IEA Bioenergy

Task 37
Country Report Finland

Saija Rasi
Natural Resources Institute Finland, Luke

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Biogas Plant Inventory

Type of installation	Number of installations	Amount of biogas produced/recovered (million m³)	Amount of biogas utilized (million m³)
Farm scale biogas plants	13	1	1
Co-digestion plants	14	30	27
Anaerobic reactors at municipal wastewater treatment plants	16	29	28
Industrial aneaerobic wastewater treatment plants	3	0,9	0,7
Reactor installations altogether	46	61.5	56.8
Landfills	40	94	75

Source: Huttunen and Kuittinen, 2015, Suomen biokaasulaitosrekisteri n:o 18, University of Eastern Finland

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Biogas Upgrading

Location	Upgrading technology	Manufacturer	In operation since
Laukaa	*Water wash*	*Metener*	*2002*
Kouvola*	Water wash	Greenlane	2011
Haapajärvi	Water wash	MetaEnergia	2012
Espoo*	Water wash	Malmberg	2012
Forssa	Membrane	Envor	2013
Joutsa	Water wash	Metener	2014
Uusikarlepyy	Water wash	Malmberg	2014
Laukaa	Water wash	Metener	2014
Lahti*	Water wash	Malmberg	2014

* Injection to natural gas grid

- Under planning:

  PSA process to Sotkamo, BioGTS as manufacturer

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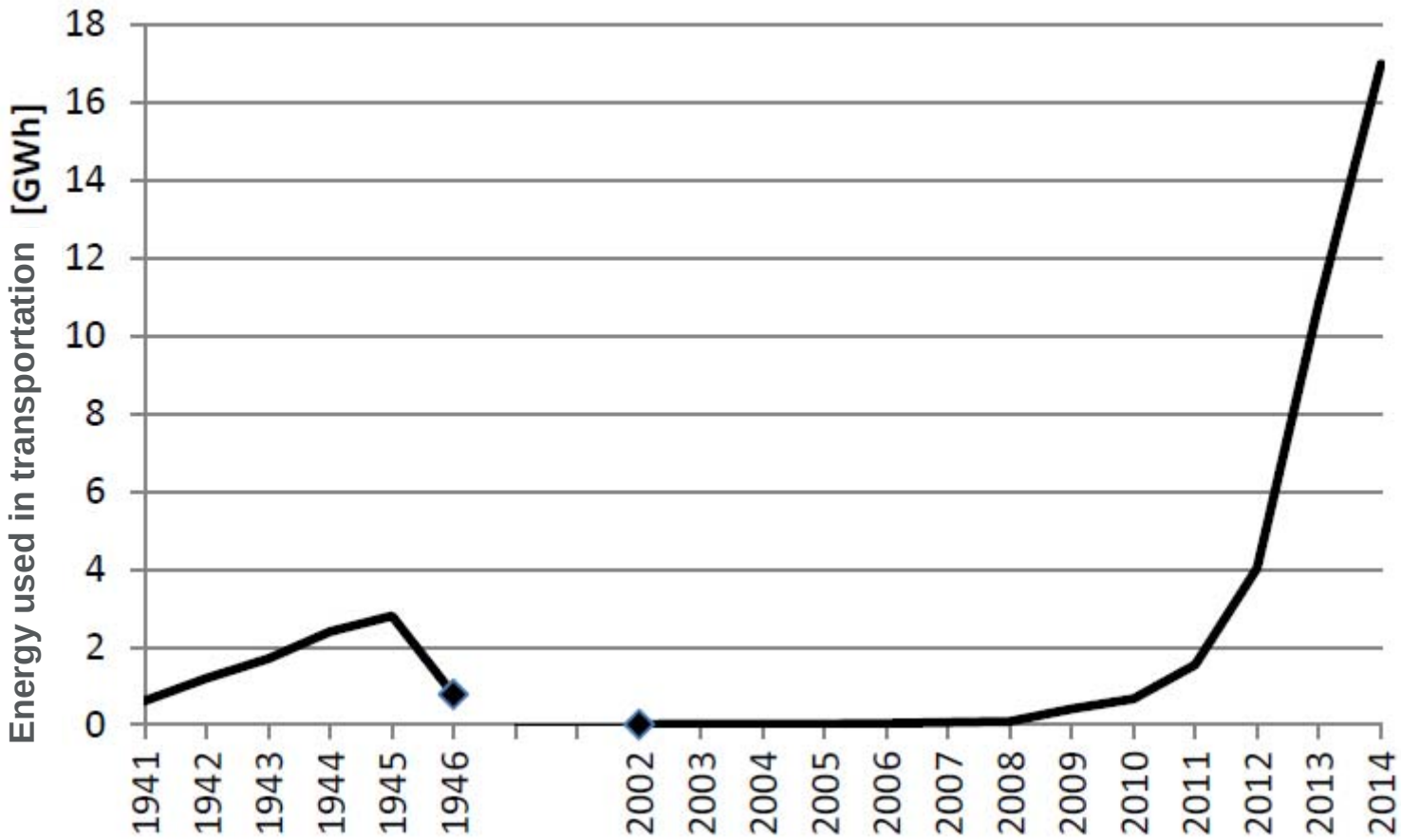
Biogas Upgrading



