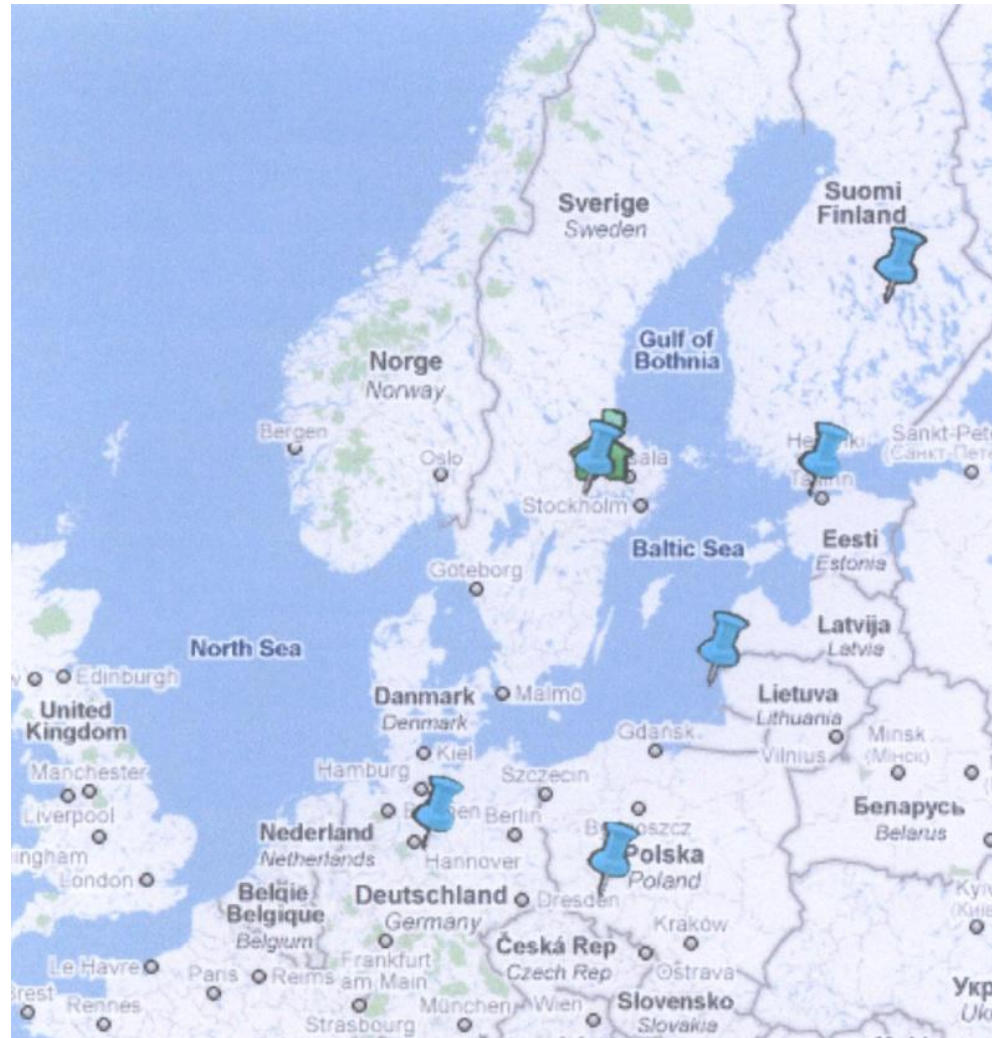


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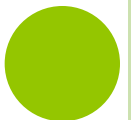


Project regions



Project regions

- **Eesti (Estonia)** - the whole country,
- **Lower Silesia (Lower Silesia Voivodship)** - one of the biggest among 16 main regions (Voivodships) in Poland,
- **Klaipėdos, Telsių, Šiaulių, Tauragės apskritys (Western Lithuania)** – 4 among the main regions of Lithuania,
- **Pohjois-Savo (North Savo Region)** - province of Eastern Finland,
- **Västmanlands län (Västmanland County)** – one of the 21 counties of Sweden

