Local Government, Housing and Planning Committee
Thursday 12 December 2024
35th Meeting, 2024 (Session 6)

Note by the Clerk on Building (Scotland) Amendment (No. 2) Regulations 2024 (SSI 2024/327)

Overview

1. At its meeting on 10 December, the Committee considered the following Scottish Statutory Instrument (SSI), which is subject to annulment by resolution of the Parliament until 17 December—

   Title of instrument: Building (Scotland) Amendment (No. 2) Regulations 2024 (2024/327)

   Laid under: Building (Scotland) Act 2003

   Laid on: 8 November 2024

   Procedure: Negative

   Deadline for committee consideration: 16 December 2024

   Deadline for Chamber consideration: 17 December 2024

   Commencement: 1 January 2025

2. The Committee agreed at its meeting on 10 December to take evidence on the Regulations from the Acting Minister for Climate Action. Given the fact that the deadline for Chamber consideration falls on the same date as the Committee's next scheduled meeting, an additional meeting has been arranged to accommodate this scrutiny.

Procedure

3. Under the negative procedure, an instrument is laid after it is made, and is subject to annulment by resolution of the Parliament for a period of 40 days beginning on the day it is laid.

4. Once laid, the instrument is referred to:

   - the Delegated Powers and Law Reform (DPLR) Committee, for scrutiny on various technical grounds, and

   - a lead committee, whose remit includes the subject-matter of the instrument, for scrutiny on policy grounds.

5. Any MSP may propose, by motion, that the lead committee recommend annulment of the instrument. If such a motion is lodged, it must be debated at a meeting of the Committee, and the Committee must then report to the Parliament (by the advisory deadline referred to above).

6. If there is no motion recommending annulment, the lead committee is not required to report on the instrument.

Delegated Powers and Law Reform Committee consideration

7. The DPLR Committee considered the instrument on 19 November 2024 and reported on it on 19 November 2024. The DPLR Committee made no recommendations in relation to the instrument.

Purpose of the instrument

8. The Policy Note states that 'the regulatory amendment will extend the limitations included in the original New Build Heat Standard (NBHS). The extended limitations will serve to permit the use of bioenergy and peat systems in new buildings, as well as in existing buildings undertaking certain conversion works covered by the Standard, for space heating, cooling and hot water demand. The amendment will also take secondary heating systems outside the scope of the Standard – meaning any heating appliance will be permitted if used to provide secondary heating."

9. The Policy Note further explains that the New Build Heat Standard was introduced in April 2024 with the intention of "eliminating greenhouse gas emissions associated with delivering space heating, hot water, and cooling in new buildings, as well as conversions of existing buildings under specific circumstances." However, following its introduction, "significant concerns were raised regarding the resilience of rural and island communities during periods of extreme weather and other events which may cause the failure of the main heating system."

10. Following a review of the NBHS the Scottish Government is seeking to amend it to "address concerns on the resilience of communities during periods of extreme weather (and other events which may cause the failure of the main heating system), address concerns on fuel poverty, and respect cultural practices."

11. The Policy Note also includes a summary of consultation undertaken on the instrument, impact assessments carried out, and the anticipated financial effects, with the overall impact on business being viewed as "positive" .

Written submissions

12. The Acting Minister for Climate Action wrote to the Committee on 8 November to advise of his intention to "permit the use of bioenergy and peat heating systems in new buildings, in recognition of the concerns raised following the introduction of the NBHS in April 2024."

13. However, the Committee also received correspondence from medical bodies raising concerns about the potential impact of the regulations on human health.

14. The Committee then invited relevant stakeholder organisations to provide written comments on the Regulations so it could better understand the extent of the potential health impact of the Regulations.

15. Four written submissions were received from the following organisations and are attached as an Annexe to this paper—

- Royal College of General Practitioners Scotland;
- Royal College of Physicians of Edinburgh;
- Short-Term Working Group on Air Pollution of the Royal College of Physicians of Edinburgh;
- UK Faculty of Public Health;
- UK Health Alliance on Climate Change.

16. The submissions raised concerns that the amendment would have negative impacts, particularly on indoor air quality, and may cause harm due to damage to the lungs, heart, brain, and to pregnant women and their unborn children.