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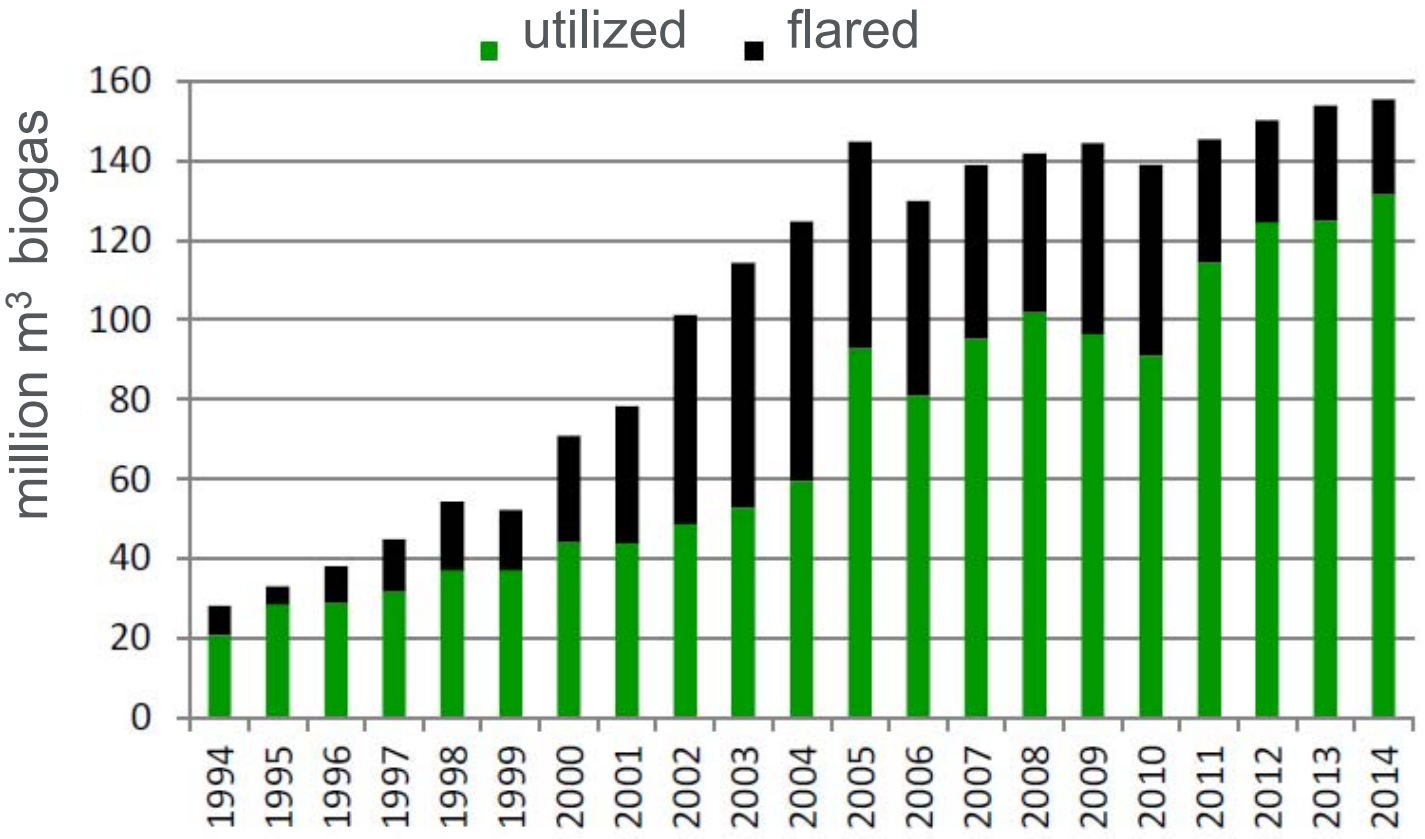
Biogas Trends: Amount of produced biogas