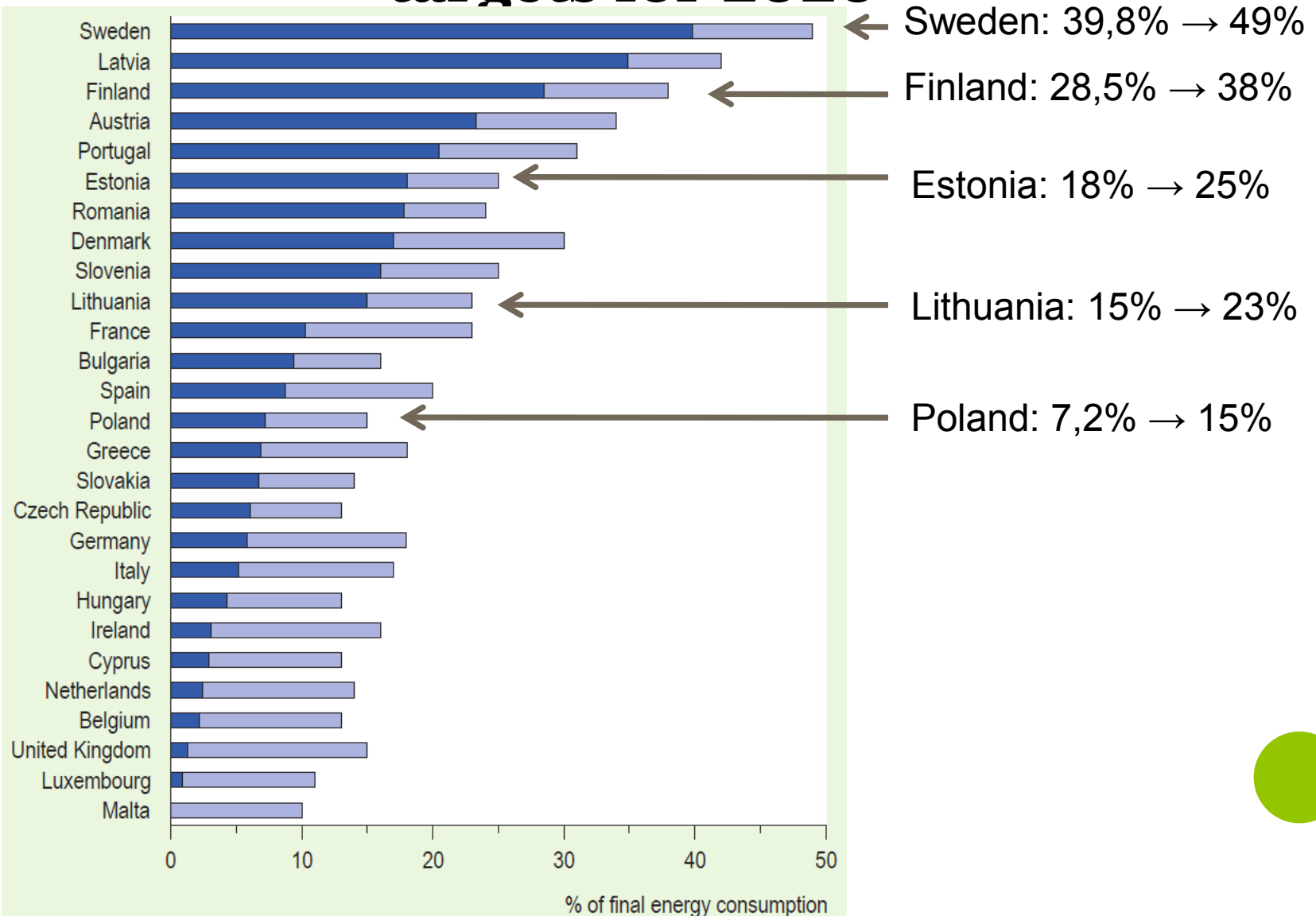


Basic characteristics of the regions

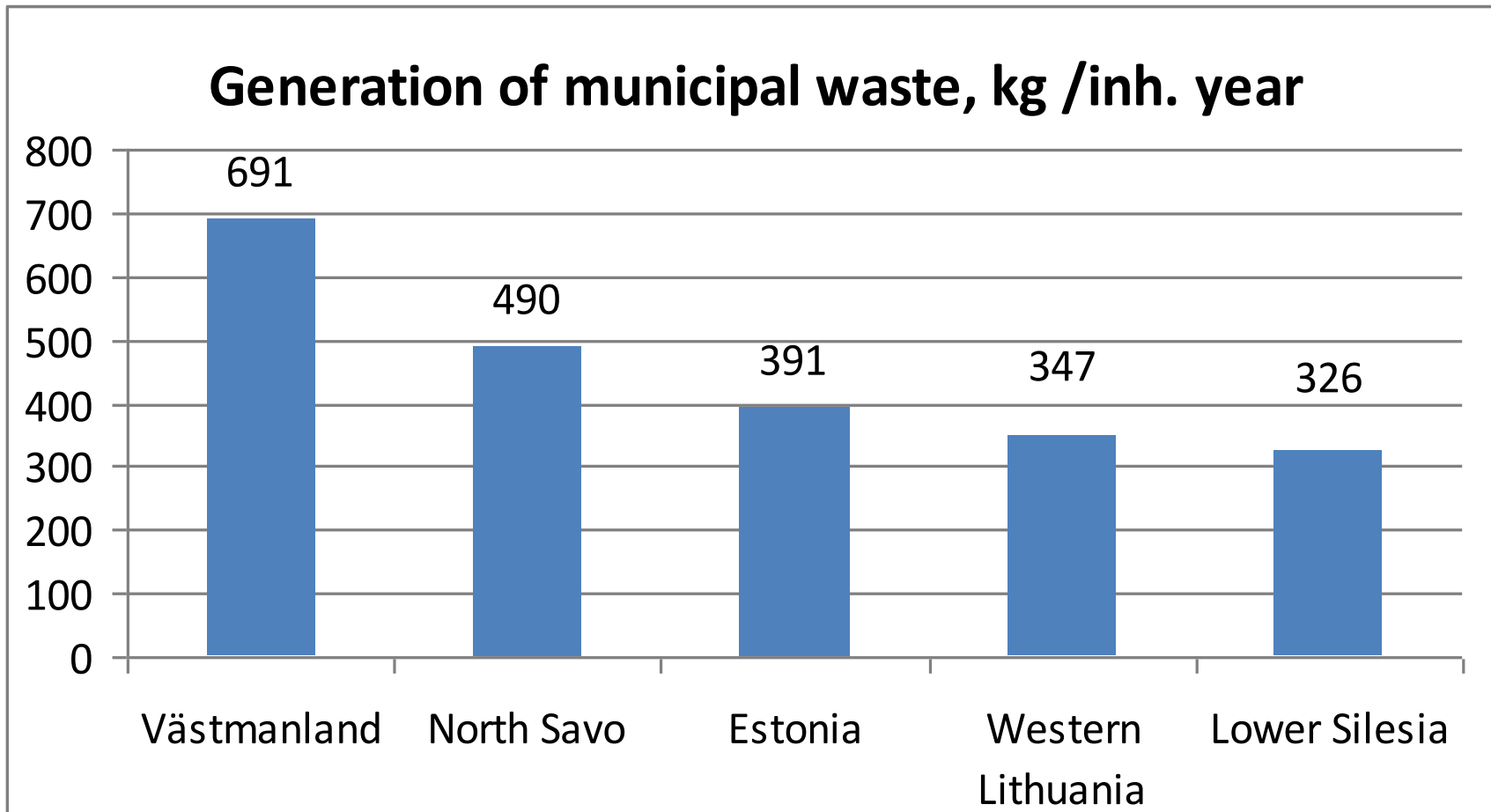
Parameter	Unit	Estonia	Lower Silesia	North Savo	Västmanland	Western Lithuania	Total
Area	km ²	45226	19947	20367	5145	22510	113195
Population	thous. inh.	1340	2878	251	252	1030	5751
Population density	inh./km ²	31	144	12	48	46	51
% of the country area population							
	%	100	6,4	6,0	1,1	34,5	
	%	100	7,6	4,7	2,7	30,9	
Regional GDP	MEUR	14305	29449	7119	6764	6706	
	EUR/inh.	10.675	10.232	28.363	26.841	6.511	



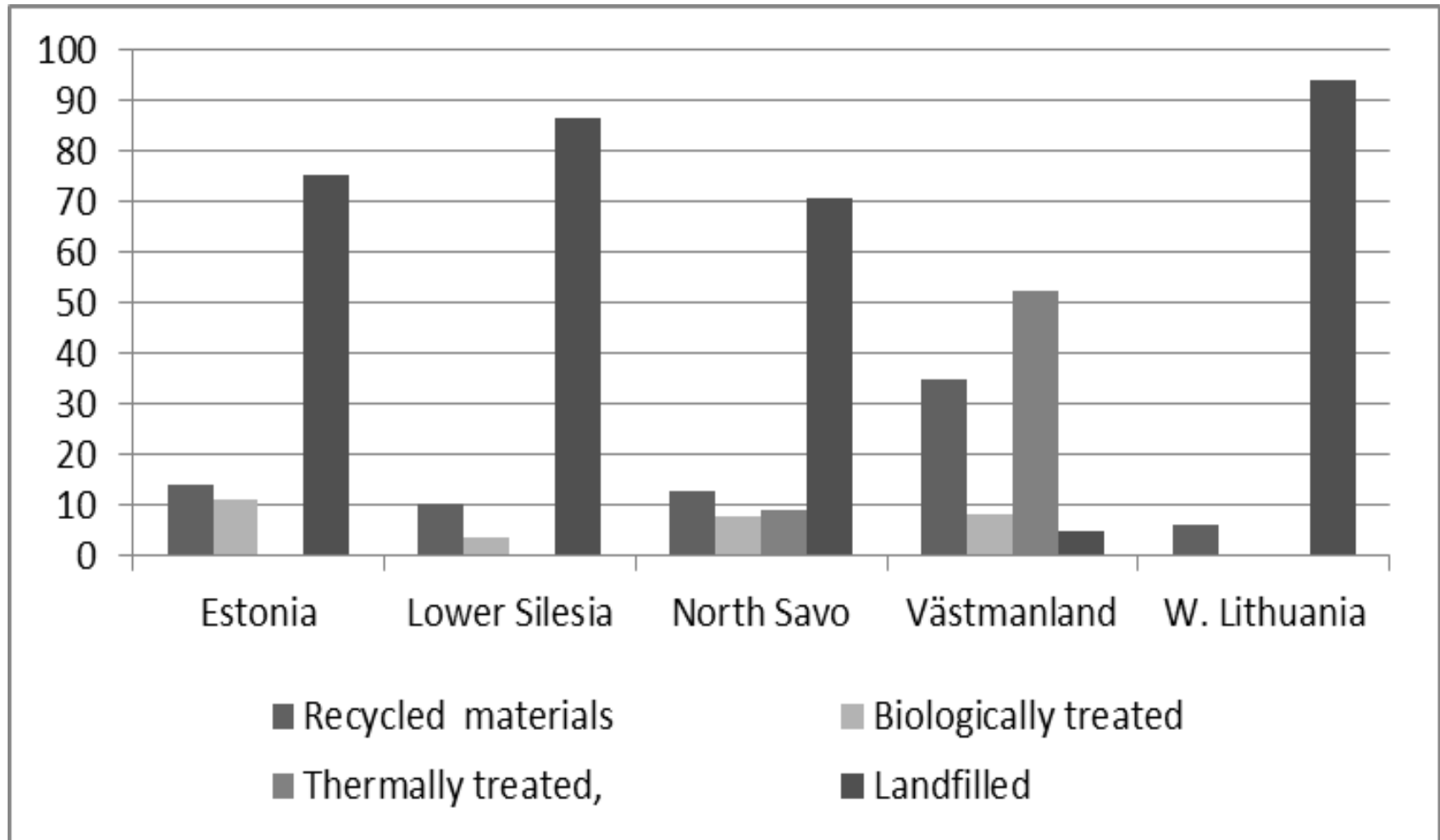
Share of renewable energy in 2005 and targets for 2020



