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JUST HEAT
LOOKING BACK, MOVING FORWARDS

"Gas? It was like another Universe!": An interim analysis of findings from the first JUSTHEAT UK case study: Rotherham

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Knowledge Applied

‘Gas? It was like another Universe!’: An interim analysis of findings from the first JUSTHEAT UK case study: Rotherham

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1 Introduction

1.1. Overview of the JUSTHEAT project

This report presents empirical findings from the international research project, *'Looking back to move forwards: a social and cultural history of home heating'*, funded through the Collaboration of Humanities and Social Sciences in Europe (CHANSE) initiative. The project aimed to understand how major changes to home heating and heating technology over the last 70 years have been designed, managed and experienced, and how they have impacted our lives. Ultimately, we aimed to identify lessons for the current transition from fossil fuelled to low carbon heating systems, reflected in the UK government's commitment to reach 450,000 heat pump installations per year by 2030.

The report sets out the empirical findings from the first of two rounds of oral history interviews (Strand 3) undertaken in the UK with members of the public in the first case study location of Rotherham, South Yorkshire. Participants were encouraged to share their memories of keeping warm at home over their life-course and the ways their lives have been affected by changes to home heating fuels, methods and technologies. A similar process was undertaken in case study locations within the other participating countries: Sweden, Finland and Romania. Reports setting out key insights from across all four countries can be found here: www.justheat.info.

In October 2023 we began gathering oral histories in our second case study location of Stamford – a small market town in South Lincolnshire, England, known as the country's first urban Conservation Area with over 600 listed buildings – which is also striving to be at the forefront of local low-carbon transitions despite facing many obstacles.

The project revolved around the following research questions:

1. Can the concepts of just transitions and energy justice be effectively unified and together provide an adequate framework for understanding fairness in past and emerging home heating transitions?
2. What are the policy and popular narratives that have developed around past heating transitions in living memory? How were they informed, approached and implemented and with what effect? How have past transitions influenced present transition pathways?
3. How have past heating transitions and associated technological change played out within and impacted the lives of citizens emotionally, materially, socially, economically, culturally and politically over time? How have these experiences varied across places, time, gender and different social groups?
4. What lessons can be extracted from lived experiences of past home heating transitions to improve the fairness of transitions to decarbonised and digitalised home heating?

It is primarily in relation to questions 3 and 4 that this report seeks to contribute.

1.2. Introducing case study one: Rotherham, South Yorkshire

The first JUSTHEAT UK case study location was Rotherham, South Yorkshire. The town was chosen because of its significant connection with the coal mining industry and associated strong political history within a national energy context. It was also selected on the basis of its current above national average use of gas central heating systems. The oral history research focused on three settlements within the broader conurbation: Wentworth, Whiston, and Maltby, described in turn below.

- **Wentworth** is a small rural village at the centre of the private Fitzwilliam Wentworth estate. Much of the wealth of the estate was derived from the mining industry that prospered in the area from the eighteenth century, so there is a very close historic connection between the Fitzwilliam estate and the economic fortunes of Rotherham. The estate owns the majority of the properties in the village of Wentworth and a culture of solid fuel burning in tenanted estate houses endures to the present day. Many of the properties in the village date from the early 1800s, are stone built and highly energy inefficient.
- **Maltby** is a large township in the east of Rotherham, first developed around the Maltby Main Colliery in the early twentieth century. Maltby's economic entwinement with coal was severed following the closure of the mine in 2013, but its cultural heritage remains intimately linked to the industry. Maltby is a planned industrial settlement built between 1910 and the 1960s.
- **Whiston** has less direct connections to coal mining (although miners lived there), nevertheless, oral histories recorded in the area still highlight the historic centrality of coal in everyday life and the community. Whiston was a rural village until the interwar period when it expanded through municipal housing development schemes which ran from the 1930s until the 1960s. Private developments followed, and the neighbourhood continues to expand to the present day.

The 30 oral histories recorded in Rotherham reveal very detailed and personal memories of home heating systems, processes, and routines, as well as other related stories and methods of keeping warm and feeling cold at home. In particular, the recordings demonstrate the significance of the coal fire in the home in the immediate decades after the Second World War and how the transition to gas central heating reshaped domestic life in the later decades of the twentieth century. Some participants bring their accounts right up to the present day, discussing the changing climate, experimentation with modern, low carbon energy systems (i.e., air source heat pumps) or discussing their fears around losing the comfort and convenience of gas central heating in the shift towards low carbon alternatives.

1.3. Who we spoke to

Between nine and 11 oral history participants were recruited from each of the focus areas of Whiston, Wentworth, and Maltby. Almost all the oral histories were collected exclusively in these areas, with only a few participants living in neighbouring villages or townships within Rotherham Metropolitan Borough. Across all three areas, participants were exclusively aged 56 and over, and all but two households were single or double occupancy. There was an even split between male/female participants in Wentworth and Whiston, but a higher proportion of women participated in Maltby. No participants recorded children (under 18 years of age) living at their address, but two participants, both in Maltby, indicated that their adult children lived at home. In both Whiston and Wentworth, all participants lived with a partner, were single, or were

widowed. Eight couples were interviewed across four households in Whiston (spouses were interviewed one after the other).

All participants described working-class backgrounds in their oral history recordings. Most lived in social rented housing as children, had fathers who worked as miners or steelworkers, and mothers who worked as cleaners, in retail, or as farm labourers, for example. Across the three focus areas, however, Maltby was the only one that reflected some continuity in this socio-economic status. While all participants were now retired, employment for participants in Maltby had largely consisted of nonprofessional roles and only one participant out of ten was educated to degree level. The percentage of owner-occupiers in Maltby was high (80% of participants) but 20% were residing in socially rented accommodation. In Wentworth, the number of renters was significantly higher (50%), but these properties were privately rented from the Wentworth Fitzwilliam Estate. There were no Wentworth residents living in social housing and Whiston participants were exclusively owner-occupiers. Moreover, all the participants from Whiston held professional roles when working, and four out of eleven were educated to degree level or higher. Wentworth participants also held professional or semi-professional roles when employed, including employment in the civil service, and nursing, for example. Whiston particularly reflected both inter-generational and intra-generational social mobility. Only two of the oral histories were collected from participants from non-White backgrounds – something for the team to make a concerted effort to address in subsequent research.

1.4. Aims of the report

The main purpose of this report is to report our primary analysis and to illuminate both the immensely personal nature of these stories as well as collective experiences of domestic warmth, cold, and change.

Moreover, we are an interdisciplinary team comprising of energy policy specialists, historians, artists and architects. There are both convergences and divergences in what we each see as most significant and compelling within the data and we each contribute a distinct perspective to the analytical process. To highlight these different perspectives, we have dedicated a section of this report to setting out what stood out to each of us as most significant within the data, from our different disciplinary perspectives.

2

A profile of Rotherham drawing on existing statistics

This section of the report briefly profiles Rotherham Metropolitan Borough using existing published statistics of relevance to this project. These statistical insights provide a high-level overview of the borough in relation to demographics, the type and condition of housing in the area and the current domestic energy profile. These insights provide a sense of the current vantage points from which the oral history participants are viewing their past experiences and demonstrate the extent of the current transition towards a low carbon energy system in the area. The statistics on which this short section is based are primarily taken from Rotherham Metropolitan Borough Council's Data Hub (see Population – Rotherham Data Hub) and the most recent (as of December 2025) ONS data from 2024 (Local indicators for Rotherham (E08000018) - ONS).

2.1. Population and demographics

Rotherham is one of four metropolitan boroughs in South Yorkshire, England. It comprises 25 council wards, covering urban, suburban, and rural areas. The borough has a population of 276,595 (2024) – an increase of four per cent since 2019 – with most residents living in the urban areas of Rotherham.

The town is among the 15 per cent most deprived local authority districts in England, with significant gaps existing between different parts of the borough. Life expectancy in the most deprived areas is 9.9 years lower for men and 9.5 years lower for women than in the least deprived. Eastwood East is the most deprived LSOA in Rotherham; Wickersley South is the least deprived (2023). The most recent data from the English Indices of Deprivation 2025 shows where the IMD decile increased (being relatively less deprived compared to 2019) is skewed towards areas that were already less deprived. The most deprived areas, based on their ranking in Decile 1, have become relatively more deprived, suggesting a potential widening of inequalities across Rotherham.

Rotherham is increasingly diverse, with 31,193 people (11.7 per cent) from minority ethnic groups (Census 2021).[1] The Pakistani community is the largest minority ethnic group after White British.

Rotherham's population is ageing: 19.7 per cent of residents are aged 65 and over (one in five people). The borough has a below-average proportion of young adults aged 18-29 (13.2 per cent vs 15 per cent nationally), reflecting outward migration for study and work.

[1] How life has changed in Rotherham: Census 2021

2.2. Housing and housing conditions

Owner occupation is in line with the national average, with 64 per cent of households owning their own home. The average house price in Rotherham in September 2025 was £193,000, a 6.4 per cent rise since September 2024, but lower than the UK national average of £272,000 (ONS, 2025).[2]

In line with wider national trends, private renting is on the rise but is below the national average. Currently 15 per cent of homes are privately rented in Rotherham, versus 20.5 per cent nationally. Twenty-one per cent of homes are socially rented in Rotherham versus 17 per cent nationally.

The average monthly private rent in Rotherham was £669 in October 2025. This was an increase from £625 in October 2024, a 7.1 per cent rise. Although private rents are increasing in Rotherham, they are still below the Yorkshire and Humber (£833) and UK (£1,360) monthly average.

Barriers to housing – the IMD domain which measures the difficulty in accessing housing and services both geographically and financially – is where Rotherham has seen the largest relative decreases in position between 2019 and 2025.

Semi-detached homes are the most common form of housing in Rotherham, comprising 49 per cent of the stock. Detached homes make up 21 per cent and terraced housing 19 per cent. Levels of pre-1919 housing is below the national average, with most homes dating from between 1945 and 1964 - the major post-war development period.

2.3. Domestic energy profile

The area has above average levels of Gas Central Heating (GCH), which makes up 86 per cent of heating systems in the area compared to the England and Wales average of 74 per cent. However, there are some areas of Rotherham where surprisingly low numbers of homes are heated this way, given it is an urban area, i.e., central Rotherham where as many as half of properties are not connected to the gas grid and presumably rely on electric heating. A small minority of households (2.6 per cent) use storage heaters and one per cent have no central heating at all. Just under one per cent of households rely on solid fuels for their heating – this is likely to represent a vast decline in the use of solid fuels compared to when the mining industry was thriving and the vast majority of households would have relied on coal as their main domestic fuel source.

The area suffers well above average levels of fuel poverty (an inability to afford to adequately heat the home), with 16.6 per cent of households in Rotherham living in fuel poverty (an increase from 16.1 per cent in 2021). Although this is lower than the South Yorkshire average of 17.2 per cent, and the Yorkshire and Humber average of 17 per cent, it is higher than the national average of 13.1 per cent (2022).

In terms of our three focus areas, Maltby has between five and 25 per cent of properties that are off the gas network. In Wentworth, around 25 per cent of homes are off gas and as many as 30 per cent of homes are off gas in parts of Whiston. These represent surprisingly high levels of off gas properties for the urban areas of Maltby and Whiston.

[2] Housing prices in Rotherham

Despite high levels of fuel poverty suggesting otherwise, homes are generally safer in Rotherham with three per cent of properties locally representing an Excess Cold Hazard (a home so cold that it presents a danger to health) compared to five per cent nationally. Average Energy Performance Certificate ratings in Rotherham are D, in line with the national average.

The transition towards a low carbon energy system in Rotherham is in its infancy. However, it is noteworthy that the local authority has undertaken a significant solid wall insulation scheme in one of the focus areas for our study (Maltby) which has seen significant improvements in the energy performance of around 200 socially rented properties in the area. This reflects the local authority's strategy of prioritising insulation schemes in a bid to reduce above average levels of fuel poverty, with greenhouse gas emissions reductions as a secondary driver of decarbonisation efforts. Levels of heat pump installations in the area are negligible and only around 5000 homes (mostly privately owned) have photovoltaic panels installed to generate electricity.

3 Primary analysis of oral histories (Rotherham)

3.1. The era of the coal fire

The prominence of the daily routine

In the main, the oral histories shared did not operate at the macro level. As was the intention, these are granular accounts of day-to-day routines, processes and struggles and only people who had worked in energy (i.e., Graham) made explicit links between their stories and energy system change/ industrial restructuring. Everyday life is lived at the micro scale, especially when it is a struggle. A semi-structured interview would have sought to probe around the manifestations of exogenous events in everyday life. However, it is telling that, given the freedom to recount what feels significant to them, participants rarely reflected on the factors behind the fuels (and availability of fuels) and heating technology and methods that they were largely hostage to. Some key energy events are intermingled with participants' stories – power cuts, the shift from town to North Sea gas, miners' strikes, pit closures (the latter two were compared by Graham- the process of conversion handled with military precision and the pit closures handled brutally), and the shift to smokeless fuel.

The Clean Air Act of 1956, which was particularly pivotal in phasing out coal fires, was not explicitly recalled by anyone, despite providing the main impetus for the phasing out of coal fires and the diffusion of a plethora of alternative heating devices and systems, including Gas Central Heating (GCH). The fact that the Clean Air Act was a direct response to the negative impacts of coal on air quality and health, makes it surprising that no one explicitly recollected any of the public information campaigns around this. The same might be said for Acid Rain- a direct consequence of excessive concentrations of sulphur dioxide in the atmosphere, something driven by coal burning.

