GHG impacts with rebound for building integrated solar energy technology

ERES 2017 Delft

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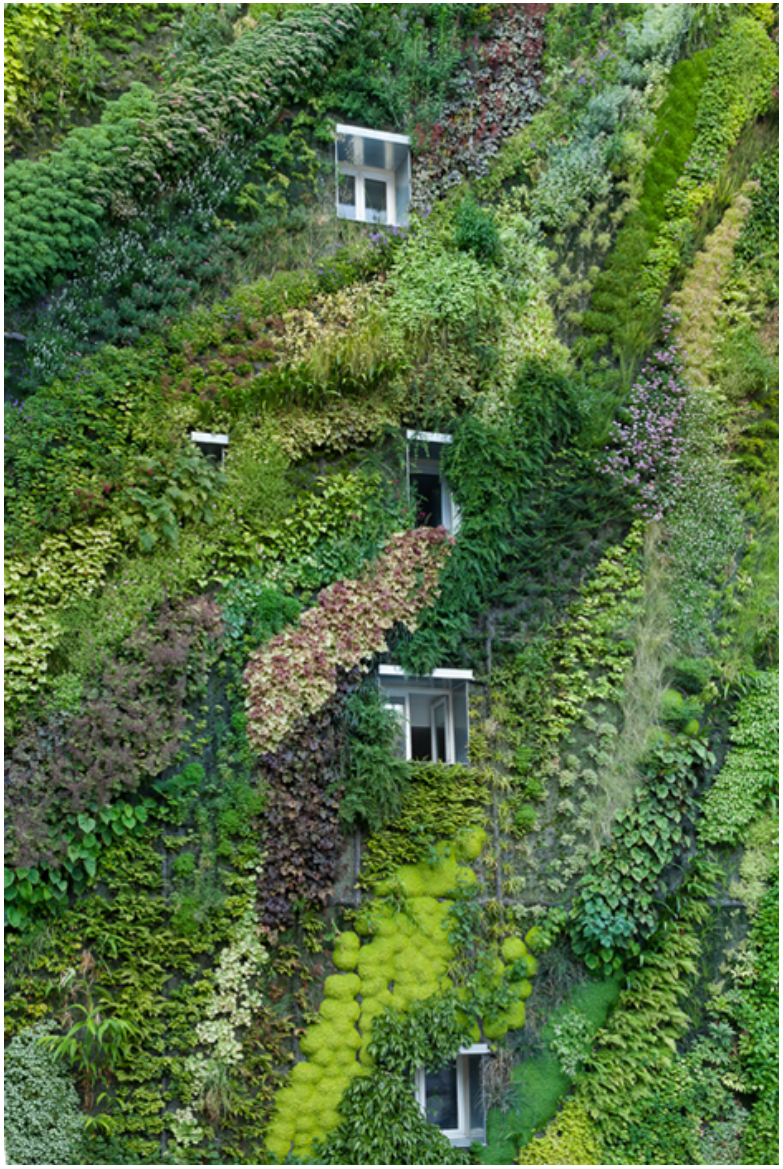
Contents

