



Health-related social costs due to residential heating and cooking

20 June 2022, Marisa Korteland



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NGOs

Introduction

- Cooking and heating cause air pollution = damage to human health
- No 'financial value' attached means not considered by policy makers
- Value the adverse health impact to society: **social cost approach**
- Loss in economic welfare:
 - direct (health care) expenditures:
hospital admissions, loss of working days
 - indirect health impacts and accompanied welfare loss:
discomfort of diseases, increased mortality risk/reduced life expectancy.
- Social costs differ per country (income level, population density etc.)



Methodology

1. Total health-related costs to society:
 - 7 pollutants: $PM_{2.5}$, NO_x , NH_3 , SO_2 , CO , CH_4 and NMVOCs
 - Direct emissions at home, indirect emissions at electricity and heat generation production plants
 - EU27+UK, Spain, Italy, UK and Poland
 - Total cost estimates (€/year): total annual emissions * social cost estimates per emission

Methodology

2. Costs per fuel-technique combination:
 - contribution to total cost figures (% of total)
 - euro/GJ delivered: emissions factors * social cost estimates per emission. To add context: translated into annual costs per (average) household
3. Expected impact of switching to alternative fuel-technique options

Main results: total costs to society

- Total health-related social costs of residential heating and cooking in EU27+UK: € 29 billion or 0.2% of GDP (2018)
 - € 27 billion: direct pollution due to combustion at home
 - € 2 billion: indirect pollution at electricity/heat production sites

Country/region	Total health-related costs to society (billion €)
EU27+UK	29
Poland	3.3
Italy	4.7
Spain	1.2
UK	2.7

Main results: differentiation

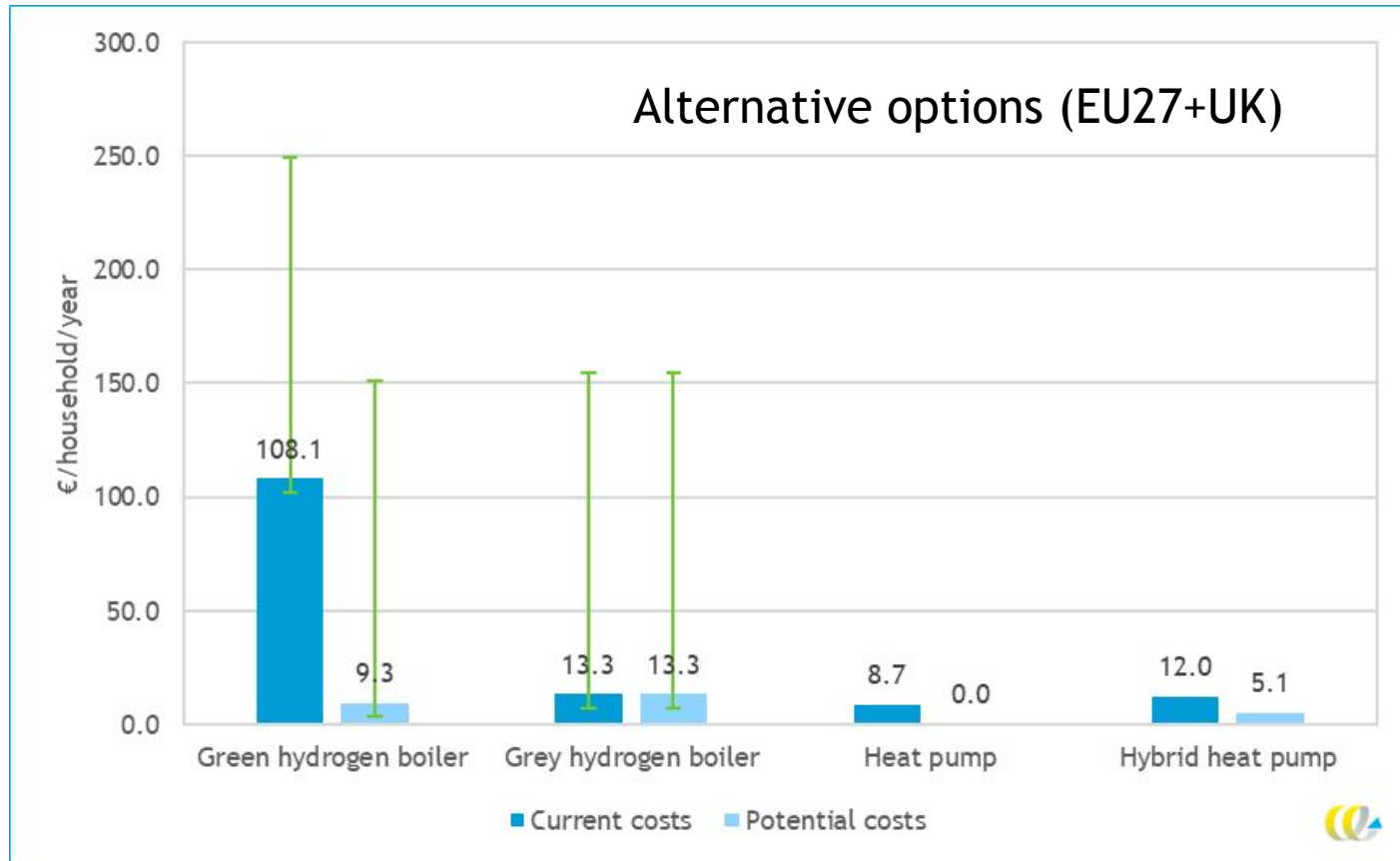
- Contributors to total health-related social costs in the EU27+UK:
 - wood stoves (31%)
 - coal boilers (27%)
- National results illustrate this:
 - coal boilers dominant in Poland (74% of costs, 36% of final energy consumption)
 - wood-based techniques in Italy, Spain and UK