The prominence of the coal fire in memories

The oral histories have established the coal fire as an historic centre of the domestic space for people living in Rotherham in the immediate post-war era. It was the main source of heat and often relied upon for hot water supply and cooking too. As such, people gravitated around the fire in the home as it provided warmth, was used [predominantly by mothers] to produce hot food and facilitated washing. Keith (Wentworth) recalled that the fire was 'crucial to the household' because of the importance of heating, cooking, and washing. Hence, the kitchen was 'the hub of it all'. Lynn (Whiston) remembered the coal fire when she was younger as 'the hub of the house', the 'central point' of the home. Linda (Wentworth) recalled 'a lot of activities' were done in front of the fire, and Sue (Maltby) explained that it 'was the centre of the universe' for her family because 'everything happened' around the fire. As the main and sometimes sole source of home heating for many families from the 1940s to 1960s

[at the earliest], the fire commanded a communal space where much of everyday domestic life was played out.

As such, no one struggled to summon memories of home heating, particularly in the more tangible era of the open (and later the closed unit, glass fronted Parkray or Rutland) coal fire. The coal fire was where participants went directly to first in their recollections and lingered the longest of any era in home heating that they had experienced. As they moved into more recent eras of home heating, recollections became more vague and it became more difficult for participants to reflect in detail on home heating, beyond remarking on improved levels of comfort. Memories of the coal fire were indelible in the minds of participants old enough to remember them (all participants). 'I do remember the gas fire going in but I remember the coal fire mainly.' (Gillian). Given the age profile of participants, most had experienced this era of home heating that ran, in the main, from around the early 19th century until the 1970s in the UK. Although, some participants used coal fires until the 1990s and even the present day. It was striking how participants born in the 1940s and 50s recalled childhood memories that had many of the hallmarks of a Victorian childhood with very little change to the way homes were heated between their generation and that of their parents and grandparents. Cooking and baking, washing and sleeping arrangements had not moved on significantly. Things then modernised relatively rapidly for many with an explosion of innovations entering the home from the 1960s onwards, such as plug in heaters, gas fires, gas cookers, fridges, immersion heaters, electric blankets and later, central heating.

The intricacies of the coal fire

The practical aspects of accessing fuel, building the fire, lighting it and maintaining it, were explained in detail within the oral histories, despite the 'everyday' nature of these processes at the time. Cold spaces were remembered as the places without fire, but the 'glow' of the 'cosy' fireplace in the main living areas of homes still shined through. Recognition of the fireplace as a 'focal point', and social and emotional connections were also evident, although the labour of maintenance and the physical discomfort of cold beyond the fire, was widely recognised. This vivid recollection of the human relationship with the coal fire emphasised the centrality of this early heating system in people's lives.

Lighting the fire/getting it going was a source of anxiety for some and it seems that few took it for granted that they would be able to get a roaring fire going. Wood was as vital as coal for getting the fire going. Coal would be delivered by the (sometimes infamous) coal man, but sticks/firewood had to be foraged.

Some people had the knack of lighting and maintaining a good fire, whilst others never quite mastered it and experienced daily anxiety about getting it going and keeping it going. All manner of tips and tricks were used such as holding damp paper over the fire to draw it or sprinkling sugar on the first flames. It was hard work, involved multiple fuels (wood, paper, coal) and multi layered techniques and was dirty (ash and soot that got everywhere). Carol (Maltby), who moved from Singapore to England when she was 17 in the 1950s felt frightened of the fire and never mastered the art of lighting it, relying on neighbours to help her. It was a significant daily source of anxiety.

Mary, as a staunch advocate (and current user) of the coal fire, provided a contemporary insight into the laborious routines associated with maintaining a fire, relaying the process in detail when looking back:

> *'I get up at 5am and I put the kettle on to boil. While the kettle boils, I get the fire cleaned out in the time it takes me to boil the kettle. I wear a mask and use a long brush. I've got it down to a fine art. Once a week, I brush out all the soot from*

behind those two doors, there are pipes which pump water round and heat the house. This fire heats the house. If I leave it, it starts to make a noise like my fire used to growing up and puthering. We have a chimney sweep once a year and I try and do it myself in between times. The soot is unbelievable. It makes such a lot of dirt. I am always cleaning. Soot everywhere. Not an easy method of heating but it is warm.' (Mary, Wentworth)

The daily toil is considered worth it for the intense warmth it offers and for the comfort and social interaction it facilitates. For their household, the fire provides the very essence of a home:

'I would miss it if it went. We sit and we look at it and we chat. You wouldn't get the same from a gas fire. [My husband] loves the poker. He loves to poke the fire and loves to sit and talk and give it a poke. Everyone who comes will sit here. Houses without it seem stiff and perfect. I was glad to come home. I have a friend who is a millionaire but she loves to visit us because it's so comfortable.' (Mary)

For Mary, bituminous (house) coal, which is no longer legally for sale as of May 2023, provides the 'spark' which helps to get a fire going. In the absence of it, more wood is required to get the fire alight:

'It's a very difficult way to heat. [My husband] has gone to chop some wood from a fallen tree now to burn on the fire. It's very hard to get the fire going with just smokeless fuel. You need some [house] coal on there with some spark to get it going.' (Mary)

Unlike the more technical heating systems that became commonplace in the home from around the 1970s onwards, the coal fire or range was a manual system and knowledge about how to build and maintain a fire was passed down between generations not through manuals but by being shown repeatedly how to do it. Not everyone mastered it, but the rudiments of the process were well understood. These were much valued skills for life:

'When the house was colder and when we got frost on the windows. I remember that more. You realise how much your parents did to keep you warm. The things they instilled, teaching us to keep warm. That sticks in my mind. It's not that I don't appreciate advances in heating but probably because later on you realise just how much was put into it and appreciate it a little bit more.' (Gillian, Whiston).

A number of participants remarked on the speed at which heating and domestic technology moves now- how it's hard to keep up and master the skills. Skills for the coal fire were honed over multiple generations but new skills and techniques of a digital nature are required all the time now.

The coal fire as the 'centre of the universe'

Coal fires were remembered by the majority of participants as comforting, bringing companionship, family togetherness and a deep sensory, meditational quality (the flicker of the flame, the red glow). They were remembered extremely fondly by many, particularly those who experienced them as children (most participants) who did not bear the same pressure as parents to keep the home warm.

Everything happened around the fire; it was the 'centre of the universe', as Sue put it. *'It was the centre of family life. Food. Smell. Laughter.'* Life was lived out in one room, around the fire until the transition away from the coal fire or stove as the sole source of heat from the 1960s onwards. It was the natural place to sit and chairs were orientated towards it. Someone would always be poking at the fire, throwing waste on

it, ‘banking it up’. Even though houses were less comfortable (beyond the fireside) in the era of coal fires, this form of heating seemed to foster a greater sense of homeliness and cosiness, despite being a place of struggle and toil partly because of the fire. It was also a means of waste disposal, with many forms of waste thrown on the fire- paper packaging, tobacco, old clothing. Bins were smaller and mostly used for ash.

The perceived benefits of the fire could only really be reaped if there was sufficient fuel to keep the fire going. The parents of many of those interviewed had parents who were miners, which meant fuel was in plentiful supply (as part of miners’ remuneration package) but other households struggled more to acquire sufficient coal to keep the home well heated. Stewart, for example, remembers how coal was in plentiful supply for his grandparents and uncle’s family because they were miners. His father worked in the steel works, which despite being intrinsically linked to the coal mining industry, did not entitle him to a free coal allowance. They relied therefore on leftover coal from his grandfather to heat the family home housing five children and two adults. This resulted in the home always being underheated. There was inequity in this- Stewart’s grandparents’ house was warm and cosy and a happy place to be, compared to his cold family home.

Despite a widespread fond affection for the coal fire amongst participants, the negative environmental and health-related impacts (that were known at the time) were recognised by some. The poor indoor and outdoor air quality that coal fires contributed and the smoky air outside was acknowledged occasionally. One woman (Liz) remembers her baby experiencing persistent chest complaints thought to be linked to the fire and which eventually led the GP to write to the Council (the landlord) to request a more modern heating system for the family (significant to note that this was the only reference so far to health impacts of the coal fire). But the impact on air quality was not widely recollected, unlike the soot and ash which many highlighted as the major drawback of the coal fire.

Sensory experiences and visual spectacles were prominent in accounts- steam of washing drying by or above the fire, the smell of gas filling the streets, the smell of damp in underheated houses, toasting pikelets around the fire, Mum’s homemade bread and buns, the sound of the coal being dumped in the store. Dropped black coal dotted in the fresh white snow, signalling that the coal man had been. The melting of old polyester clothes thrown on the fire. The fire could also be a source of fun and adventure, as detailed in the next section.

Fireside Children: Work and Play

Childhood memories highlight the fireside as a source and space of intersecting experiences of work and play. Children were often involved in the labour of collecting and moving fuel (responsible for foraging sticks to help get the fire going and collecting coal from the coal store), and occasionally, children would help light the fire. Whilst adults perceived the labour of the coal fire as work - and this was sometimes recognised by children (often retrospectively from their adult vantage point) - the tasks associated with the fire and the fire itself were also a source of childhood excitement.

These childhood experiences created a culture of shared knowledge and understanding of the fire that aided them in adulthood - knowing how to build, maintain and clean out a coal fire was seen as a vital life skill to be passed from one generation to the next. Those who did not observe or participate in fire lighting and maintenance as a child, such as Carol (Maltby), faced difficulties keeping themselves and their own children warm using coal fires. Liz, Carol’s daughter, also found it difficult to light the fire in adulthood, perhaps because of Carol’s own anxieties and resentment of the coal fire.

The fireside was also a site of play and entertainment. Many participants shared memories of playing games, rehearsing the piano, and reading by the warmth of the fire. The fire itself was also played with: Liz's (Maltby) brother used to light sparklers on the fire, and they would write their names using them (without the knowledge of their parents). Richard (Whiston) used to burn his broken model aeroplanes in the flames. Food cooked on the fire was another source of joy and excitement for children, with bread and pikelets toasted on the fire forming a happy memory for several participants:

> *'Obviously it [the fire] was the central point. Again as a treat, we used a long toasting fork to toast some thick bread. Toast has never tasted as good as that.' (Lynn)*

Childhood fears in connection with home heating systems were also remembered. Lynda remembered a 'scary' cellar where coal was stored and the 'shadows' the fire cast onto the walls. Peter also mentioned a 'spooky' cellar. Linda remembered the hot water tank in the attic, which the children were 'terrified' of because they thought a 'serpent lived in there'. These fears differed to those of adults, who were more concerned with children getting burned by open fires, or the fumes from gas. But the oral histories demonstrate that children were largely aware of and respected these dangers.

Domestic spaces and thermal comfort

The main space to access warmth was in living rooms on the ground floor of the house because of the reliance on the fire. Prior to the 1960s/70s when the phasing out of coal fires was underway, these spaces housed the largest or only coal fuelled fire in the house, usually housed within a Yorkshire range in a kitchen-living area, or in a cast iron fireplace or grate in a sperate living room. In front of the main fireplace was often the warmest part of the home. Hence, it was also the main social space. Furniture was orientated toward the fireplace and most people recalled the fireside as the space where they spent most of their time. Sue (Maltby), for example, recalled the front of the range at her childhood home in Wentworth as 'a lovely warm place' where the family would sit and listen to her father tell stories of when he was young. Graham (Wentworth) reflected that while generally houses in the past were cold, the family sat round the fire, which he thought 'was quite nice'. He believed the 'focal point' of the fire was important in a home. Richard (Whiston) emphasised social aspects of the fireside, stating that it was 'very nice to sit round the fire' in the living room and remembered 'gazing into the fire'. Richard explained that the orientation of the furniture and general focus of the room (before the introduction of the television) was toward the fire. The living room and kitchen fires were almost constantly lit for heat in colder months and all year round for other household needs (i.e., baking, water heating). The times fires were lit varied depending on the availability of fuel, financial constraints, routine, and external climate, but their existence was noted as a space where heat was almost always available. The thermal comfort of the fireside was also intimately connected to the social space of the home.

'Occasional spaces' were also described. These were areas of the house with fireplaces used for specific purposes or special occasions. Keith (Wentworth), for example, first remembered living in a two-up-two-down stone-fronted terraced house, heated by a black lead range in the kitchen. There was a cast iron fireplace in the living room, but this was only lit on special occasions. Keith said his first birthday, when his family and cousins visited, was one time that this fire was lit. Similarly, Linda remembered her grandparents' coal fire was very warm. There was another fire on the ground floor, but it was only lit on 'high days', holidays, and Christmas when 'all the family were there.' Linda explained that they did not 'waste money on fuel if they didn't have to.' Likewise, Graham explained that his childhood home was heated daily by the

main fire in the house, which had a grate, tiled surround, and a back boiler for hot water. There was a fireplace in 'the best room', but that space was only used for special occasions or when family visited. There were never two fires lit at once, he clarified, because 'that wasted too much fuel.' The use of the 'best room' and its fireplace, again, appears to be both an economic choice and cultural practice, and was likely influenced by notions of class.

In contrast to the living space downstairs, bedrooms and bathrooms (when there was one inside) were recalled as the coldest parts of the house, particularly before central heating. Getting out of bed to get washed and dressed for school was one of the few times Rita (Whiston) remembered being cold as a child. The morning routine was done 'as quick as possible' so she could 'get down to that fire.' Likewise, Christine (Maltby) remembered it being cold upstairs in a morning and at night when she went to bed because there was no heating upstairs. She would sleep on a small matt on the lino floor. She also recalled the bathroom being particularly cold. Like Rita, she would run downstairs after a bath to get near the coal fire because it was 'too cold' to stay upstairs. The ice on the inside of bedroom windows described in most of the oral histories is emblematic of the cold temperatures upstairs in most houses before the introduction of central heating.

