



# **Responsible district heating with biomass**

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Valladolid, September 25<sup>th</sup> 2019



**Bioenergia**

# Content of the presentation

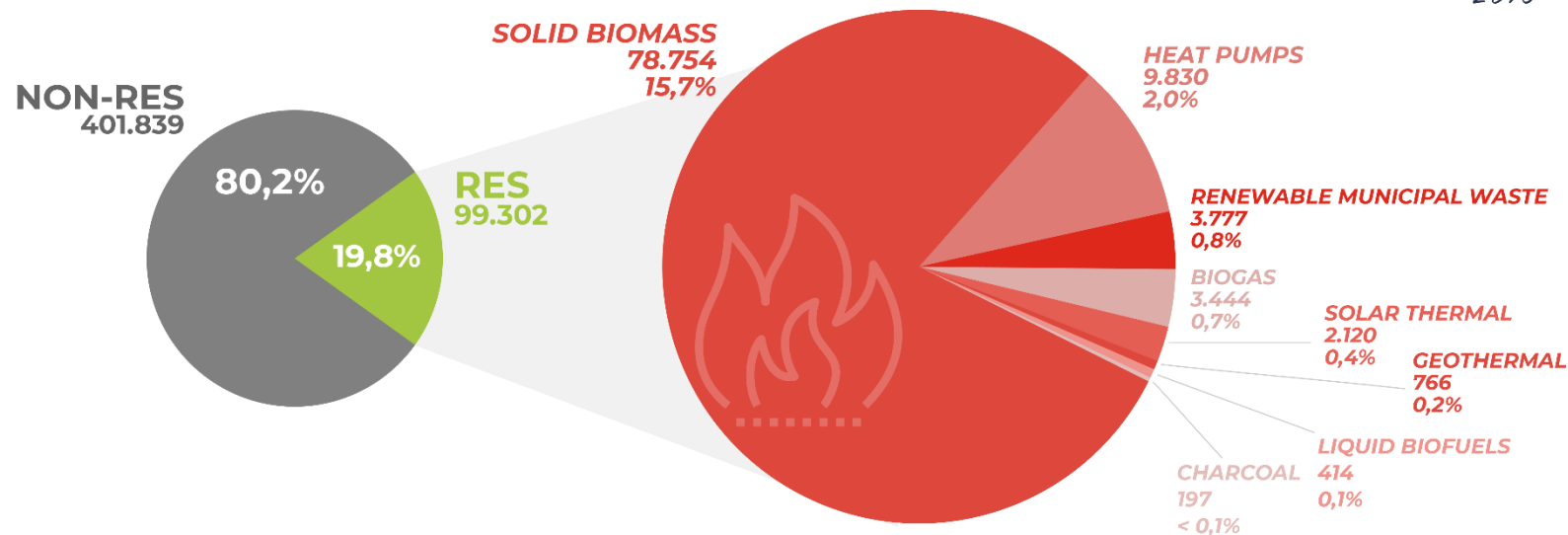
- ❖ What is bioenergy all about
- ❖ District heating as a means to decarbonise
- ❖ Bioenergy and carbon sinks
- ❖ Responsibility of bio-district heat
- ❖ Finnish know-how via examples



# What is bioenergy about?

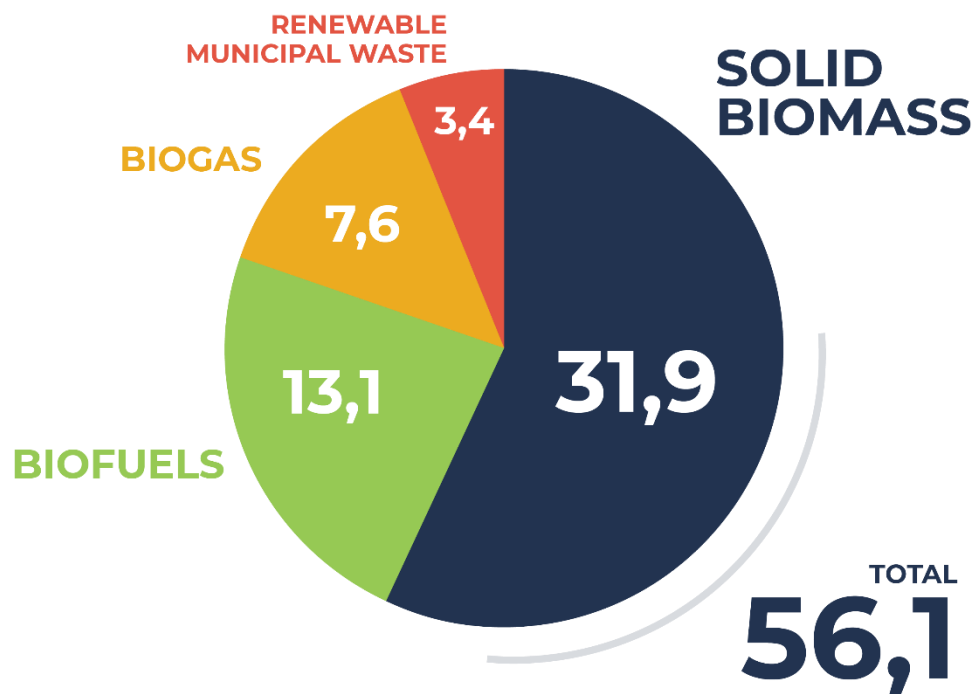
## SHARE OF RENEWABLE ENERGY IN GROSS FINAL ENERGY CONSUMPTION FOR HEATING & COOLING IN EU28

(2016, %, KTOE) SOURCE: EUROSTAT, BIOENERGY EUROPE'S CALCULATIONS



## TURNOVER OF THE BIOENERGY SECTOR

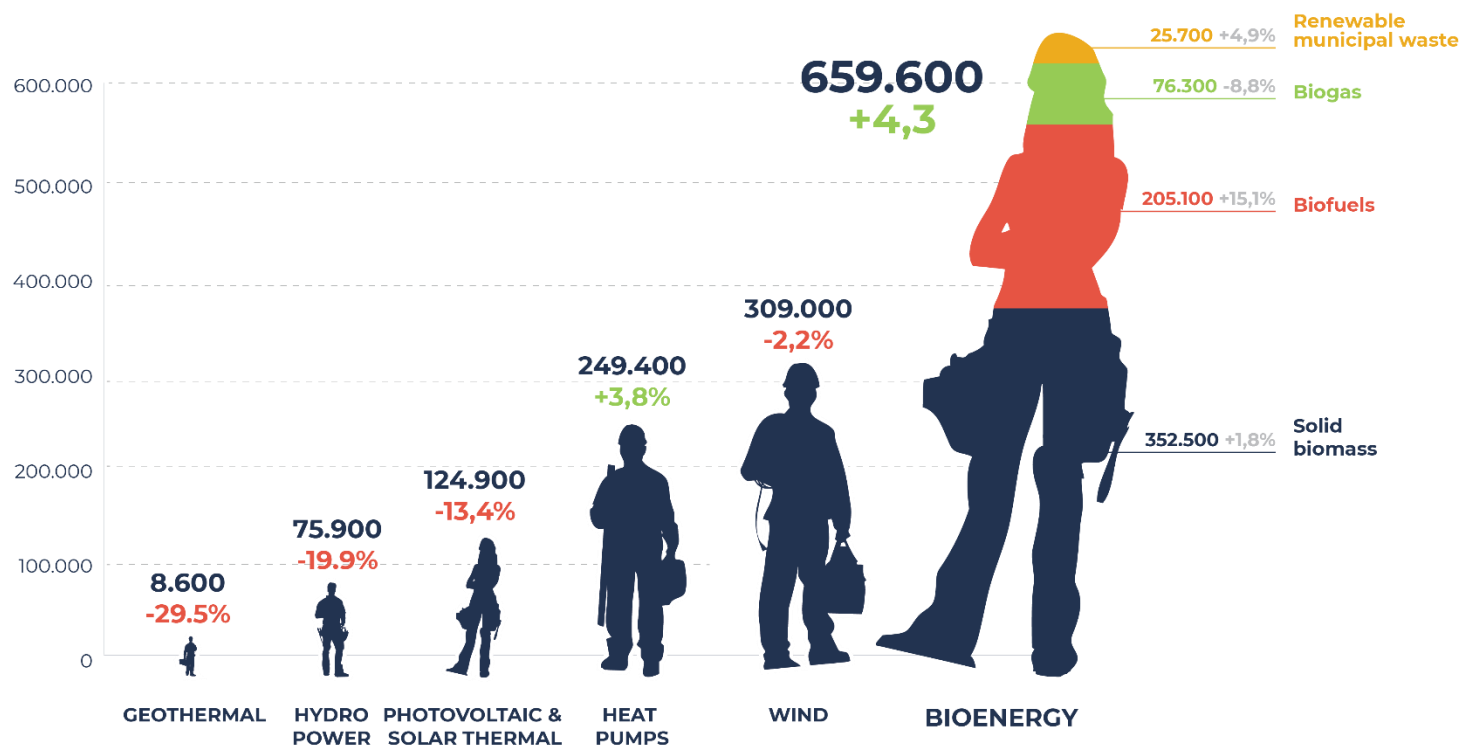
(IN 2016, BILLION €) SOURCE: EUROBSERV'ER