Under planning: 19 farm biogas and 19 co-digestion plants

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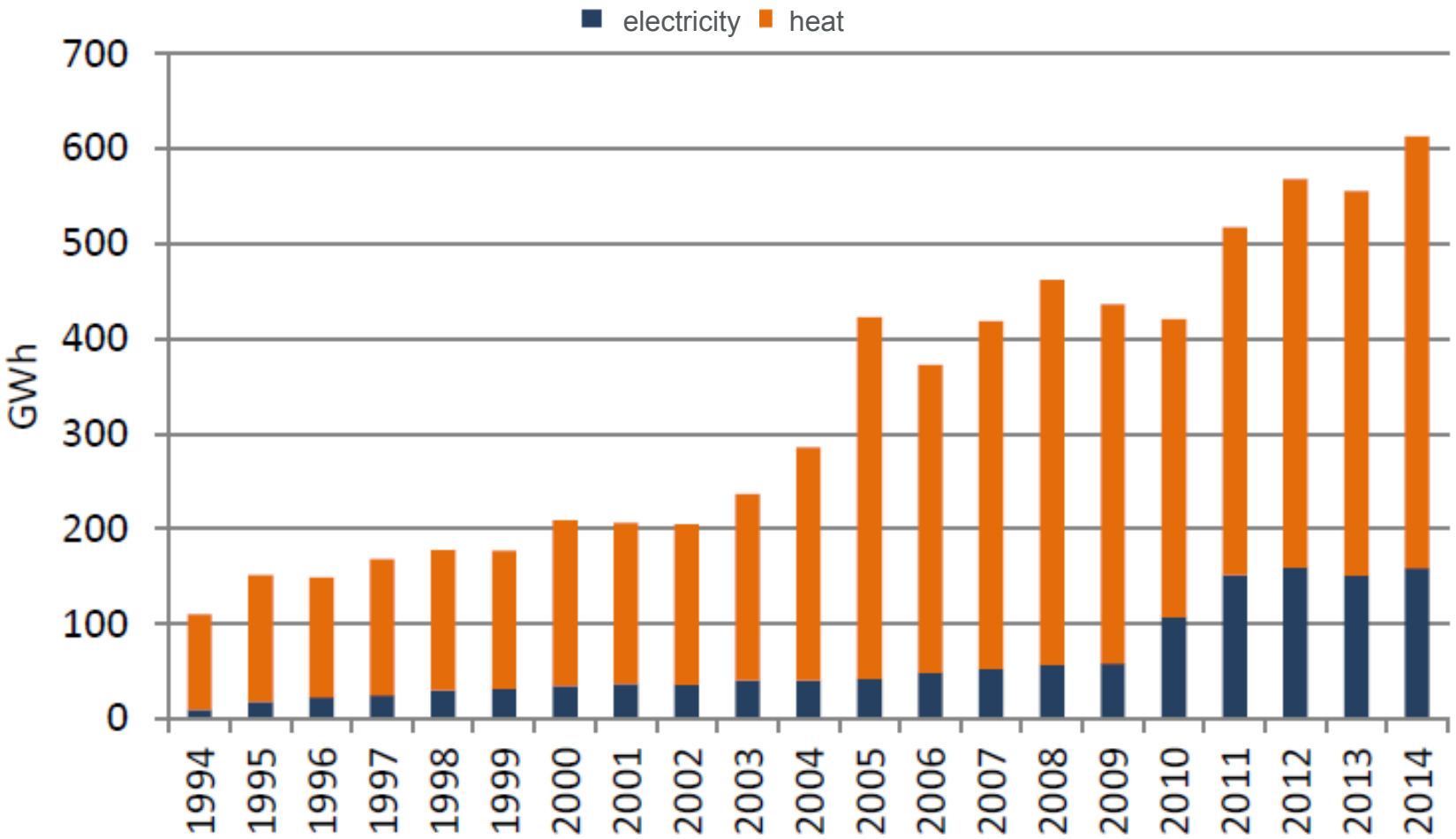
Amount of heat and electricity utilisation