Fireplaces were also recalled in bedrooms, but these were very rarely lit or were out of use completely. Sue (Maltby) maintained that 'it was too expensive' to light the bedroom fire, and the only occasion she remembered it being lit was during the birth of her younger brother. Similarly, Dinah (Whiston) did not remember the master bedroom fireplace in her childhood ever being lit but presumed it would have been when someone was 'poorly'. Keith (Wentworth) also explained that bedroom fireplaces were only lit when someone was ill. Lynn (Whiston) thought the upstairs fireplaces may have been too costly to light, and Linda (Whiston) stated 'nobody used the bedroom fireplace' noting the difference she felt in the 'cold bedroom'. Hence, she remembered, her family keeping warm by staying in the living room downstairs by the 'cosiness' of the coal fire.

The limited use of upstairs fireplaces was driven by limited financial resources, but likely became part of cultural practice. Carol (Maltby), born in Singapore, explained that when she lived with her mother-in-law in Maltby there were fireplaces upstairs, but these were never used. When Carol questioned this (because she was so cold at night) her mother-in-law said, 'we don't do that'. There was a double coal allowance in the household, and Carol's daughter, Liz (Maltby) recalled their willingness to use coal fairly liberally, suggesting that a reluctance to light the bedroom fires had more to do with avoiding additional labour or simply a cultural acceptance or preference for cooler bedrooms. Indeed, a preference for a cool bedroom was evident in the present. Graham (Wentworth) maintained that he does not have central heating turned on upstairs now because he prefers the bedroom to be cooler, and Dinah (Whiston) insisted that the bedroom was somewhere 'you automatically want to keep a bit cooler.'

Due to the cold temperatures in bedrooms, bedding and clothing were especially crucial to keeping warm there at night. As a child, Graham (Wentworth) had an eiderdown quilt and several 'army blankets' and the number of blankets on the bed altered with the weather. He explained: 'your mum would bring out another blanket if there was a cold snap' and that 'you could hardly move with the sheer weight of bedding.' Dinah remembered Army blankets as 'rough to the skin' but 'very warm', with red and green binding on the edge, which she thought 'made them posh'. Dinah also had an eiderdown blanket, which was 'quite warm', 'quite thick', and 'heavier than duvets'. Liz (Maltby) recalled having several thick blankets with a silk edging and a flannelette sheet, which 'felt furry' as a child. The bed was also topped with 'an eiderdown or candle wick bedspread' that was 'all wavy and patterned'. She remembered the weight of the blankets too, which made it difficult to move but kept

her warm. She would wear socks and thick pyjamas in bed, and her brother wore his balaclava because it was ‘so cold’. Gillian (Whiston) also had ‘lovely warm flannelly sheets’ that were ‘snug’, as well as additional blankets and pyjamas. She would wear an old cardigan over her pyjamas if needed.

When blankets and quilts were not available, coats were used as bedding. Rita (Whiston) had ‘proper bedding’ at home but recalled a family on her street who used coats. It was ‘a common thing then’, she said. Stewart (Whiston) wore football socks to bed and laid jumpers and coats on the top of him to provide some warmth while he slept. In his 20s, an RAF coat was his ‘companion on top of the bed’, until he moved out his parents’ house permanently. Sue (Maltby) also recalled coats laid on the bed, as well as sleeping with three of her siblings, which she said helped to keep her warm. Rita remembered that sleeping with her mother kept her warm, too. For some, however, upstairs spaces were so during the winter, regardless of night clothing and bedding, they had to sleep downstairs. As recalled by Liz (Maltby), in her adult life she would sleep with her children in the living room near the (very small) coal fire. Liz clarified that the upstairs fireplaces were ‘blocked off’, ‘long gone by then’, and that she still dressed her children in layers and layers of clothing to try to keep them warm.

Supplementary heat sources were used for thermal comfort in bedrooms in the absence of a fire and hot water bottles were particularly common. Lynn (Whiston) remembered that they were ‘nice to cuddle up to’. When hot water bottles were not available, other heated objects would be placed in the bed. Sue (Maltby) remembered that her parents would wrap an oven plate and put it in the bed to warm it before she got in, until they had hot water bottles. Keith (Wentworth) also remembered the oven shelf, or a warmed fire brick was wrapped up and placed in his bed before he got in, but if he hit his toe on it - it hurt! Being from Singapore, Carol (Maltby) had never seen a hot water bottle before she moved to the UK, until one was gifted to her by her mother-in-law. She would still wake up ‘shaking and shiver, freezing cold’ because the bottle would not stay warm through the night. Carol ‘made sure’ her children had hot water bottles as well, but her experience is an example of feeling cold despite employing common methods for keeping warm at the time.

Those who had the means used electric blankets and heaters in cold spaces. This seemed to become more common over time. Lynn (Whiston) remembered her mother buying her an electric blanket and that she ‘loved going in to bed at night’ after that. She explained that although the family were not ‘wealthy’, electricity was not ‘rationed’, and the use of the electric blanket was not restricted. Richard (Whiston) recalled his parent’s buying an electric radiant fire for the bathroom, which was positioned on the wall close to the ceiling ‘for safety’. Even after the introduction of central heating in homes, however, supplementary heat sources were sometimes required. Keith (Wentworth) noted that electric fires were used in bedrooms ‘as a booster’, ‘if you were lucky’, but it was unclear if Keith had one himself. Lynda (Whiston) explained that eventually her family got a small electric transportable fire that they could move into other rooms, but that she still had few memories of warmth at home.

The one place that was noted as a consistently warm space upstairs was the airing cupboard. Lynda (Whiston) remembered an airing cupboard with an immersion heater and hot water tank in her bedroom. The bedroom itself was cold, but she would open the cupboard and put her hands on the tank to keep them warm. Similarly, Dinah (Whiston) would ‘open the cupboard door and enjoy the heat from the boiler’ in the bathroom of her childhood home, and family members would take turns sitting inside for ten minutes on a morning. Graham (Whiston) also noted the heat of the airing cupboard in his bedroom, and when Richard (Whiston) was a baby, his cot was positioned in the front bedroom of the house where an airing cupboard was situated because it provided some residual heat. This recognition of the airing cupboard as a small source of thermal comfort in domestic space is still noted by Linda (Wentworth)

today. She explained that one of the 'main joys' in her current house is the airing cupboard, describing the warmth provided as 'beautiful', 'gorgeous'. It is where Linda dried her slippers.

Memories of domestic heating also reached beyond the primary internal spaces. Outside toilets and laundry rooms were highlighted as especially cold. Rita recalled being cold when she needed to go to the toilet at night, which was situated outside at the end of the garden path. Graham explained that when he was in secondary school, his family had a brick 'out house' used as a laundry room. In the winter months it was 'very cold' in there, so they used paraffin heaters. It was Graham's job to collect the 'Aladdin pink' paraffin. If the wick setting was not right on the paraffin heaters, it would smoke and 'soot up the glass'. Graham explained that these heaters were essential because the building got 'bitterly cold' and wet.

Women's work, Men's work

Coal dealers were associated with some underhanded practices (underfilled bags, wet coal to maximise profits). The 'coal man' was a prominent figure in everyday life but was not always trusted. The coal man was always mentioned in recollections and formed a vital and reassuring part of the daily rhythms of life. What happened to the coal men as coal consumption was eroded away? Was there a just transition for them into another area of work?

It was not always a woman's job to build, light and manage the fire and children were not involved much- but some remember being taught how to do it or having roles in filling the coal bucket from an outside store and foraging for sticks to help get the fire going. Most recounted that Dad looked after the fire but the struggles of Liz as a single mother of three to keep her children warm using just one coal fire were very vividly recounted. Graham, Sue and Stewart both separately (and emotionally) recalled the hard life their mothers in particular had lived, which included very early morning efforts to get the fire going before going to work or before the family woke up.

Sue's mother's life was dedicated to maintaining the fire and enabling family life. Despite her fond memories of her childhood, she did not romanticise her mother's work:

> *'Mum, bless her, had a life of drudgery trying to keep us all warm and fed. Must have been horrendous. Five children under ten and having all that to do. Mum was at home all day- that's all she did, looked after the fire, looked after the food. But by the 1990s I was off working full time – out all day but Mum wouldn't have had time for that. Lovely cosy memories but it was blooming hard work.'*

Mary was still enacting (in the present) the same dirty, heavy work that many participants recalled their mothers being responsible for some 60-70 years ago:

> *'It's exactly the same for me now as it was when I was growing up. It's the dirt that gets you down, the dirt. I have dirt coming in from the farm anyway and then there's the fire. It's disheartening when your walls are always dirty. That's why I had them tiled because I was painting them every six months before that and now I can wipe them over. You haven't got to be a perfectionist when you have a fire. I've had it slowly squeezed out of me.' (Mary)*

> *'If I had a wish, one would be 'may your coal bucket always be full'. They're always empty because no one likes fetching the coal. I remember going to fetch coal when I was pregnant. I gave birth two days later. I'm going to put some air on it now. And there's a damper, a piece of metal, oblong shape. You pull it in and out [sings song about damper].' (Mary)*

Mothers were frequently remembered as the cooks (using the range to bake and cook with great success) and responsible for laundry. But Liz, Gloria and Sue's mothers' lives were truly revolutionised by the advent of GCH which, amongst many other things, allowed Liz to get up at 7.30 with her children, rather than at 5.30 to battle to get the fire going. Perhaps it was the critical mass of more efficient appliances (i.e., gas cookers, gas fridges, washing machines) that came in at around the same time that made the difference in terms of women's labour. There are recollections, though, of people finding established ways of doing things hard to part with, even if they were labour intensive- i.e., Liz's neighbour preferred to cook on the range and use manual irons, even when electric or gas alternatives were available and affordable.

Care is imbued in the recollections participants shared about the domestic work of their mothers and grandmothers; deep enveloping care in the form of maintaining warmth, cooking, baking, knitting warm clothes, and teaching children how to make a fire. In most people's recollections, their mother's life was dedicated to the care of the family. Warmth and comfort were key expressions of this and would even be given as a gift:

> *'The fire in the kitchen, the black range: it had a space above the oven where Mum put our gloves to warm them.'*
>
> *'One Christmas we got a hot water bottle each- my sister got a red riding hood one. Mine was a dog. We loved our little hot water bottles.' (Both quotes from Gillian)*

Although, there were other accounts (smaller in number) where care felt sorely lacking and the fireside became a site of neglect.

Emotional Comfort and Familial Care

Memories of warmth were often associated with parental care. These memories were particularly strong in connection with coal fires but not exclusive to that system of home heating. Home knitted clothing, sharing beds, the purchase of new supplementary heat sources could all be interpreted as acts of care. Parental sacrifice was a powerful theme in many of the oral histories. Once children recognised (usually retrospectively) the work that their parents put in to trying to keep them warm, they felt a sense of intergenerational gratitude and guilt. But the comfort of children was not always prioritised or just not possible due to financial [and indeed political circumstances (i.e., the miners' strike)].

Special occasions, particularly Christmas, were often recalled in connection with emotional and thermal comfort, and times of familial care. More/more vigorous fires were lit at these times and ideas of the 'cosy home' were even more prominent.

These memories of family, care, and home heating also extended beyond humans and pets were often remembered as part of home heating stories. Rita (Whiston) had a Doberman that would bark at the gas heater in the kitchen until it was switched on. Dinah (Whiston) cleared the cupboard next to the Yorkshire range for her dog's bed so it could be warm. Liz (Maltby) remembered the dog laying in front of the fire and her resting her feet on its warm fur. Graham (Wentworth) would care for lambs from the local farm during the summer holidays and would use the warming shelf of the range to warm them up, ultimately helping them to survive.

As well as thermal comfort, the emotional and social comforts of a fireplace were a prominent draw to the fireside and influenced people's choices of home heating systems over the years. Reflecting on the choice to install a new gas fire during the transition to central heating, Trevor maintained:

'It was psychological… the lure of an open fire… people want to sit in front of an open fire don't they… we thought, well we can have it both ways here… we can put the gas central heating on, or we can turn that off and just have the gas fire on.'

Rita, Trevor's wife, supported this stating: *'I think fires mean a lot to people don't they. It's engrained in us… It's a nice feeling isn't it, looking into flames… you just sort of drift off… staring, watching the flames moving… bit like meditation… and you've got the comfort of the warmth…'* She remembered 'sitting staring into the flames' as a child which, for Rita, that was 'a nice childhood memory.' Graham highlighted it as a space of 'companionship' and family as a child. Graham, an advocate of solid fuel fires who still has a multi fuel burner in his home today, thinks it is nice to sit in front of the fire, 'watching the flames'. For Graham, the fire provided a sense of 'wellbeing' and 'contentment' as well as thermal comfort. Lynda reflected on the fire as a place where 'everybody is together… everybody is safe'.

Hence, even with central heating and the spatial shifts outlined elsewhere in this report, the desire for a fireplace remained because of the social and emotional connection. Graham and his wife Lynda (Whiston) said it was 'a conscious choice' to invest in a multifuel burner in their current home. They wanted to 'marry' having the efficient 'tucked away' central heating system that gave them thermal security, with 'a nice cosy warm fire' in the living space. Because of the effectiveness of the central heating, it did not matter to Graham if the fire in the living room could heat the whole house, that was not its purpose- it was primarily a source of emotional comfort. For several oral history participants, however, the decision to keep or install a fire (gas or coal) in addition to central heating has not resulted in the fire being used in practice in the present. Dinah (Whiston), for example, had an electric fire installed 'for the look' but she said that it is never used, suggesting that the need for an attractive focal point in living areas is not met by modern systems.