## EU-28 EMPLOYMENT DISTRIBUTION IN RENEWABLE ENERGY

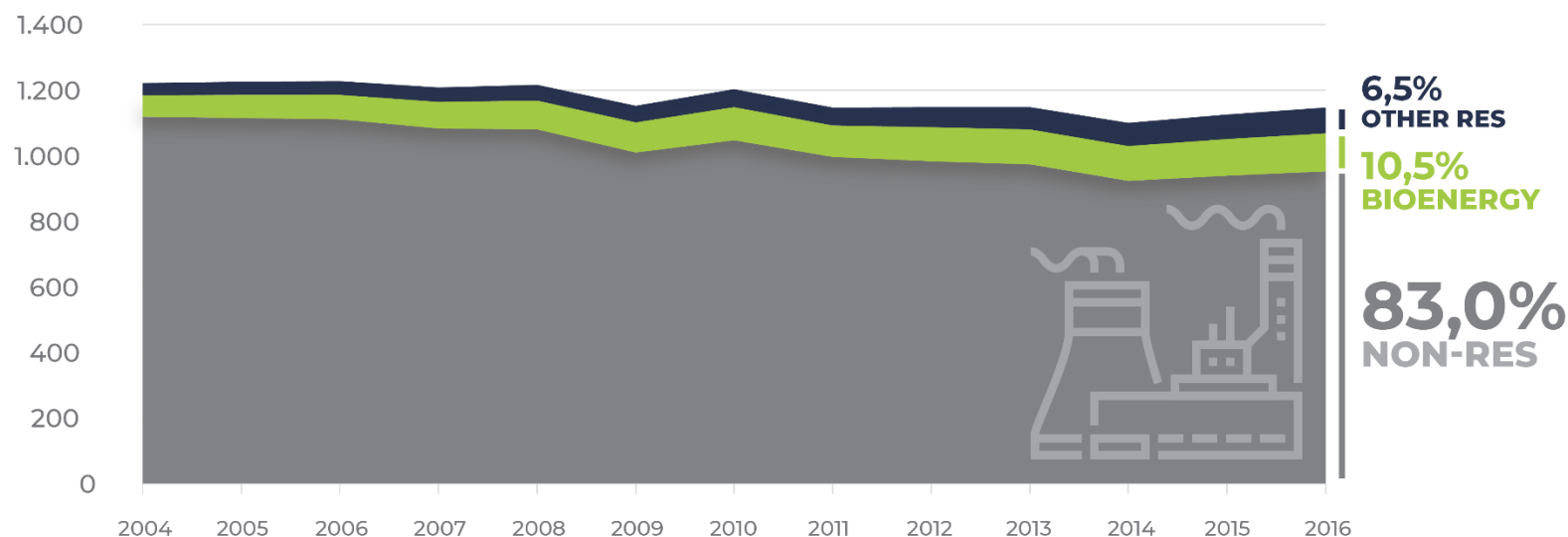
(IN 2016, % GROWTH 2015-2016, DIRECT AND INDIRECT EMPLOYMENT)

SOURCE: EUROBSERVER



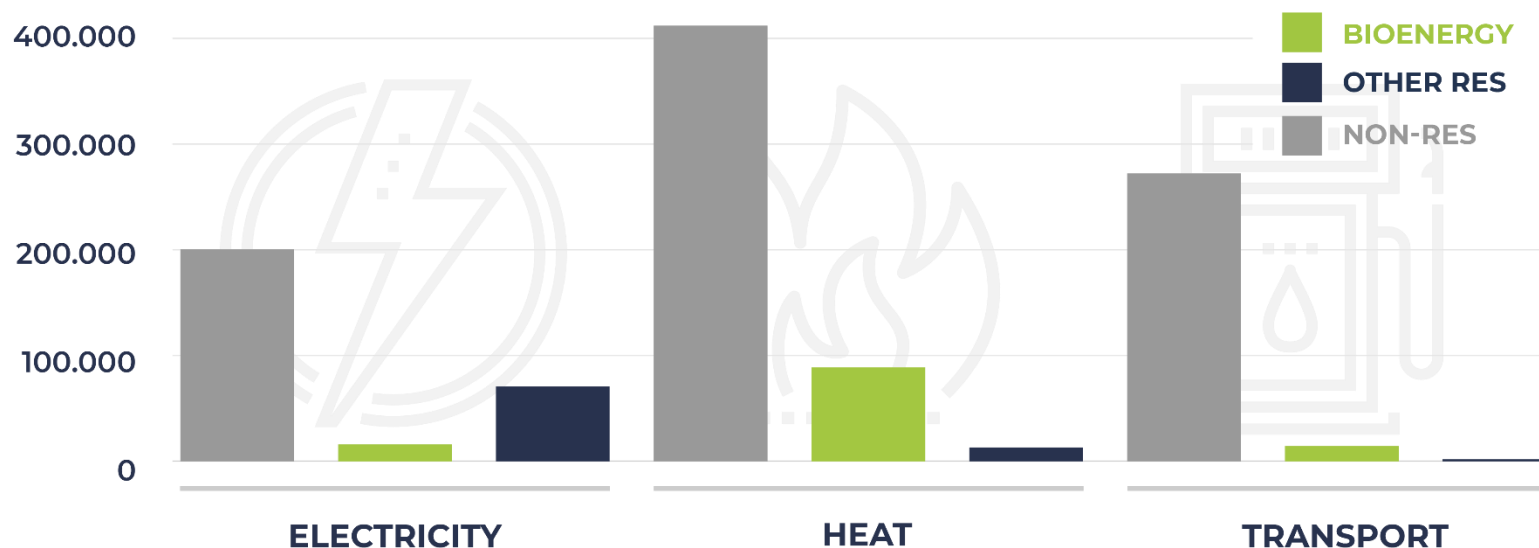
## EVOLUTION OF EU-28 GROSS FINAL ENERGY CONSUMPTION

(MTOE, %) SOURCE: EUROSTAT, BIOENERGY EUROPE'S CALCULATIONS



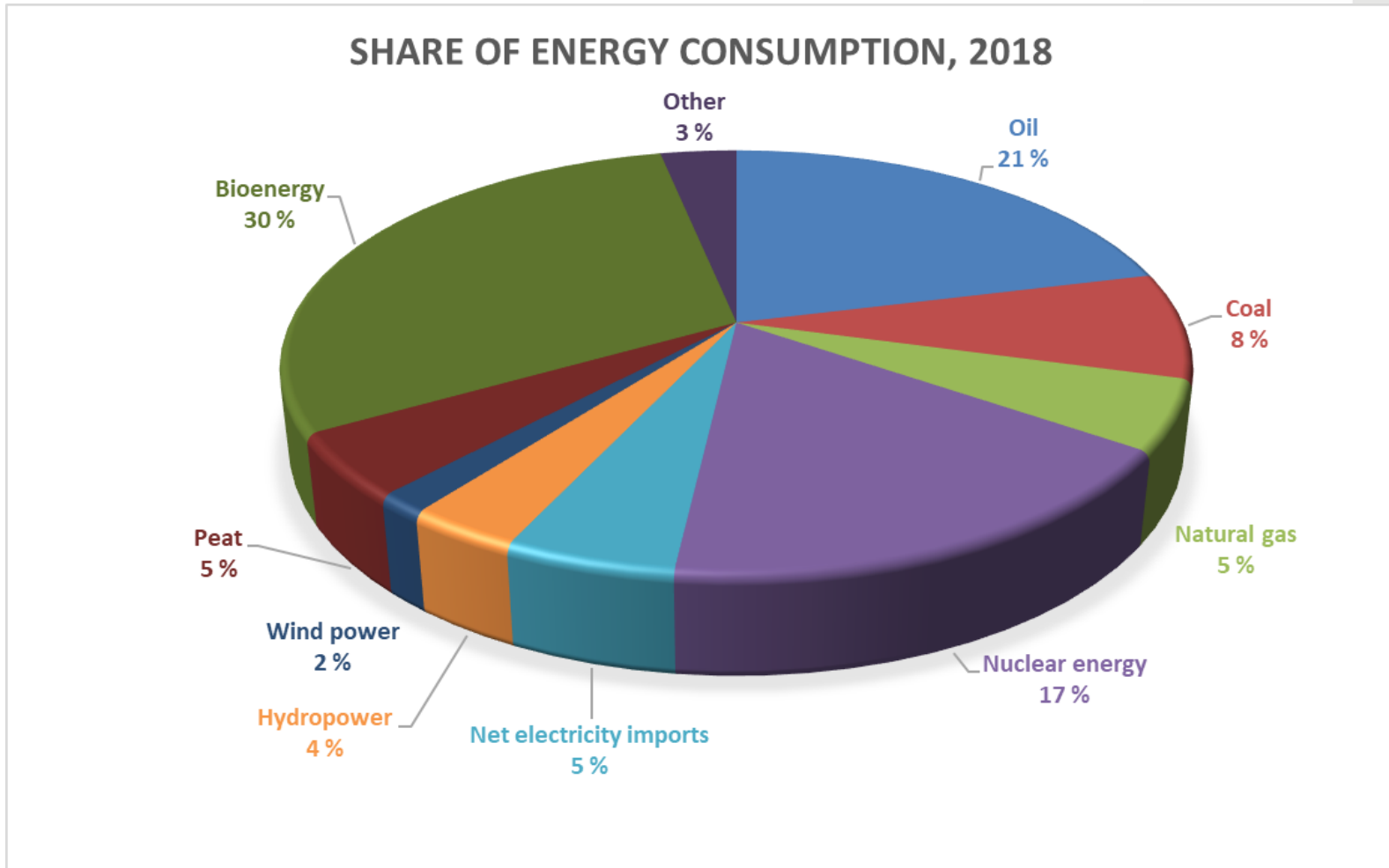
## EU-28 SHARE OF ENERGY FROM RENEWABLE SOURCES IN THE GROSS FINAL ENERGY CONSUMPTION BY SECTOR

