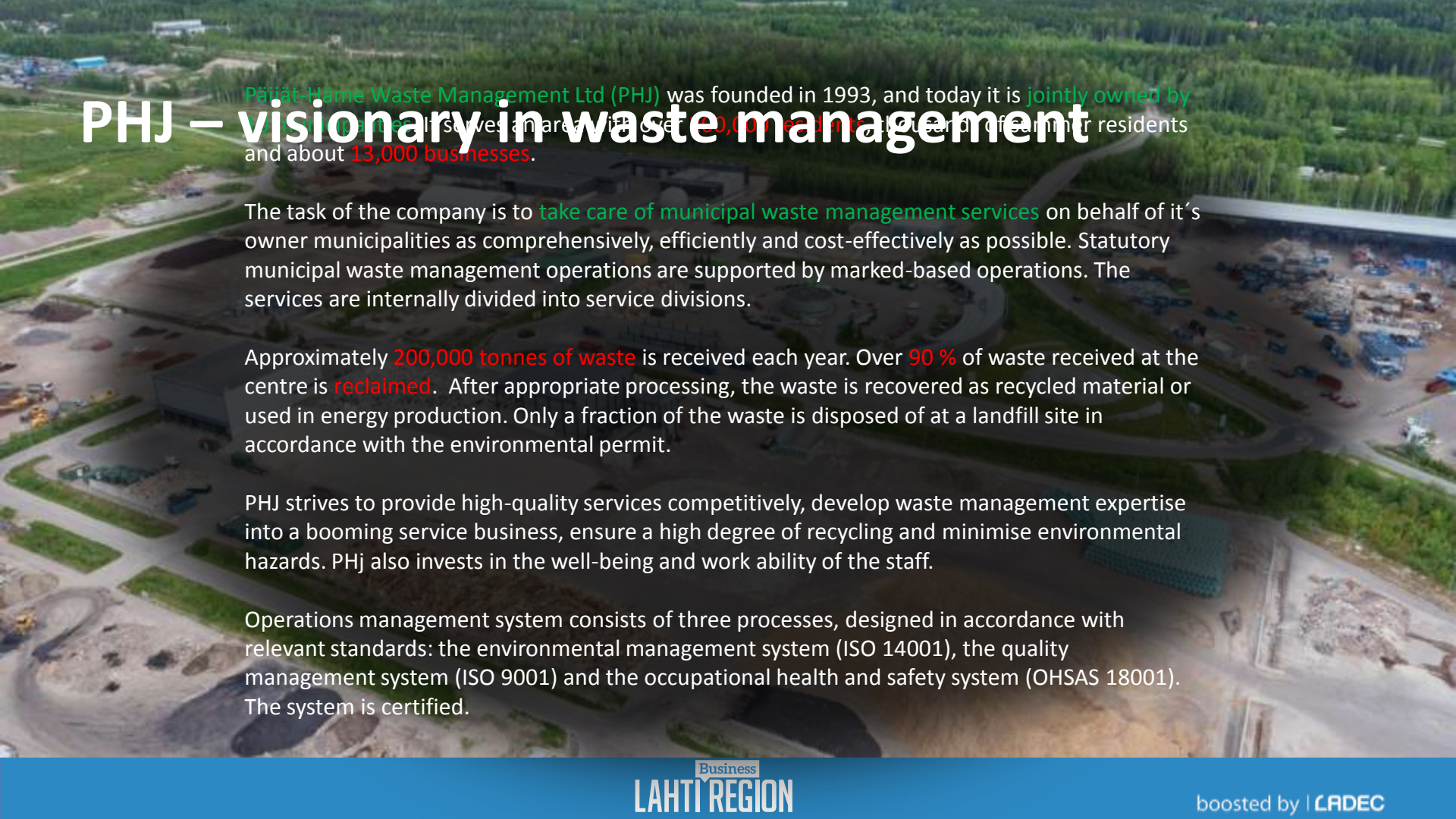


# CIRCULAR ECONOMY IN LAHTI REGION





# PHJ – visionary in waste management

Päijät-Häme Waste Management Ltd (PHJ) was founded in 1993, and today it is jointly owned by 15 municipalities. It serves an area with over 200,000 people, 100,000 households of Finnish or residents and about 13,000 businesses.