It is important to note, however, that these social and cultural traditions did not apply to all, as with the case of Carol (Maltby) who had no positive connection with the fireplace. She attributed this to her upbringing in Singapore and the challenges she faced trying to learn to heat her home using a coal fire when she moved to the UK. The gas fire that remains in her home was something encouraged by her children, but Carol explained that it has never been turned on because she does not like it so does not use it. Yet the gas fire remains for decorative purposes, and family photographs covered the frontage and mantlepiece. It is still a focal point in the living room.

Household Economy

The coal fire was significant to the household economy in terms of cost (outside of the mining community where free coal allowances for miners helped enormously) and associated labour. The cost of fuel has been alluded to above – families did not light fires in the bedroom because of the expense (as well as the labour). For example: Lynda (Whiston) recalled that people 'complained about the price of coal'. Trevor (Whiston) maintained that it was 'the financial side of it' that stood out most in his mind when thinking about home heating. Coal was 'precious' to Liz (Maltby) because of the cost, as well as her desire to keep her family warm. Stewart (Whiston) explained that usually, his family were given coal by his grandfather who received an allowance due to his employment at a local colliery, but when his grandfather could not spare any, his family would be forced to purchase fuel from the coal merchant, which he recalled as 'expensive'. Because purchasing coal was considered a significant expense, people recalled checking their deliveries and being aware of 'all sorts of scams'. As previously mentioned, Graham (Whiston) explained that often the coal was damp so it weighed more, so 'when they were delivering you a 100-weight bag of coal, or whatever the weight was… the weight factor would be affected.' Graham's parents would check the

coal after it was delivered and comment that it was ‘a bit wet’. Graham’s mother used to instruct him to count how many bags of coal were delivered. The expense of coal, however, was less of a concern for the families of mineworkers, who received a free coal allowance as part of their wages.

For many oral history participants in Rotherham, the household economy was bound up with the coal mining industry, whether directly due to the coal allowances or indirectly within the broader community and local economy. Keith (Wentworth) explained that as his father was a mineworker, the family received a coal allowance, which was delivered by the tonne. After his father ceased work down the mine, the family could still access cheaper fuel by purchasing ‘spare load’ from miners in the area. Keith recalled this as an aspect of community, ‘everybody did it’, it was ‘how it worked’. Liz (Maltby) also recalled buying spare coal from miners on her street. Stewart (Whiston) remembered cycling to his grandfather’s house (about a mile away) to collect a sack of coal and wheel it back on the cross bar to his parents’ house. He also had a trolley for collecting the coal from extended family.

Both Keith and Stewart recalled their grandparents’ houses being warm because their grandfathers were miners. Keith explained that access to free coal allowed his grandparents to have multiple fires lit downstairs at once. Keith remembered it being ‘really homely’ there. He maintained that his friends’ houses were much the same because they were also mining families. It was ‘very cosy’ he recalled. Likewise, Stewart remembered there was always a ‘roaring’ fire at his grandparents’ house. Stewart distinctly remembered the difference in temperature from his parents’ house (his father was a steelworker), recognising his grandfather’s occupation as a miner as key to this. He explained his grandfather ‘got the coal’, ‘he was never short of coal’. Stewart clarified that it was the norm for mining communities to have easy access to fuel, so heating was less of an issue for them. By contrast, Graham (Whiston) who grew up in Huddersfield, placed emphasis on the significance of wool for keeping warm, reflecting the fact that wool was central to the local economy in Huddersfield.

As well as the miners themselves, the coal fire supported other employment which directly impacted access to fuel and the household economy. For example, Richard (Whiston) explained that his father worked in the coal industry but in laboratories in Rotherham conducting scientific testing, so initially his family did not receive any coal allowance. Richard’s maternal grandfather, however, was a coal merchant, so he delivered fuel to the house for free. Richard recognised this as one of the reasons why his family could afford to fuel three fires in the downstairs of the house, which he remembered being ‘pretty warm’ for most of the time. The coal fire not only supported mineworkers, but other businesses facilitating supply, and by extension, their families. Chimney sweeps are another example.

Free coal and a delayed transition to gas

Due to union action, Richard’s father was eventually granted a fuel allowance. Richard explained that it meant the family, like miners, had free fuel and were ‘included in that scheme’, although he was unsure if the delivery was free. Richard described the free coke (smokeless fuel) allowance as ‘an enormous benefit to the family’, that enabled them to have more fires than most people. Richard described his father’s wages as ‘not good at all’ and the family living ‘hand to mouth’, so the allowance was crucial to their standard of living. Richard recognised that transition to gas was ongoing in the background during the 1960s on a national scale, but that his family ‘stuck’ with coke because his father was receiving it ‘as part of his wage’. This echoed Christine (Maltby), who explained her mother only switched to gas after her father died, and their coal allowance was cut, in 1999, by which time the majority of UK households had been using gas central heating for decades. The cost associated with change influenced

home heating decision-making, and in these cases, the coal allowance was central to this.

Nevertheless, the cost of change was influential in most of the oral histories recorded and across the entire time period that participants reflected on (roughly 70 years). Linda (Wentworth) explained that her parents never had central heating because her father 'was frightened of the expense'; it was considered an 'expensive luxury'. Personally, Linda did not think the cost mattered if the money was available but said her parents were 'a different generation'. Richard (Whiston) contemplated having an electric fire installed after his old gas fire was condemned, but the expense of electric fires was higher. Even after transition, the cost of new and unfamiliar technology was often a source of anxiety. Gillian (Whiston) recalled an immersion heater being installed in her parents' house. Her father would comment on the cost because, she explained, it was new and he was cautious about how it worked. She clarified that her father was not restrictive because of cost but that he 'liked to have everything reckoned up.' But the financial implications of transition were not the sole influence on decision-making. Costs were often weighed up with the work and disruption involved, both during transition and afterward. Lynda (Whiston) explained that she balanced the cost of buying the multi fuel burner in her current home against the cost of the gas fire and the question of 'how much mess would it create to have it done.' Graham recalled switching to a new coal merchant because the price of smokeless fuel was cheaper, but he found the cheaper fuel left up to four times more ash to clear than the more expensive fuel. Graham described the cheaper coal as 'nasty' and 'dirty', and quickly reverted to the more expensive fuel which required much less labour to clean up after it was burned.

Desperation and Exploitation

The pursuit of thermal comfort, however, was sometimes recalled in connection with desperate measures to secure fuel. For example, Trevor's (Whiston) parents had low paid jobs, which led to financial hardship and energy insecurity. As a steelworker, Trevor's father was exposed to industrial waste sites, 'slag heaps', which were formed from by-products of the steel industry. Trevor described how 'little bits of coal' could be found in these waste sites. Trevor recalled his parents pulling a sledge in the snow down to the heap and filling a sack with the waste coal they could find then pulling the sledge back home again. As well as his own memories, Trevor recalled stories told by his mother and her sister. He explained that 'their shoes, they were always cold' and that 'they often had holes in their shoes.' To try to keep their feet warmer, they wrapped each individual toe in long strips of cloth, which were called 'toe rags'.

Rita (Whiston) spent her early childhood years on an inter-war council estate in Sheffield, which she described as 'quite a poor council estate', 'a poor neighbourhood'. She remembered a particular incident involving a young girl at her school who was 'obviously undernourished'. One day in mid-winter, the girl started to shake in the playground and turn 'a funny colour'. Rita remembered holding the other child under her coat and knocking on the window to call a teacher for help, who let them both in from outside. After that, the other child 'went missing for a few days… she was really not okay'. Rita explained: 'I didn't know what was happening then, but I do now. She was going hyperthermic', commenting that it was a sad memory 'of somebody being so cold they nearly died.'

Rita recalled the fire being on at night in winter and coming down to a lit fire in the morning, which she considered an indicator that they 'were doing okay' in comparison to other families on the estate. Because her mum was working and her grandmother had a pension, Rita maintained that her family were relatively secure. She maintained: 'We were okay, financially, and we could afford coal', but other families on the street 'were struggling'. She explained 'if the chimneys were not smoking you knew they

didn't have a fire… I think probably we were one of the few families that did have a smoking chimney in the winter.' Rita was aware of deprivation in the area, even as a child.

Sexual exploitation in relation to access to coal was also significant in Rita's memory. The 'coal man' who supplied the fuel, she explained, had 'really bright red ginger hair', and that a couple of her friends had the same hair colour while their parents did not. She realised later in her life that 'something was amiss', that she 'used to hear whispers…' and that she thought 'people couldn't pay him and wanted the coal.' This instance provides insight into the sexual exploitation of women who could not afford coal, but still sought to provide fuel and warmth to the family.

The oral histories also reveal household and personal items being used for fuel. Lynda (Whiston) remembered that when coal was particularly sparse, her family would 'find some wood somewhere', 'if it was available'. She had a small desk in her bedroom as a child that was ultimately chopped up for firewood. She did not notice the desk was taken at first but realised later that her family 'had to resort to burning it.' Lynda has few memories of being warm before moving to Whiston- her first experience of gas central heating. Tony (Whiston) recalled during his work as a social worker in Maltby, visiting a family that had no internal doors because they had all been burned.

Maltby was an area where the effects of the miners' strikes on the provision of fuel was especially clear. This was an area where, because of the nature of local employment and the economy, most residents had access to a coal allowance. This ceased during the strike. Ray, an ex-miner still living in Maltby, explained that during the strike he would cut down trees in local woods because his allowance had ceased. Ray, along with other striking miners, would search for coal at night in ditches at the edge of the entrance to the pits. Others also reflected on the cold during the strike.

Regardless of whether family members were actively striking, the industrial action had an impact. Christine's father retired before the strikes, but it still affected coal extraction and thus the coal allowance. They felt the cold then, she explained, and they 'had to sit with no fire on'. Because the central heating was reliant on the coal fire, they had nothing at all. To try and keep warm the family would wear hats and coats inside. This was not the only time that Christine's family had limited fuel. She explained that if they ran out of coal before the next delivery, they were 'freezing'. Christine reflected on other people, including herself, wearing additional clothing inside because they could not afford their gas bill.

There were recollections of those who received an allowance during the strike (even if this was reduced), supporting other families by donating fuel. This sort of neighbourly support was also exercised beyond times of industrial action. Liz (Maltby) lived next door to a widow whose husband had worked in the pit, so she still received a coal allowance. The neighbour would occasionally leave half a bag of coal over the garden wall to help Liz out, especially in the snow. Liz explained that her neighbour would say, 'you make sure them babies are warm all the time.' Liz found this 'lovely', but she was happy when she knew the coal man had been and would look for his footprints and wheelbarrow path in the snow in winter. Liz also explained that excess coal from allowances was often sold on for 'spare money', and when anyone would ask if she wanted any of the spare, she would always say yes, even in summer, because come winter she wanted to ensure a plentiful supply.

The eventual closure of coal mines in South Yorkshire led to mass unemployment in the area. Graham was the manager of the local unemployment office at the time. Part of his role involved dealing with the Mineworker's Resettlement Scheme as the collieries in South Yorkshire closed. He described the coal industry being 'decimated' and the problems that caused on a 'sociological level'. In his role he met people who

had ‘worked all their lives and now were out of work.’ Graham described the resettlement scheme as ‘good’ but clarified that the cultural change was dramatic for the mineworkers who then had to sign on with the ‘dolies’. Graham described the change to the coal-driven local economy as ‘brutal’, ‘unsympathetic’, and ‘disturbing’. Graham compared the mass unemployment of mineworkers to the training and recruitment scheme that accompanied what he referred to as the ‘North Sea Gas conversion’, which seemed ‘efficient’ and ‘well planned’ on a national level. On the transition to gas from coal more broadly, Graham maintained that even though change had made his own situation ‘more comfortable’ at home, it was ‘hurtful’ to witness it costing other people their livelihoods.

Environmental Change

Oral history participants were aware of environmental changes over their lives so far. The reduction in domestic smoke and smog in the atmosphere was particularly noticeable. Graham (Whiston) recalled the bus stopping when he was on his way home from school (1950s) because the smog was so severe. Graham clarified that Huddersfield (where he grew up) was a wool town, rather than heavy industry like Sheffield which was more associated with pollution. Still, he explained that the smog was so bad that he could not see the length of his arm. He added that it ‘was quite alarming that your atmosphere can change just like that’ and that it is ‘something you forget about nowadays with clean air’. Graham associated smog with ‘lots of chest problems’. His father died of cancer, primarily due to smoking, but Graham thought that the ‘air environment was bound to be a factor, in those days.’ Linda (Wentworth) also recalled ‘dreadful fogs [smogs] in Sheffield’ caused by burning coal, which stopped transport in the city centre. Like Graham, she recalled on occasion she had to walk home to Crookes because ‘it was such thick impenetrable fog’. Linda remembers ‘Clean Air’ legislation being introduced but was not old enough to think about it much at the time.