(IN 2016, KTOE) SOURCE: EUROSTAT, BIOENERGY EUROPE'S CALCULATIONS



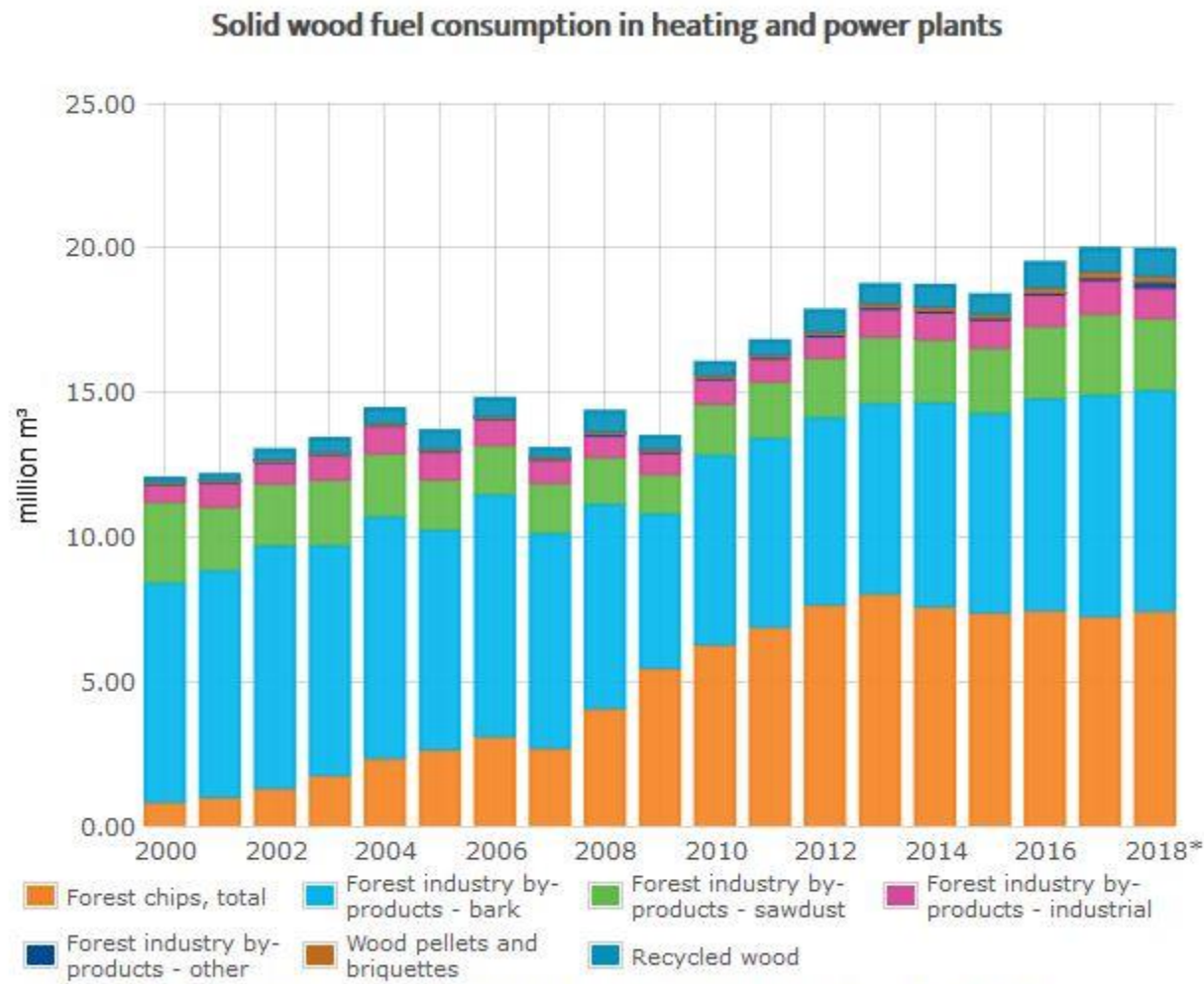


# Role of Bioenergy in FINLAND



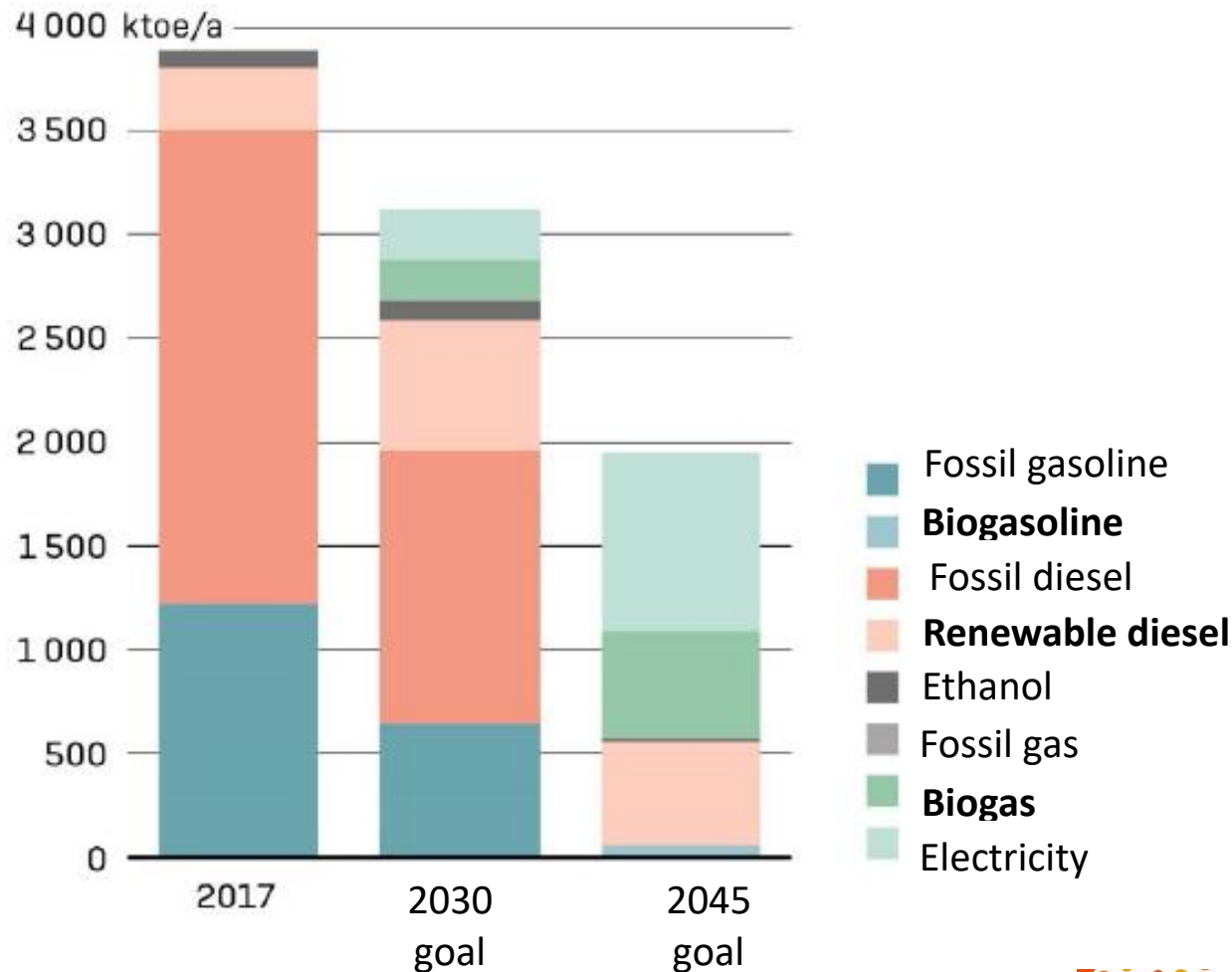
Source: Statistics Finland 2019

# Solid Wood Fuels in Heat and Power Plants



Source: OSF: Natural Resources Institute Finland, Wood in energy generation.