17. The UK Faculty of Public Health pointed out that "domestic wood burning is the largest source of fine particulate matter (PM2.5) in the UK, accounting for 22% of emissions—surpassing even transportation. Exposure to PM2.5 is linked to severe health issues, including respiratory and cardiovascular diseases, cancer, and developmental problems in children. It also stated that wood-burning stoves are more expensive than central heating options and produce more harmful carbon dioxide (CO_2) emissions compared to other heating methods.

18. Respondents also noted that, in general, the use of wood burners tends to be more common in affluent households, meaning air pollutants can be generated by relatively wealthier households and passed on to those who are more deprived, particularly in more densely populated areas.

19. However, respondents also recognised the energy challenges faced by some residents of Scotland's more remote and rural communities and on that basis, suggested that the existing ban on bioenergy and peat heating systems should remain in place with exceptions permitted for rural and island communities. For example, the short-term working group of the RCPE requested that "very serious

consideration be giving to reintroducing the ban but adding exceptions to rural areas where power cuts may occur or where homeowners are off the grid."

Committee consideration

20. At the time of writing, no motion recommending annulment has been lodged.

21. As noted earlier, however, the Committee will be taking evidence from the Acting Minister for Climate Action.

22. Members are invited to consider the instrument and decide whether there are any points they wish to raise.

23. If members have no points to raise, the Committee should note the instrument (that is, agree that it has no recommendations to make).

24. Members may wish to reflect on the following themes in taking evidence from the Acting Minister—

- Alternative approaches considered when developing the Regulations through the review of the New Build Heat Standard undertaken between May and October 2024;
- Comments from stakeholders disputing the content of the Business and Regulatory Impact Assessment (BRIA) accompanying the Regulations in terms of potential health impacts and the potential for significant health impacts within individual homes and urban communities (the BRIA suggests that the changes would have "negligible impacts on overall air pollution and it is not considered that they are likely to result in air quality related health impacts);
- Potential challenges in defining rural and urban geographical areas and distinguishing between them. Why is it too complex to make an exception for rural and island areas only, given for example, the Scottish Government's existing rural/urban classification?
- The rationale for the inclusion of an exception for all secondary heating systems; and
- Numbers of new builds or redevelopments of existing buildings commenced under the current arrangements and the anticipated impact of a reversal of the current prohibitions on biofuel and secondary heating on such developments.

Clerks to the Committee
December 2024

Annexe: Written submissions

Building Regulations (Scotland) Amendment (No. 2) Regulations 2024, RCGP Scotland Response

RCGP Scotland welcomes the opportunity to provide feedback on the negative Scottish Statutory Instrument 'Building Regulations (Scotland) Amendment (No. 2) Regulations 2024'. As the membership body for general practitioners in Scotland, we exist to promote and maintain the highest standards of patient care.

We note that the review of the New Build Heat Standard was announced by the then Minister for Climate Action, Gillian Martin MSP, in response to concerns from rural and island communities regarding resilience during extreme weather events which may lead to the failure of main heating systems.

Scotland has some of the cleanest air globally and some of the most ambitious air quality targets in Europe. However, air pollution in Scotland remains above the recommended World Health Organisation level and we believe that further action is needed to ensure Scotland's air quality meets the WHO's recommendations and to protect the Scottish population's health.

RCGP Scotland is concerned that indoor air pollution is a significant issue and may cause harm to an individual's health due to damage to the lungs, heart, brain, and to pregnant women and their unborn children.

It is not just the user of bioenergy or peat heating systems whose health is damaged but, depending upon proximity, may also have a negative effect upon their neighbours too. We note that in general the use of wood burners tends to be more common in affluent households, meaning air pollutants can be generated by relatively wealthier households and passed on to those who are more deprived, exacerbating Scotland's already stark health inequality levels. This is particularly the case in urban areas where the density of housing is greater.

On 18 November, Dr Munro Stewart, RCGP Scotland's Joint Clinician Representative for Climate and Sustainability signed a letter from the Royal College of Physicians Edinburgh (RCPE) to the Local Government, Housing and Planning Committee, setting out our concerns.