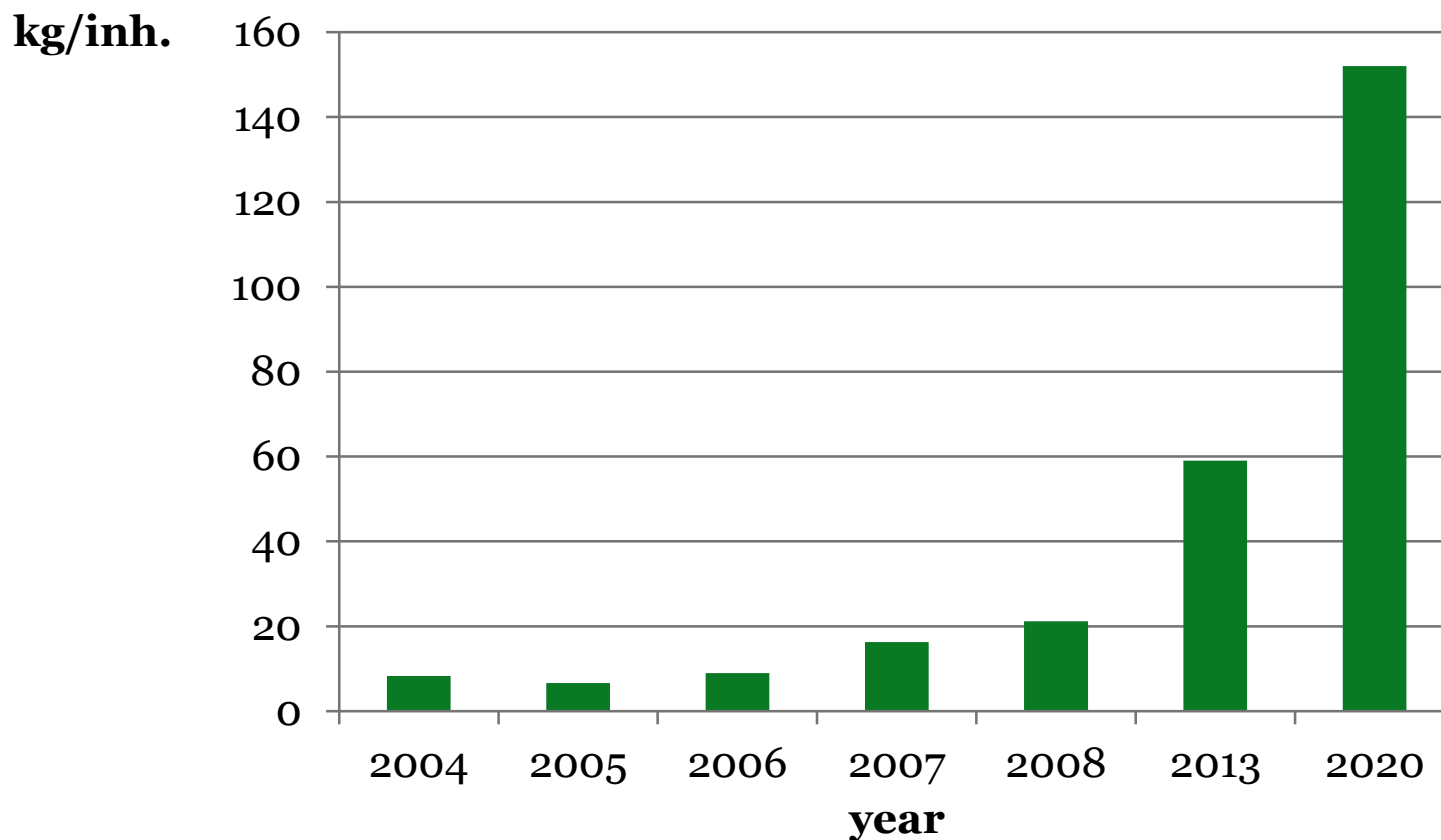
GENERATION OF MUNICIPAL WASTE



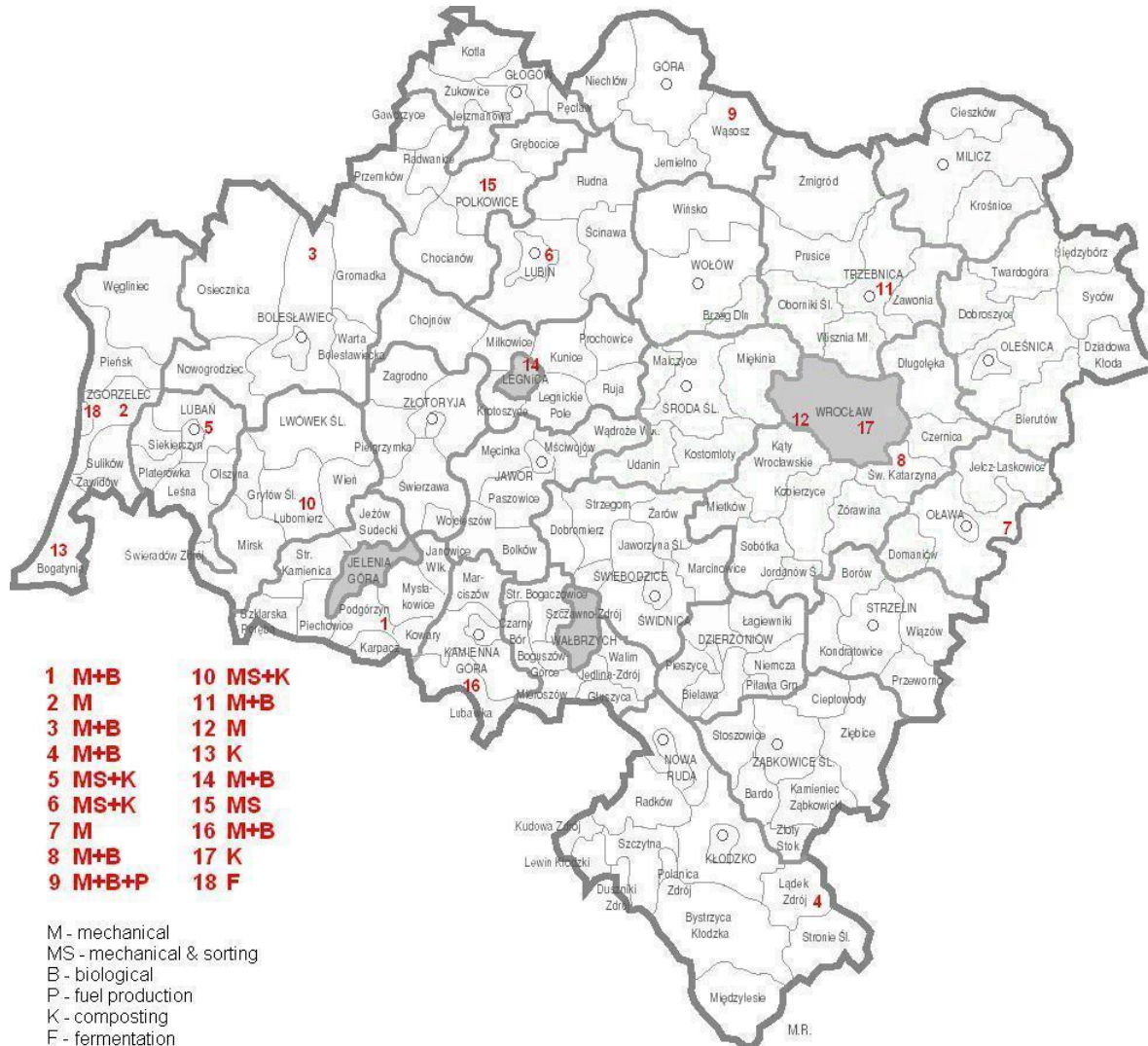
MUNICIPAL WASTE MANAGEMENT



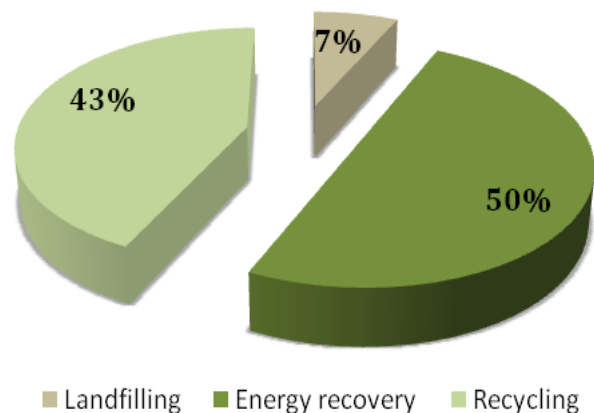
Achieved and forecasted necessary levels of separate waste collection in Lower Silesia



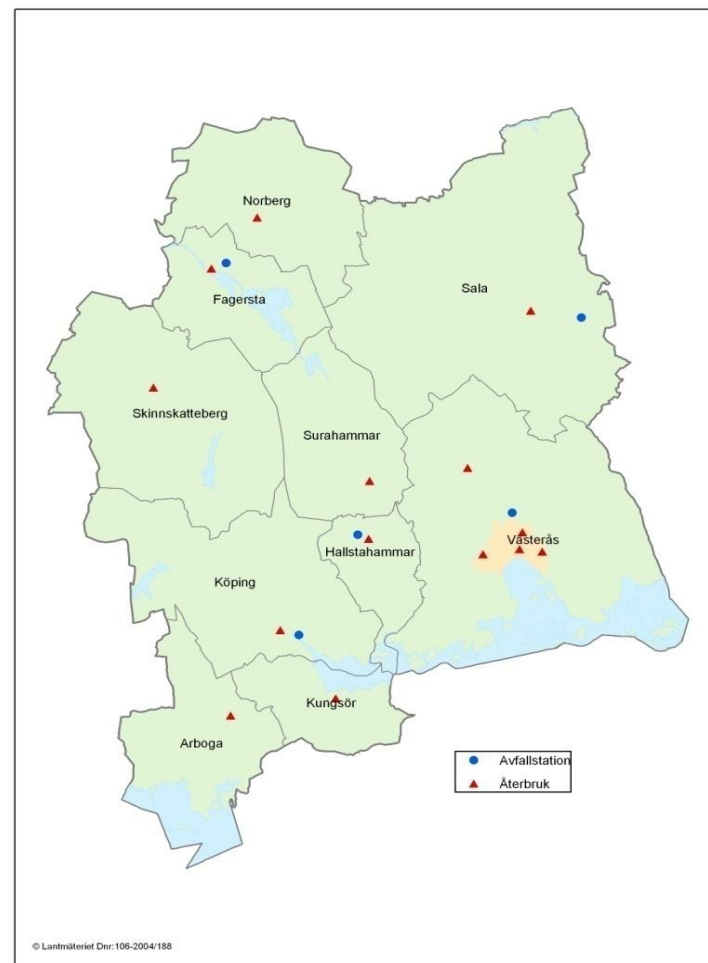
Mechanical, biological and mech.-biol. waste treatment plants in Lower Silesia



Household waste treatment in the County of Västmanland 2008



- 15 recycling stations in Västmanland (Jan 2010)