# Biofuel Outlook for cars – recent WG report

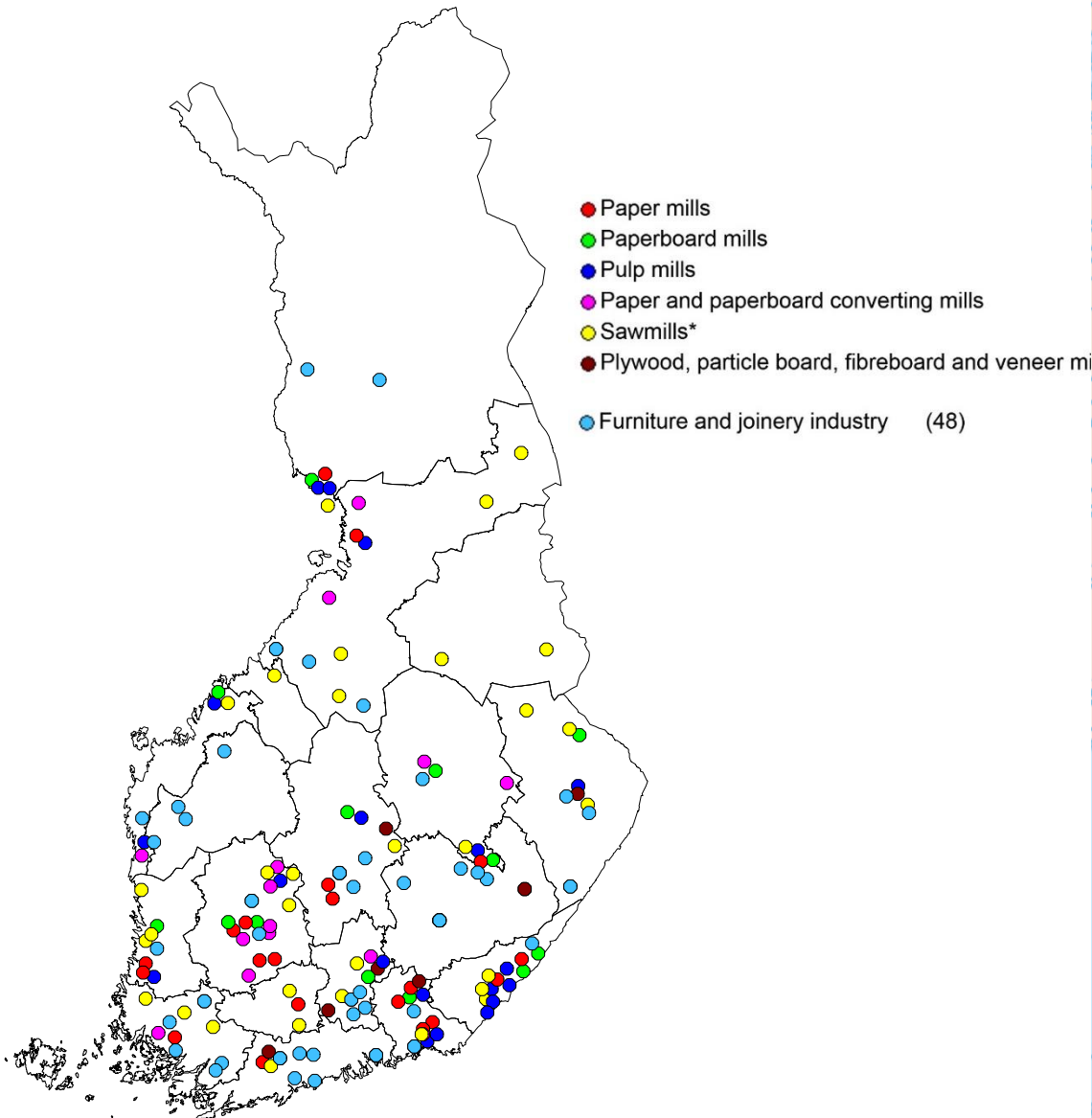


Source: Ministry of Transport & Communications Finland 2018



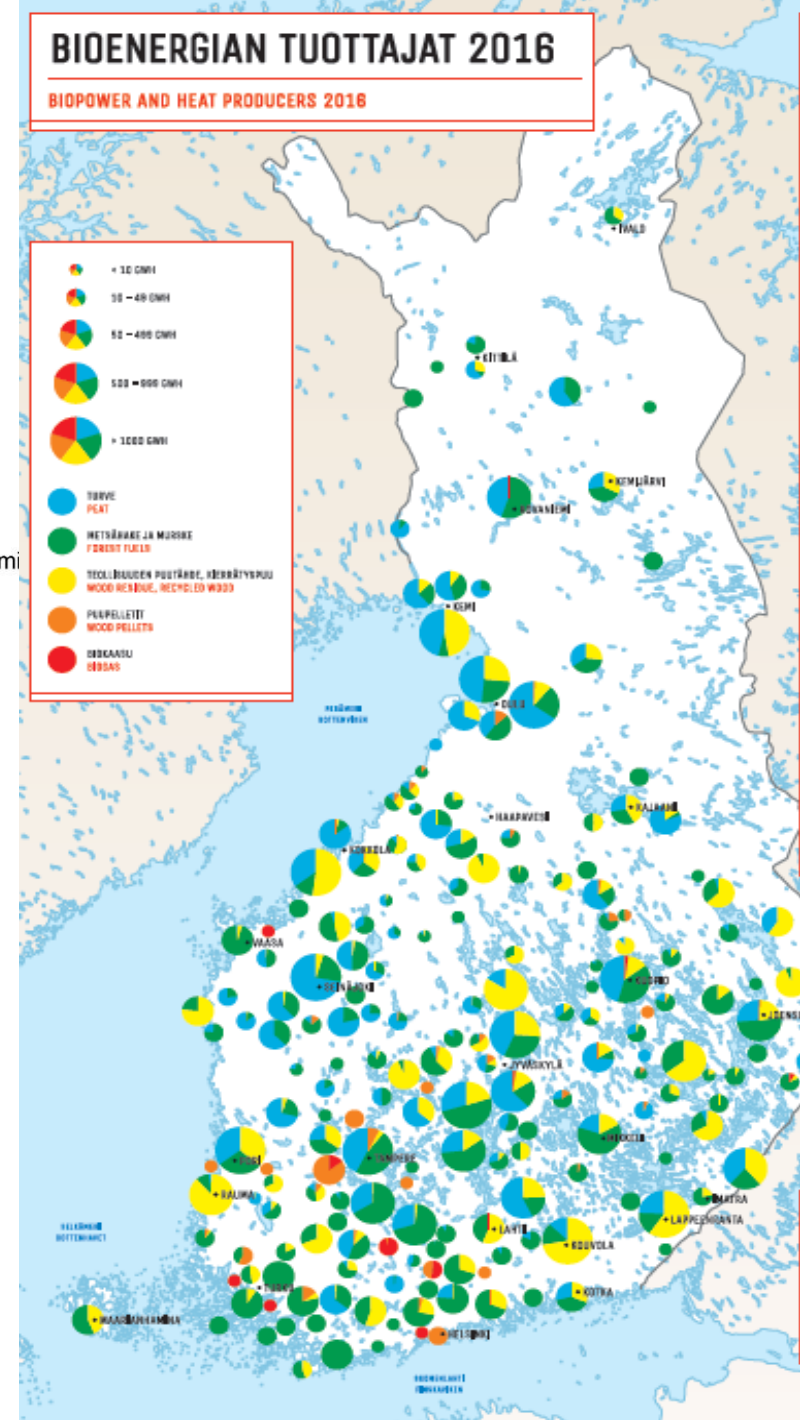
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# Bioenergy in FI often closely linked with forestry sector