- Reactor installation: 310 GWh
- Landfills: 304 GWh



Biogas Utilisation as vehicle fuel

	2014	increase from 2013
Biomethane use as vehicle fuel	17 GWh	57 %
Share of biogas in transportation	3 %	50 %
Amount of public CBG100 stations	24	20 %
Amount of biogas upgrading plants	9	80 %
Amount of produced biogas	40 GWh	22 %
Share of biomethane of methane use in vehicle use	30 %	11 %
Amount of methane vehicles	1900	19 %

Under planning:
- LNG filling stations to Helsinki, Vantaa, Turku and Jyväskylä

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Digestate handling

- Digestate
  - from WWTP mainly to landscaping
  - From co-digestion plant to landscaping and fields (usually no value to plants)
  - From farm biogas plants to fields

- Increasing interest to process digestate to more valuable products and to more efficient use

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Financial Support Systems for Biogas

- The feed-in-tariff system for electricity produced from biogas to force on March, 2011
  - Guaranteed price 83.5 €/MWhe + 50 €/MWhe heat bonus, if 50 % total efficiency is obtained (=133.5 /MWhe).
    - Generator power ≥ 100 kVA (~85 kWe)
    - Only new plants
    - Landfill gas and municipal plants excluded
    - Plants can be included in the feed-in-tariff scheme for 12 years
  - Biogas plants can be accepted to the feed-in-tariff scheme until their total efficiency reaches 19 MW (only 10 x 2 MW plants)

- Investment grants in the order of 15-40% available for construction of biogas plants
  - An alternative to joining the feed-in-tariff system

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National Strategies

National Strategy/Support for Exploitation of Biogas:

- One of the goals in government programme (2015) is that 50% of manure and sewage sludge goes to “more advances” processes by the end of 2025
  - E.g. in some regions the goal is that 1.6 million t of manure (from total 12 million t) is treated in biogas plants
  - In 2015 about 200 000 t manure/a is treated in biogas plants
  - Assumption is that also other biomass (waste and side products) will be treated in those biogas plants

Obstacles for the Biogas Development

- A lot of unpromoted information retrieval is needed before building a biogas plant
  - In general there is a lot of information but dispersed
- Low amount of Finnish plant manufacturers
  - Variation in experience of manufacturers
- Plant constructor has to discuss with lot of authorities; lot of different permissions
- Unclarity with taxes in own electricity use
- Different rules for manure and digestate in terms of Environmental Support of Agriculture
- Hard to make profit because of low electricity prices and high investment costs
- Positive future perspectives both with farmers, manufacturers and authorities: significant effect if digestate has value and demand in future
- Biogas plant should be seen as a whole, not just an energy production plant OR waste treatment plant OR investment in agriculture OR fertilizer production plant
- Benefits on environment are acknowledged but now valued

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Biogas Research

Research Activities:

- Processing digestate to value added products
- Developing sustainable crop cultivation for biogas production
- Developing use of biogas as vehicle fuel

- Main actors:
  - Natural Resources Institute Finland (Luke), www.luke.fi
  - Tampere University of Technology, www.tut.fi

- National project: Sustainable Bioenergy Solutions for Tomorrow (BEST)
- International project: From Waste to Traffic Fuel (W-FUEL)

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Vuogas biogas reactor at Luke Sotkamo

- A high solids digester, located at Luke Sotkamo research station
  - Plug flow process
  - 72 m^3
  - Designed and constructed by BioGTS ltd

- Start up during summer 2015
- Basic feed is silage
  - Other feeds possible
- Separation of digestate to liquid and solid phases
- Produced biogas will be used for heating the research station buildings
  - In future as a vehicle fuel

Photo: Jari Lindeman

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The Helsinki Region Environmental Services HSY

- New biogas plant in operation 6/2015
- Partial flow digestion plant, dry thermophilic AD with a design retention time of about 20 days
- 44 000 t biowaste capasity at biogas plant (in total 60 000 t biowaste)
- At the moment 35 000 t biowaste is treated in biogas plant (total 51 000 t)
- An average production 30 GWh
- Heat and electricity production

https://www.hsy.fi/en/experts/waste-management/ammassuo-waste-treatment-centre/Pages/Treatment-of-biowaste.aspx