Elaine (Maltby) recalled the introduction of Clean Air legislation (The Clean Air Act, 1956). She recognised the positive affected this had on the atmosphere but remembered a sense of confusion around what could and could not be burned, and where fires could and could not be lit within domestic spaces (including in the garden). Christine (Maltby) remembered changes to the coal delivery following the Clean Air Act. Rather than delivering in heaps on the pavement, which used to cause soot to ‘puther out’, she remembered it was delivered in bags and put directly in the coal house instead. She also recalled smokeless fuel looking different to coal, which was delivered in ‘right big lumps’. By comparison smokeless fuel was like ‘little puddings’. Christine said that there was no choice in the transition, they were told about the switch and ‘that were it’, although she recalled her family being given different types of fuel to test in advance. Christine thought too much choice in the matter would be unworkable because everyone needed to switch together for the transition to be effective. Christine recognised the transition to smokeless fuel as a movement toward cleaner air and noticed the air was cleaner afterwards. Before the switch, Christine recalled the washing on the line and her mother’s net curtains being covered in the pollution from coal deliveries and domestic chimneys. Elaine and Christine were from a coal mining family and community, which is perhaps the reason why this change in the fuel itself was more memorable for them.

As well as changes to the atmosphere, the oral histories reveal experiences of climate change over time. Winters are remembered as much colder with more snow. This is a persistent theme across most of the recordings. Graham (Wentworth) recalled that winters were much more severe when he was younger. There was a ‘couple of feet of snow, the fire was lit earlier in the day and it was ‘banked up higher’. Richard (Whiston) also remembered ‘a lot more snow’, arriving in early January. He explained that there would ‘easily be 6 inches’ on the ground. The fires were kept burning while the children

went sledging along the service roads in Whiston, turning them into ‘glass’. This annoyed the adults; though the children were annoyed when the paths were cleared. Richard also described less housing in Whiston as a child, which meant more sledging ground. And he remembered returning to a ‘nice warm home’. A contrast in the experiences of child and adult is indicated here.

Graham (Whiston) maintained that winter ‘always seemed to be snowy’ and ‘crisp’. His parents’ house was on a hill, so sledging ‘was wonderful’ and children skated on the paths. Clearing the snow was one of Graham’s tasks as a child, another example of childhood responsibilities within the domestic space, but Graham maintained that this gave him ‘a pile of fresh snow to make snowballs with.’ Lynn (Whiston) did not have any strong memories of being cold at home but thought that she ‘must have been’ because there were ‘proper seasons’ then. She thought these colder winters would have impacted home heating because more coal was needed. The snow, Lynn recalled, would fall so deep that the family would use a broom to push the door open and get out on to the path outside, and the milk delivery would freeze on the doorstep. Sue (Wentworth) maintained that ‘you were guaranteed to have snow’ and it was ‘freezing’, ‘really really cold in those days’. She also clarified that clothing was even more important to keeping warm then and that she had to ‘wrap up’ in layers of clothing because of the cold – ‘you needed your hat on and you needed a scarf and gloves and wellies’. Snow, like the fireside itself as highlighted above, was a source of excitement in childhood memory, as well as a distinct source of coldness. There was no discussion of why winter might have been colder, but it was a common observation that the UK climate had changed.

3.2. The era of gas central heating

A gradual transition

The reasons for making the switch from coal fires (and in a minority of cases, coal or coke fired central heating) to gas central heating were varied. In some cases, the landlord (usually in this case study the local Council who took over the management of Coal Board housing stock) decided to change the system or in one case, a child was getting sick due to the poor indoor air quality and the GP wrote a letter demanding its installation. Several participants remembered still having coal fires into the 1990s, usually in council housing or former Coal Board housing that did not get modernised until that time. Earlier modernisations were also recalled which involved installing indoor bathrooms (usually resulting in the loss of a bedroom or reduction in size of one bedroom) and switching open fires to closed ‘Parkray’ style units with a water heater behind the fire (which generally seemed to have been a well like development- more efficient and less mess). It seemed these households were at the mercy of decisions taken (usually without consultation) by their landlords- sometimes this meant losing their coal fire before they wanted to (Christine). For several participants privately renting from the Fitzwilliam estate, the transition was still yet to come, with the landlord unwilling to fund GCH unless the tenants were willing to split the costs. This reflects the broader trend towards the worst housing conditions and poorest amenity being concentrated within the private rented sector.

For owner occupiers, there was a sense that these more socially mobile households were driven to be as ‘modern’ as possible which motivated experimentation with the latest heating technology. Several such households experimented with many different heating systems in their adult lives and arrived at different places- air conditioning for one couple and GCH with supplementary log burner for the other. Early adopters had to make do with some inefficient systems (early GCH).

Plug in, wall mounted or free-standing devices (i.e., fitted and mobile gas fires, two bar electric fires) were an interim measure between coal fires and GCH or a supplement

to early, ineffective gas central heating systems that did little more than take the chill off. The increase in availability of affordable plug-in electric heaters, electric blankets and free-standing heaters powered by gas canisters from the 1950s onwards provided some respite from fire building. But the home would need to have electricity on all floors to take full advantage of this- a further expense for households or landlords.

The modernisation of heating systems does not come across as sudden in the oral history accounts, with free-standing, plug-in devices easing in change and chipping away at coal fire dependency between the 1950s and 1970s. Rarely did a household report moving from total reliance on the coal fire directly to GCH. Early experiences of GCH were not convincing to some users- lack of vigour in the heat meant supplementary fires or plug in heaters were needed. The cost of these early GCH systems would have been high for such a disappointing result.

Often, we heard that it was the increasing affordability and availability of a multitude of domestic devices (not just those related to heating) that made the difference for households in terms of labour saving and greater comfort and amenity. For example: Sue recalled in detail the transformative effect that it had on her family when they moved to a home with a plethora of modern features to support domestic life. It was the coming together of a wide range of innovations that liberated her mother from hard domestic labour and delivered comfort on a level previously unimaginable (central heating, a washing machine, a fridge, a gas oven, carpets and gas and electric fires):

> *'I was then 17 (1967) when we moved to the Rockingham Estate, Greasborough. A new council estate. It had central heating but that was a coke boiler- not gas. It was like another Universe! It was comfortable. Everything became less intense- you didn't need so much clothing. Everything was light and airy and warm. Bright and lovely. The days of cooking on the fire were gone. We had carpets! Not just peggy rugs we'd made. It was like living in a palace. Fabulous! Someone still had to fill the coke bucket up but it was less intense. The boiler could run all day without anyone doing anything. They got a washing machine! Mum used to have to wash by hand. It totally changed everything. We felt like millionaires. Life was good. We had electric heaters in the bedrooms if we needed them and a gas fire in the front room. The boiler heated the water but we could use an immersion heater in summer. The boiler didn't have to go all the time- the gas fire could take the chill off. We got a fridge at that point- that changed life as well.'*

Heating and links to other home improvements

Insulation, new windows, and other home improvements emerged as strongly connected to home heating transitions via the pursuit of 'upgrading' homes to be more modern. It was rarely the case, in participants' accounts, that changes to heating systems were undertaken in isolation and new windows, fitting insulation (loft, cavity wall) and installing indoor bathrooms were often recounted in connection with changes to heating. The overarching goals associated with these changes seemed to relate to the pursuit of a greater sense of modernity, of 'keeping up' with modern technological advancements to give a sense of progress and social advancement as well as the achievement of greater comfort, cleanliness and the reduction of hard domestic labour. These two goals were linked, with the idea of being 'modern' seemingly being bound up with the achievement of greater, more consistent comfort, reduced labour and a greater sense of personal control over the home environment. Modernity also emerged as linked to design and fashion, which related to how domestic spaces were used and the personal and collective aspirations people had for their home i.e., not just a place where basic needs of shelter and warmth were met, but a place for entertainment and relaxation.

However, not everyone appreciated the idea of 'the modern' and new technologies caused anxieties (historically and more recently) for some, but there was a general recognition that progress is either beneficial or, at the very least, unavoidable. Most participants recognised that changes in the domestic space as resulting in greater comfort and ease (i.e., indoor bathrooms, GCH), even if they were not entirely welcomed on social, cultural, and emotional grounds.

Stranded coal users

Transitions between heating systems can be disruptive and represent major (rather than incremental) changes in the home and change of this magnitude seems less welcome as people get older. Mary and her husband, still dedicated coal users, felt the definitive end of the coal era looming, as they became restricted to smokeless fuel. They did not relish change to their ingrained routine, despite the labour and dirt of the current arrangements:

> *'It's such a big disruption to start altering your heating. I don't want gas coming in while I'm here. I don't want more disruption, I'd rather put up with it as it is. [My husband] is upset that coal is finishing. There is a lot less smoke and mess with the smokeless fuel- I could get away with clearing it out less often, every two weeks or three.' (Mary)*

As coal becomes a progressively more niche fuel, so it grows increasingly expensive and potentially unobtainable. Smokeless coal is higher grade and a more expensive option than house coal (banned as of May 2023). Households reliant on it risk a form of 'asset stranding' whereby they remain reliant on a fuel source used by a minority of households and therefore at the mercy of high prices:

> *'My eyes were watering when the coalman last came. He said, 'I'm sorry it's only going to be smokeless coal from now on'. We used to have a bag of house coal to get the fire to ignite. This is the first time we've had this said to us- we've always been able to get fuel.' (Mary)*

The changing use of the home after transition to GCH

GCH had the effect of making the ambient temperature more stable throughout the various rooms in a property, making thermal comfort more easily achievable beyond the fireplace. For Gillian (Whiston), the change 'opened the house up'. She emphasised that every bedroom and every person got a 'fair share', adding that central heating makes 'for more comfortable living'. Liz (Maltby) also explained how her modern combi boiler system had made it comfortable enough throughout the house to use all of the rooms, and each room is kept at a regulated temperature. Dinah recognised that 'all enveloping heating' has allowed her to move between warm rooms even if, in Dinah's view, it has made people 'a bit soft'. Lynda equated the opening up of the home following the arrival of GCH with 'more freedom', explaining that when she lived in her mother's house everyone spent their time in the room with the fire so they were warm, but with a central heated house 'you can be in any room and do whatever you want to', 'you can change where you're sitting', 'work in different areas'. Women in particular seemed to appreciate the physical freedom provided by GCH. The gravitation to the fireside, meant that opportunities for privacy or time alone was limited or thermally uncomfortable.

Some participants equated this 'opening up' of the home with the physical dispersal of the family unit. Christine (Maltby), for example, thought that children now only wanted to sit upstairs in their bedrooms, something she regarded as sad and an erosion of family life. Graham (Wentworth) felt the same, commenting that now children sat upstairs gaming, as opposed to together around the fire. He explained that his

granddaughters do this, talking to friends online upstairs and spending less time downstairs. He thought that modern facilities had 'driven families apart' and led to 'a different way of life'. In the 1960s and 1970s, he insisted, there was 'family time'. Even Graham (Whiston) who maintained he had no emotional connection to the 'Christmas card image' of families gathered round the fire, noted the significance of the fireside as a communal space. He explained that his family rarely spent their time in different rooms, insisting that 'you'd never go up to your bedroom to do something [other than sleeping]'. These changes are linked to other technological, social, cultural, and economic changes in the twentieth century (i.e., television), but home heating transitions were key to and interacted with this shift.

Despite the 'opening up' of the home, the need for supplementary heat sources often remained. Liz explained that the new radiators installed as part of the initial transition to GCH in her home in Maltby did not fully warm the house. In response, she bought 'little fan heaters' for the bedrooms and would put them on for an hour before the children went to bed. She would also position one on the landing for when the children got out of the bath. Before Liz got 'proper central heating' with a modern combi boiler, she explained, the bedrooms and bathroom were still relatively cold spaces.

Other spatial shifts connected to the decline of coal fired heating systems include the changing use of the coal shed. These were repurposed for storage or demolished completely to create more external space. Liz (Maltby) recalled using the bricks from the demolition of her coal house to extend her house. Gas central heating systems took up new spaces. Graham recalled a 'very early gas boiler' in his childhood home as comparable in size to 'a modern fridge freezer'. Over time, however, these systems were modernised and reduced in size, as reflected in Graham's experience. He explained that when the gas fire and back boiler was removed in his current property in Whiston, a combi boiler was installed in a 'cubby hole' in the bathroom. Graham described it as very small, 'almost like a microwave', in comparison to the first central heating system he remembered.

The combination of central heating and widespread take up of the television also signalled the end of the so-called 'posh room', the keeping of the front room or parlour for best, where the fire was only lit on 'high days and holidays.' There were some indications, however, that there was more to this practice of keeping a room 'for best' than just avoiding lighting the fire to conserve fuel and labour. Keeping a room grime free was part of the motivation but a display of decency and conveying a respectability may also have formed part of the picture.

One family provided a different perspective on the use of the fire in the front room, pointing out that they had felt it necessary to keep fires lit in two rooms when their children were young, to avoid the family being on top of one another, avoid conflict and provide space to do homework:

> *'The fires are different between here and the front room. We used to run two fires to get away from each other when the kids were at home. They would do their homework in there. My goodness you would use some fuel. We have them both going at Christmas and new year. We don't use that room from November until May. We start popping there once in a while from spring.' (Mary)*

It is clear in Mary's account that the fires determine which spaces are used in the home and it remains the case in their household (still reliant on coal fires for heating) that it is only when spring arrives that they are able to extend their lives beyond the kitchen area.

Mary also alerted us to the possibility that the advent of the television actually brought households closer together, providing a shared focus. But in her household, space

constraints meant that watching TV (in a house without central heating) took the family away from the warmest room of the house (the kitchen) and into the front room.