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# Bioenergy and carbon sinks

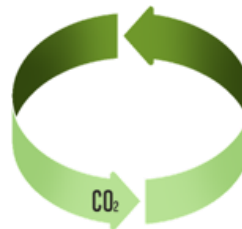
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# Carbon neutrality of biomass is not a myth

- Bioenergy contains carbon that has been taken from the atmosphere by the plant; when released again the **CO<sub>2</sub>-level not changed from previous**
  - With Bio-CCS or PyCCS (biochar) even negative emissions!
- Bioenergy **utilises low grade biomass**, which use helps to increase growth and decrease fire risks etc. → additional positive effect on sinks
- **LULUCF and REDII** creates monitoring **framework** and regulations to ensure positive development

**Carbon storage** =  
balance in bank  
account

**Carbon sink** =  
annual interest  
(increase) for the  
balance

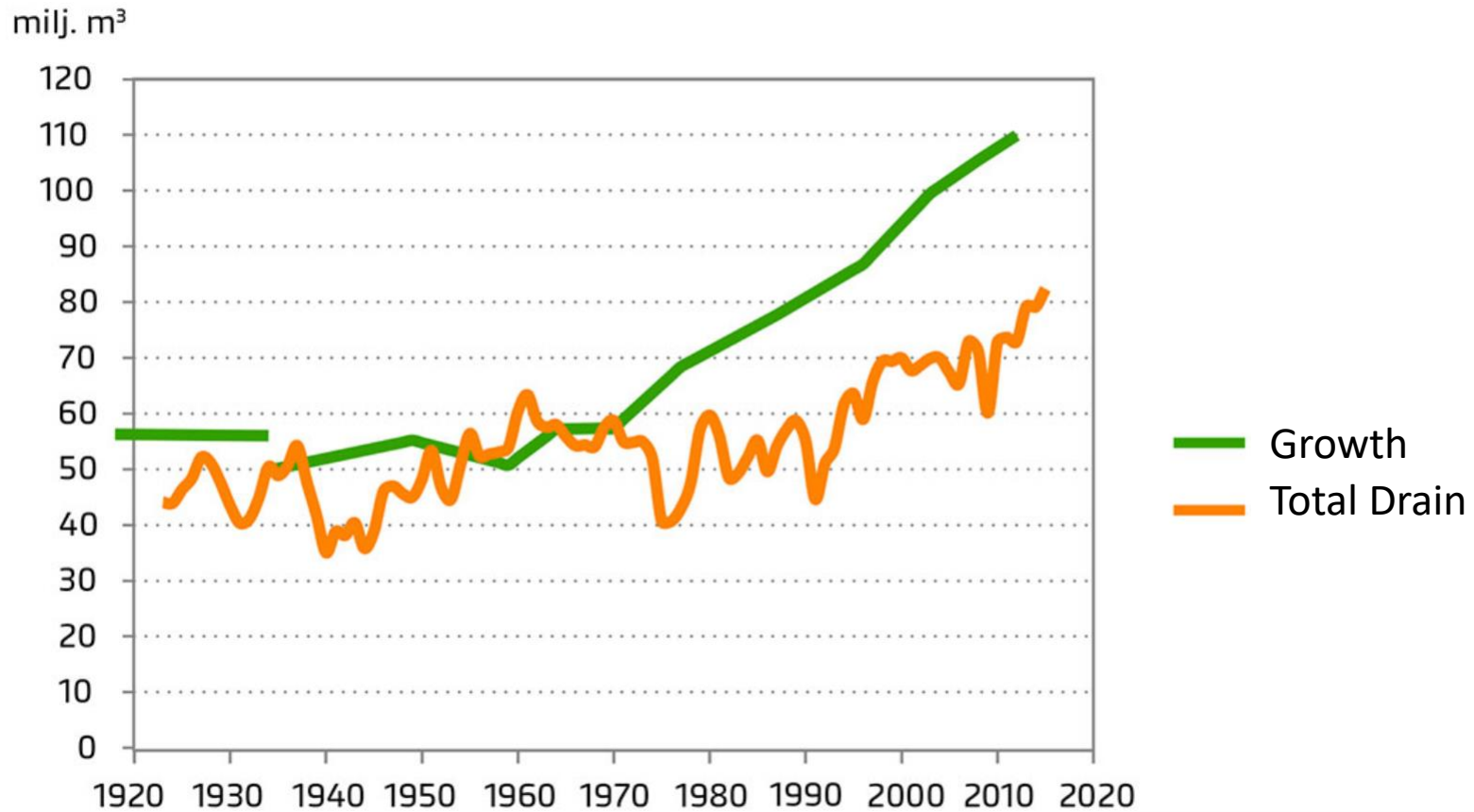


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# We can do it!

Forests and Forest Land are a huge carbon sink that sequesters 46 % of Finland's emissions