The task of the company is to take care of municipal waste management services on behalf of its owner municipalities as comprehensively, efficiently and cost-effectively as possible. Statutory municipal waste management operations are supported by marked-based operations. The services are internally divided into service divisions.

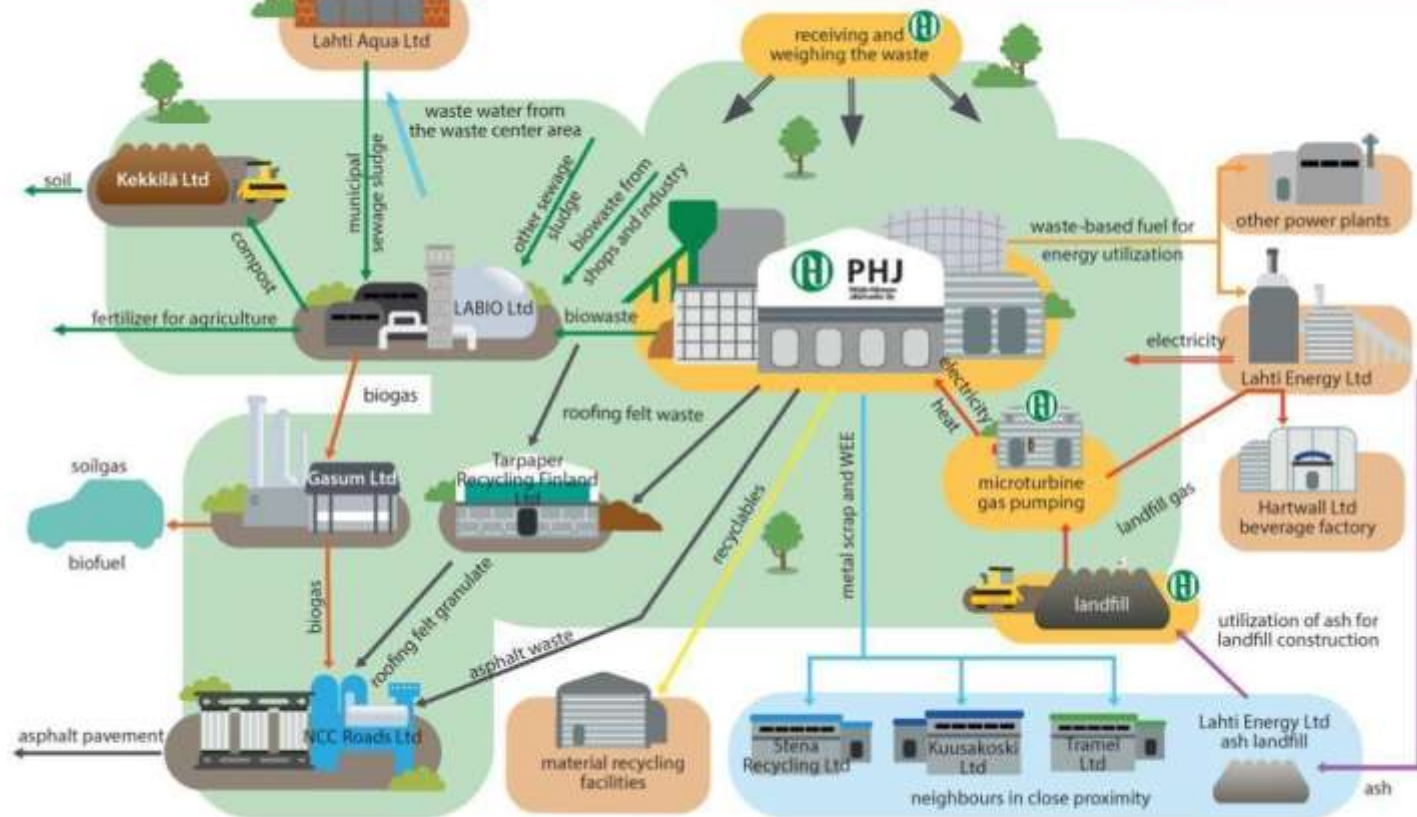
Approximately 200,000 tonnes of waste is received each year. Over 90 % of waste received at the centre is reclaimed. After appropriate processing, the waste is recovered as recycled material or used in energy production. Only a fraction of the waste is disposed of at a landfill site in accordance with the environmental permit.