Main results: per fuel-technique combination

- Costs to society per fuel-technique (annual €/hh):
 - coal boiler: € 1,200
 - wood stove: € 750
 - gas boilers: € 30
 - heat pumps: € 10
- Costs can be reduced by:
 - alternative fuel-technique combinations
 - greener electricity and heat production
- To compare: rough and indicative estimate of annual social costs diesel car: € 210

Main results: alternative heating options



Further research

- Underestimation of health-related social costs: results are based on outdoor pollution only
 - Indoor pollution:
 - impact depends on many factors (ventilation, space, time spend indoor)
 - method and data needed for quantifying *additional* impact
- further research needed



Thank you for listening

Further questions?

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Background sheets



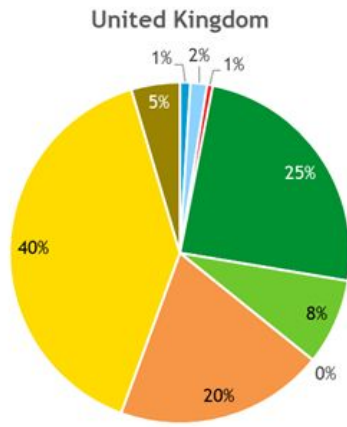
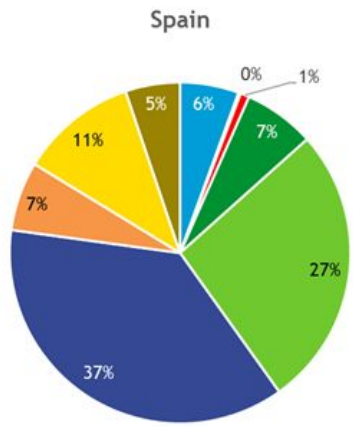
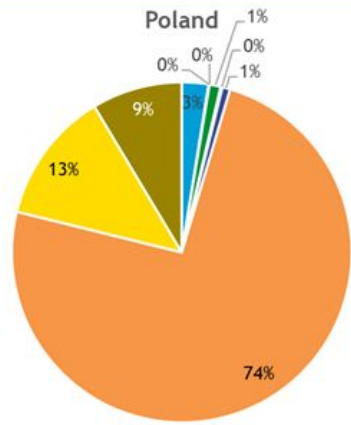
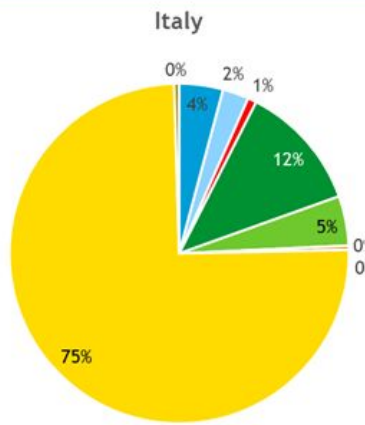
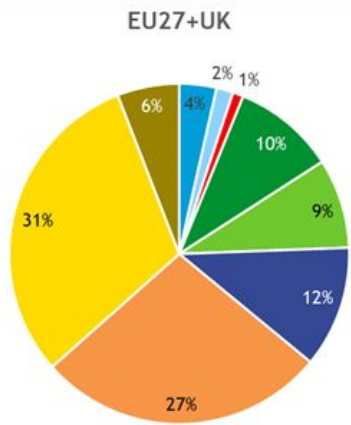
Final energy consumption heating & cooking