- NORSA waste incineration plant in Köping. about 25 000 t/a
- Incineration of waste outside of the region



• Between 1994 and 2007, the amount of household waste landfilled decreased by 89 %. There is a ban on landfilling of combustibile and organic waste.

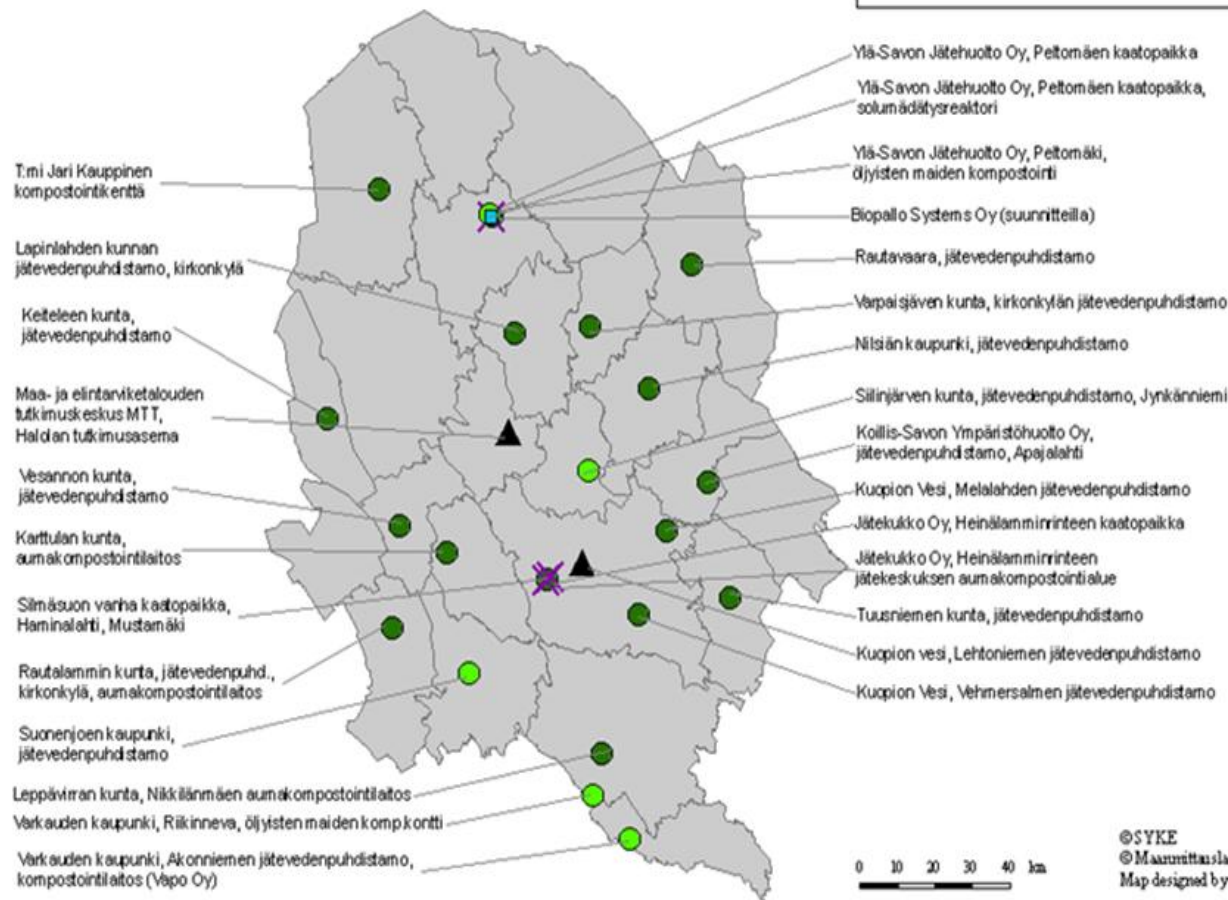
Waste treatment plants in North Savo

Composting and digestion plants in operation or being planned on in the area of Centre for Economic Development, Transport and the Environment for North Savo in 2010