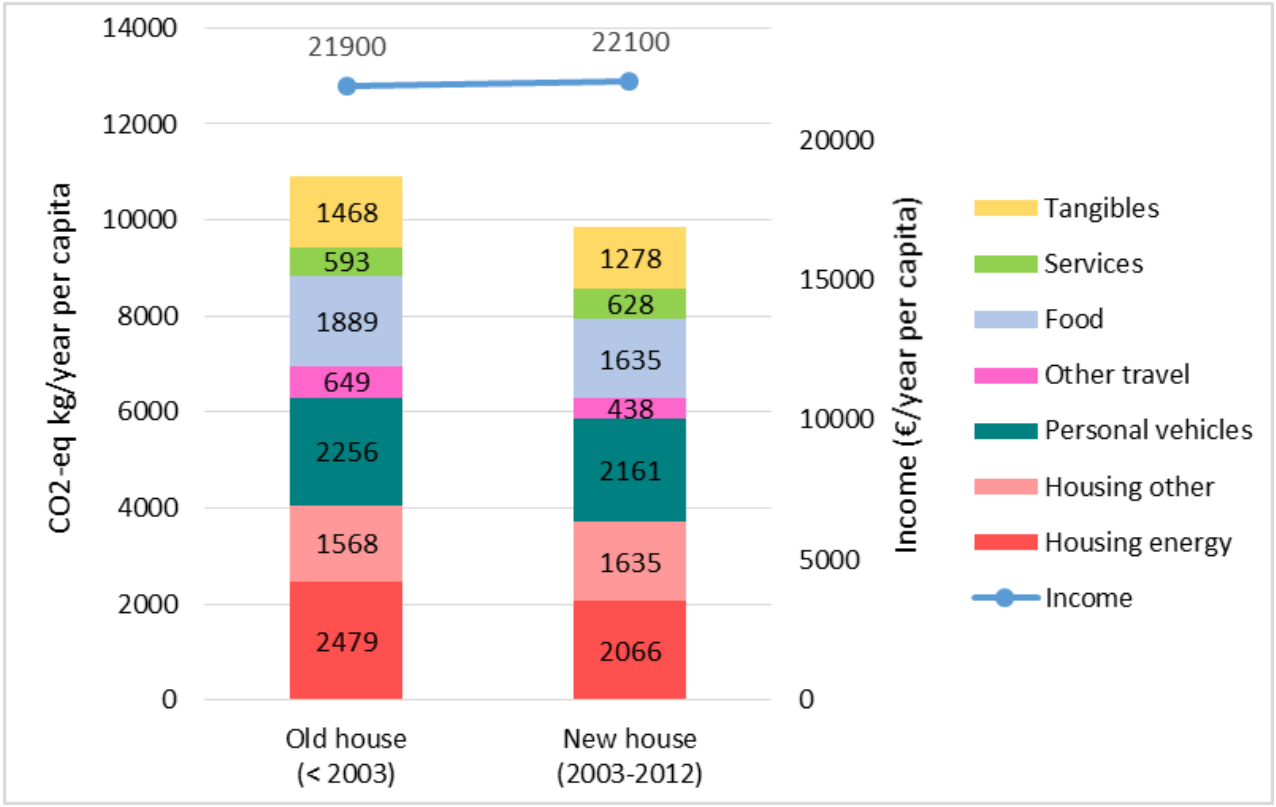
- Research question
- Materials and method
- Studied investment cases
- Results
- Conclusions



The Oasis of Aboukir by Patrick Blanc

Research question

What is the overall GHG impact of investment in building integrated solar energy technology, when rebound effects are taken into account?



