

remowe

Regional Mobilizing of Sustainable Waste-to-Energy Production

Remowe WP 3 Workshop

24.11.2011 Wroclaw

North Savo, Finland

Project Manager Ari Jääskeläinen

Savonia University of Applied

Sciences

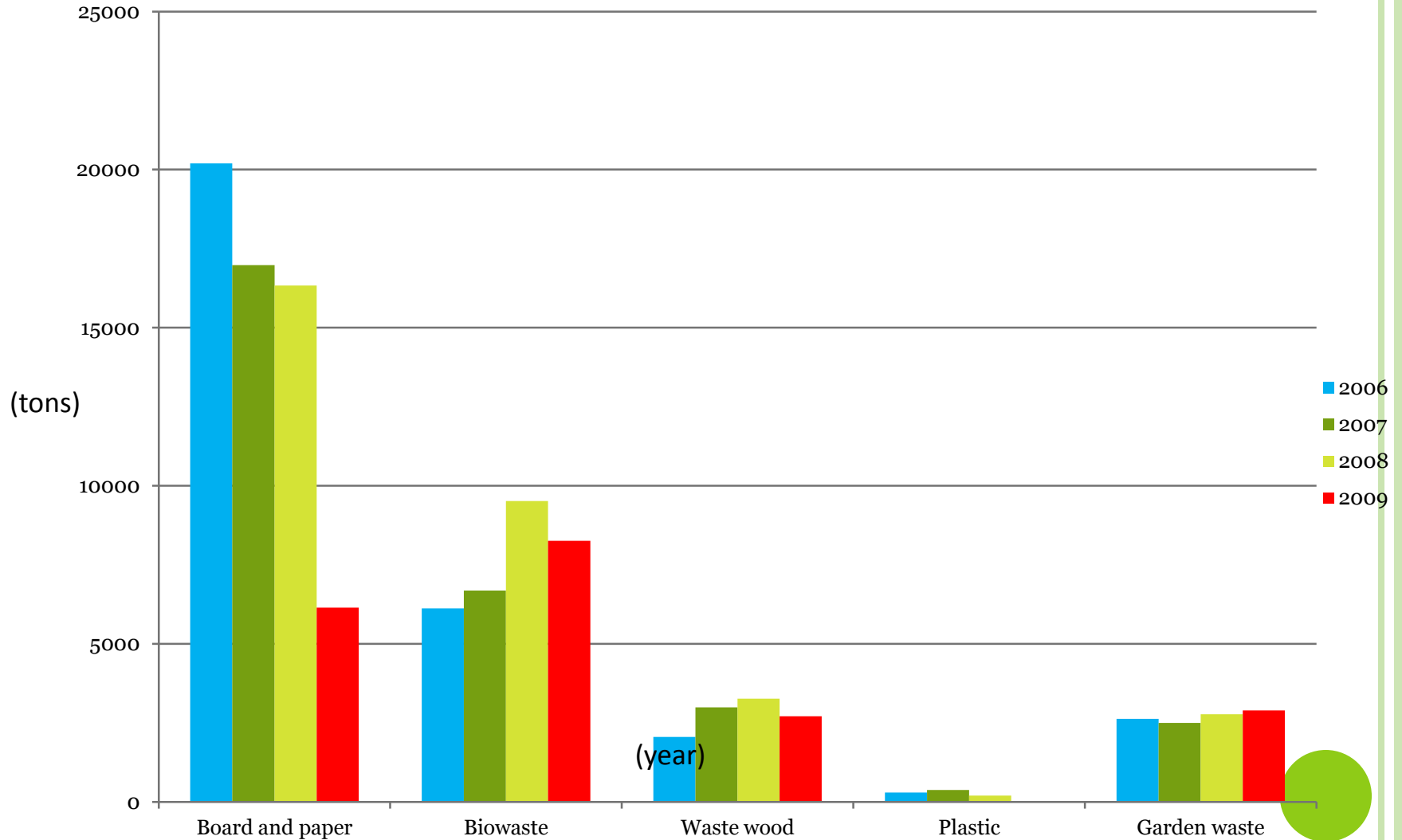


Part-financed by the European Union
(European Regional Development Fund
and European Neighbourhood and
Partnership Instrument)