PHJ strives to provide high-quality services competitively, develop waste management expertise into a booming service business, ensure a high degree of recycling and minimise environmental hazards. PHJ also invests in the well-being and work ability of the staff.

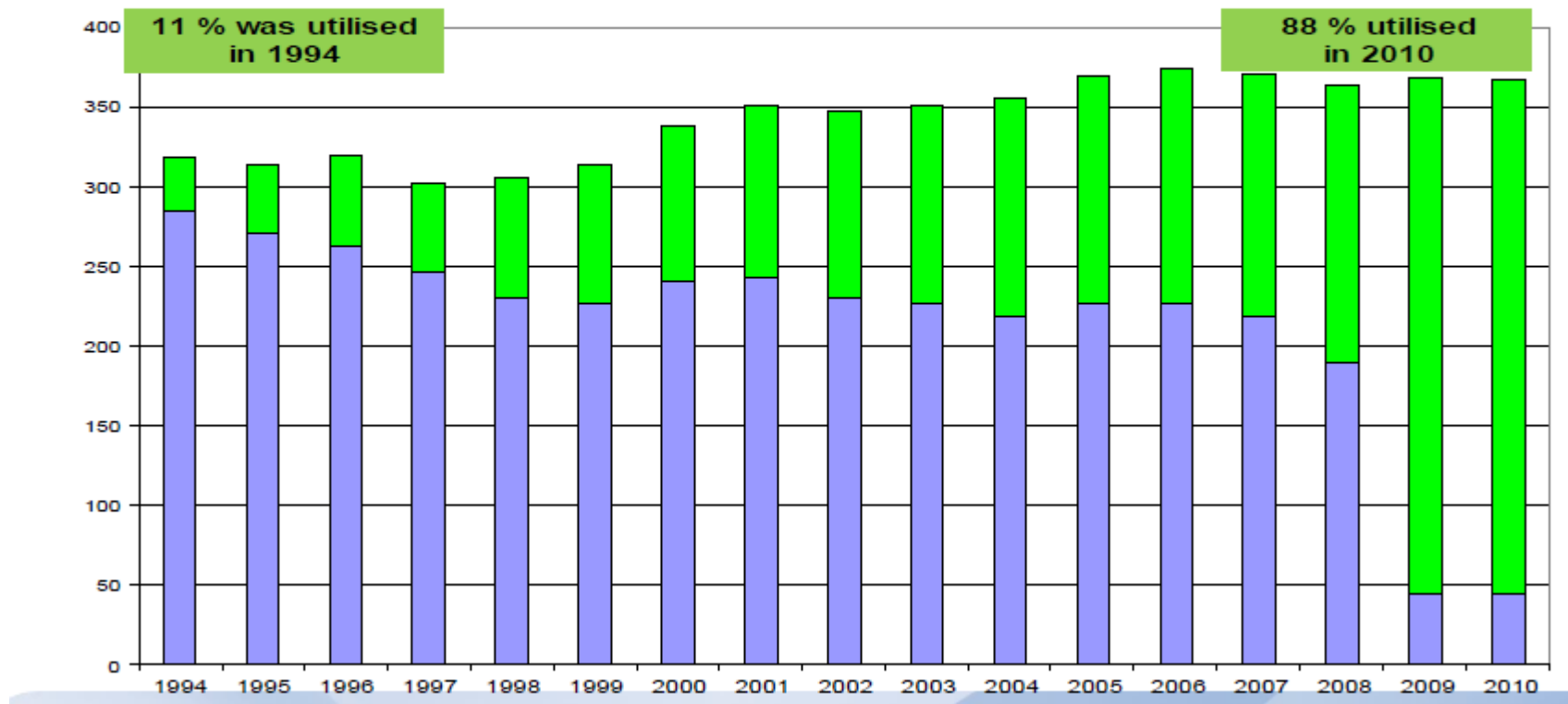
Operations management system consists of three processes, designed in accordance with relevant standards: the environmental management system (ISO 14001), the quality management system (ISO 9001) and the occupational health and safety system (OHSAS 18001). The system is certified.