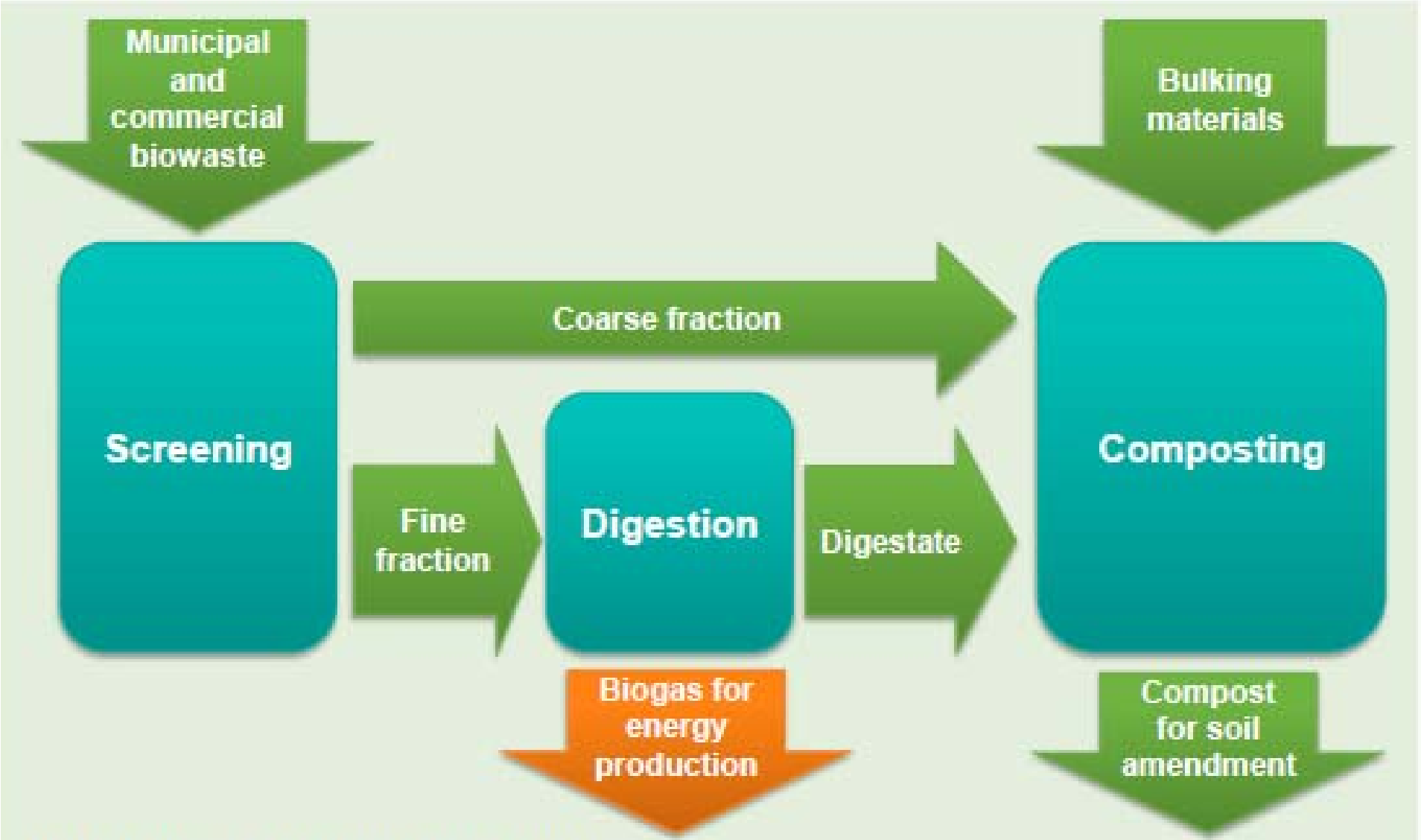

Figure 1. The new partial flow digestion process

https://www.hsy.fi/fi/asiantuntijalle/jatehuolto/tutkimusjakehitys/Documents/Poster_modelling_nutrients_web.pdf