Jožef Stefan Institute
Energy efficiency centre

Presenter
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REPUBLIKA SLOVENIJA
MINISTRSTVO ZA OKOLJE IN PROSTOR

LIFE CLIMATE PATH 2050

ARE BIOMASS BOILERS SOLUTION FOR LOW-CARBON TRANSITION IN HOUSEHOLDS?

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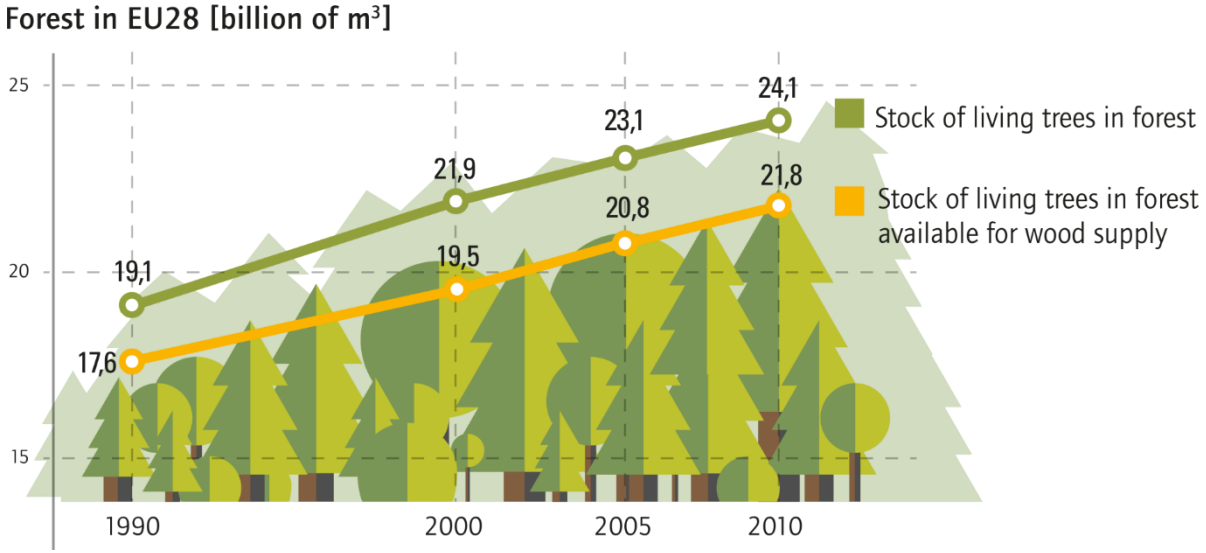
Conference
International Conference on Sustainable Energy & Environmental Protection

University of the West of Scotland, Paisley, Scotland
8th May 2018

The current issues on energy and climate

- How to reach the 2°C target?
- Energy security
- Economic aspects of fossil and renewable energies
- What is the future of the energy system?
- What is the future of solid biofuels?



Source: AEBIOM, European Bioenergy Outlook 2014

Science base facts and climate mitigation

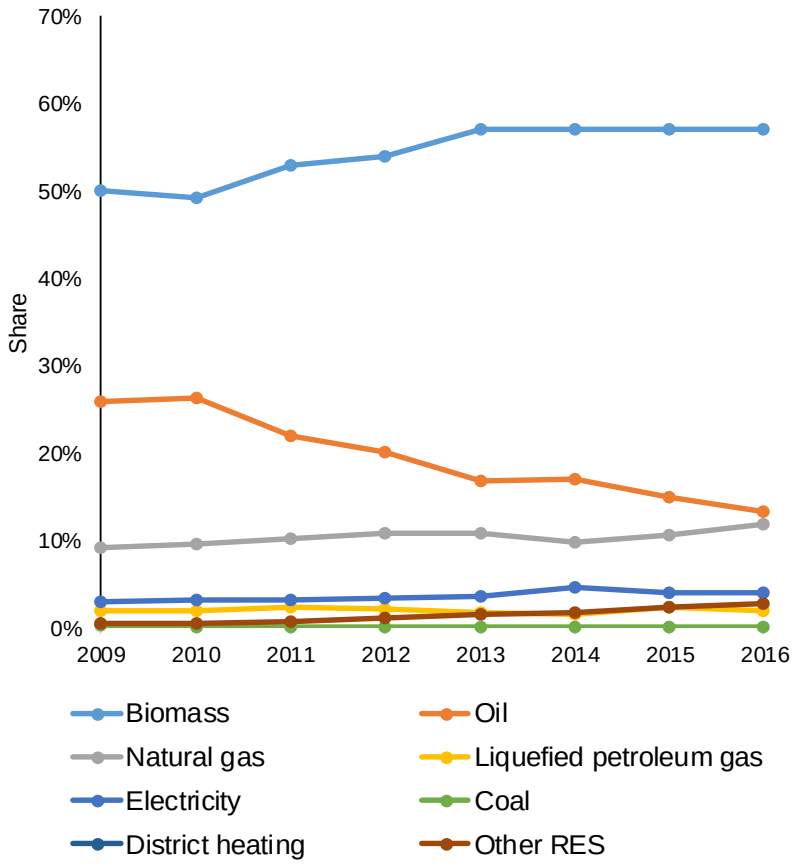
- CO_2 - the main cause of climate change
- Fossil fuels: the main source of CO_2 emissions
- Not cutting forests is the problem but digging out fossil carbon! Coal, oil, gas should remain in the earth crust!