Having said this, we are accepting of multiple issues faced by island and rural communities that are identified by stakeholders and are set out within the “New Build Heat Standard: Island Communities Impact Assessment Addendum October 2024”.

We continue to ask the Local Government, Housing and Planning Committee to reconsider the Scottish Statutory Instrument 'Building Regulations (Scotland) Amendment (No. 2) Regulations 2024' so that the ban on bioenergy and peat heating systems remains in place with exceptions allowed for rural and island communities.

Letter from the Short-Term Working Group on Air Pollution of the Royal College of Physicians of Edinburgh on wood burning, 18 November 2024

Scotland has some of the cleanest air globally, along with some of the most stringent air quality objectives in Europe (1, 2). However, air pollution remains above World Health Organization guidelines and further reducing pollutants is key to maximising the health gains. Scottish road transport linked air pollution has improved significantly thanks to these regulations (3). However, **indoor** sources of air pollution is a significant contributor to poor air quality which is not adequately addressed in Scotland. This will in part be managed by the 'New Build Standard' being brought before your committee.

We understand that the current proposals have been discussed with many stakeholders, but as medical professionals with a significant interest in preventable illness, we hope you will allow the Royal College of Physicians' Edinburgh, the Royal College of General Practitioners, and the Royal College of Paediatrics and Child Health to provide further evidence-based concerns on the health effects of wood burning and our concerns about the removal of wood-burning stoves, multifuel stoves, and pellet stoves from the fuels from the regulations on heating in new builds. being banned in new builds, such that they will be freely available in new properties across Scotland, which would as a consequence markedly reduce air quality.

The burning of wood, even in so called 'eco stoves', produces both noxious gases and airborne particulate matter. Emissions from wood burning also contain greenhouse gases such as nitrogen dioxide and methane, the latter globally is responsible for 30% of the current temperature rise.

However, it is the particulate matter, especially particulate matter with a size of less than 2.5 micrometers in diameter ($PM_{2.5}$) that is especially harmful to health, passing through the nose and lungs into the blood stream leading to not only lung disease, but worsening heart disease (including triggering heart attack (4)), stroke, dementia, diabetes, amputation (5), cancer, and permanently damaging organ development of our children (6). Further there is a link between poor air quality in pregnancy and development of autism (7). Gestation, infancy, and early childhood are vulnerable times because the child's body is developing rapidly and has immature systems which are vulnerable to damage by inhaled toxins. There is a correlation between areas of high deprivation and poor air quality in both children (8) and adults, exacerbating pre-existing health inequalities.

Wood burning in the UK now produces more $PM_{2.5}$ than transport, and domestic burning is estimated to cause almost 40% of $PM_{2.5}$ pollution in the UK (9). Scientists have found that the concentrations of $PM_{2.5}$ in the home was almost 200% higher than normal when a wood burning stove was in use. Concentrations can reach up to 400% higher after the stove door was opened to add more fuel. The researchers named these 'flooding events'

Studies from Scandinavia by the European Environmental Bureau (10) show that even so called 'Ecodesign- compliant' wood burning stove can release the same amount of particulate matter per hour as 18 newer diesel cars or six modern heavy

goods vehicles. This is alarming given these invisible but extremely harmful pollutants will be released into peoples' living rooms.

It is not just the wood burner and their family whose health is damaged but that of their neighbours too. A study from Imperial College London (11) found "hotspots" of outdoor pollution where there were high concentrations of wood burning stoves, showing that particulate pollution from stoves can escape to pollute outside air, settling over a neighbourhood affecting a wide area. Because wood burners tend be more common in affluent households, pollutants can be passed on to those with a lesser means to live a healthy life. More worrying, the air pollutants could reach those with established disease who chose not to have wood burners could be forced to breath the noxious air from their neighbours.

We understand that the ban on these heating appliances is to be permanently halted after concerns were raised that a ban on wood and peat burners would have a negative impact on people living in rural areas. The original legislation prohibited these installations, except in specific exemption cases such as when they were deemed as 'emergency heating'. We respectfully request that very serious consideration be giving to reintroducing the ban but adding exceptions to rural areas where power cuts may occur or where home-owners are off the grid. Most harm comes from wood burning in a packed neighbourhoods such as in cities and so thoughtful exemption in rural areas could be easily obtained.