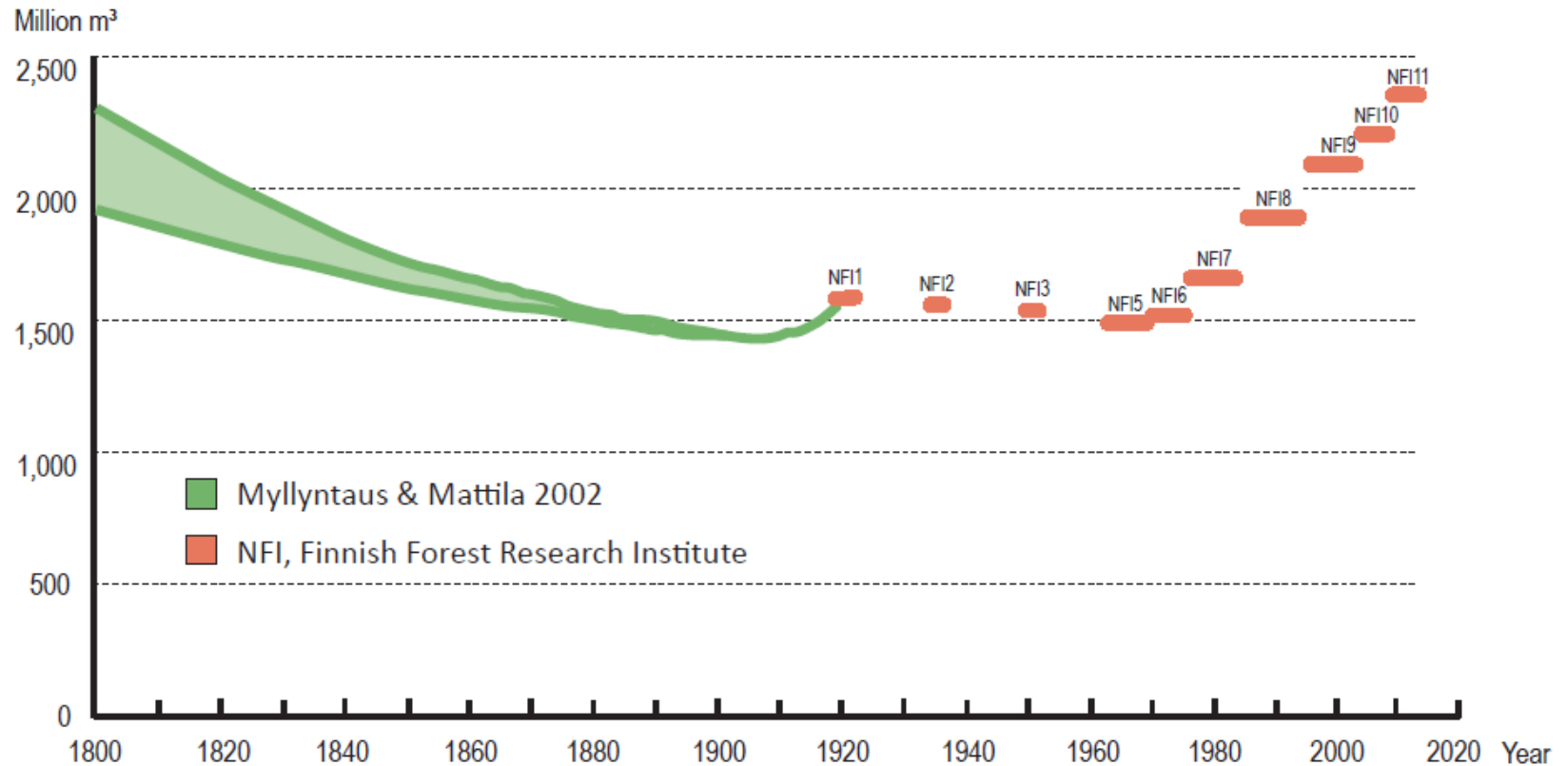


Source: National Resources Institute of Finland 2017



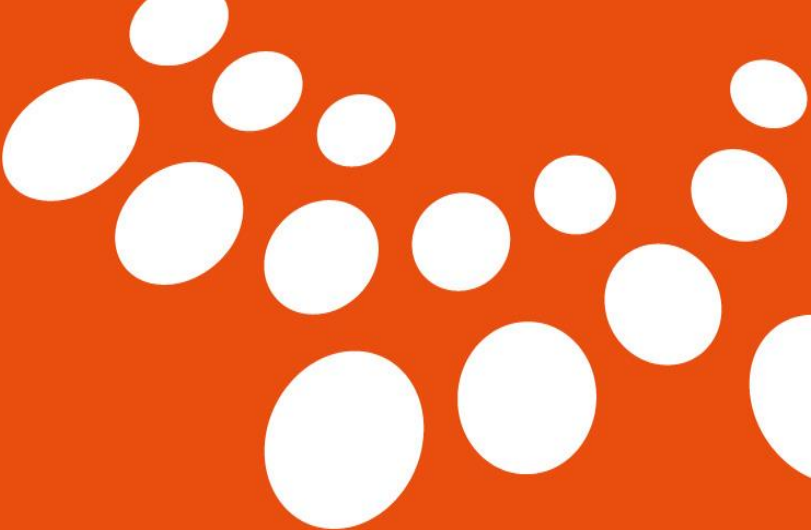
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## DEVELOPMENT OF THE STANDING TIMBER STOCK 1800–2013



- Estimation of timber stock after 1920s refers to the years the respective National Forest Inventories (NFI) were carried out.
- Historical methods have been used to assess the volumes of standing timber stock before 1920's, when the first NFI was carried out. This is why the estimation is less reliable, the more distant the evaluated period is.
- The decrease starting in 1940s is due to the cession of land areas to the Soviet Union after World War II.
- Sources: Timo Myllyntaus and Timo Mattila: Decline or increase? The standing timber stock in Finland, 1800–1997. Ecological Economics 41 (2002); Natural Resources Institute Finland, National Forest Inventories. Updated 31.07.2017.





# District heating and cooling – solution to decarbonise energy system

# DISTRIC HEAT + C - PART OF THE SOLUTION TO MEGA CHALLENGES

66% new buildings are being attached to DH  
2,8 milj people in Finland (51 %) on DH  
99,8 % supply reliability  
70 % of municipalities have DH  
2/3 of fuels are domestic fuels



1950 1960 1970 1980 1990 2000 2010 2020 2030 2040



A man is shown from the chest up, emerging from a body of water or ice. He has a pained or shouting expression, with his mouth wide open. The background is a vast, icy landscape under a blue sky. Several semi-transparent text boxes are overlaid on the image, containing various terms related to energy and technology.

**New technologies**

**Energy storages to network:  
Thermal & Electricity**

**Bio-oil**

**New Customer Services**

**Biogas**

**Towards control of  
customer conditions**

**Circular Economy**

# **District Heating & cooling**

**Service Platforms**

**Renewable energy solutions:  
centralised or decentralised**



## **DHC means flexibility and efficiency**

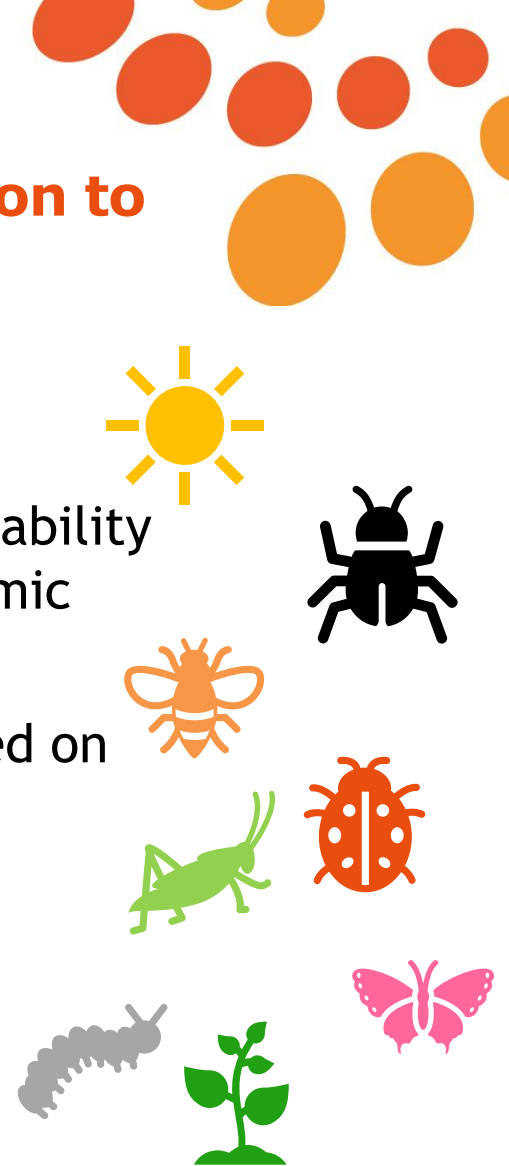
- Heat network as such is energy storage for some time
- Energy efficiency as network can also take in excess heat from the clients
- Several energy sources may be included: solar thermal, geothermal if they are economic.
- Biomass heatplant or chp may be either base load, high flexibility plant or peak up plant. What is your need?

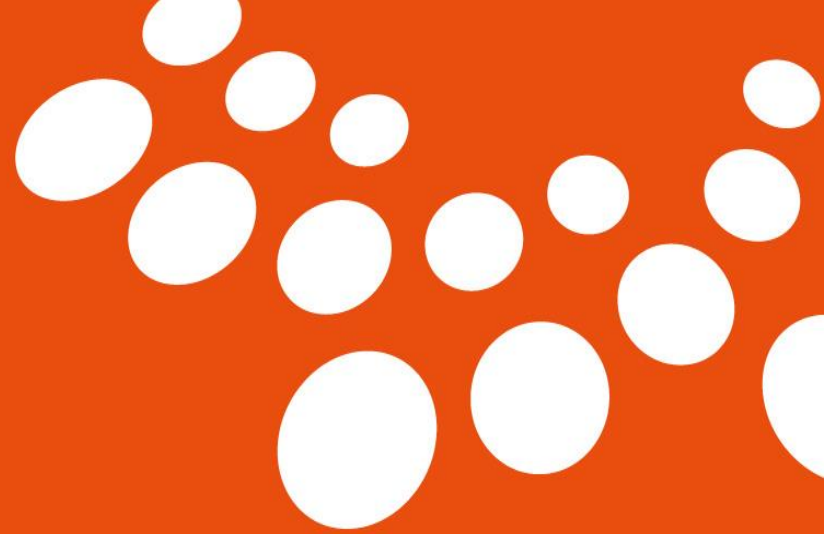


# Responsibility of bio-heat

# Responsibility towards society is precondition to successful business

- For bio-CHPC is means especially:
  - **sustainable biomass**, with all corners of sustainability taken into account: social, environment, economic
    - REDII creates good framework
    - voluntary certifications may be used or based on national system
  - **air emissions** very low with right technology
    - condensing increases same time efficiency
  - ashes and other to include **circular economy**
  - **Justifiable price** for the end customers, which requires commitment but also stability from administration





# Finnish know-how via examples



## Fortum HorsePower – from stable to energy





## Fortum's Otso Bio-oil



Ecological Fortum Otso bio-oil is produced from renewable wood-based raw materials by using fast pyrolysis technology. Fortum Otso bio-oil originates from Finnish woods, that is why we have named it Otso which refers to bear.