rem^owe
CURRENT
STATUS
REPORTS OF
WASTE-TO-
ENERGY
UTILIZATION IN
PARTNER
REGIONS

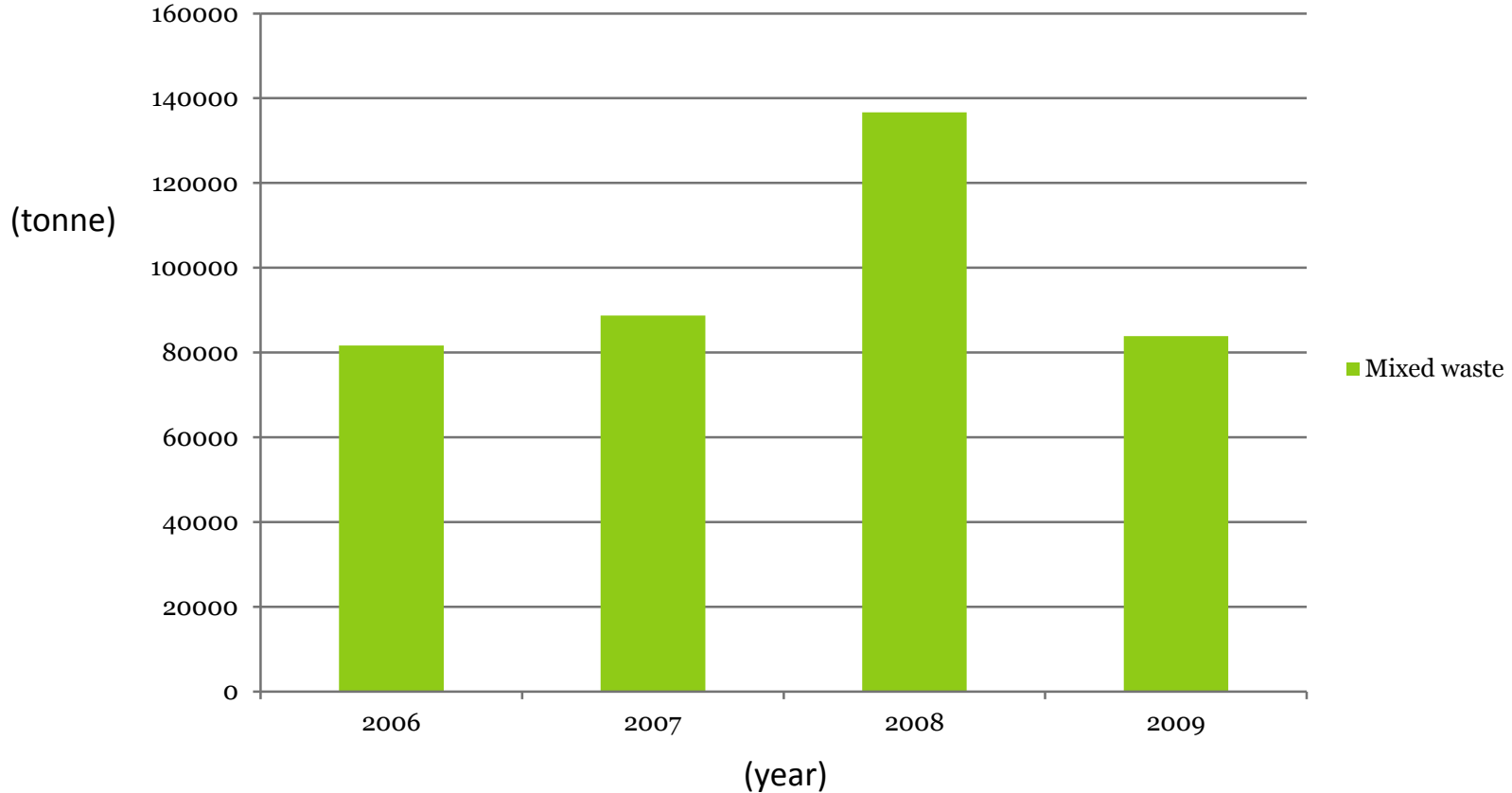


MUNICIPAL WASTE COLLECTED TO NORTH SAVO REGION



MUNICIPAL WASTE COLLECTED TO NORTH SAVO REGION

Mixed waste



Year 2008 mixed waste was gathered about 40 000 tons from outside of Northern Savo



CURRENTLY OPERATING WASTE-TO-ENERGY ESTABLISHMENTS IN NORTH SAVO REGION

- Lehtoniemi biogas plant in the municipal waste water treatment plant in the City of Kuopio
- Biogas plant of MTT Agrifood Research Finland in Maaninka
- Biogas from Heinälamminrinne landfill area is collected and burned in the local energy plant in Kuopio



LEHTONIEMI MUNICIPAL WASTEWATER TREATMENT PLANT, INCLUDING BIOGAS PLANT (PHOTO: KUOPION VESI LTD)



PLANNED WASTE-TO-ENERGY PLANTS

- Eco-powerplant to Varkaus
- Biogas plant to Pieksämäki (South Savo)