> *'Once we got a TV – we all huddled around this tiny stove to watch the TV while the main fire blazed in the kitchen.' (Mary)*

The enduring romance of the coal fire in modern times

The era of the coal fire seemed revered by participants, despite the hardships. GCH is recalled as making a big difference in terms of comfort and convenience but does not evoke the same enthusiasm amongst participants. Other approaches to home heating were simply not liked or felt to be ineffective or unpleasant, for example: warm air heating provided via ducts in the walls (found in some 1960s/70s social housing) and paraffin heaters which created condensation and lots of soot. Some felt GCH made a huge difference to them once systems got sufficiently advanced- providing wraparound heat at the flick of a button. The ease, cleanliness and comfort meant they didn't relish parting with GCH at some future point. But some commented that progress was being lost as energy price increases forced them to use GCH more sparingly.

But not everyone felt better off with GCH- it might have made warmth more pervasive throughout the home but the more intense heat and sensory experience of the coal fire were missed. Mary and her husband, who lived on a rural farm, had no intention of parting from their coal fire. As farmers, it was felt to meet their needs better than the alternatives, offering intense, rather than background heat when you came in from the cold:

> *'Here we are forced to go out to feed the animals and we get really cold. When [my husband] comes in, we make a cup of tea and sit around the fire because I've built it up by then. It wouldn't be the same with a radiator- it wouldn't give you that direct heat.' (Mary)*

Coal fires (whether in open, closed or range form) were remembered with huge detail and fondness by many- they were associated with a way of life that was missed by many and characterised by togetherness and family life. For some, fires seemed ingrained in their memory and whatever technological innovations were available in relation to heating, they always returned to the desire for a fire. Sometimes this was achieved by taking out a gas or electric fire and reinstating the coal fire or Parkray (Sue), sometimes by installing a log burner as a supplementary heat source (Trevor and Rita) or by installing a chiminea or log burner in a summer house (Sue). Despite this, an open fire was never opted for over and above central heating- only ever as a supplement for comfort and pleasure. The benefits of modern heating systems are undeniable even if they fail to evoke the same feelings and sensory experience of the fire.

> *'Fires have been with me all my life. In the next house (Braithwell), we had a wood burning stove put in the summer house- we had it on even in the summer. Loved it. You can't get fires out of your blood. It was the centre of family life. Food. Smell. Laughter.' (Sue).*

Looking forward and a 'last fond farewell' to solid fuels

There was a sense of looking forward to new technologies and transitions amongst participants. Peter (Whiston), for example, reflected on the modernisation of heating systems, highlighting solar panels and heat pumps as possibilities. Peter was unsure, however, how heat pumps worked and questioned whether they were more cost effective. Peter also explained that he had, in the last year, considered having solar panels installed on the roof of the garage. He did not want them on the roof of the

house because he was concerned about maintenance of the technology and the property. Peter was deterred completely when an engineer visited the house to survey the work and explained that a 3-foot trench would need to be dug on the drive to lay the cable. Peter said, 'forget it then.' He clarified that he thought gas was more convenient.

The disruption involved in the installation of a heat pump also influenced how Trevor (Whiston) viewed the technology. Trevor was a chartered electrical engineer and remembered installing a heat pump in the home of a 'well known family' living 'in a very large house', 'with a very large swimming pool' locally. Trevor described the installation as 'a right job'. Trevor also recalled the installation being 'very expensive'. For these reasons, Trevor thought that heat pumps would 'take about a million years to get in...' adding that 'you're never ever going to get those in, in my view.'

Linda was also aware of air-source heat pumps and had recently enquired about having one installed when she needed a new boiler (at the time of the recording this had just been fitted). She explained that she asked the plumber for his opinion, but he informed her that the property was not suitable for a heat pump. She could not remember the exact reason why because it was 'technical' she said. Linda recognised, however, that 'boilers, when they first came in, it was a technicality we didn't really understand.' In contrast to Trevor, Linda thought heat pumps were legitimate 'things for the future' and explained that she 'did try and consider them when I had this new boiler, to try and look to the future', but she thought at her 'time of life' she had to just replace the boiler, which is what she did. Linda thought her new boiler would last the rest of her life now, because of the guarantee it came with.

Graham (Whiston) considered home heating 'a topic at the forefront of anyone's mind at the moment', including questions of how to be most efficient and how to manage a transition to a new system. Graham was conscious that 'at some point' they would need to replace their combi boiler, which was silently 'bubbling away in the background'. Concern over gas prices influenced Graham's thinking on this and he wondered whether the best replacement would be 'a more efficient new combi gas boiler' or whether to invest in a heat pump. Graham thought there was 'so much hype' around heat pumps but questioned how they worked and whether it would be an effective solution in his property. He commented that 'you don't really know which way to go', because investing in a new gas boiler means being subjected to 'rapid price hikes' and being 'tied to that' for years to see 'a return on your investment'. Graham noted that instead you can invest in 'supposed new technology' but explained that when he had tried to research heat pumps, he was referred to a supplier 'promising you the world', rather than any 'facts and figures'. The lack of independent information was deterring Graham from investing in the new technology. Graham and Lynda (Whiston) also had a multifuel burner, but Graham explained that they only used smokeless fuel or 'sustainable wood'.

Finally, Rita reflected on the use of fossil fuels for heating and its impact on the climate. She maintained that 'we just can't be doing that now… greenhouse gases… it's not on… we've got to find another way haven't we.' She noted the recent upward trend of log burner installations, commenting 'I thought we weren't supposed to do that anymore. I thought we were in a smokeless zone, aren't we?' Although Rita recognised the lure of an open fire, she thought that having solid fuel burners in the home now, with the future in mind, was 'very strange.'

In contrast, Graham (Wentworth) was very attached to his multifuel burner and less concerned about burning solid fuels. Graham sought permission from the Fitzwilliam estate to have the burner installed, which they granted. Graham described it as 'great', 'lovely', 'beautiful', 'more natural' than GCH. He said the heat from the chimney at the centre of the house 'permeates' throughout the property without 'wasting gas' that

costs an ‘unearthly sum’. Remembering his mother and fathers’ house, he noted smoke ‘puthering’ out of every chimney from the coal fire and described the atmosphere as ‘not the best’. Graham burns anthracite on his burner. He said that he can smell it burning in the village, but thought the smoke produced did not harm people or the environment if it was not excessive. He maintained that his solid fuel burner was 70% efficient and meets ‘DEFRA requirements’.

Like Graham, Linda (Wentworth) appreciated the appeal of wood burners, describing them as ‘lovely’, ‘romantic’, ‘cosy’, and ‘popular’. She watches Escape to the Country and, she explained, ‘every single property’ has a wood burner. Linda considered their use as ‘a last very fond farewell’ to a visible source of heat, adding, ‘I’m not sure we’ll always have that in the future.’ Linda said that ‘it’s a romantic notion… using natural materials and burning them like we did in the olden days’ and that she had previously considered having one installed in her own home, but now, she thought the practice would eventually be banned.

3.3. Contemporary times

The energy crisis and interrupted trajectories of increasing comfort

There was a clear sense amongst more socially mobile participants (and indeed most participants) of following a clear trajectory of increasing comfort, reducing labour in the home and progressively better quality housing, with most having started life in coal board or council housing. For most, they felt life was undoubtedly better, more comfortable now but others (i.e., Christine and Sue) had a strong attachment to the past and perhaps some disillusionment with the present. Her memories of family life revolving around the fire were crystal clear and cherished. Some alluded to a tailing off of their hitherto trajectory of increasing comfort due to inflated energy prices this year (i.e., Liz). Others expressed sympathy for people struggling to afford adequate warmth, which sometimes included their own (grown up) children. They could no longer rely on the idea that their children would have a more comfortable life than they did.

4

Towards an interdisciplinary analysis – disciplinary perspectives

Our analysis followed the 'hermeneutic circle' approach which involves interpretation on multiple levels (Heidegger, 1988; Goodchild et al., 2017). The following process has generally been followed: as an initial step, each team member listened to the full set of oral histories and wrote an account of what seemed to 'glow' from their disciplinary position (MacLure, 2013). These accounts did not contradict each other, but each team member did pick up on different aspects according to their disciplinary vantage point. The different accounts were knitted together in a written narrative that captured a holistic, interdisciplinary account of the findings, identifying a comprehensive range of themes supported by quotations. Here we share our interpretation of the data from our respective vantage points.

4.1. The perspective of an artist, Dr Becky Shaw, Lead Artist

In thinking about what stood out from the oral histories for me as an artist, I am led to question what 'standing out' means for me and in qualitative data analysis generally. Through reflecting on what stands out, it seems important to pay attention to *how* our methods let us see, and how our methods of analysis might be orientated towards making some things 'stand out' more than others. This is one of the affordances of a project like JUSTHEAT where the different disciplinary modes of seeing might make different things stand out.

In thinking about my artistic process, I connect strongly with how education researcher Maggie MacLure (2013: 228-232)[3] reflects on data. She talks about data that 'glows', that draws us towards it for its strangeness or intensity. She says:

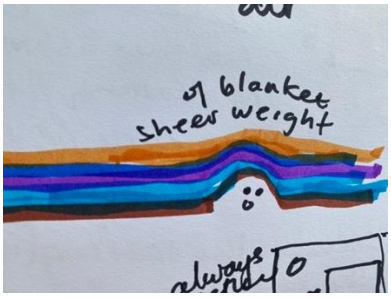
> *'But there is, I suggest, another potentiality associated with data, beyond and beside their capacity for mute surrender to the colonialist administrations of social science. This potentiality can be felt on occasions where something – perhaps a comment in an interview, a fragment of a field note, an anecdote, an object, or a strange facial expression – seems to reach out from the inert corpus (corpse) of the data, to grasp us. These moments confound the industrious, mechanical search for meanings, patterns, codes, or themes; but at the same time, they exert a kind of fascination, and have a capacity to animate further thought. On other occasions I have called this intensity that seems to emanate from data, a 'glow'.'*

[3] MacLure, M. 2013. The wonder of data. https://doi.org/10.1177/1532708613487863

It seems unsurprising (but no less interesting) that so many of our coal stories would 'glow' as they are doubly intense: they glow from their hot and flickering subject matter and the extremes of the hot and cold life entailed, but they also 'glow' from their materialisation of love, home and care. This generates some challenges as the seductive power of 'coal life' to corral togetherness (or our nostalgia for it) might easily obscure its catastrophic environmental legacy. However, we could speculate that it is the combination of love, meaning *and* destruction and loss that makes the stories so powerful. This also offers up the potential that we could draw from the immense social, political and emotional meaning of the coal 'assemblage' (of warmth, care, love, togetherness, light, safety, food, work and play etc.) to develop meaning around new sustainable heat technologies.

Artists' methods

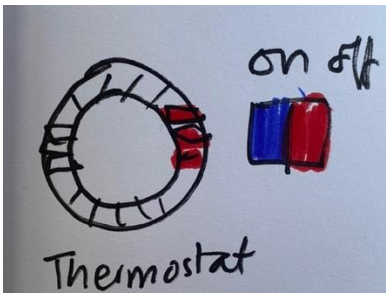
As I listened, I drew my way through the interviews. This was not done from a methodological principle that assumes drawing 'reveals' some aspects that cannot be 'seen' by other types of analysis (although I think that can sometimes be the case) but that it might offer a different kind of relationship with the data. I was driven by my physical desire to be closer to the stories. Through drawing, the movements and objects described could feel more actual and 'lived'.

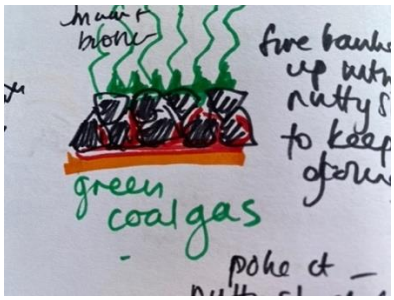


Before, or as, you make a drawing you have to roughly have an idea of how to form the basic shape or to have an idea of the planned size. However, you don't (or I don't) know how you want the drawing to look before you make it. Instead, each line is a live negotiation of how to understand and form something, that also interacts with the texture, density and 'touch' of the pen on paper. It is much more like making a plasticene model than it is like taking a photograph. This is seen in the drawings above in the extra lines added on to the jumper to emphasise that there were layers of jumpers that were restrictive, or in the joy of adding layers to the blankets or the open paper left in the drawing of the jelly.

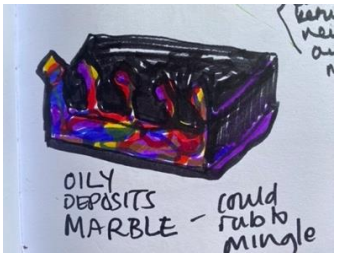
This is a way of actually 'experiencing' or converting the processes, labours, materials, objects, movements and gestures of the stories through my own movement (even though they are different). Through the process of drawing, I had a way to touch the people, processes and materials and to feel like I had properly absorbed them so they didn't stay as someone else's story from the past, but they became living actions in the present. As the drawing is made there are also decisions about weight, space, shape, colour etc that are not connected to trying to represent the past account truthfully (how could we possibly know?) but about enjoying the forging of the drawing itself- literally making the encounter in the present. This movement between past and future through an enjoyable aspect of the present seems so important to thinking about how past stories can affect the future.

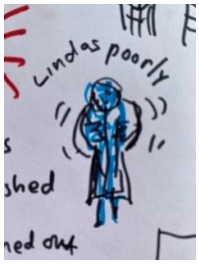
Sometimes also the drawing can literally relate to the making of the original object or story. The drawing of a rag rug below, for example, leaves an open drawn grid to show that the rags are worked into it, to build its density. This uses the density of drawing to echo the increasing thickness through making. I have never made a rag rug but the drawing let me imagine something of what it might be like. The 'green coal gas' drawing tries to capture the orderly and planned making of fires with nutty slack to keep unattended coals going so they can be 'reanimated' when needed. This can be seen in contrast to the very 'binary' solid blue OR red of the 'thermostat' drawing. By putting the two next to each other (comparison, a very standard research method) something of the difference between hand-made and switch-controlled interactions comes through.