Further, as gas boiler emissions of $PM_{2.5}$ are almost eight times less than the figure for the best Danish wood stove, we anticipate that oil and gas boiler makers will rightly question their ban, as the premise of these regulations is to lessen emissions, which a gas boiler would do more effectively than a wood stove. "Ecodesign" wood burning stoves produce 450 times more toxic air pollution than gas central heating, according to new data published in a report from Prof Chris Whitty, the Chief Medical Officer for England (12, 13).

We cannot underestimate the major health harms from wood smoke, from serious cardiovascular diseases, through cancer (wood smoke is linked to 40% of lung cancer in non-smoking women (14)), to asthma (15) and chronic lung diseases. Further the hugely damaging effects these particles have in pregnancy and on childhood are major, with increased still birth, death before the age of 2 years, permanent poor health in the child in later life, and effects on learning and behaviour (16).

The membership of these three Royal Colleges reflects a majority of doctors in Scotland. Such significant concern has been raised by members, that we write today asking that the committee reverse this amendment, with significant exceptions allowed as above for rural areas, for the sake of Scotland's health. Ends.

RCPE Short-Term Working Group on Air Pollution membership:

Co-Leads

Prof Andrew Elder, Consultant Physician, NHS Fife, Honorary Professor, University of Edinburgh and President of the Royal College of Physicians, Edinburgh.

Prof Jill JF Belch, Head of the Institute of Cardiovascular Research, Professor of Vascular Medicine & Honorary Consultant Physician NHS Tayside.

Members

Dr Sarah Bartlett, SpR Stroke / Geriatric Medicine, Royal Infirmary of Edinburgh, NHS Lothian.

Ms Kerry Flinn, Former Investigator and Trainer for Scottish Public Services Ombudsman (SPSO) and member of the RCPE Lay Committee.

Dr Robert C Hughes, Clinical Research Fellow and member of Centre for Climate Change and Planetary Health Management Group, London School of Health and Tropical Medicine and adviser to the Clean Air Fund.

Dr Mark R. Miller, Reader in Air Pollution and Health, British Heart Foundation Centre for Cardiovascular Science, University of Edinburgh, UK.

Prof David Newby, BHF Duke of Edinburgh Chair of Cardiology, Deanery of Clinical Sciences, Centre for Cardiovascular Science, University of Edinburgh.

Dr Terry Quinn, Senior Clinical Lecturer at University of Glasgow, and Honorary Consultant Physician in Stroke, NHS Greater Glasgow.

Other signatories

Professor Stephen Turner, President of the Royal College of Paediatrics & Child Health, Consultant Paediatrician, Royal Aberdeen Children's Hospital.

Dr Munro Stewart, Joint clinician representative for Climate and Sustainability, RCGP Scotland.

Footnotes:

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UK Faculty of Public Health submission, 18 November 2024

I write to you as the President of the UK Faculty of Public Health.

The Faculty of Public Health, as part of the medical Royal College arrangements, is the standard-setting body for public health in the UK and professional home for over 5,000 members of the public health workforce. We advocate on key public health issues and have a strong mandate and responsibility to ensure that the essential functions, standards and resources of a robust public health system are maintained.

The Faculty of Public Health urges the Scottish Government to reconsider its decision to halt the ban on wood-burning stoves, multi-fuel stoves, and pellet stoves in urban new builds. Air pollution remains a major killer, and while Scotland is making progress in improving outdoor air quality, indoor air pollution remains a critical and overlooked issue. Allowing the widespread installation of wood burners risks undoing these gains and endangering public health and increasing economic burden.

Health Impacts and Costs:

Domestic wood burning is the largest source of fine particulate matter (PM2.5) in the UK, accounting for 22% of emissions—surpassing even transportation. Exposure to PM2.5 is linked to severe health issues, including respiratory and cardiovascular diseases, cancer, and developmental problems in children. Notably, "eco-design" stoves emit 450 times more PM2.5 than gas boilers, exacerbating urban air pollution and endangering public health. Even though wood burning produces only 6% of heat in the UK, it is associated with £0.9 billion in health-related damages.