## Kujala Waste Centre- Industrial Symbiosis Lahti, Finland



# Utilisation range of municipal solid waste 1994-2010

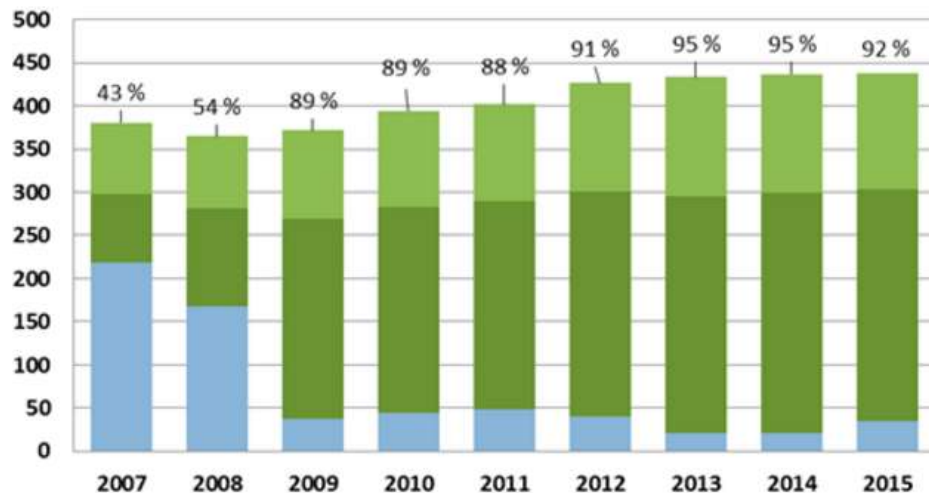


# UTILISATION OF HOUSEHOLD WASTE IN LAHTI REGION 2007-2015

light green color = kg per capita recovery as material

dark green color = kg per capita recovery as energy

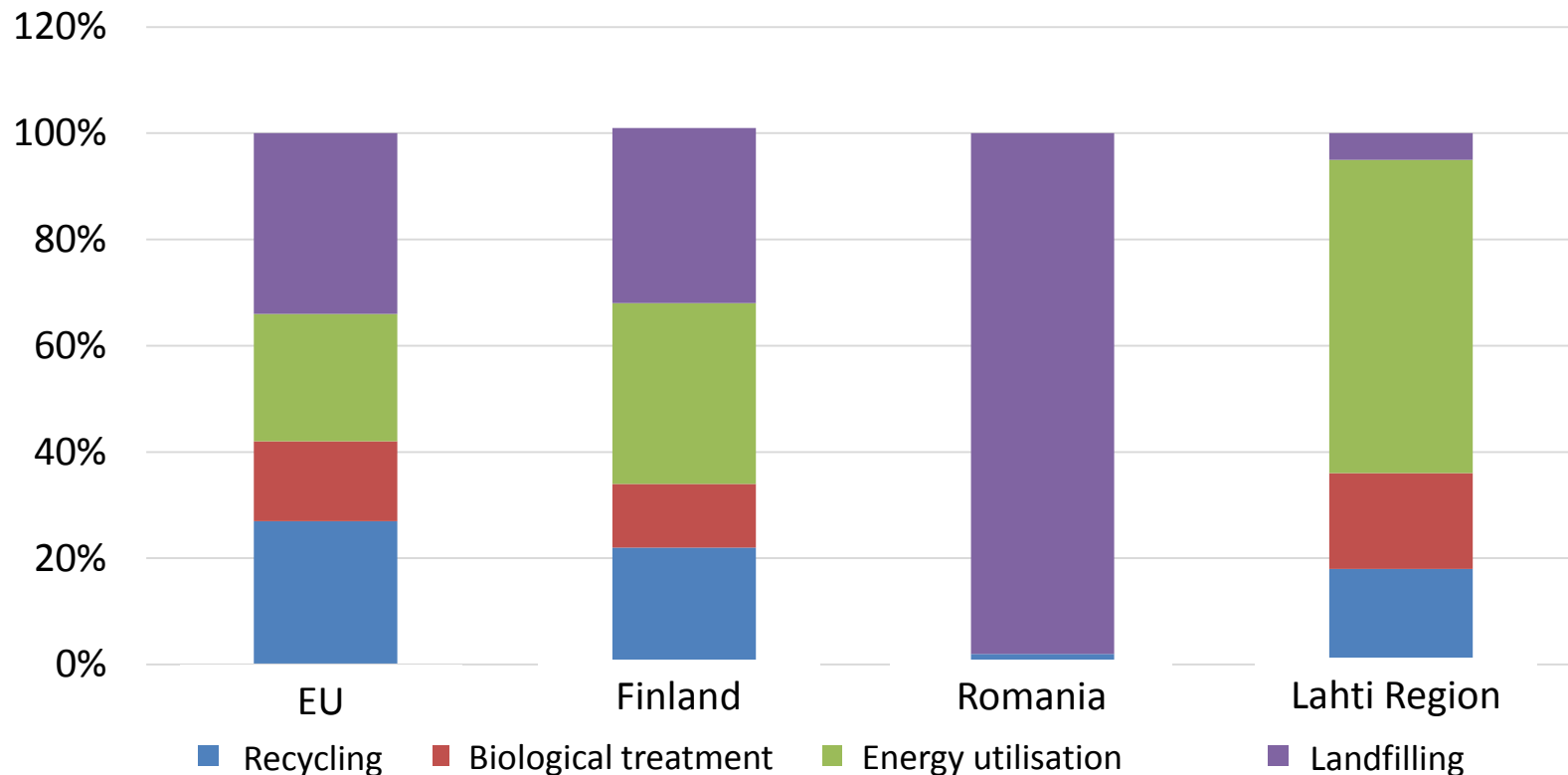
blue color = kg per capita landfill



# The most important milestones for municipal waste management of Lahti region

- 1993: Establishment of **regional municipal solid waste company** Päijät-Hämeen jätehuolto Oy / Päijät-Häme Waste Management Ltd (PHJ)
- 1995: Separate collection and windrow composting of **bio-waste**
- 1998: Separate collection of **combustible waste** from large scale estates
- 1998: Lahti Energia Oy (LE) started the first **gasification plant**
  - 2000: Extension of separate collection of combustible waste **to all households**
  - 2002: **Landfill gas capture** (PHJ) and **utilisation in Hartwall brewery**
  - 2005: **Joint composting company** Kujalan Komposti Oy and **composting plant** for sewage sludge of Lahti Aqua Ltd (LA) and bio-waste of PHJ
  - 2006: **Outsourcing of compost post treatment and marketing** to Kekkilä Oy
  - 2008: **Outsourcing of incineration** (PHJ) of **mixed waste** into new incineration plants and construction of **transfer station** (PHJ) for waste to be incinerated
  - 2011: Construction of **combustible waste treatment plant** (PHJ)
  - 2012: Starting new big **gasification plant** (LE)
  - 2014 Starting new dry digestion plant for bio-waste and sludge

# UTILISATION OF HOUSEHOLD WASTE



# A large proportion of waste reclaimed through recycling promoted

Reclaiming waste significantly reduces environmental hazards. Thanks to new material and energy recovery solutions, less than **5 %** of incoming waste now ends up **in landfill**. Around **60 %** of waste is used in **energy production**, while approximately **35 % is recycled** as material. The company's strategic goals include increasing the proportion of waste used in materials production to 50 % by 2020.



# How to reach the 50% recycling rate

## A) More efficient sorting in households

- Advising people to separate their waste in the collection bins
- By tightening waste management regulations