The only alternative to a climate disaster concerning the building sector:

Reducing fossil fuels and replace them by better efficiency and renewable energies

Outline

- 464.730 households, more than **70 %** are **energy inefficient** and need a deep renovation, including energy systems.
- **Wood biomass was and still is an important source** of energy for households in Slovenia. It prevails as the main source for heat production.



Final energy consumption for heating and energy source (SURS, 2018)

Outline

- In Slovenia the issue of air pollution is largely linked to particles (PM10 and **PM 2.5**) and, in the summer, to ozone.
- Slovenia has obliged to reduce fine particulate matter by 25 % by 2020 and by 60 % by 2030 compared with 2005.
- Regarding the greenhouse gas emissions, the goal of Slovenia is that by 2020 the emissions will not increase by more than 4% compared to 2005 (EC, 2009).

Aim

By observing Slovenian households, to identify

(1) energy saving potential by replacement of existing biomass boilers with new, efficient ones.

(2) CO_2 abatement by replacing fuel oil boilers with biomass boilers in Slovenian households.

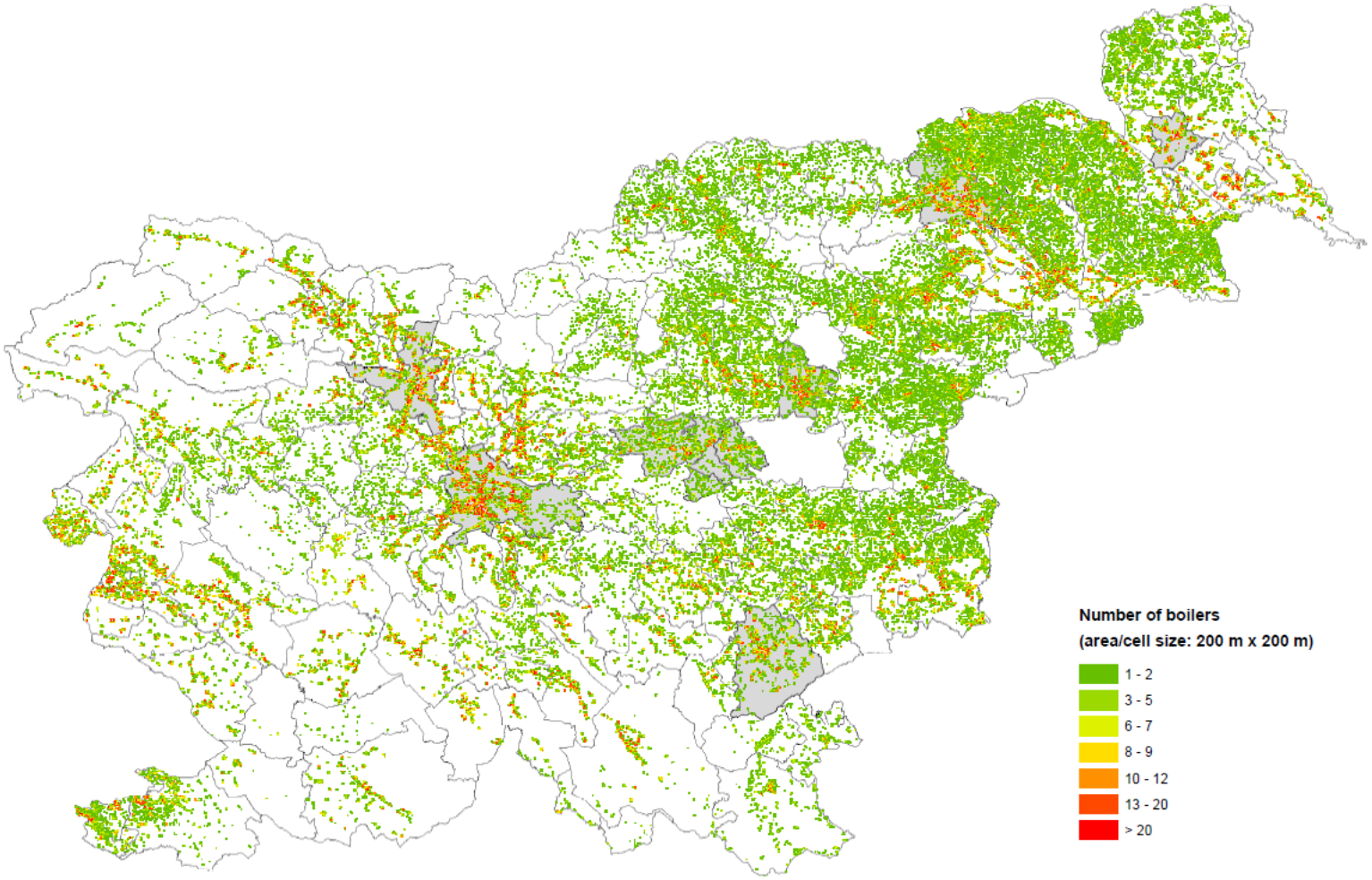
- The analysis is differentiating rural and urban areas.
- Technical and environmental potential is assessed taking into account spatial constrains.
- The results are used to support informed decision-making of long-term climate action planning.