Damage costs encompass asthma incidence, hospital admissions for respiratory issues, and even structural damage to buildings, representing a significant societal burden. These costs increase when damp or improperly prepared wood is used. Furthermore, wood burning produces high levels of carbon dioxide (CO_2) emissions and growing more trees does not offset this within a reasonable timeframe.

We understand the concerns about rural heating needs, but exemptions for emergency and off-grid use can be maintained without jeopardising urban air quality. Rural and urban settings face vastly different risks, and policy should reflect this. New builds present a unique opportunity to incorporate the cleanest option with practically zero emissions; electric stoves. The 2024 Lancet Countdown on Health and Climate Change policy brief has called on the UK governments to “develop a framework to implement a just transition away from wood burning to clean fuels in urban and rural areas”. Reinstating the ban on wood burners in urban new builds would protect public health, reduce health inequalities, and align with Scotland’s leadership in air quality and climate action. We urge you to prioritise evidence-based decision-making and reverse this decision to safeguard Scotland’s future.

Yours sincerely,

Professor Kevin Fenton, President of the Faculty of Public Health

UK Health Alliance on Climate Change submission, 18 November 2024

I write to you as the Chair of the UK Health Alliance on Climate Change* to urge the Scottish Government to reconsider its decision to halt the ban on wood-burning stoves, multi-fuel stoves, and pellet stoves in urban new builds. While Scotland has made significant progress in improving outdoor air quality, indoor air pollution remains a critical and overlooked issue. Allowing the widespread installation of wood burners risks undoing these gains and endangering public health and increasing economic burden.

Health Impacts and Costs:

Domestic wood burning is the largest source of fine particulate matter (PM2.5) in the UK, accounting for 22% of emissions—surpassing even transportation. Exposure to PM2.5 is linked to severe health issues, including respiratory and cardiovascular diseases, cancer, and developmental problems in children. Notably, "ecodesign" stoves emit 450 times more PM2.5 than gas boilers, exacerbating urban air pollution and endangering public health. Even though wood burning produces only 6% of heat in the UK, it is associated with £0.9 billion in health-related damages.

The associated health damage costs to society are stark. For example:

- **A family of four** using an eco-stove with well-seasoned wood incurs **damage costs of £9,060 over 15 years** when **wood burners provide 80% of heat**.
- For an older couple in the same scenario, the cost is £8,171.

These costs skyrocket with inefficient use. A family of four using damp wood in an older stove faces damage costs of £39,243, while an older couple faces costs of

£39,106. Damage costs encompass asthma incidence, hospital admissions for respiratory issues, and even structural damage to buildings, representing a significant societal burden.

Economic Impact:

Further, contrary to perceptions of cost-effectiveness, wood-burning stoves are more expensive than central heating options. Research indicates that using a wood burner for 20% of home heating incurs annual costs 24% higher (at £2,028 – £2,204 per year) than a gas boiler. For 80% usage, the costs are 47%–48% higher (at £2,433 –

£2,614 per year). These figures highlight the financial disadvantages of wood burners compared to gas boilers and air-source heat pumps.

Environmental Concerns:

Wood burning is not an environmentally friendly form of heating. It produces more harmful carbon dioxide (CO_2) emissions compared to other heating methods. The

reabsorption of CO_2 by growing ecosystems takes years, decades, or even a century, depending on forest management and biomass sources. This delayed carbon offset undermines efforts to combat climate change.

While concerns about rural heating needs are valid, exemptions for emergency and off-grid use can be maintained without jeopardising urban air quality. Rural and urban settings face vastly different risks, and policy should reflect this. Gas boilers, with PM2.5 emissions nearly eight times lower than wood stoves, offer a far cleaner alternative. However, new builds present a unique opportunity to incorporate the cleanest option with practically zero emissions; electric stoves. The 2024 Lancet Countdown on Health and Climate Change policy brief has called on the UK governments to "develop a framework to implement a just transition away from wood burning to clean fuels in urban and rural areas". Reinstating the ban on wood burners in urban new builds would protect public health, reduce health inequalities, and align with Scotland's leadership in air quality and climate action. We urge you to prioritise evidence-based decision-making and reverse this decision to safeguard Scotland's future.