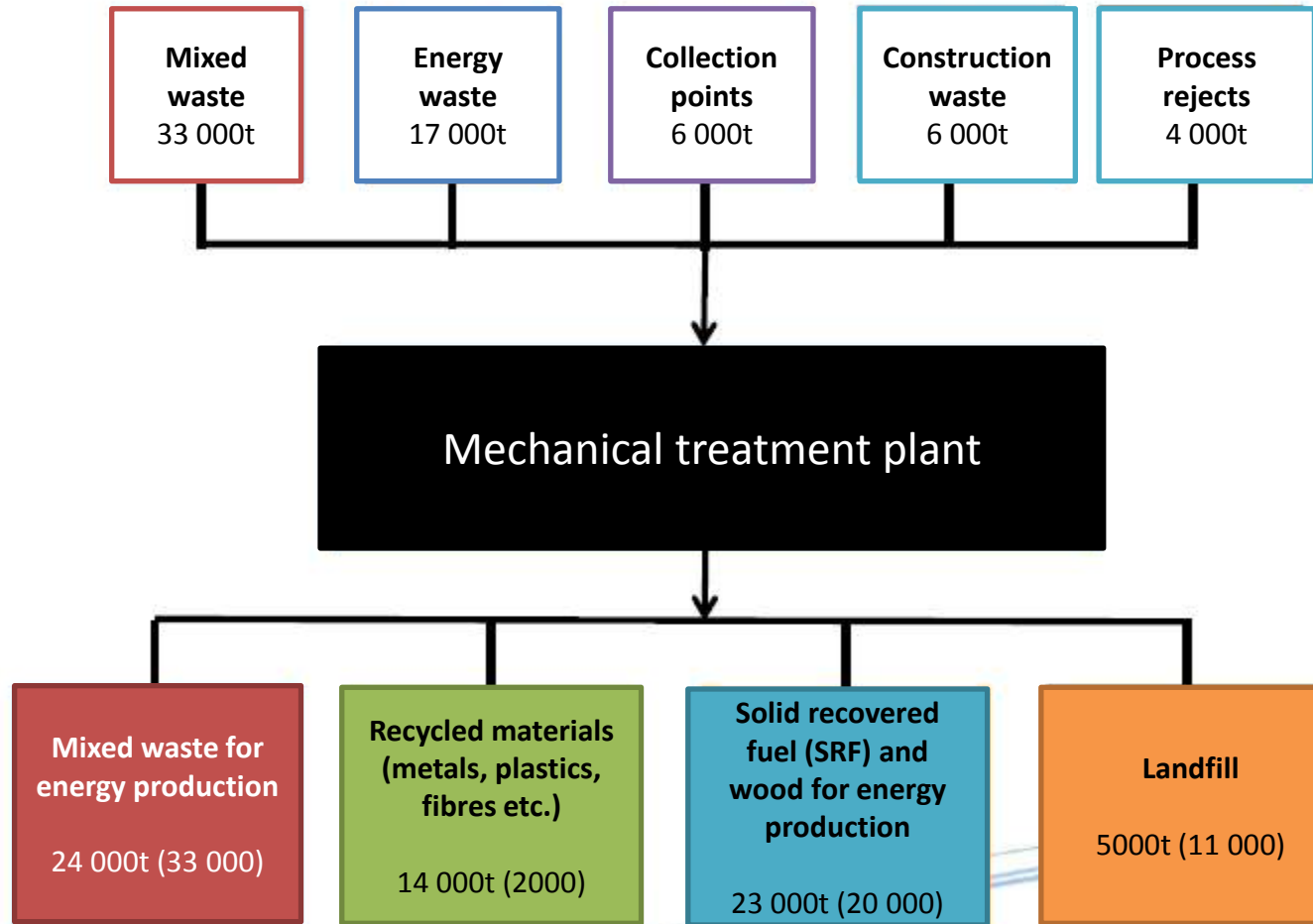
## B) Developing mechanical separation system at Kujala Waste Centre

- New technology implemented in late 2016 to enable better utilisation of different waste
- Metal, plastic, wood and energy waste separated from mixed waste
- Construction waste
- Plastic and carton separated from energy waste

# New mechanical treatment plant 2016

- PHJ opened a new mechanical treatment plant for mixed-, energy- and construction waste in October 2016
- The new plant enable PHJ to achieve 50% recycling goal. Plant is also a step towards the circular economy and it strengthens Lahti Regions position as waste management pioneer and area of cleantech expertise.
- Plant will process approximately 66 000 tonnes of waste per year.
- The goal is to get around 15 000 tonnes of recyclable raw materials (such as cardboard, wood, various metals, films and hard plastics) from mixed-, energy- and construction waste per year.
- Plant investment is about 9 million euros.







# Kujala Waste Centre





# Kujala Waste Centre

## 1. Offices, employee facilities and equipment storage

Building completed in 2001, expanded in 2003 and 2011.

## 2. "Jälkimaininki" (the Aftermath) site-specific artwork

The piece of site-specific art, designed by the architecture firm of Tapani Vuorinen, was created from excess soil and recycled glass to add visual interest to the reception area at the waste centre in 2001.

## 3. PILLERI waste reception station

The reception station accepts waste brought in via car or vanload. Pilleri provides services particularly for households and small businesses. Pilleri serves over 60,000 customers annually and customer satisfaction ratings have been consistently high. Pilleri is one of PHJ's seven waste reception stations and it was taken in use in 2001.