**Renewable oil  
reduces CO<sub>2</sub>-  
emissions by  
90%**



**Bio-oil is  
competitively  
priced**



**Ideal for for  
heat and steam  
production**



**Maybe heat entrepreneurship could  
be model to increase bioenergy in  
Spain too?**

# BioHeat entrepreneurship in Finland

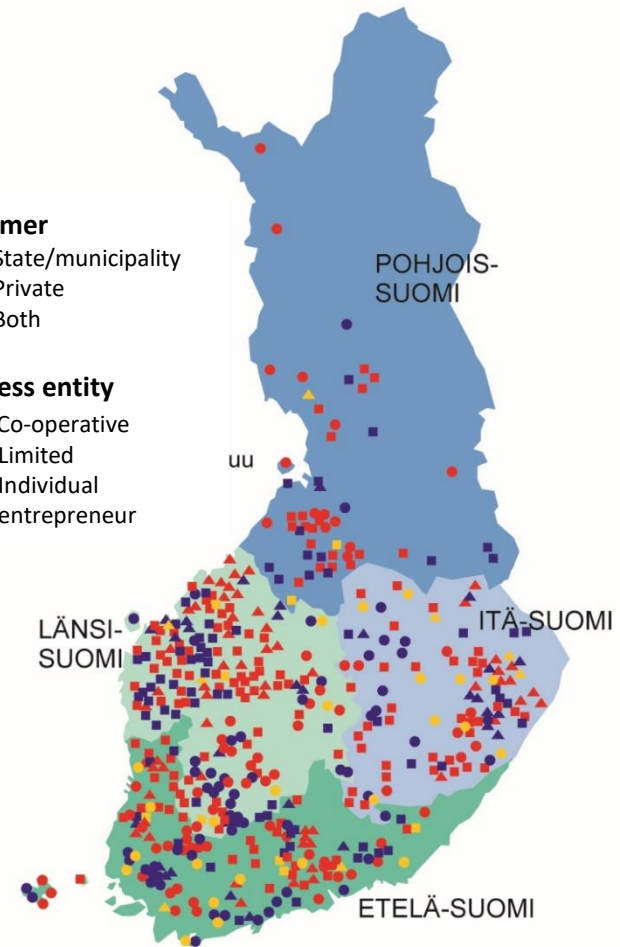
- Started in the early 1990's
- Plants operated by BHE's in 2016:
  - 621 in total
  - Heats up ca. 200 schools, day cares, elderly care houses
- Ca 350 operated by limited companies (Oy), ca 90 Co-ops, nearly 200 by entrepreneur or group of entrepreneurs with shared responsibility
- Thermal capacity ca 370 MW in total
- Scale 300 kW-6000kW
  - 30 % operate on heat networks, 70 % heat individual buildings
  - 150 > 1 MW and 380 on 300 kW – 1 MW

## Customer

- State/municipality
- Private
- Both

## Business entity

- △ Co-operative
- Limited
- Individual entrepreneur

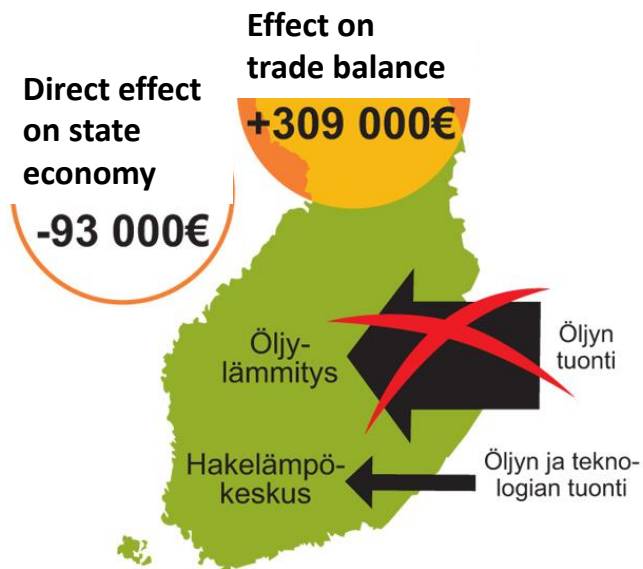
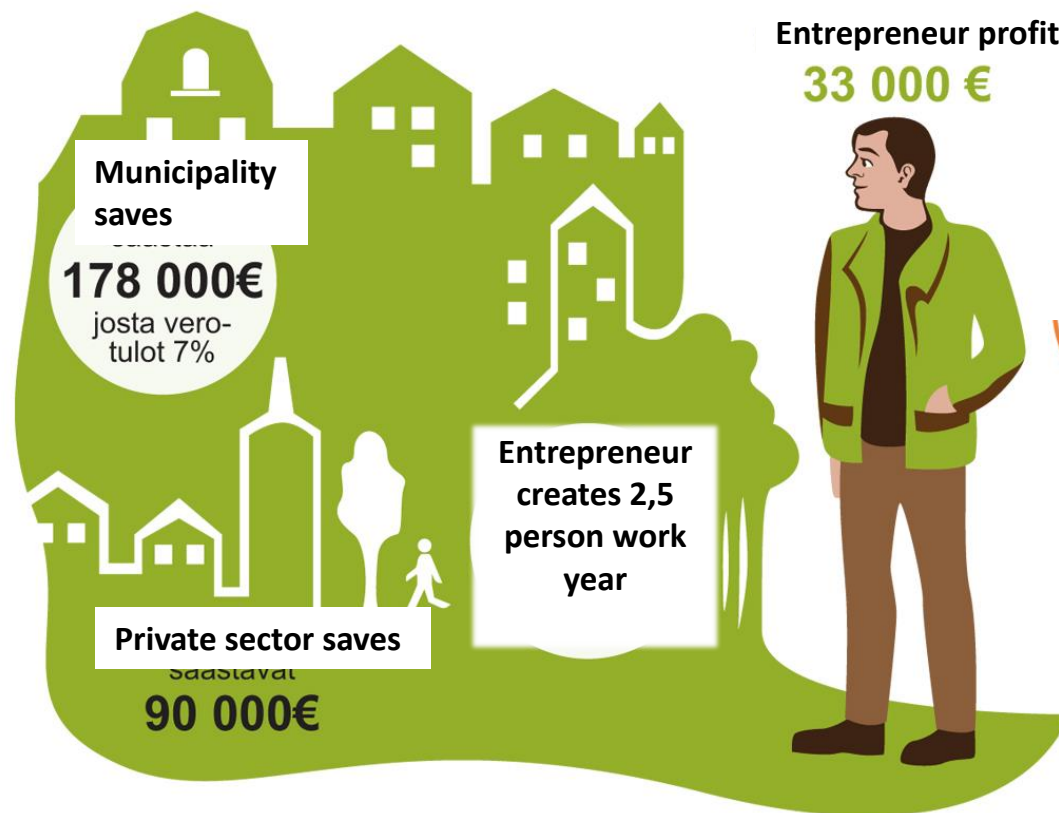


Heating units based on heat entrepreneurship in 2012 (TTS)



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# Regional economic impact of a heat entrepreneur company per annum, as 5000 MWh of oil heating is replaced



**Motiva**

Luvut perustuvat Gaia Consulting Oy:n 2014 tekemään laskentaan. Esimerkkikohteena on Lapinjärven kirkonkylän 2 MW:n lämpölaitos. Öljyn ja hakkeen hinta on vuodelta 2013. Lisätietoja [www.motiva.fi/lampoyrittajyys](http://www.motiva.fi/lampoyrittajyys)

## Case Itä-Savon Lähienergia Oy



- Heat entrepreneur company founded in 2003, joined by wood fuel company founded in 1980.
- Service model Metsästä Lämmöksi (from forest to heat)
- Selling 16 000 MWh/a heat (= 25 000 loose-m<sup>3</sup> forest fuel) to several customers through 8 heating plants in Savonlinna region
- Revenue 1,1 M€ (2016), seeking to further expand and in 2017 acquired another BioHeat company
- Total procurement of wood fuels 40 000 loose-m<sup>3</sup>/a