Kind regards,

Richard Smith CBE FMedSci

Chair, UK Health Alliance on Climate Change

**The UK Health Alliance on Climate Change is an alliance of 49 UK-based health organisations including Royal Colleges, journals, associations and societies representing more than one million health professionals, a significant proportion of the NHS workforce.*

LGHP/S6/24/35/1

Royal College of Physicians of Edinburgh, Woodburning stoves response

Thank you for the opportunity to comment further on the removal of the ban on wood burning in new builds, and to further express the concern that we have as doctors about the harms of indoor air pollution caused by wood burning.

In your correspondence dated 20 November, you refer us to the Business Regulatory Impact Assessment (BRIA) accompanying the Regulations, where the potential impact of wood burning is noted. You note that the BRIA suggests that the changes would have a negligible impact on overall air pollution, and that it is not considered that these stoves are likely to result in air quality related health impacts. We believe this statement is incorrect and does not consider the full scientific
evidence on the emissions and health effects from wood

burning. We note the calculations in their document, which are

as follows:

> "…. to provide a broad illustrative example of the potential increase in emissions (relative to the NBHS as
> introduced on 1 April 2024), we assume secondary heating is used at about 25% the rate of main heating, with continued installation at a rate of 3% of new builds. This could result in roughly 9 tCO2e per year, or about 480 tCO2e to 2045. This is a negligible amount of emissions accumulated to 2045 as part of overall emissions from buildings (less than 0.0001% of current emissions from buildings)."

However, these figures give an expected proportion of Scotland's total buildings' emissions, when the issue for these stoves is not how much they add to Scotland's total CO2 but that the local pollution both within the houses themselves, and in the neighbourhood, will give much higher
concentrations, with the health risks we have described previously. So whilst the addition to Scotland's total may be small, the local effects will be huge compared to other forms of heating (1).

More importantly, these calculations focus on CO2, a gas linked to atmospheric warming, but not a criteria pollutant for health, the latter being largely overlooked in the BRIA report. Burning wood, produces a number of air pollutants known to have detrimental effects on health, most notably
fine particulate matter, especially PM2.5, and the associated ultrafine particles (2), and these are not addressed at all in the BRIA report. Domestic wood burning is the largest source of PM2.5 in the UK, accounting for 22% of emissions—more than is produced by road transport (3). UK
Government figures (4) show that the use of wood as a fuel contributed 75% of both total PM2.5
and PM10 emissions from domestic combustion in 2022. Without curbs, these harmful emissions are likely to continue to grow: emissions of particulate matter from domestic wood burning

increased by 56% cent between 2012 and 2022 (4), and wood stove sales in 2022 increased 60% over the preceding year (5) .

PM2.5 particles are so small they can enter the blood stream and affect all major organs. Whilst most accept that lung infection (6, 7) and asthma (8) are linked to wood smoke PM 2.5 pollution,
less well recognised is the effect such smoke has on cancer. The US Sister Study (9) a prospective study of wood burning and lung cancer incidence among U.S. women found that higher wood
stove/fireplace usage associated with 70 % higher incidence of lung cancer. Associations were also elevated when analysis was restricted to 'never smokers' and the data suggested that even
occasional indoor wood burning can contribute to lung cancer. A second study of the same cohort
(10) showed that using an indoor wood-burning stove/fireplace at least once a week was associated with a higher risk of breast cancer. Equally less well recognised is its damaging effect on the heart (11), the brain, with stroke and longer exposure leading to dementia (7), and the permanent and devastating effect on children's growth and health (12, 13), including effects in pregnancy affecting the growing baby (14). Even short periods of exposure to woodsmoke, stiffens arteries, promotes blood clotting and alters the rhythm of the heart (15, 16), all of which increase the risk of cardiovascular diseases, which represent the biggest source of early death in Scotland. It also raises general mortality rates (17). Furthermore, ultrafine PM2.5 particles are so small they can enter the blood stream and affect all major organs and accumulate in tissue where there is already developing disease (18) making it worse. We have summarised more of the scientific work in this area outlining the serious health consequences in our original correspondence.