Source: VAHTI-database, Biogasplant register of the University of Eastern Finland, Finnish Environment Institute SYKE and Ministry of the Environment

Plant type

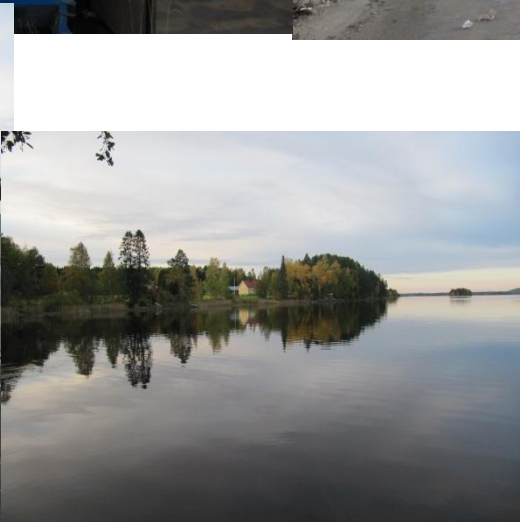
- Windrow composting plant (16)
- ▲ Biogas plant (2)
- ✕ Pumping station for landfill gases (3)
- Composting plant (5)
- Cell digestion plant (1)



Västmanland – biowaste anaerobic digestion



North Savo – landfill with sorting line and RDF production



Lower Silesia - landfill with sorting line and aerobic stabilization platform



Biogas production potential of animal waste, GWh/year


Animals	Lower Silesia	Västmanland	North Savo	Western Lithuania	Estonia
Cattle	354*/56	28	178	175*	
Pigs	172*/67	15	7	140*	
Poultry	333/333	1		34*	
Horses		24	11		
Sheep		1	2		
Total	859*/456	68	198	349*	55**

*Maximum potential calculated on the base of the total possible stocking of farms and the maximum number of breeding cycles per year

** Estimation based on the total mass of manure produced

Wastewater treatment plants (WWTP) with anaerobic digestion of sludges

In total, 30 wastewater treatment plants in five regions are equipped with installations for methane fermentation of sewage sludge, including:

- more than half (6 out 10) WWTP in Västmanland,**
 - approximately 10% of the WWTP of Lower Silesia (21 out 203) and**
 - 1 plant in each region of Western Lithuania (Klaipėdos), North Savo (Kuopio) and Estonia (Tallinn).**
- 

Biogas usage for energy recovery in WWTP

○ Lower Silesia

- heat & power generation 7 WWTP
- only heat generation 4 WWTP
- no biogas capture 10 WWTP

Electr. 9,9 GWh/year
Heat 36,7 GWh/year

○ Västmanland

- heat generation 5 WWTP
- gas upgrade 1 WWTP

Total 19 GWh/year

○ North Savo

- heat & power generation 1 WWTP

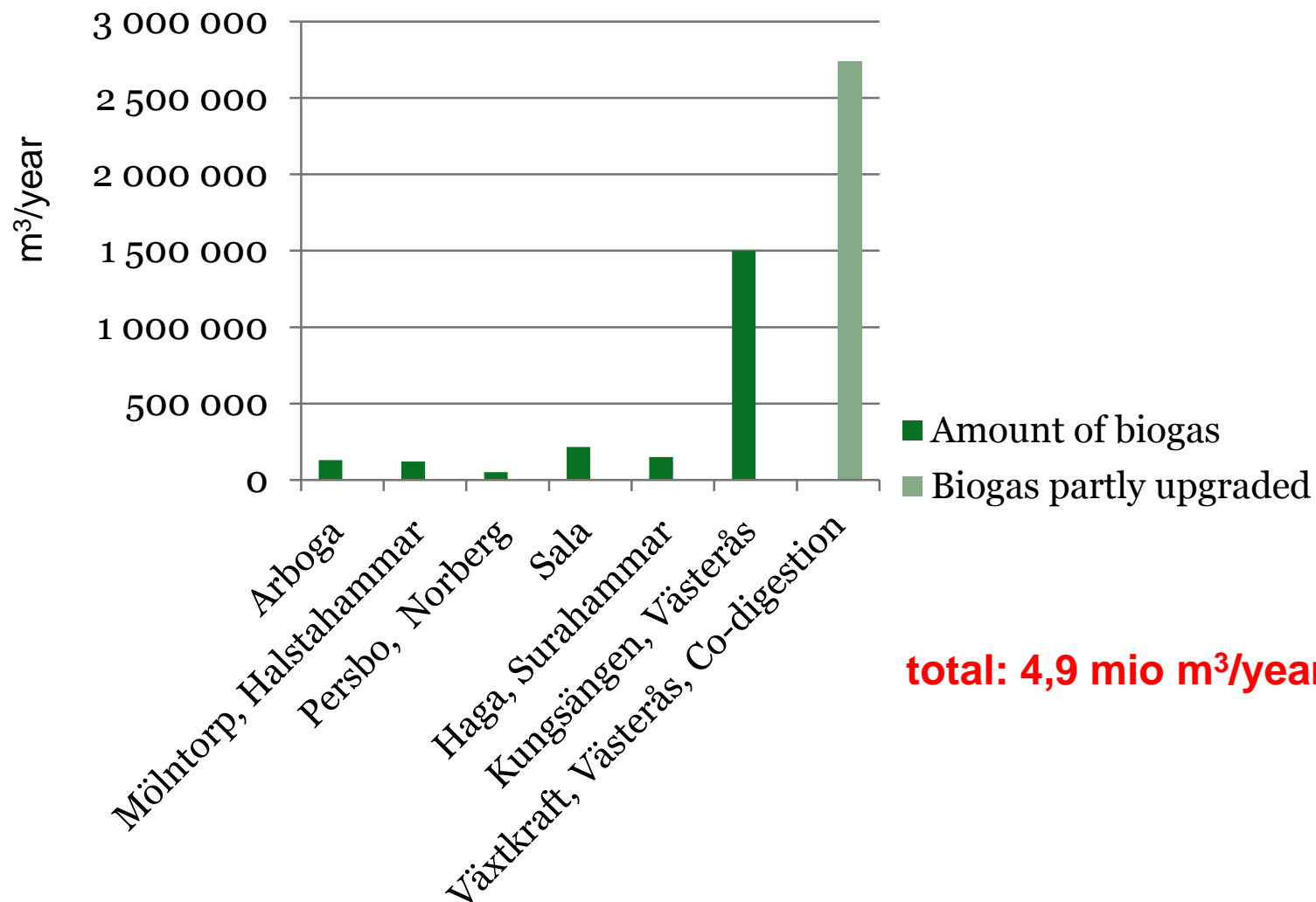
Electr. 2,1 GWh/year
Heat 4,2 GWh/year

○ Western Lithuania (only Klaipėdos)