## 4. WEIGH STATION, waste reception

The weigh station weighs all waste transported into and out of the centre, as well as internal transfers. Loads are checked, logged and invoiced.

## 5. MURRE, treatment of energy waste and wood waste

The facility transforms wood waste and waste with plastic or fibre

content which is unsuitable for recycling into fuel (SRF) for power plants. During the process the waste is crushed, and magnetic and non-magnetic metals are removed. The capacity for treatment is 60,000 tonnes of waste per year. The facility was introduced in 2011.

## 6. LATE, sorting terminal

Mixed and construction waste is sorted in the terminal using a demolition-sorting grab and transported for utilisation in materials and energy production. The terminal can handle approximately 50,000 tonnes of waste annually. The facility began operations in 2009. After the completion of a mechanical sorting plant at the end of 2016, LATE will serve as the sorting plant's reception hall. Some of the waste is processed at the mechanical sorting plant, while the remainder is transported directly for use in materials and energy production.

## 7. Mechanical sorting plant

The mechanical sorting plant will separate recyclable waste (plastic, carton, wood and metal) from mixed, energy and construction waste with the assistance of several screens and separators. Once the plant opens in October 2016, it will have the capacity to treat 66,000 tonnes of waste per year.

# Kujala Waste Centre

## 8. OILI, facility for treatment of liquid waste/sludge

The facility uses the Geotube process, which mechanically handles liquid waste. The sludge is pumped into a geotextile sack which allows liquid to pass through it while retaining solids inside. This process is suitable for sludge from rainwater tanks and oil and grease traps as well as sewage sludge and industrial sludge. The facility can handle approximately 10,000 tonnes of liquid waste each year. The facility was taken in use in 2007.

## 9. Contaminated Soil Storage Areas (CSSA)

Severely contaminated soil and soil containing wastes are pre-treated by sifting after which the soil is stabilised and compacted into a non-toxic form. The compacted soil is utilised in embankments at the waste site or as preliminary cover for the landfill in accordance with its environmental permits. CSSA sites cover 2.5 hectares.

## 10. Decommissioned landfill

The old landfill, in use since 1950s, was closed in 2007. It covers approximately 23 hectares. The landfill embankments contain collection wells and channels for landfill gases. The decommissioned landfill will continue to be maintained and inspected for at least 30 years.

## 11. Current landfill

Current landfill covers 8.3 hectares. The foundations were constructed in accordance with the most recent EU requirements. The waste in the landfill is not currently recoverable.

## 12. Recyclable waste grounds

Tarmacked recyclable waste grounds serve as interim storage for twigs and brushwood, garden waste, tree stumps, metal, concrete, bricks, asphalt, gypsum, roofing felt, windows with their frames and companies' plastic packaging. Brushwood and stumps are turned into chips. Shredded brushwood go to energy generation, while chips from stumps are used as support material in the composting plant. Most of the garden waste is transferred to the composting plant to be used as mixing and support material, while some of it is suitable for biogas generation. Concrete and bricks are crushed and utilised in landscaping and road construction. The majority of recyclable waste is transferred to facilities that process the waste before utilising it in the production of new material. Metals are used as raw material by the steel and foundry industry. Glass waste goes to the production of glass packaging, glass wool and foam glass. In addition to asphalt waste, bitumen roofing material can be used in the manufacture of asphalt. Gypsum waste serves as raw material in the production of new gypsum boards, while plastic packaging from companies is used to manufacture plastic products. Approximately 5.3 hectares is used for the reception and storage of recyclable waste.

# Kujala Waste Centre

## 13. Seepage basins and wastewater pumping station

Around 150,000 - 200,000 m<sup>3</sup> of wastewater is directed to the detention basin for concentrated wastewater and to Lahti Aqua Ltd's wastewater treatment facility from outdoor areas. Seepage water from landfill sites accounts for the majority of these wastewaters. The mild wastewater generated in the area is collected in a separate detention basin. Each year, approximately 10,000 m<sup>3</sup> of wastewater is released into the surrounding environment via a seepage bank.

## 14. Landfill gas pumping facility

Landfill gas collected at the decommissioned landfill is channelled into the pumping facility. Most of the gas collected is piped to Hartwall's heating station, where it is used to generate process steam for the soft drinks plant.