To put wood burning in perspective, it might be helpful to compare emissions from various heat sources (Table 1) (1). As can be seen a very large amount of PM2.5 is produced by wood smoke compared to other heating types.

Table 1: Emissions of air pollution from heat sources (g pollutant/GJ house heating)

LGHP/S6/24/35/1

	Energy [1]	$PM_{2.5}$	BC	NOx	SO_2	CH_4	CO	PAHs [2]	NMVOC
Wood stove/boiler	Wood	375	22	90	14	140	3,440	0.08	465
Oil boiler	Fuel oil	6	0.25	65	8	0.9	4.5	0.0001	25
Gas boiler	Natural gas	< 0.1	< 0.1	22	0.5	1	22	< 0.0001	4
District heating (Plant < 50 MW)	Coal	6.5	0.15	125	584	1.2	13	< 0.0001	1.3
	Fuel oil	6.6	0.26	173	9	1.2	21	< 0.0001	1
	Natural gas	0.1	< 0.1	43	0.6	1.3	37	< 0.0001	2.6
	Wood	13	0.44	120	15	14.5	320	< 0.0001	9.7
Electric heating (Plant > 50 MW)	Coal	2.3	< 0.1	28	11	1	11	< 0.0001	1
	Fuel oil	5.5	0.2	126	7.4	1	16.5	< 0.0001	0.9
	Natural gas	< 0.1	< 0.1	31	0.5	1.1	16.5	< 0.0001	2.2
	Wood	5.3	0.18	90	2	3.4	100	< 0.0001	5.6
Electric heating + direct solar heat	Wind, sun, and hydro	0							
Heat pumps [3]	One third of the emissions from electric heating depending on primary energy (see above)								

1) Primary energy: For electric heating the fuel used for producing the electricity.

2) Measured as Benzo[a]pyrene.

3) Small new heat pumps covering both air to air, air to water and soil to water all having average efficiencies around 3.

Comparative studies (Figure 1) have likened wood burning stoves to having a diesel truck in the sitting room, in terms of the toxic PM2.5 production(19). Focusing on stoves that were certified by the UK's Department of Environment, Food, and Rural Affairs (DEFRA), the daily average indoor PM concentrations when a stove was used were higher for PM2.5 by 196% and PM1 by 228% than
those of the non-wood stove use control group(20). Second, hourly peak averages are higher for PM2.5 by 124% and for PM1 by 133% than daily averages, showing that PM is 'flooding' into indoor areas through normal use.

Fig 1 (Fig 2 from the referenced paper (1)): Particle emissions (PM2.5) from heat sources (g pollutant/GJ house heating). (ECO wood stoves here are wood stoves with the Nordic Swan eco- label indicating that even 'green' stoves generate high levels of particles)