Materials and method

- Real investment cases of Finnish real estate owners

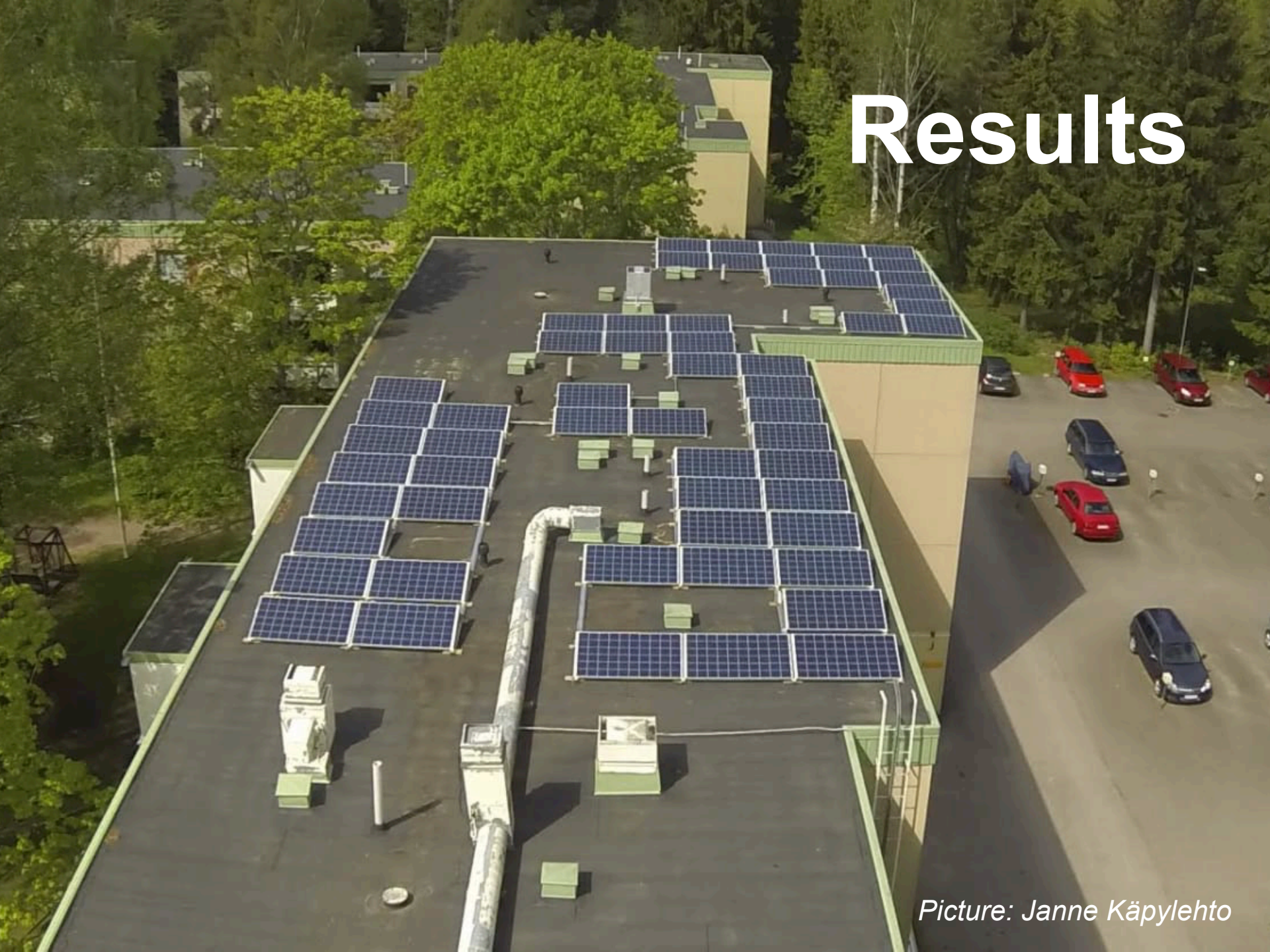
- EE IO analysis: input-output model of Finnish Economy, ENVIMAT (Finnish Environment Institute)
- Limitations: no consideration of time (energy price, inflation, GWP)

	CO2-eq kg/€
GHG intensity of the investment (solar panel production etc.)	1,0
Average GHG intensity of electricity production in Finland	2,1
Average GHG intensity of consumption in Finland	0,4