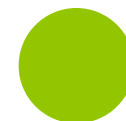
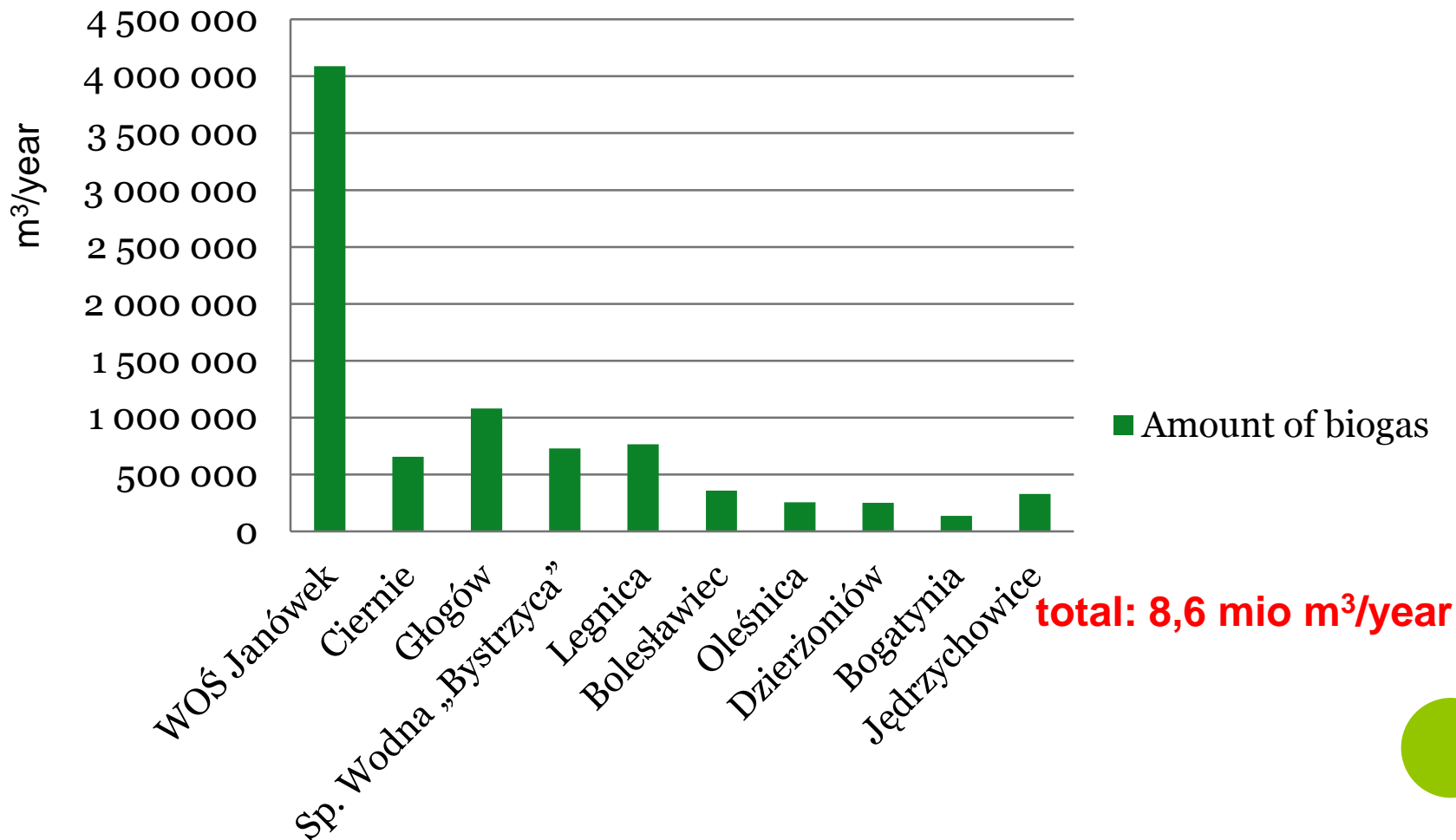
- heat & power generation 1 WWTP

Electr. 4,7 GWh/year
Heat 6,6 GWh/year

Sewage sludge and biowaste use for biogas generation in Västmanland



Sewage sludge use for biogas generation Lower Silesia



Biogas management in WWTP



Landfill biogas capture & power generation

Lower Silesia:

- Total number of munic. landfills under operation 42
 - with biogas capture & power generation 4
 - with biogas capture & power generation under construction 2
 - with biogas capture and flaring 34

Total electricity produced: 17,5 GWh/year + heat

Västmanland

- two landfills with landfill gas extraction: Isätra and Gryta - biogas in Gryta landfill, which corresponds to 19 GWh.

**Electricity production 4,7 GWh/year + 10 GWh/year
heat production**

Landfill biogas capture & power generation

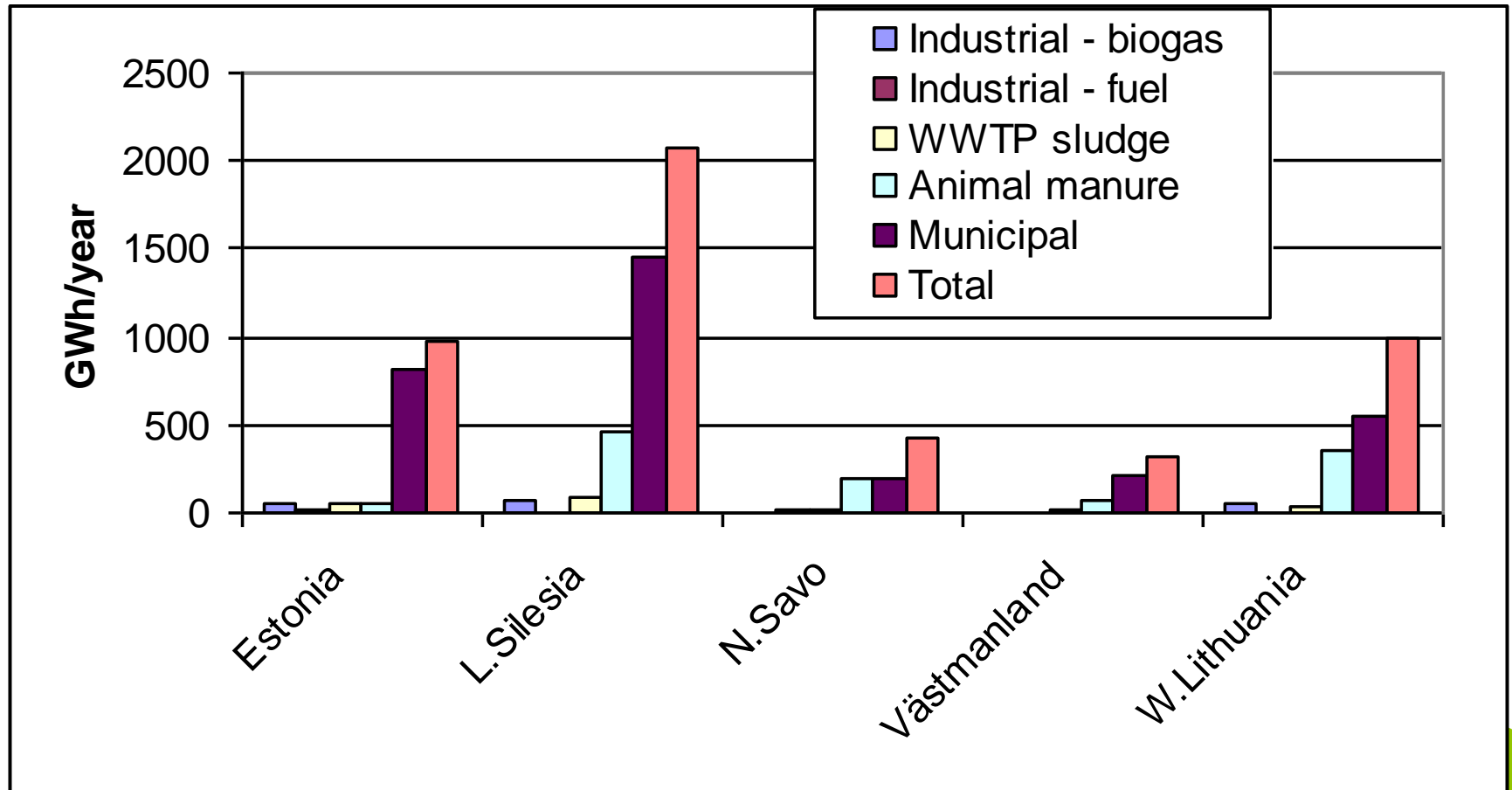
North Savo:

- Total number of munic. landfills with biogas capture 4
 - with biogas capture & heat generation 2
 - with biogas capture and flaring 1