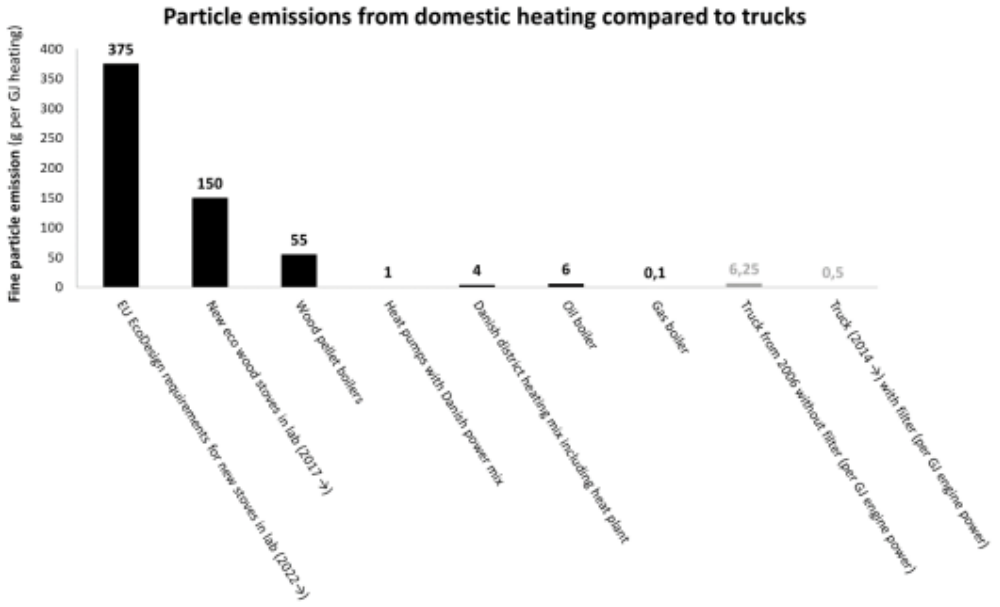

Figure 2 shows that both the EU EcoDesign requirements and the more ambitious Nordic eco-label fail —under optimal laboratory conditions— to reduce new stoves' particle emissions to acceptable low levels. Furthermore, it is clear that particle pollution from wood stoves and boilers is heavily under regulated in comparison to the regulation of trucks. A new EcoDesign stove in 2022 is allowed to emit 60 times as much particulate matter as an old truck from 2006 and 750 times as much as a newer truck from 2014 per GJ. A new EcoDesign stove in 2022 is allowed to emit 5 g fine particles per kg wood. Burning just one kg of wood will pollute 500,000 m^3 of completely clean air to up the level of the current WHO air quality guideline for fine particulate matter (10 µg/m^3).

In addition to the human cost, the cost to the NHS is substantial. Table 3 shows comparative costs of Year 1 health costs (21) for various scenarios. Even though wood burning produces only 6% of heat in the UK, it is associated with £0.9 billion in health-related damages (22).

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Rank	Heating system/ pattern	Annual central damage cost (low damage costs; high damage costs)	
		Family of four	Older couple
1 highest	Wood burner 80 %, gas boiler 20 % conventional stove	£4878.11 (£1913.1; 12841.35)	£4400.34 (£1725.77; 11583.44)
2	Wood burner 80 %, gas boiler 20 % high-efficiency stove	£2484.86 (£962.72; £6544.07)	£2229.87 (£868.43; £5902.71)
3	Wood burner 20 %, gas boiler 80 % conventional stove	£1085.47 (£421.34; £2882.61)	£1087.41 (£422.56; £2872.51)
4	Wood burner 80 %, gas boiler 20 % eco stove	£665.49 (£249.98; £1811.13)	£600.17 (£225.47; £1633.16)
5	Wood burner 20 %, gas boiler 80 % high-efficiency stove	£560.58 (£213.86; £1507.83)	£559.98 (£214.23; £1503.03)
6	Wood burner 20 %, gas boiler 80 % eco stove	£166.18 (£58.26; £474.56)	£163.96 (£57.99; £465.53)
7	Gas boiler 100 %	£26.73 (£4.71; £101.28)	£23.94 (£4.22; £90.71)
8 lowest	ASHP 100 %	0	0

2024 Lancet Countdown on Health and Climate Change policy brief has called on the UK governments to “develop a framework to implement a just transition away from wood burning to clean fuels in urban and rural areas”. However, we understand the concerns of the rural population in Scotland and of those where grid supply is uncertain, thus a ban on wood burners with
exemptions for rural areas would protect public health and reduce the inner-city health inequalities we see with air pollution related diseases.

Of further concern is that the endorsement of wood burning in homes by the Scottish Government appears to give tacit approval for this form of heating and will thus encourage its adoption in other older homes. This would significantly compound the ill effects linked to wood burning in the new builds (23).

Hence, we argue that wood burners are not a cost-effective, healthy or sustainable alternative (21) to other forms of heating, notably heat pumps, and should not play a critical role in the heat security of new builds. Scotland has an enviable record on air pollution, and such a ban, with rural exceptions, would continue this trend.

We would ask the Scottish Government to reconsider these points, and reinstate an amended ban on wood burning in Scotland, based on the clear scientific evidence of the risk of this practice to health.

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