rem^owe
ECO-POWERPLANTS
IN FINLAND

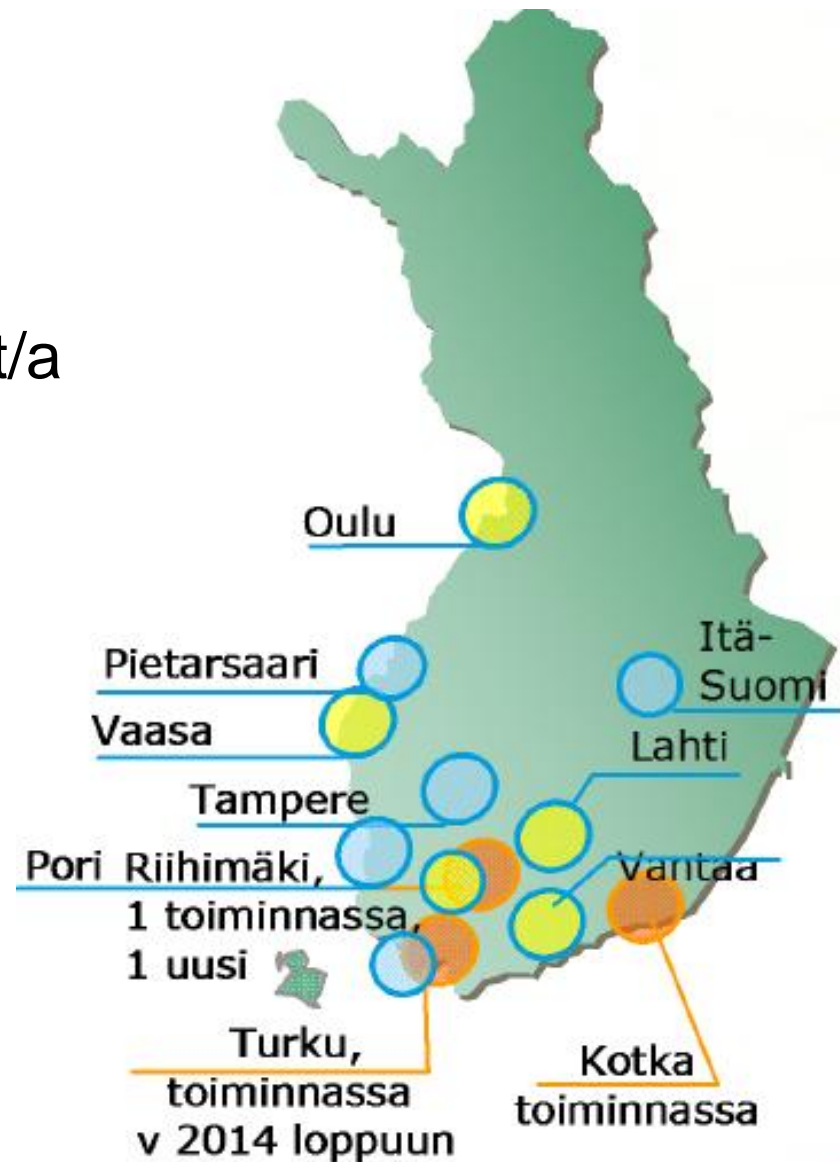
Municipal solid waste 2,5 Mt/a

46 % Landfilling

36 % Recycling

18 % Energy utilization

-  Planned
-  In operation
-  In construction



PLANNED LOCATION IN RIIKINNEVA WASTE MANAGEMENT CENTRE



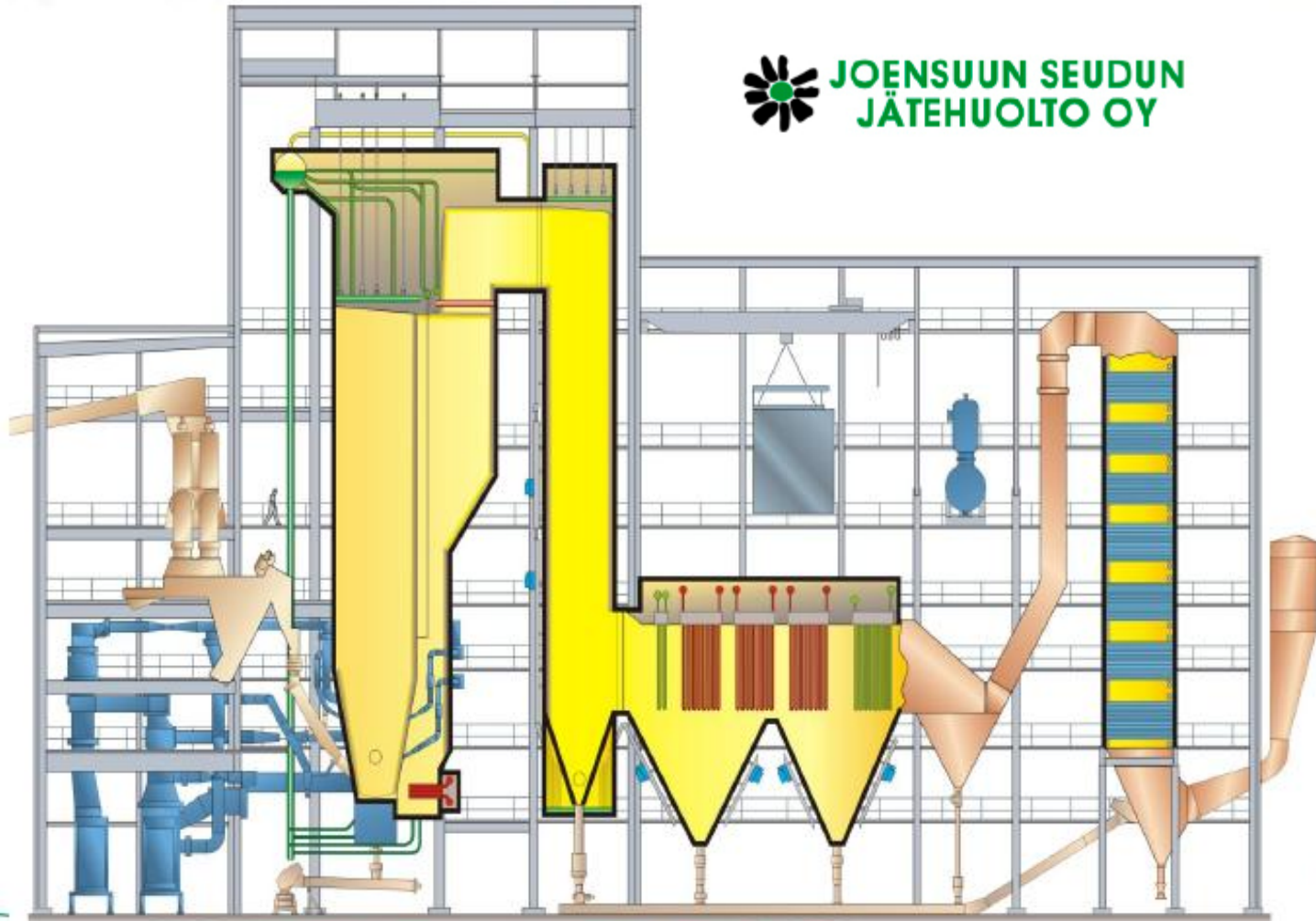
FRAME DESIGN

- 60 MW Circulating Fluidized Bed boiler
- High usability and efficiency in comparison to conventional grate firing boiler
- The plant could utilize c. 160.000 t of various recycling fuels (REF I-III) + biofuels and waste wood
- Seven waste management companies behind, covering the Eastern and Western Finland:
Joensuun Seudun Jätehuolto Oy, Jätekukko Oy,
Keski-Savon Jätehuolto, Mustankorkea Oy,
Metsäsairila Oy, Ylä-Savon Jätehuolto Oy,
Savonlinnan Seudun Jätehuolto Oy



CFB PLANT FOR WASTE INCINERATION