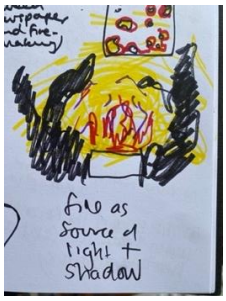
Sometimes the drawings do not start well so become over-worked, or I might get particularly interested in trying to form something that feels like it really warrants a 3D understanding, like a coal scuttle, so then the drawing builds up more densely, more like a weave. This starts to make the more 'worked' drawings (see oily marble deposits below) which have a greater amount of literal time accrued and a sense of weight and density. Weight, density, and thickness are artists' 'ingredients' while making a drawing but they were deployed here because of the connection to the black, smeary colours of oil on a grate. These contrast with some of the lighter, rougher, faster (and sometimes not very good) drawings where I wanted to just capture the idea (see the 'warming welcoming cake') where the story itself did not (for some reason?) lend itself to more careful rendering- or where the lightness/'roughness' worked better for the subject (see coal ring). For 'Linda is poorly' the scratchy shaky line came from me imagining Linda's shivering.

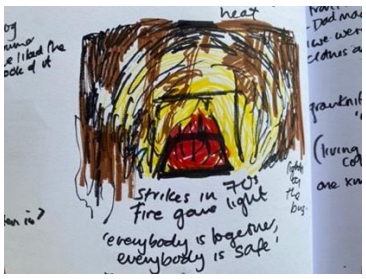




Drawing oral histories has many problems: how the enjoyment of the drawer could amplify or obscure aspects of the stories told, the difficulty of understanding things we've never seen, the way emotions let us connect to the past, but at the same time how inaccessible the past is- these are the same problems any oral historian knows well, but the drawing starts to make these methodological issues visible, connecting the very problems of understanding past, present and future in energy transition with methods themselves.

Methodological difficulty of the emotional intensity of childhood memory and the profound 'all encompassing' significance of coal life

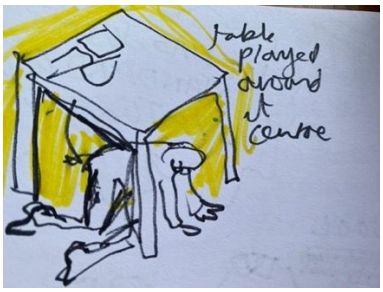




The stories of coal have an extraordinary intensity. The way that we used coal to form a completely integral system is compelling. The stories form a picture of coal as a source of warmth, food, waste disposal, cleaning, comfort, entertainment, focus and play, as well as danger and hard labour (for both women and men). Coal was abundant for many but also a source of anxiety, burden, instability, inequality, unfair trade and

scarcity for others. Coal was also always a system of contrasts- warmth and light in some rooms, icy windows, and coats on the bed in others. The coal stories have an intensity (indeed Sue says that 'everything was less intense' when they changed to GCH) which really drove me to want to carve them through drawing- beautiful comfort food, warming family rituals of eating and learning, satisfying cleaning rituals, traces of dirt. The visualness of the accounts led to the desire to hold, understand and capture them.

As the coal tales nearly all belonged to childhood, I wonder if it would be easy to over-egg their profundity if we don't take into account who is telling the tale and why they might be particularly intense. Our respondents talk less about politics, trade and dispute, perhaps because, as children, they didn't have to be responsible for managing these- that doesn't mean that these weren't profound issues for the adults who did. The families of our respondents created continuity and safety, even when poor. There is a 'double-sided' amplification at work here. When looking back, coal fires seemed to amplify these strong sensations of being cared for, loved and safe, and at the same time the coal fire was subject to some powerful projections: about safe family life (for some that may now be gone as old age encroaches), and even, perhaps, about an age when community, stable roles and a sense of optimism were entwined through coal life (are also now gone- so their intensity also comes from absence). There is a different version of this optimism present in tales of the move to other heating sources – so we might then ask if what we are experiencing is people's belief in progress, felt in coal lives and in early GCH lives.



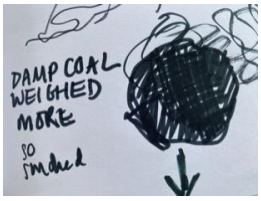
The medium of felt-tip pens felt like the right one to make these drawings, where the narration of childhood is so strong. Felt-tip pens have an intensity of colour, they provoke experiment when new, they are produced out of petrochemicals (being ancestors of the early 20th century's discovery that a rainbow of artificial colour could be unleashed from coal), and they are also a medium we associate with childhood, the every day, and not particularly with exclusive fine art practice. That said, I was aware that when drawing the many stories of children's play around the fire- plastic airplanes, playing under tables and doing homework on tables in front of the fire, the felt tip pens

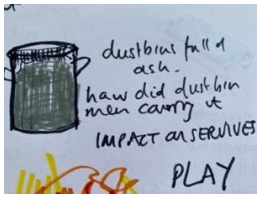
I was using would not have become available until after many respondents' stories- but became commonly available in the '70s and '80s.

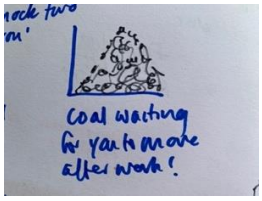
Enlightening and freeing experience of transition out of coal (also intensely meaningful but less obviously intense because it is less 'weighty', 'burdensome' 'high contrast' or 'visible' than coal).

The accounts form a collection of stories of 'assembled' transitions. It was hard to keep track of what technology was actually in some homes at certain points as respondents described complicated assemblages of coal fired backboilers, then becoming gas central heating, while also being supplemented with gas or electric files, calor gas fires, then also the dry heat of hot air heating and storage heaters. Interestingly in some of the more affluent home histories, coal or log burning stoves have been put in recently 'because people love to sit around it' and, ironically now often a sign of having 'made it' today. The act of trying to assemble and draw these home aggregates of types of heating and evolving systems was tricky and I was never sure I had really understood it.

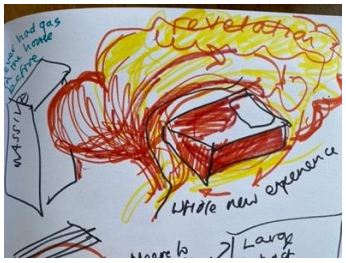
There are multiple accounts of the weighty, dirty, 'mucky' and burdensome life of coal. These generated a lot of drawings as they seemed so material, tangible, present and 'drawable'.

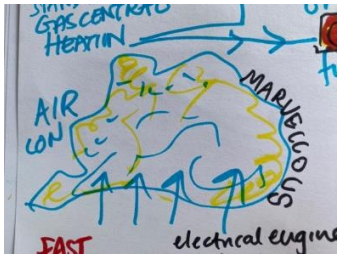


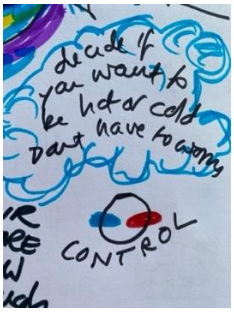


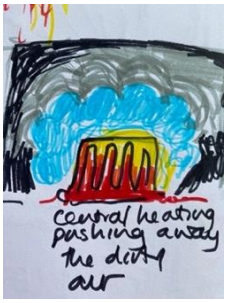


These weighty and black materials and stories stood in stark contrast to the accounts of transition to other forms of heating, including electric storage heating and gas central heating, although it was never so distinct as one being bad, the other good. Accounts of the change were described as 'marvellous', and being 'swish', 'the future', 'all mod cons', 'a revelation' and as actually pushing away the dirty air of coal. The way I have drawn them 'rifs' on this sense of movement and upwards current- being lifted and lightened, carried forward and upwards in a motion almost as gaseous as the gas itself.









Gas central heating enabled a cleaner, less weighted way of life- no one was doing so much hard physical labour, and people's homes were opened up because they were potentially all warm- so also enabling people to have more individual space, 'you can go anywhere, work anywhere, there is a freedom'. Graham contrasted this space and distance to the more communal living of coal fires where people would move *en masse* to follow warmth (and noted that they had re-installed a log burning stove during the pandemic, a time when comfort was needed?). Interestingly, one respondent connected getting gas central heating to his most distinct sensation of progress, which was getting a colour TV and realising Star Trek was in colour. Somehow in my attempt to draw the warm clouds of GCH and the language of the marvellous, the presence of UK popular culture and especially sci-fi feels quite close.

Undulating sense of control and agency to make 'a home' – and how will this be understood by agents of transition?

In the accounts there are undulating levels of importance placed on the agency of individuals and families in making a home and how this interacted with the different levels of control of the different heating technologies afforded. This included the endless burdensome need to maintain the fire. In contrast, some respondents seemed to delight in the responsive way of living coal generated- the 'making the best of it' adaptations, keeping warm based on what was around you' via clothing, food, hot water bottles, as well as kit for the fire- newspaper twists and 'drawing up' kit etc. There was a kind of pride and sense of control in these personal technologies to supplement the coal fire. This immediacy of personal methods was felt to be preferable to a 'whole lot of fuss' with system change. These 'work around' family-level technologies were at the scale where the household had a degree of autonomy; an exercise of freedom that to some seemed preferable to the more large-scale freedoms of central heating. Interestingly when people spoke of other forms of technology, there was both a love of automatic controllability, but also some accounts of irritation at systems that were not quick enough to heat or quick enough to cool. There did not seem to be the same frustration levelled at coal. I had never considered coal as a more responsive system but perhaps it was the expectations of immediacy and controllability that drove some disappointments or frustrations with newer methods. This context about the hype and 'promise' of a technology and its realities might be easy to miss when looking from the present. Across the stories there is a spectrum of value placed on personal or family

level control in relation to the systemic. Understanding people's relationship with their personal agency seems a vital aspect of our heating relationships that needs to be understood in a transition context. I'm not sure any of the drawings particularly grasp these issues, but the complexity of understanding and time is, I hope, one of the issues that the artwork can explore.

4.2. The perspective of a historian, Dr Kathy Davies

From my perspective as an historian, the significance of coal fires in the home and community; emotional histories of heat and home; and understandings of postwar modernity and standards of living in relation to heating transitions, were most prominent.

Centrality of coal: home and community

The oral histories collected demonstrated the historical centrality of coal in the home and in the broader community. The coal fire was described as fundamental to domestic life in the immediate postwar decades, even as the use of gas and other technology such as electric heaters became more common. Families gathered around the fire for warmth and, as such, it was the crux of social routines. For children, the hearth was a site of both work and play, as well as a place where memories of parents reading, smoking, talking, hosting, were recalled in detail. The design of the Yorkshire Range with cast-iron grate, and tiled surrounds, and the orientation of furniture toward the fire, were all recalled in detail.

'Kitchen Range', wikicommons ©

Likewise, the practice of building, lighting, maintaining, and cleaning out the fire was explained clearly. This daily routine demanded labour, and enabled other important household needs, particularly washing and cooking. Hence, the fire was not only imperative for warmth, but it was the keystone of many other aspects of domestic living. This work was gendered, with women mostly being responsible for keeping the fire

alight in the day and for clearing the ashes into the dustbin. Still, the oral histories highlight the complexity of domestic gender roles in practice, with the demands of employment, availability of resources, and the make-up of the family unit (absent fathers, grandparents living in the house, older siblings) shaping routines and domestic work associated with the fireplace. This labour was also remembered as part of a broader system of male dominated *paid* work. The coal *man* and the dust *man* were recognised as essential to this early home heating system.

Memories of the hearth in the home starkly contrasted those of other domestic spaces. The upstairs of houses were described as much colder, except for airing cupboards, which were highlighted as micro-warm spaces after hot water tanks that were separate to the fire became more prevalent. Upstairs was cold and limited time was spent there. There were often fireplaces in bedrooms, but these were usually boarded up or unused. The limited use of heating upstairs was thought to have been financially motivated, but it was also indicated that domestic decision-makers felt less *daily* need for such a 'luxury'. Memories of additional fires being lit, whether upstairs or downstairs, were usually associated with experiences of illness, childbirth, or particularly emotive or special occasions, such as a death, birthdays, and most commonly, Christmastime.

JUSTHEAT Photograph Collection, 'Me and my brother in front of the coal fire', Sheffield (c.1987)

Nevertheless, as Rotherham was a coalmining area, many participants' families had access to a coal allowance from the National Coal Board (NCB). As such, those with proximity to the mining industry were more confident in their ability to keep warm. There was an awareness of broader economic constraints of their working-class households, but the pursuit of warmth was largely remembered as less worrisome because coal deliveries were secure, except during times of industrial action. During strike periods, alternative methods of keeping warm (clothing, blankets etc.) became even more important and other ways of procuring fuel were remembered as common practice. Allowances for retired mineworkers continued during industrial action and

Margaret from Maltby thought it likely her family obtained coal from a retired miner when her father was on strike.

Spare coal from NCB allowances was often sold by miners at a lower price or exchanged for other resources across the local community. This informal economy provided access to cheaper fuel for non-mining households. Coal was also gifted, usually by extended family, but also as gestures of neighbourly kindness. Still, families working in other industries such as the steelworks, and single parent mothers, described limited access to heat and fuel with more frequency and severity, indicating distributional and gendered injustices. The benefits of allowances and connected injustices also had implications for transitions to gas. Christine in Maltby, for example, explained that her mother switched to gas after her father (ex-miner) passed away because the family coal allowance was then reduced.