Studied investment cases

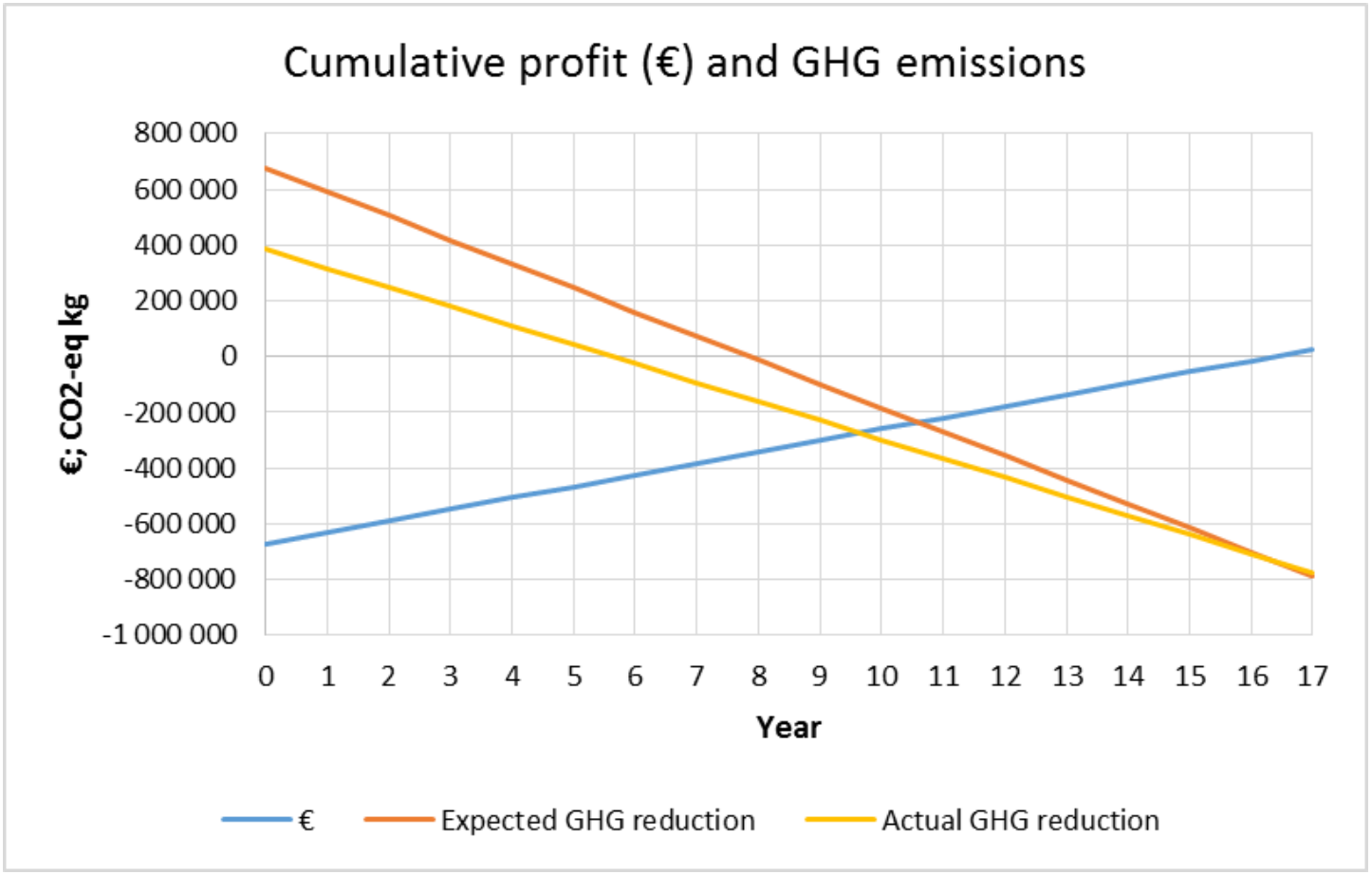
	Logistic centre	Exercise centre	Business centre	Office building	Shopping centre
Location	Hämeenlinna	Oulu	Joensuu	Helsinki	Lahti
Investment (€)	115,000	290,000	670,000	105,000	680,000
Energy savings (MWh/year)	110	320	720	120	690
Energy savings (%)	17 %	16 %	23 %	6 %	9 %
Energy savings (€/year)	8,400	24,500	49,000	9,100	51,000
Maintenance costs (€/year)	1,500	4,000	8,000	1,500	8,000
Floor area (m2)	10,000	5,000	20,000	8,000	35,000
Repayment period (years)	17	14	17	14	16