 **JOENSUUN SEUDUN
JÄTEHUOLTO OY**



SOME TIME-SCHEDULES

- Planning started Autumn 2010
- October 2011 City of Varkaus made a tentative decision to choose this option as the primary heating solution for City of Varkaus to investigate further
- If waste incineration plant will be decided, it could start in operation 6-9 / 2015
(Varkausvoima Oy)



BENEFITS FOR WASTE ENERGY OVER TRADITIONAL BIO-POWERPLANT

- Equal or even higher heating value than in wood
- Availability of fuel is more stable
- The waste incineration plant receives gate fees for the fuel, whereas bio-powerplant needs to pay for the fuel

 More profitable



IF NO TO VARKAUS PLANT OR BEFORE IT'S START UP: MIXED WASTE PRE-HANDLING FOR ENERGY UTILIZATION



rem^owe STATUS WITH CENTRALIZED BIOGAS PLANTS REGARDING NORTH SAVO 1.

○ Pieksämäki biogas plant

- Feasibility study together with Savonia Univ.of Appl. Sciences, City of Pieksämäki, Jätekukko Oy, Savon Voima, two regional Councils



- Jätekukko Oy and City of Pieksämäki have made positive decisions
- Now they wait for administrative decision: permit or EIA
- Could be completed 2014 or 2015



FRAME DESIGN

- Biodegradable wastes 19.000 t / a
 - Separately collected biowaste of Jätekuikko Oy
 - Sewage treatment sludges from three cities
- Two-line plant: clean and dirty materials -> nutrient recycling possibilities
- Wet digestion (also dry taken into account)
- The biogas would be led to an existing CHP-plant (Savon Voima Oy)
- Possibilities of integrating bio-ethanol production covered (ST1 Biofuels has given insights to this option)



STATUS WITH CENTRALIZED BIOGAS PLANTS REGARDING NORTH SAVO 2.