Methods

1. Identification of the **current status** of buildings by integrating data sources.
2. **Characterisation** of the building stock.
3. Defining the **replacement rates** using Weibull distribution.
4. **Spatial constraints**: *air pollution* and *District Heating (DH) and Natural Gas (NG) Distribution Networks*
5. **Identification of potential**.

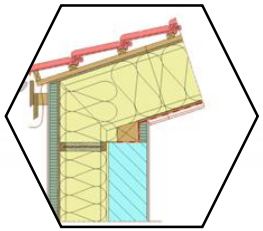
ON A BUILDING LEVEL!

Methods:
GIS-based analyses



Number of boilers, aggregated on area size 200x200 m in Slovenia

Methods: Bottom-up approach



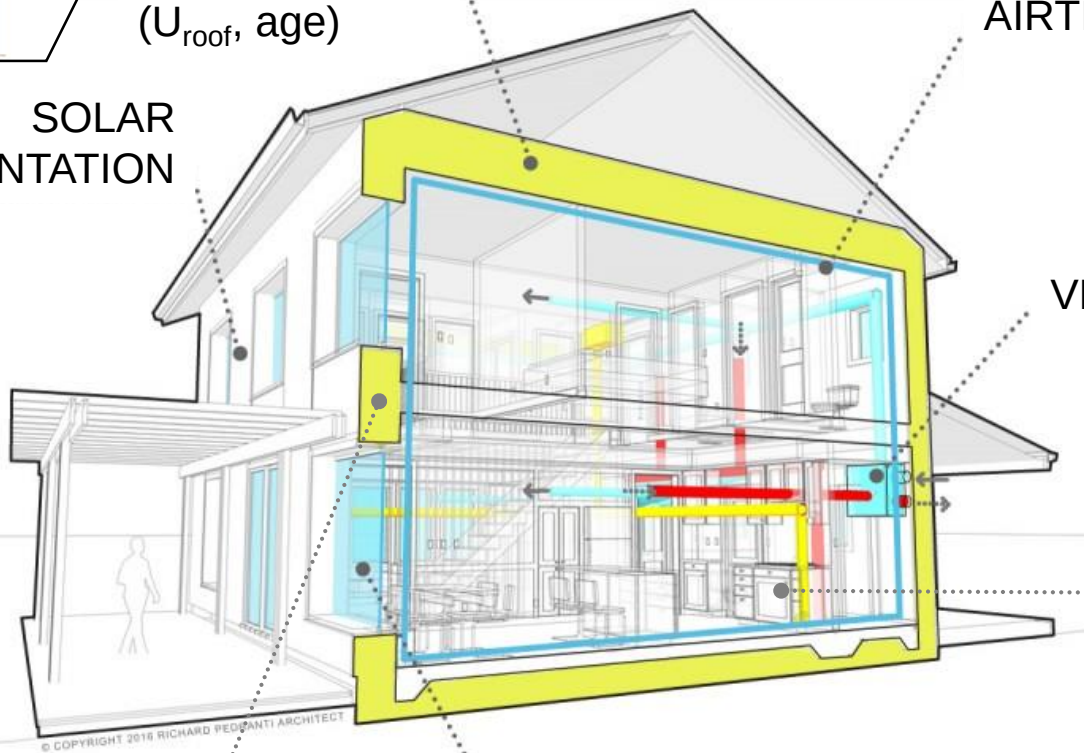
ROOF INSULATION (U_{roof}, age)