## 15. Micro-turbine plant

Some of the landfill gas is directed to a micro-turbine plant, where it is used to produce electricity and heat for the plants and office premises located at the Kujala site.

## 16. LABIO Ltd, biogas and composting plant

The biogas plant produces raw biogas from the biowaste and garden waste collected separately and wastewater sludge via a dry fermentation process. The remaining material is transferred to the composting plant for composting. The composting products are used in agriculture and the manufacture of growing media. The plant can handle approximately 80,000 tonnes each year. The plant covers approximately 5 hectares.

## 17. Gasum Ltd, biogas upgrading facility

The facility upgrades the raw biogas generated by LABIO Ltd's biogas plant, producing biogas that is similar to natural gas in composition. The biogas, which is suitable for use as transport fuel, is then fed to Gasum's natural gas network.

## 18. Kekkilä Ltd, soil processing plant

The plant processes mineral soil and compost products from LABIO Ltd's composting plant to produce soil.

## 19. Tarpaper Recycling Finland Ltd, processing facility

The company receives, stores and processes bitumen roofing material at Kujala Waste Centre. Roofing felt is crushed and used in asphalt production to replace bitumen as raw material.

## 20. NCC Roads Ltd, asphalt production facility

Using also crushed bitumen produced from roofing felt as its raw material, the company manufactures asphalt in its facility at Kujala Waste Centre.

## 21. Lahti Energia Ltd, landfill site for ash

PHJ operates Lahti Energy Ltd's landfill site where sand, lime and ash generated by Kymijärvi I and II power plants are stored and disposed of.

Construction waste treatment at  
Kujala Waste Centre:

[https://www.youtube.com/watch?  
v=CSUI4uQvGB0](https://www.youtube.com/watch?v=CSUI4uQvGB0)

Concrete waste treatment at Kujala  
Waste Centre

[https://www.youtube.com/watch?  
v=VSIXkJIPEjg](https://www.youtube.com/watch?v=VSIXkJIPEjg)

Recyclable waste land treatment at  
Kujala Waste Centre

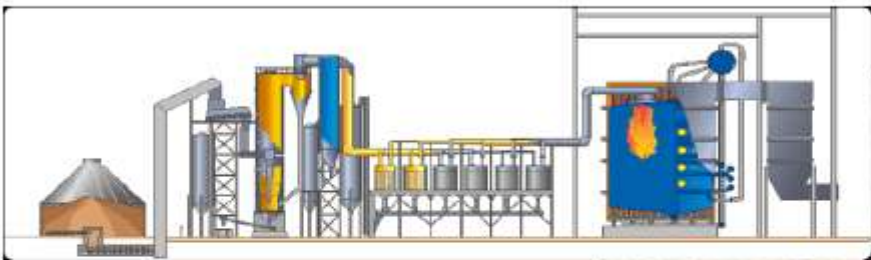
[https://www.youtube.com/watch?  
v=XNb1m984Qqo](https://www.youtube.com/watch?v=XNb1m984Qqo)

# Construction waste and waste land treatments



# Waste gasification with hot gas cleaning

## Lahti Energia Oy



- Total investment 157 M€
- Start up April 2012
- 250.000 t/a SRF waste
- Fuel power 160 MW
  - 60 MW electricity
  - 90 MW district heat
- Overall efficiency 89%



# Landfill gas utilization since 2002

- Kujala landfill operated from 50's => 27 ha, 3.5 Million m<sup>3</sup> waste
- Landfill gas captured with 24 vertical wells and 6 horizontal canals
- Collected 15.000 MWh/a, average power 1.8 MW
- Mainly utilised in brewery, 4 km from the landfill
- Partly utilized for own heat and power needs
  - 2 x 65 kW micro turbines
  - gas boiler



# Making landfill gases into energy

As waste decomposes in oxygen-free conditions in a landfill, landfill gas is generated. This biogas consists mainly of methane and carbon dioxide with small amounts of odourous sulphur compounds.

Landfill gas has been collected at Kujala since 2002. Most of the gas collected is piped to Hartwall's heating station, where it is used to generate process steam for the soft drinks plant. The rest of the gas is used at Kujala Waste Centre, where a micro-turbine generates electricity and heating. Collecting landfill gas cuts down on odours in the local environment and reduces the amount of greenhouse gases released into the atmosphere.