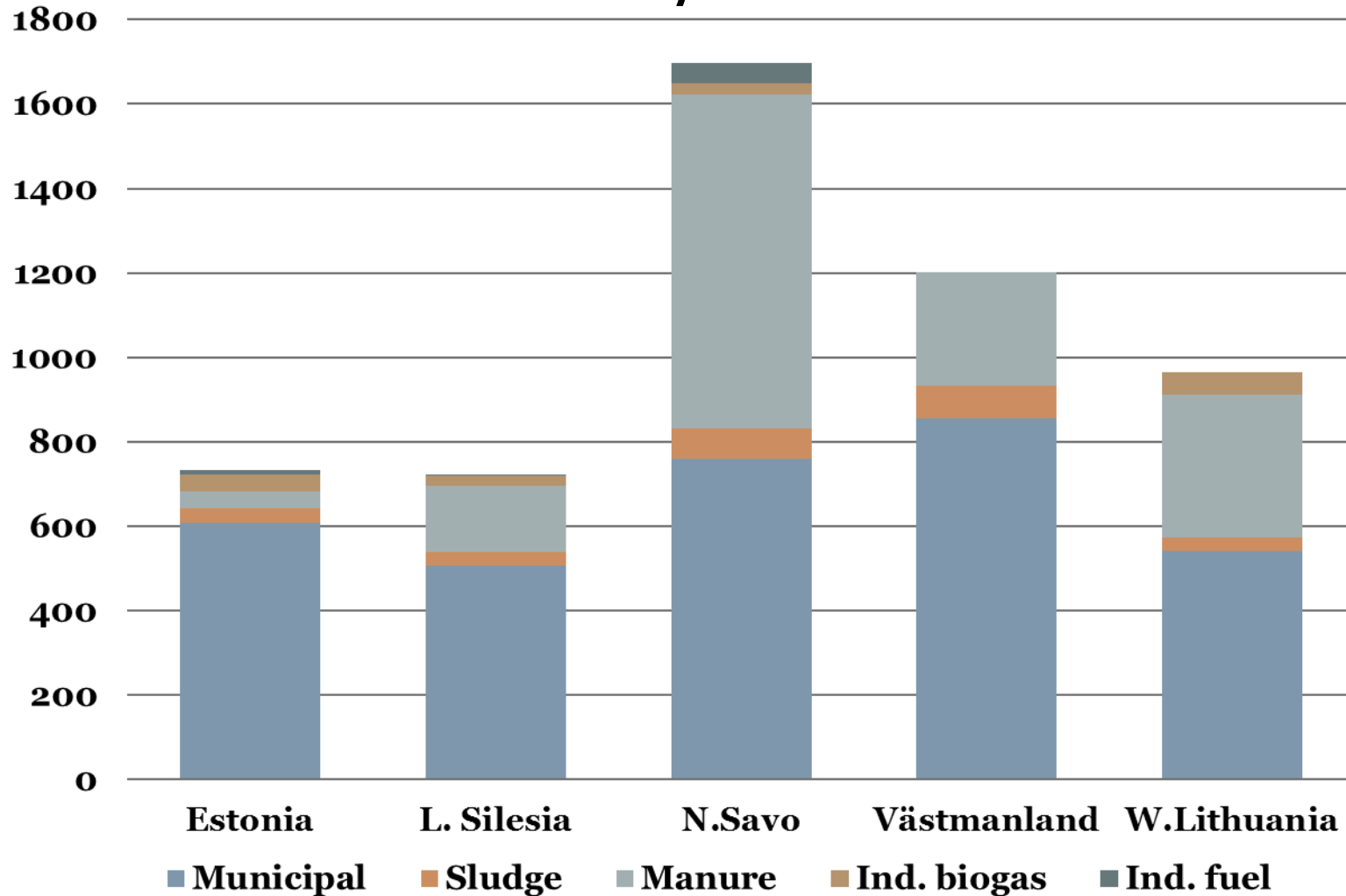
Total heat produced: 7,2 GWh/year



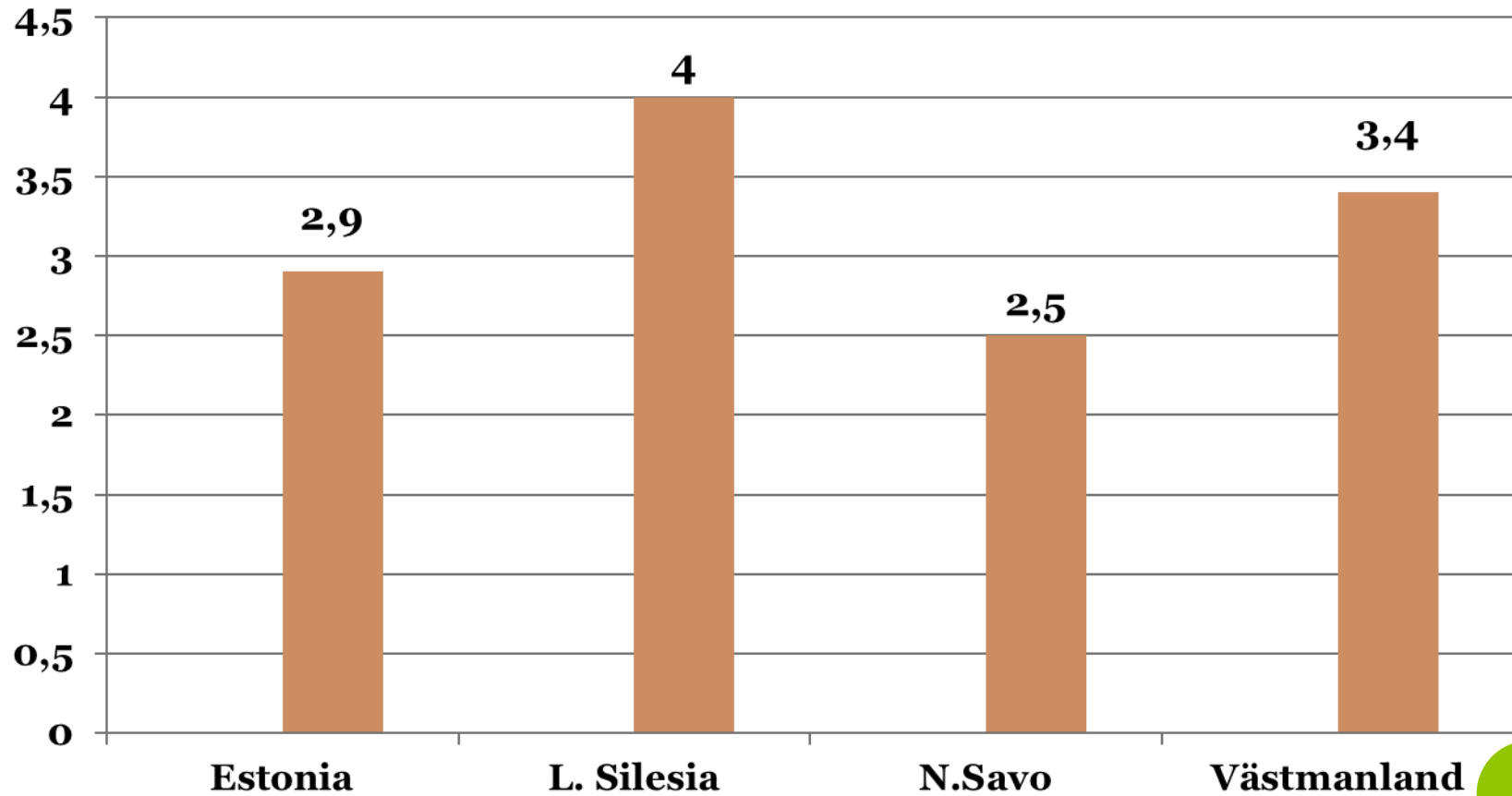
Total waste-to-energy potential, GWh/year



Total waste-to-energy potential, GWh/inh.