Results

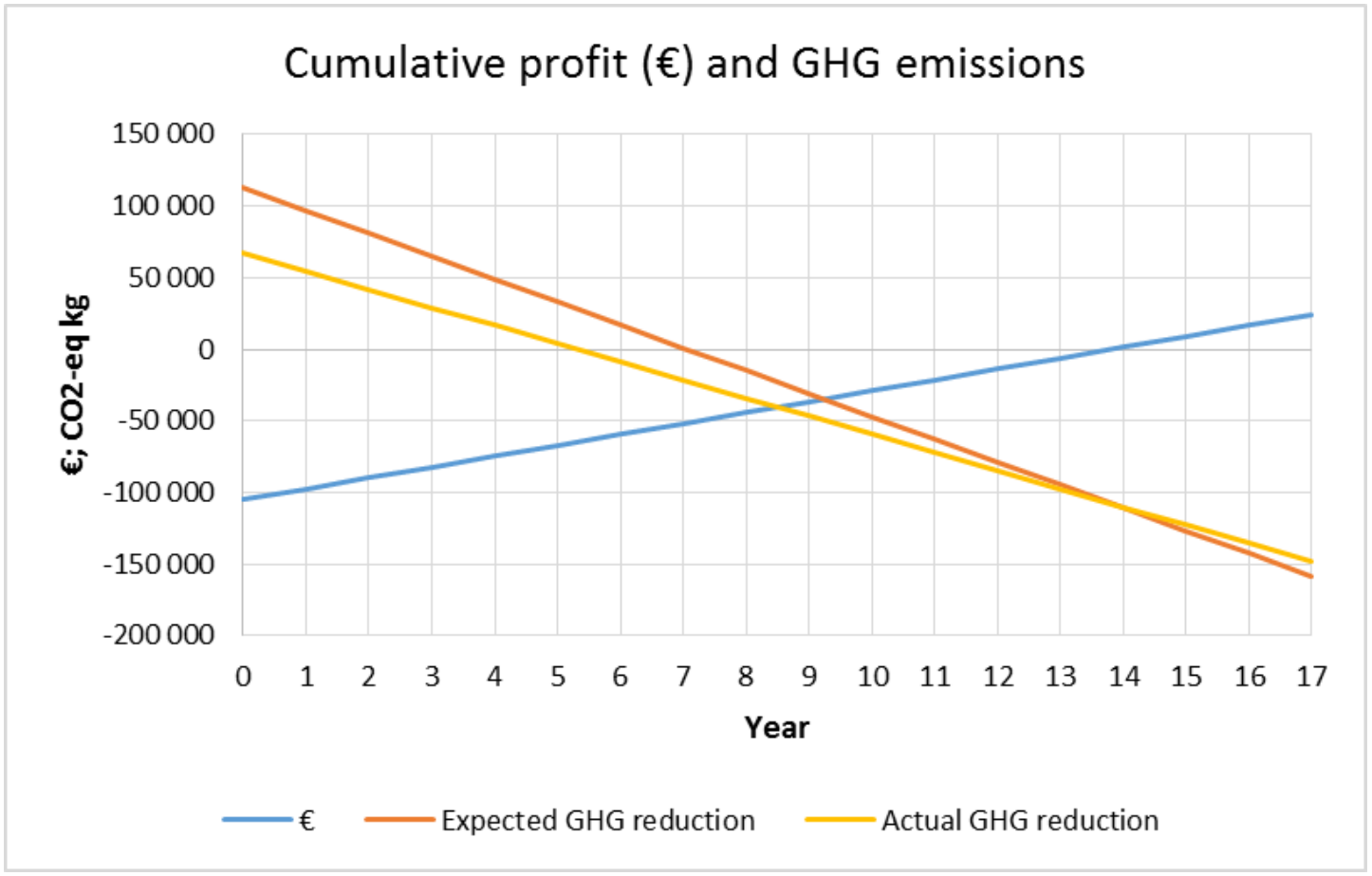


Picture: Janne Käpylehto

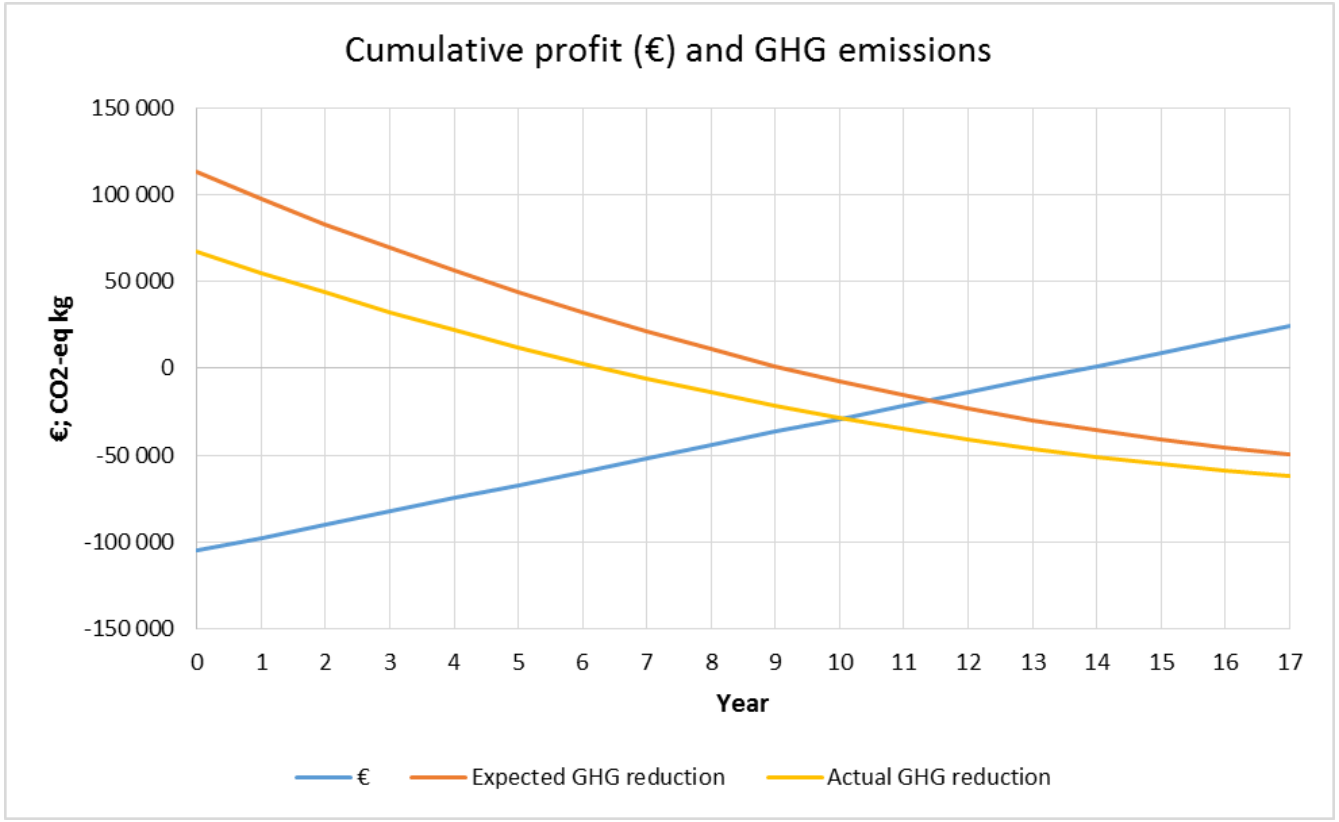
Business centre



Office building



Scenario: GHG intensity of energy production drops



	CO2-eq kg/€
Average GHG intensity of electricity production in Finland	0,5
Average GHG intensity of consumption in Finland	0,1

Conclusions

- GHG repayment period is shorter than expected because of the negative rebound effect caused by the investment
- When the investment starts to make profit, the actual GHG reductions become smaller than the expected
- Greening energy system weakens both GHG impact and rebound, but the actual GHG impact is better than the expected

Thank you for your attention!

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