Technique	Fuel	EU27+UK	Spain	Italy	Poland	United Kingdom
Condensing boiler	Oil	1.3%	0.8%	1.1%	0.0%	0.5%
Condensing boiler	Gas	5.8%	0.7%	9.5%	1.0%	4.5%
Non-condensing boiler	Oil	10.6%	25.0%	6.2%	0.7%	7.0%
Non-condensing boiler	Gas	35.2%	23.4%	45.7%	15.1%	69.6%
Non-condensing boiler	Coal	3.8%	0.6%	0.0%	35.6%	1.6%
Non-condensing boiler	Wood	8.8%	22.6%	0.3%	2.0%	0.0%
Stove	Wood	8.6%	2.3%	22.3%	12.3%	6.0%
Electric radiators	Electricity	5.6%	9.2%	1.3%	2.2%	6.4%
Aerothermal heat pump	Electricity	1.8%	1.4%	0.4%	0.1%	0.3%
Geothermal heat pump	Electricity	0.3%	0.0%	0.0%	1.1%	0.0%
Solar	Solar	0.9%	2.6%	0.6%	0.3%	0.2%
CHP	Electricity and heat	0.4%	0.2%	0.0%	0.0%	0.5%
District heating	Electricity and heat	10.3%	0.1%	4.9%	20.6%	0.2%
Cooking	Oil	0.8%	1.8%	0.8%	2.8%	0.0%
Cooking	Gas	2.2%	3.0%	5.4%	4.0%	1.8%
Cooking	Coal	0.0%	0.1%	0.0%	0.4%	0.0%
Cooking	Wood	0.4%	0.3%	0.3%	0.3%	0.0%
Cooking	Electricity	3.3%	5.9%	1.2%	1.5%	1.6%