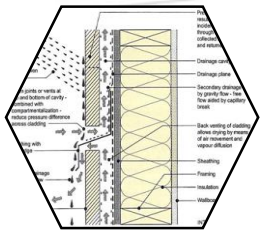
SOLAR ORIENTATION

AIRTIGHTNESS

VENTILATION

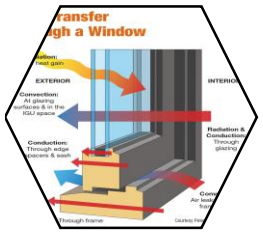
BIOMASS BOILER (η, age)





FACADE INSULATION (U_{fac}, age)

WINDOWS PERFORMANCE (U_{win}, age)



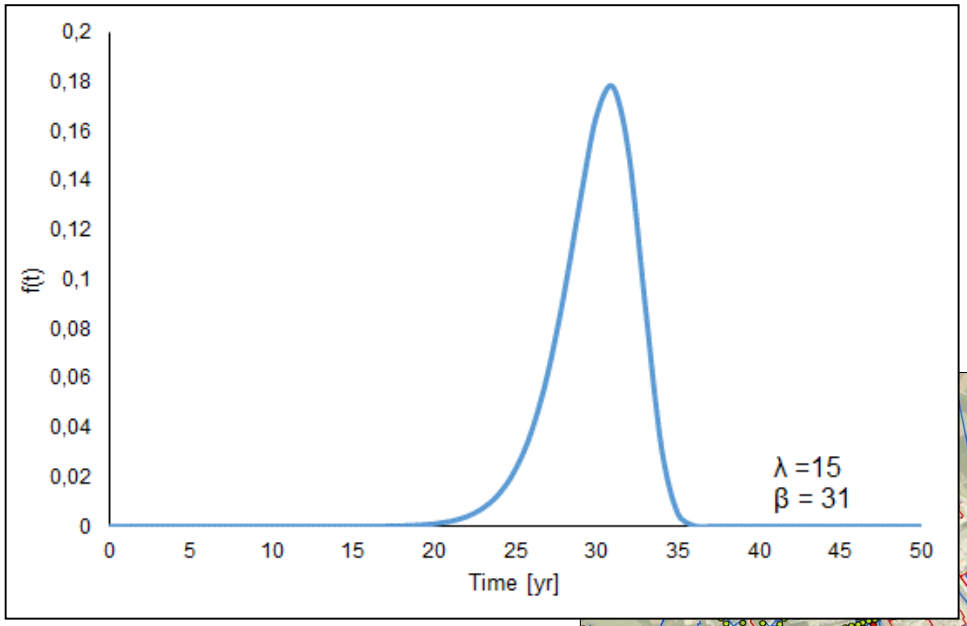
Results

OBSERVED GROUPS

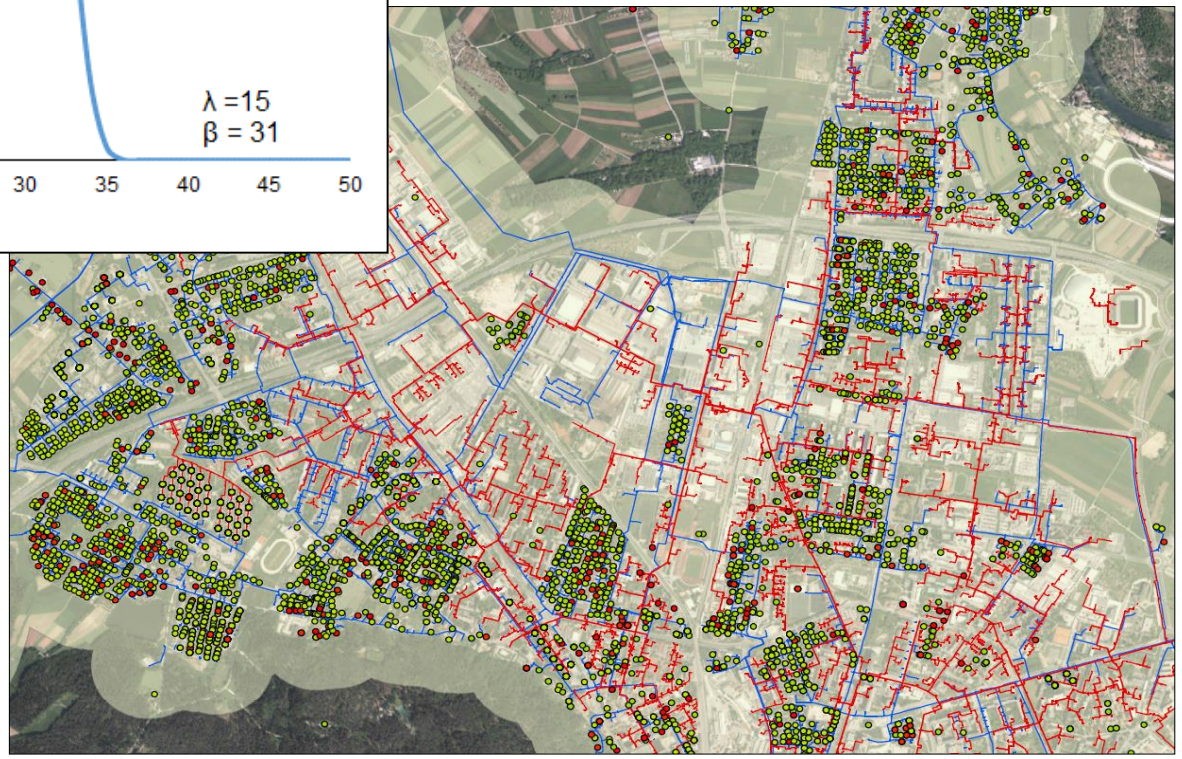
Original Energy Source	**Biomass**	**Fuel Oil**	**Fuel Oil**
Parameter	PM2.5	PM2.5	CO2
Unit	[t]	[t]	[kt]
Baseline	1 696	678	536
Savings			
All buildings, taking into account no constraints in the baseline year.	350	195	154
All buildings, taking into account the technical lifetime boiler period (30 years).	40	20	16
Buildings located outside municipalities with air quality plans.	274	149	118
Buildings located outside DH and NG distribution networks.	273	150	119
Buildings located outside DH and NG distribution networks and outside municipalities with air quality plans.	193	106	84

DH – district heating, NG – natural gas

Results



Weibull distribution of biomass boiler replacement (left) and observed boilers in part of Ljubljana, with highlighted 250 m buffer zone (below)



Results

From 2020 onwards the obligations of the Directive (EU) 2016/2284 applies and Slovenia has committed to reduce fine particulate matters for 60 % by 2030.

- Savings on account of replacement of old biomass and fuel oil boilers can aggregate to 12.5 %.
- The replacement of oil fuel boilers with new, efficient ones lowers the carbon emissions reduction by 15 %.
- The results indicate **high relevance of biomass for the current and future position** of the RES heating.

Conclusions

- Slovenia already has a high share of biomass boilers for heating, however, a large proportion of these are old.
- If biomass heating should grow in absolute terms, new systems have to overcompensate the replacement of old biomass boilers. Therefore, **the growth within the biomass sector will be limited**.
- Further spatial planning analysis could identify plausible locations of biomass cogeneration plants instalment as well as DH with biomass, possibly for small towns.

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“We cannot solve our problems with the same level of thinking that created them” – Einstein, A.

Thank you for your attention.