*Itä-Savon Lähienergia Oy*

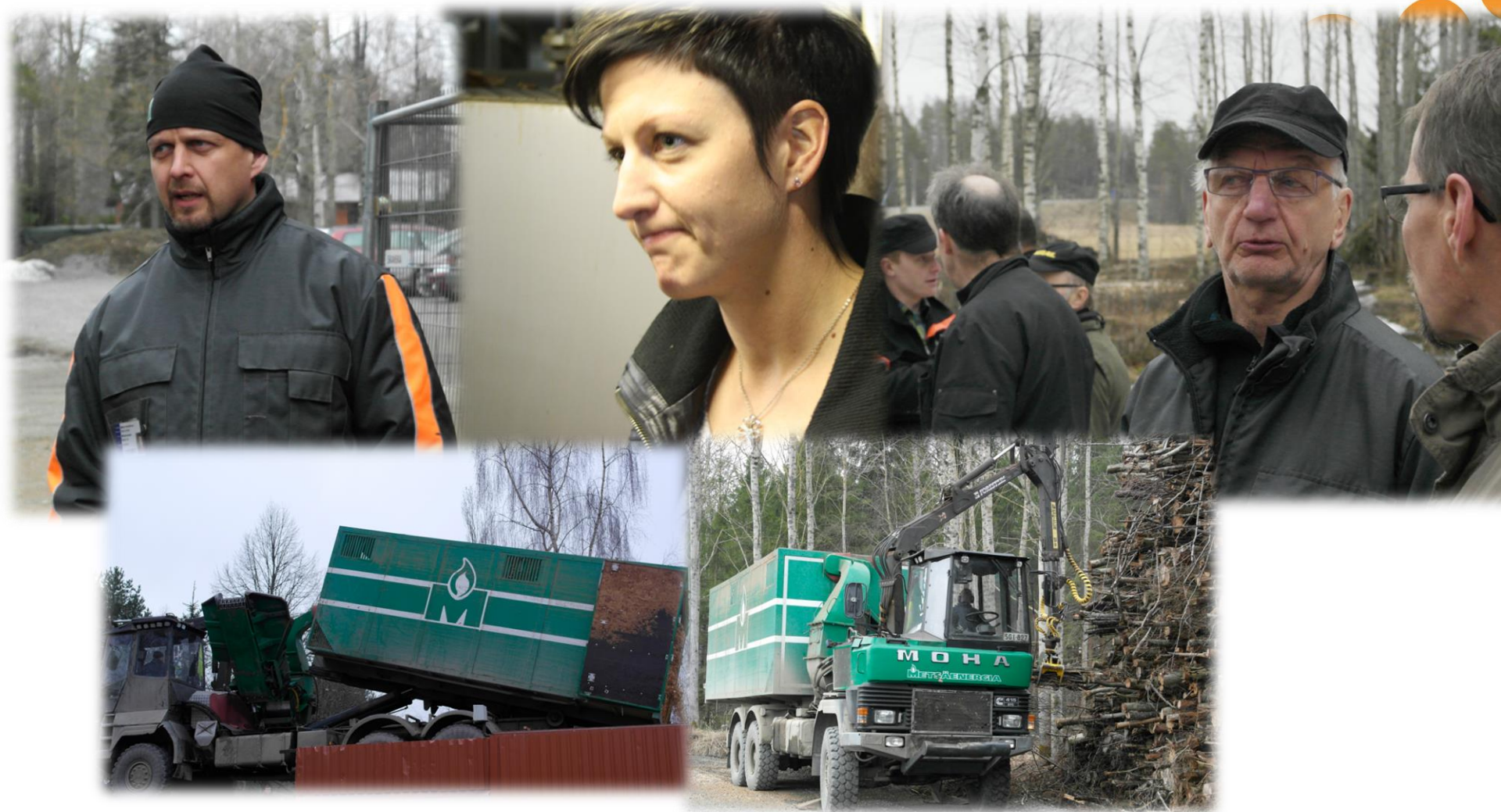


*Metsäenergia Meter Oy*



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<https://www.youtube.com/watch?v=k4G3anHTWX0>

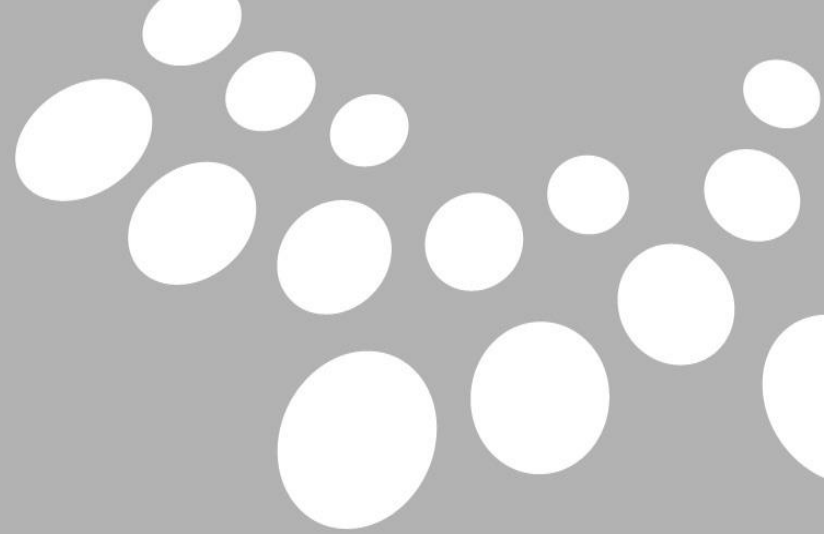
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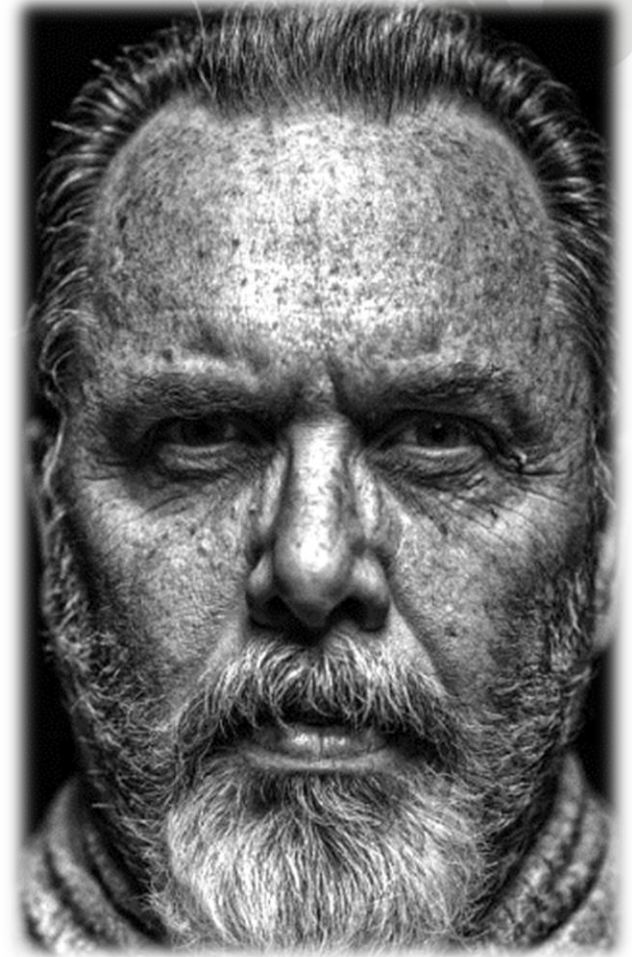
# Finnish technology has been hard tested in severe conditions





## Finnish robust high tech providers

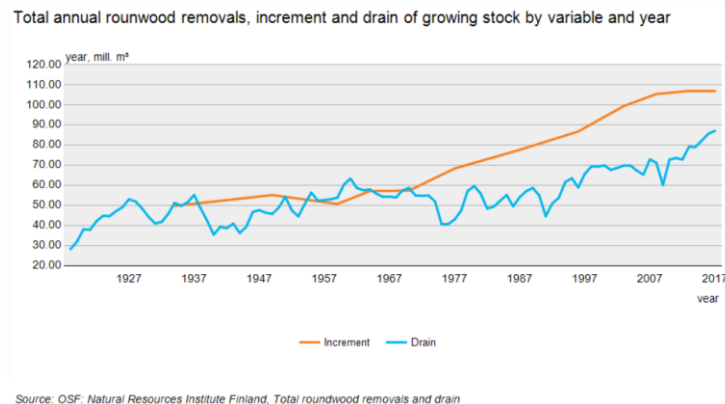
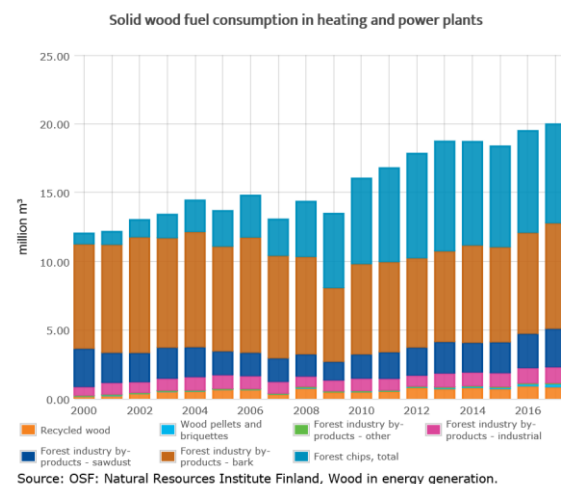
- Decades of joint development with tech companies, energy companies and public organisations together
- Reliable, robust solutions, works also on low quality fuels
- Wide range of references from micro-CHP to mid size heating plants and high efficient large CHP.
- Not only the plants but intelligent handling, logistics and maintenance solutions. Turn key solutions that really work!





# Proven lessons from Finland (and other countries) to make change in policy

- Incentivise decarbonisation with carbon pricing energy use
  - FI: introduced carbon based tax as first country in the world in 1990
    - rate for coal, natural gas, HFO, LFO in heating and transport fuel 62€/tCO<sub>2</sub>ekv
    - 4,68 billion € collected 2019
    - Renewable energy share in Finland is 40 % (bioenergy alone ca 30%)
  - Globally 46 national and 24 subnational jurisdictions are putting a price on carbon
- Utilise the great potential and utilise the further growth with active forest management
  - Thinning induces growth and maintains forest health → bioenergy for fossil substitution





# Thank you for your attention!

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