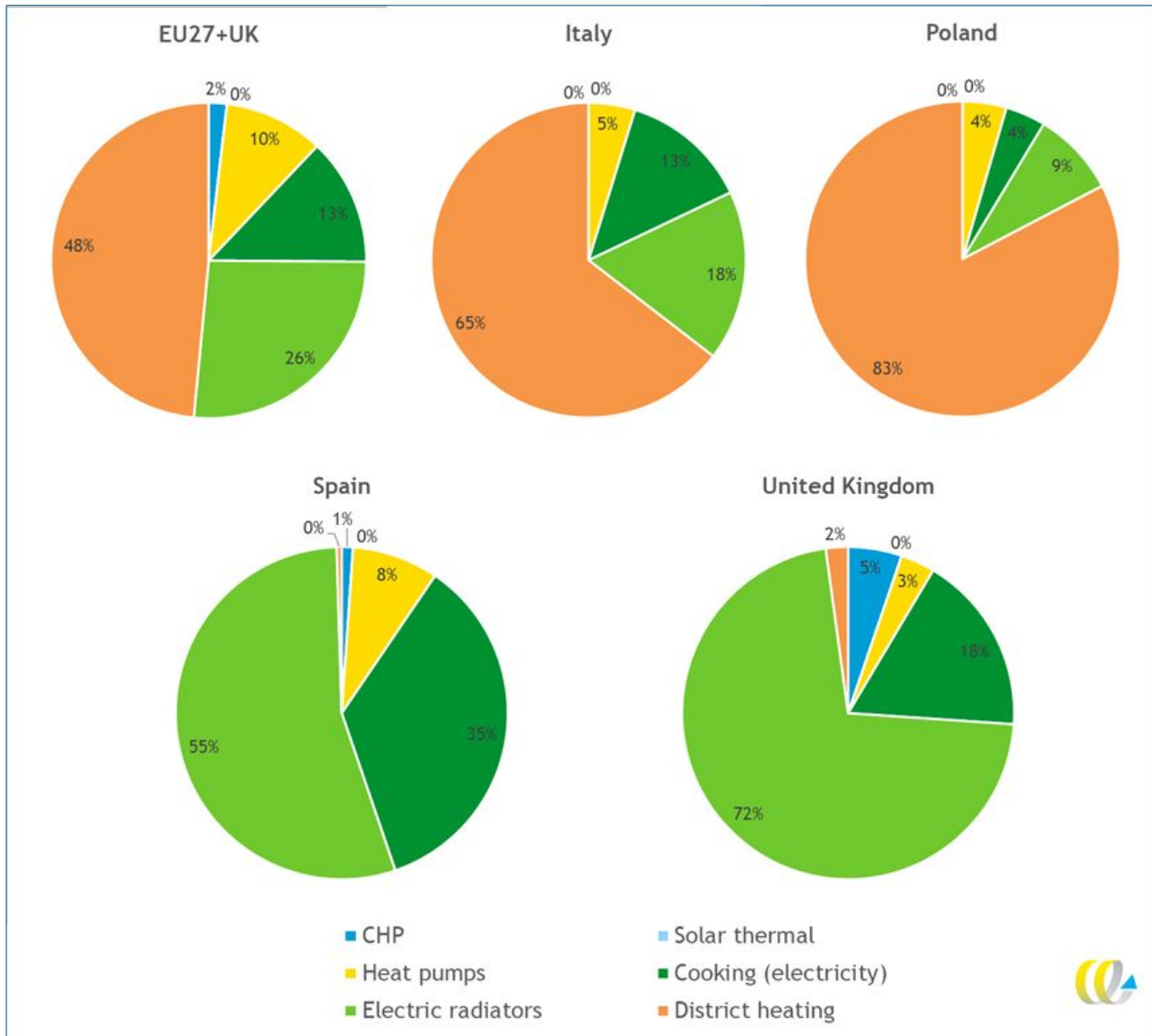
Absolute health-related social costs

Technique (fuel)	Direct or indirect	EU27+UK	Italy	Poland	Spain	United Kingdom
Solar thermal	indirect	0	0	0	0	0
CHP	indirect	31	0	0	1	6
Cooking (coal)	direct	114	0	42	14	0
Cooking (oil)	direct	121	17	13	15	0
Heat pumps	indirect	173	1	13	5	4
Cooking (electricity)	indirect	221	3	12	22	22
Cooking (gas)	direct	262	100	14	16	26
Condensing boiler (oil)	direct	290	39	0	10	14
Electric radiators	indirect	447	4	25	34	89
Condensing boiler (gas)	direct	460	116	2	3	42
Cooking (wood)	direct	522	77	15	22	0
District heating	indirect	821	14	237	0	3
Non-condensing boiler (oil)	direct	2,451	220	5	322	219
Non-condensing boiler (gas)	direct	2,804	562	36	81	656
Non-condensing boiler (wood)	direct	3,320	19	25	445	0
Non-condensing boiler (coal)	direct	7,905	0	2,477	79	531
Stove (wood)	direct	8,822	3,494	419	133	1,064
Total		28,764	4,666	3,336	1,203	2,676



- Cooking (coal/gas/oil/wood)
- Condensing boiler (oil)
- Non-condensing boiler (oil)
- Non-condensing boiler (coal)
- Indirect costs (electricity&heat)
- Condensing boiler (gas)
- Non-condensing boiler (gas)
- Non-condensing boiler (wood)
- Stove (wood)





Environmental prices health impacts

Core Endpoints	[EUR/ $\mu\text{g}/\text{m}^3$]	risk group (RG)
<i>PM2.5 ($\mu\text{g}/\text{m}^3$ annual concentration)</i>		
Life expectancy reduction	26,040	all
Sum of 3 types of restricted activity days including WLD	3,563	various
<i>PM10 ($\mu\text{g}/\text{m}^3$ annual concentration)</i>		
Increased mortality risk (infants)	0,234	infants
New cases of chronic bronchitis (CPOD)	7,316	all
respiratory hospital admissions	0,017	all
cardiac hospital admissions	0,010	all
medication use/bronchodilator use	0,001	Children with severe asthma
<i>Ozone [$\mu\text{g}/\text{m}^3$] - from SOMO35</i>		
Increased mortality risk	0,713	all
respiratory hospital admissions	0,015	all
Minor restricted activity days	0,272	all
<i>NO2 ($\mu\text{g}/\text{m}^3$ annual concentration > 20 $\mu\text{g}/\text{m}^3$)</i>		
Increased mortality risk	11,803	all
Prevalence of bronchitis in asthmatic children	0,007	all
Hospital admissions due to respiratory diseases	0,094	all