Share of waste-to-energy potential in primary energy usage, %



Västmanland - conclusions

○ **Municipal waste**

- high recycling and energy recovery rate,
- very low rate of landfilling,
- expected further increase of energy recovery,

○ **WWTP sludge**

- high rate of energy recovery even from small WWTP

○ **Manure**

- lack of energy recovery,
- expected construction of several biogas plants

○ **Industrial waste**

- lack of reliable data



Lower Silesia - conclusions

○ **Municipal waste**

- low recycling and biological treatment rate,
- very high rate of landfilling,
- expected increase of recycling and biological treatment, including anaerobic digestion,
- longterm plans for energy recovery by incineration,

○ **WWTP sludge**

- growing rate of energy recovery – biogas and sludge drying,

○ **Manure**

- growing development of biogas plants,

○ **Industrial waste**

- lack of reliable data



North Savo - conclusions

- **Municipal waste**

- low recycling and biological treatment rate,
- high rate of landfilling,
- low rate of energy recovery (co-incineration),
- longterm plans for energy recovery by incineration,

- **WWTP sludge**

- low rate of energy recovery (biogas), high rate of composting,

- **Manure**

- low rate of energy recovery (biogas),

- **Industrial waste**

- high amount of wooden waste.



Estonia - conclusions

- **Municipal waste**

- low recycling and biological treatment rate,
- very high rate of landfilling,
- lack of energy recovery,
- longterm plans for energy recovery by incineration,

- **WWTP sludge**

- low level of energy recovery (biogas),

- **Manure**

- low level of energy recovery (biogas),

- **Industrial waste**

- high amount of wooden waste.



Western Lithuania - conclusions

○ **Municipal waste**

- low recycling and biological treatment rate,
- very high rate of landfilling,
- lack of energy recovery,
- construction of incineration plant,

○ **WWTP sludge**

- low level of energy recovery (biogas),

○ **Manure**

- lack of energy recovery (biogas),

○ **Industrial waste**

- lack of reliable data.



Economic support for RES (Renewable Energy Sources) in Remowe regions

- In all countries available **investment support** for RES technologies
- Most of the regions - an obligation of energy companies providing electricity for final users to **purchase electricity** generated and heat produced in cogeneration from RES,
- All the regions implemented the **certificates of origin** which confirm that energy was generated from renewable resources.
- A number of **tax exemption** measures implemented in individual countries.



Price regulation

- **Feed-in tariffs** - the most common instruments in the EU27, two options:
 - the feed-in tariff, which guarantees a fixed price per kWh, or
 - the feed-in premium, which is paid on top of the market price for electricity.

When this payment is guaranteed to the electricity producers for 15-20 years, they face high investment security
(Estonia, Lithuania, Finland)

- **Quota system** – alternative system - the support is based on, stimulated by trading of certificates of origin **(Poland and Sweden)**

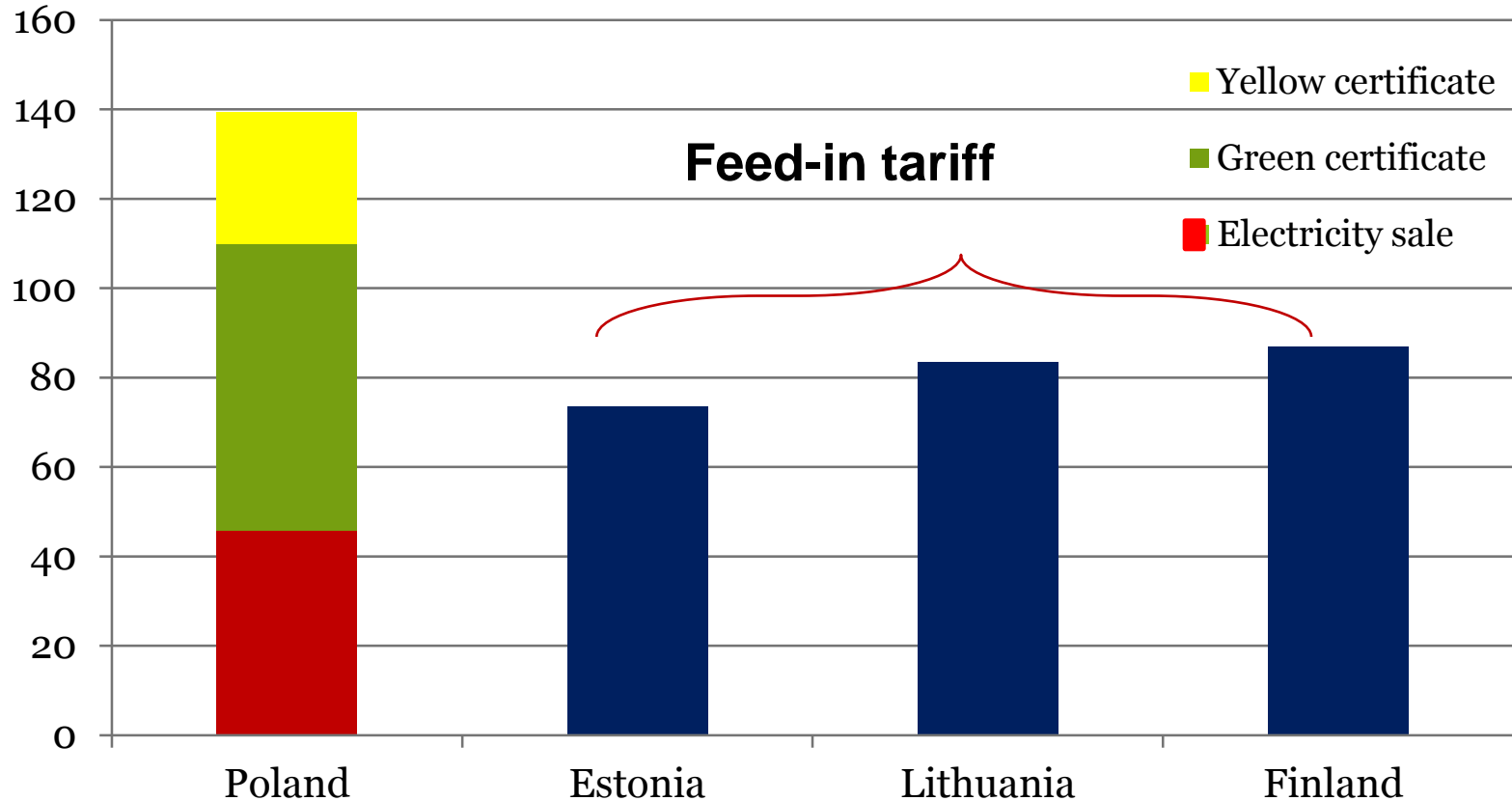


The level of price regulation

Country	Feed-in tariff EUR/MWh _{el}	comment
Estonia	73,5 (or 51,8)	CHP, alternatively feed-in premium of 53,7 (or 32,0 EUR/MWh _{el})
Finland	83,5	In CHP a heat premium of 50 EUR/MWh is paid
Lithuania	87	

Country	Revenue from certificates EUR/Mwh _{el}	comment
Poland	63,9 – 93,5	only electricity – CHP (cases)
Sweden	33	

Current level of price regulation



Conclusions

- **High potential of renewable energy from waste, amounting to 2,5-4,0 % of primary energy consumption of the particular regions**
- **Västmanland is a leader among the Remowe regions in recovery of energy from municipal waste and WWTP sludge**
- **Lower Silesia is a leader among the Remowe regions in recovery of energy from agricultural biogas**
- **There is a need for efficient development of waste-to-energy projects in all sectors of waste management in Remowe regions**



Conclusions

- **Availability of EU funds – stimulation of development: Poland - 6 incinerators, Lithuania – 1**
 - **but also a driver for high investment costs**
- **Very high investment costs for biogas plants (>4 mio EUR/1 MW installed)**
- **In Poland currently the highest level of support, but no price guarantee – recession in investment expected**
- **In Sweden landfill tax, tax on fossil carbon and energy and other supporting measures stimulated high biomass use and waste-to-energy**