- A new feasibility study started in Summer 2011 for Lapinlahti biogas plant
- Idea to digest waste water treatment sludges from Lapinlahti, Iisalmi and Kiuruvesi + possibly biowaste from one waste management company
- Also lots of biowaste from food industry
- Possibly manures and sludges from agriculture
- Many digestion experiments, both in laboratory and pilot scale
- Feasibility calculations due 12/2011
- Municipality of Lapinlahti need to decide during 2012, what to do with its sewage treatment sludge



REGIONAL MODELING OF BIOGAS PRODUCTION, NORTH SAVO AS THE PILOT REGION (WP5)

rem^ewe

Regional Mobilizing of Sustainable Waste-to-Energy Production

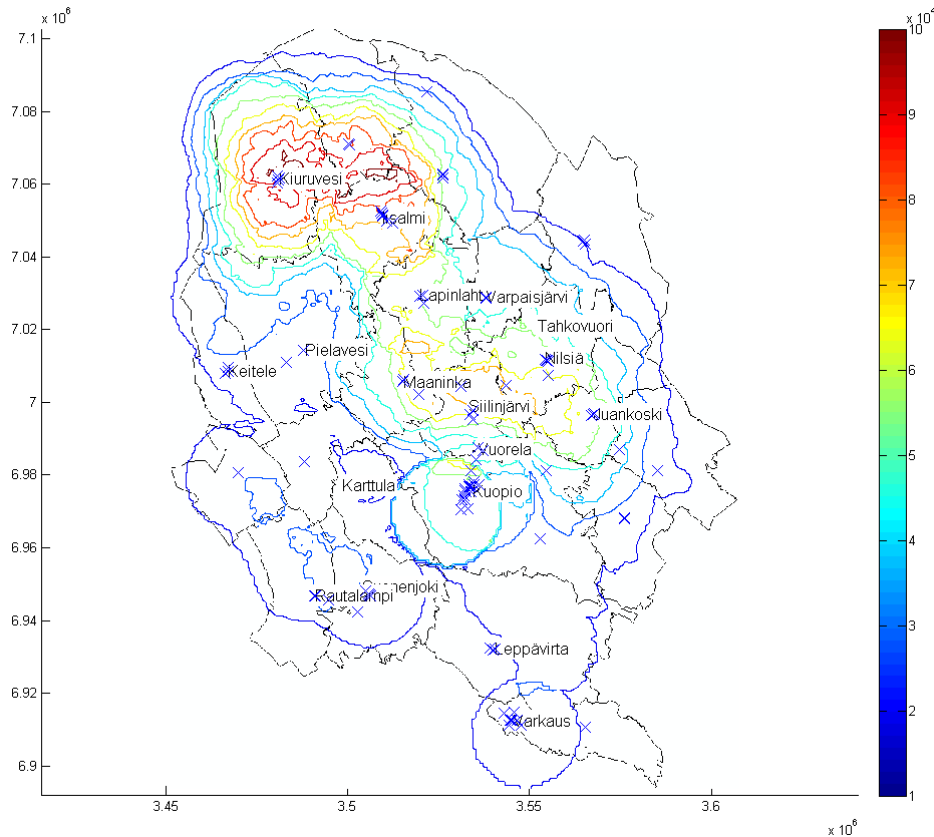


Part-financed by the European Union
(European Regional Development Fund
and European Neighbourhood and
Partnership Instrument)

TUOMAS HUOPANA, HARRI NISKA AND MIKKO KOLEHMAINEN
UNIVERSITY OF EASTERN FINLAND
DEPARTMENT OF ENVIRONMENTAL SCIENCE
ENVIRONMENTAL INFORMATICS

INPUT DATA OF THE MODEL

Biogas potential inside the radius of 15 km in GJ/a, service stations as "X" and named district heating plants



Input data and number of locations

Feedstock:

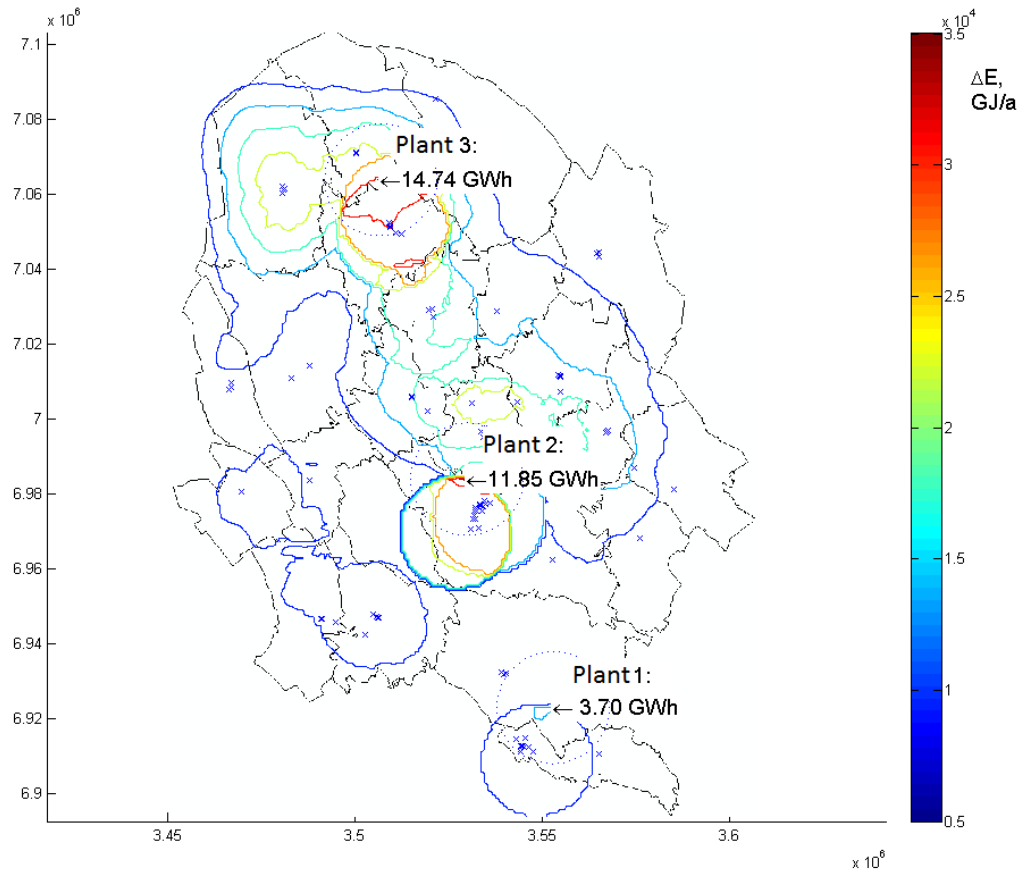
- Cow farms, 1968
- Pig farms, 58
- Horse farms, 382
- Sheep farms, 118
- Goat farms, 29
- Duck farms, 5
- Spoiled grass silage, 2214
- Sewage sludge, 22
- Household biowaste, 3 (Waste management centre)
- Fatty residues, 3
- Fatty waste water, 2
- Potato waste, 2

The end users:

- Fuel stations, 100
- District heating plants, 18



VEHICLE FUEL PRODUCTION

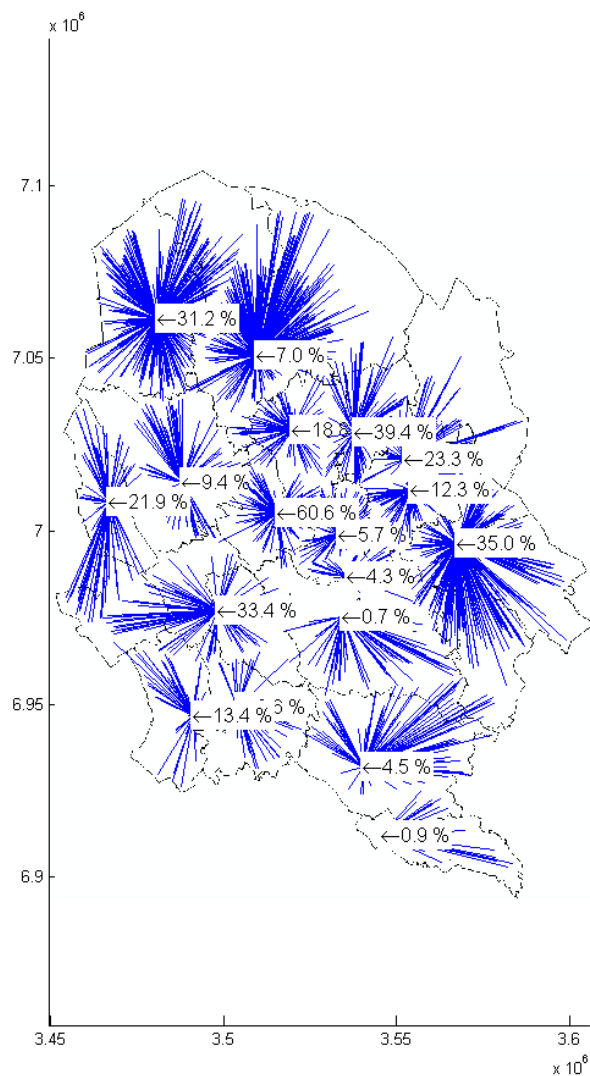


- The net produced energy ΔE was calculated inside the radius of 15 km.
- The maximum transportation distance of feedstock and digestate was also 15 km (blue dotted line).
- The produced vehicle fuel was transported into the nearest fuel station (blue x).
- Three local maximum points in ΔE were found inside the radius of 15 km.
- Maximum points in ΔE are the biogas plants in the table, below.
- The relative CO_2 emissions were smallest in the plant 2, because the feedstock in the area were suitable for efficient vehicle fuel production.

Plant:	fuel, GWh/a	$E_{\text{OUT}}/E_{\text{IN}}$	kg CO_2 /(MWh fuel)	Cars/a
1	3,70	4,7	552	201
2	11,85	6,4	483	644
3	14,74	3,0	720	801



HEAT AND POWER PRODUCTION



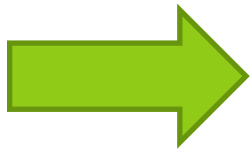
	Heat replaced by biogas, %	Biogas heat, GWh	Biogas power, GWh	E_{OUT}/E_{IN}	kg CO ₂ /(MWh)
Iisalmi	7,0	13,5	9,2	2,4	888
Siilinjärvi	5,7	4,2	2,8	3,8	865
Kiuruvesi	31,2	15,3	10,3	2,1	1001
Leppävirta	4,5	2,2	1,5	1,8	981
Suonenjoki	3,6	1,6	1,1	4,6	788
Vuorela	4,3	1,1	0,8	3,1	930
Pielavesi	9,4	2,3	1,5	2,2	984
Lapinlahti	18,8	4,4	3,0	3,9	872
Juankoski	35,0	6,9	4,7	2,3	963
Nilsä	12,3	3,1	2,1	2,7	976
Keitele	21,9	2,5	1,7	1,9	998
Rautalampi	13,4	1,6	1,1	2,9	911
Tahkovuori	23,3	2,2	1,5	2,2	994
Varpaisjärvi	39,4	3,2	2,2	2,5	983
Karttula	33,4	2,4	1,6	2,7	888
Maaninka	60,6	3,7	2,5	3,2	951
Varkaus	0,9	1,9	1,3	7,0	645
Kuopio	0,7	6,5	4,4	7,5	631

- The distance between origins of waste and biogas plants are shown in blue lines.
- The heat produced from biogas of the heat production of the existing district heating plants is shown in terms of % in the figure.



REMOWE CONNECTION WITH SAVO CLIMATE PROGRAM

- Remowe findings will be utilized in Savo Climate Programme in 2012, which is done in co-operation between North Savo and South Savo municipalities and other stakeholders (South Savo environmental authority as coordinator)



Hopefully will boost development towards traffic biogas and other paths for Waste-to-Energy in North Savo!