Emotional histories of home heating

Participants were frequently moved by their home heating memories. These poignant stories have unveiled emotional histories of home heating that are valuable to historical scholarship and for informing future transitions. Parental efforts to keep children warm were a powerful feature of most of the oral histories captured, regardless of whether these efforts were successful. Trevor in Whiston recalled his mother's work to provide warmth with sadness and guilt. Participants who felt that their own thermal care was *not* a priority as children were often left with a sense of dejection. Liz from Maltby recalled anxiety about using too much coal while trying to keep her children warm. Feelings of anxiety and frustration were also recalled during transitions to new systems, as well as fears of change or the 'unknown'.

Carol from Maltby grew up in Singapore and had no exposure to open fires as a heat source until she moved to the UK at 17 years old. Her story was characterised by fear of the fire and severe dislike of the cold. She associated cold with initial feelings of regret when she moved to England. As well as offering a different perspective on the emotional history of home heating, Carol's memories provide a valuable starting point for understanding the importance of shared and intergenerational knowledge in domestic heating practices. We also see this knowledge-sharing in 'reverse' – with some participants explaining how younger family members had shown them how to use their thermostat or digital (i.e. Hive) technology. Carol's story also illustrates complexities in the relationship between fuel, energy, home heating, and identity within a coal-mining town.

Many negative feelings were recalled, but feelings of joy, love, and safety – feeling 'cosy' – were overwhelmingly associated with the open fire. Occasions such as Christmas day and stories of family interaction and play were remembered as happy times. Alternative methods of providing warmth were also associated with feelings of love. For example, hot water bottles, oven shelves wrapped in blankets, and home-knitted clothing provided by parents and grandparents were recalled as important to feeling warm, physically, and emotionally. These experiences indicate the significance of heating in domestic relationships and culture, as well as alluding to the potential emotional impacts of future transitions on individuals and families. These stories also speak to the 'History of Emotions' that has gained prominence in the historical discipline in the last two decades.

Modernity and a higher standard of living

After memories of the coal fire, oral histories focussed on the increased cleanliness (historically associated with modernity), 'instant heat', and the greater physical comfort and control provided by gas fires and central heating. Participants explained that their houses and their lives 'opened up' spatially and socially after transitions to gas. The

benefits of a ‘cleaner’ and ‘more convenient’ heat source were particularly noted as a positive for women, and participants recalled their mothers’ lives (after a period of adjustment and – frustration) being ‘made easier’ by reducing their domestic workload.

The energy crisis and regression

Significantly, transitions to gas central heating (1960s onward) were recalled as intimately linked to progress, modernity, and improved standards of living in postwar Britain. By contrast, toward the end of the oral history recordings participants reflected on the current energy crisis in Britain - a feeling of ‘going backwards’ prevailed. Some explained that they had returned to only heating and staying in one room, wearing their coat indoors, and ‘doing without’, as they had done as children in the coal fire era. Others expressed concern for vulnerable neighbours, elderly people, and younger generations. These present-day realities cannot be divorced from movements of the past, nor from contemporary policy decisions. Deeper exploration of these big ideas, past and present, could be useful for future change.

Transition as multilayered and disjointed

Finally, the oral histories illuminated the transition from coal fires to gas central heating as multilayered, often disjointed, and influenced by conflicting practical, social, economic, and emotional factors. ‘Transition’ implies a smooth and linear shift, but the reality for individuals was much more fragmented – it was rarely a fluent story. For example (and perhaps unsurprisingly) transitions were both temporally and experientially linked to whether participants owned their own homes, lived in social housing, or rented private accommodation. And of course, while most people in Rotherham use gas heating systems today, some do not. The coal fire as the sole source of heating was recalled and remains the experience of Mary in Wentworth to the present day.

To conclude, coal was crucial to the individual and familial pursuit of warmth (as well as wages, for many) in Rotherham in the immediate postwar decades. It shaped everyday life for all participants, regardless of their relationship with the colliery. The oral histories provide opportunity for new contributions to the historical discipline, especially through the lens of domesticity. These histories also illuminate the complex and uneven transition to gas, which was remembered as practically beneficial and as indicative of postwar progress. That association is contested in the current energy climate. Nevertheless, these oral histories provide insight into how heating and change was experienced and is remembered by individuals within communities connected to coal mining. As such, for a historian, this allows for more nuanced reflections on shifts in the national energy landscape, as well as social and cultural change in Britain since the Second World War to the present day.

JUSTHEAT Photograph Collection, 'Mary's coal fire', Rotherham (2023)

4.3. The perspective of an architect/researcher, Dr Sally Shahzad

As an architect and thermal comfort researcher, I was particularly struck by the fact that, in many cases, GCH systems were installed in houses designed around the coal fire. Changes to the heating systems within these homes resulted in two distinct patterns of use and activities, which are explored in more detail below.

Houses equipped with coal fire

Mainly one room, the living room, was warmed using the coal fire, ostensibly motivated by labour and cost saving, and despite the availability of fireplaces in other rooms. The

fire in the living room was maintained all day long, while the fire in the bedrooms was either blocked off or only used in case of illness, to warm the patient. In winter, bedrooms were mainly used at nighttime to sleep. They were cold and the only source of heat was clothing and bedding layers and oven trays, water bottles and later electric blankets to warm the bed directly. Other sources of heating were used sparingly to warm the bedroom for a short period of time (e.g., one hour of using an electric heater in the morning).

The warm indoor air temperature of the living room brought all family members together during the day. This created a feeling of family and unity with shared activities, such as listening to the radio, playing games and chatting. Some interviewees enjoyed describing the memory of family time around the fire. However, some other participants explained the difficulties of having only one room available for all activities during the daytime in winter. For example, one participant explained the difficulty of doing homework as a child, due to lack of space (e.g., sitting at the kitchen table or next to the fireplace) and privacy (e.g., distraction and noise of siblings playing in the same environment). He described his solution to use the school or library as much as possible. Some interviewees explained that although the fire was set in only one room, the fact that it was maintained all day long was quite pleasant and kept them warm.

Houses equipped with gas central heating system

The introduction of effective, modern gas central heating and the ability to warm all rooms in the house changed the pattern of use of spaces and activities within the household. In winter, members of the household were not bound to use one environment only to keep warm. Instead, every room could be used for different activities. For example, bedrooms could be used more than just sleeping and children could use their bedrooms to play, to do their homework or simply to enjoy some privacy. Some interviewees explained the shift from a nuclear family life towards individuality and privacy. Most interviewees were delighted by the maintenance and hassle-free central heating system. However, it came at the cost of scheduling it and only keeping the house warm at certain times during the day (e.g., a few hours in the morning and evening), as they could not afford to have the heating on all day long. Some explained that overall, they felt much colder in a centrally heated house, as compared to their previous house equipped with a coal fire, mainly due to the cost and consequently the schedule of heating. This was particularly the case for those who spent most of the day at home, such as the housewife or older people.

The language use for thermal comfort in winter

The language that participants used to demonstrate thermal comfort during winter is significantly different from that used in thermal comfort studies. The main method of assessing thermal comfort is through Thermal Sensation Vote (TSV), which is the ASHRAE (2004) seven-point scale question as follows:

- How do you find the thermal environment? Hot, Warm, Slightly warm, Neutral, Slightly cool, Cool, Cold.

Some researchers consider slightly warm, neutral (thermoneutrality) and slightly cool, as the state of comfort. However, during the interviews for this project, no participant mentioned the word ‘neutral’, when describing their feeling of comfort during winter. The words and phrases they used to demonstrate their feeling of comfort regarding the thermal environment included: ‘Nice and warm’ and/or ‘Warm and cosy’.

A ‘warm’ sensation in thermal comfort research is considered as thermal discomfort. For example, the Griffiths Method suggests that a four degrees reduction in temperature is needed to ensure the thermal comfort of the respondent if they describe

themselves as ‘warm’. In the Griffiths Method, each scale on TSV necessitates two degrees change in the room temperature. For example, in cases where the room temperature was 20°C and the respondent reported feeling ‘warm’ (which is two scales higher than neutral), the room temperature should be reduced by 4°C, meaning down to 16°C, to ensure the comfort of the respondent.

The findings of the JUSTHEAT project regarding the language of thermal comfort are in contrast with the thermal sensation scale and thermoneutrality. As such, I am keen to look into this further and explore the use of language for thermal comfort in the other three countries, as thermoneutrality is used internationally.

Expectation of comfort or thermal acceptance

Many participants shared similar stories regarding thermal comfort in the home from the 1940s (most participants’ earliest memories) to the point at which central heating was installed (for those that had access to it). This sense of collective experience influenced their acceptance of the situation (e.g., limited heating in the house) and in turn, expectations of comfort were low and discomfort was expected in winter with additional clothing the only way to redress it. The comment ‘you expected to be cold’ was repeated many times.

Radiant heat

The radiant heat of the fireside was appreciated by some participants but had its disbenefits. The main reason for the appreciation was having a source of heat all day long. However, air movement was needed to feed the coal fire but resulted in a cold draft that was often felt to be uncomfortable. This meant that the house was deliberately ‘leaky’ to allow a constant draught to feed or ‘draw’ the fire. Thus, if someone was sat in the path of the draught, while in front of the fire, they would feel very cold on their back, while quite warm at the front. This was associated with a feeling of discomfort.

Lack of acceptance of new unfamiliar technologies

One participant expressed the view that people did not appreciate new and unfamiliar technologies, despite their effectiveness and energy saving potential. For example, he introduced a new, uncommon heating system, which was run on electricity. However, when selling the house, he had to replace it with gas central heating, as prospective buyers were deterred by the unconventional nature of the system.

4.4. The perspective of an energy policy researcher, Professor Aimee Ambrose

My disciplinary background is less clear cut than the other researchers within the UK team, who identify as historian, artist, architect respectively. Multiple influences are at play in my research including a background in sociology and later, town planning which leads me to consider how human existences are shaped and mediated, for better and for worse, by the design, structure, infrastructure and quality of the built and natural environment, as moderated by humans. This relationship cuts two ways: humans structure and modify the built and natural environment and we live with the consequences and constraints this creates. The same can be said of energy systems and infrastructure- we design them and we’re all hostage to them.

Control and agency over the domestic environment

It is rare that we can exert direct control over the structure and quality of our immediate environment (the home, the neighbourhood), with our homes usually designed and

built by ‘others’, who tend to live different lives from our own. Certainly, in the UK, homes have, for several hundred years at least, been built by industrialists to house their workers, by speculative developers who see an opportunity in an urbanising and growing population and later by municipalities providing for those outside of the housing market, for returning war heroes and a booming population. These homes have been designed usually by relatively elite male architects and engineers, detached from the realities and rhythms of working-class life and how they might be eased through sensitive design of housing and domestic systems.

That is not to say that there have not been (perhaps in my opinion) some notable successes in sensitive housing design, including the Homes for Heroes and garden city movements that inspired spacious social housing with generous gardens and the Parker Morris standard, which carefully attended to indoor space standards and layouts. However, the general trend is one of detachment between designer and inhabitant and this is something I am sensitised to within the data emerging and which extends to the design and function of the key systems within the home, most notably heating, in this context. Although this was never explicitly acknowledged by participants, they were and remain hostages to someone else’s design, decisions made elsewhere about how we should earn a living, access warmth and power and structure our daily routines- the parameters of which are heavily mediated by the fuels and technologies available and affordable at the time.

Most participants (with the exception of the ‘socially mobile’ homeowners of Whiston) described how, in the era of the coal fire, they worked with and made the best of the technology they found available to them in homes they did not own. The available technologies, fuels and textiles were fully exploited to provide for the family in terms of thermal comfort, and care in the form of hot food, warm water, a warm bed and clean clothes. In many ways, this worked well, especially where families were directly associated with the coal mining industry which allowed households access to a plentiful supply of the coal that they helped extract in partial recompense for their hard manual labour and the risks they endured daily. Provision of a free coal allowance was not an act of enlightened self- interest (healthy workers, productive mines) on the part of the National Coal Board or mining companies, but a hard-won benefit secured through trade unions which gave them voice and sway, for a time at least. Many of those we spoke to, especially in Maltby (a colliery community) and Wentworth (a village owned by an aristocratic family), were dependent on the benevolence of richer, more powerful entities (gatekeepers) for provision of the most basic necessities of shelter, warmth and cooking fuel which were supplied sparingly in exchange for labour. Those we spoke to were not, at least in their formative years, part of families that were agents of their own destiny, although some did go on to (perhaps unsurprisingly) vociferously exercise their agency, by experimenting seemingly relentlessly with the design of their homes and heating systems (i.e., the socially mobile participants in Whiston).

Top-down decision making

Many participants were well accustomed to decisions being made of their behalf and this extended to the heating systems within the home. Christine in Maltby’s account provides an example of passive and futile resistance to her landlord’s (the local authority) paternalism, which saw her lifestyle forcibly reinvented overnight by a stark switch from coal fires to gas central heating. The landlord no doubt felt they had a full mandate to drag Christine into the modern world, given that by the 1990s the vast majority of UK homes had GCH, and perhaps assumed this would be welcomed. Christine’s story will have been repeated across the country under the New Labour Decent Homes initiative (2000-2013) which sought to modernise the entire social housing stock across the UK, including many former coal board homes. This included replacing coal fired heating systems, where they were still in place. No thought would have been given, at this time, to the shock waves this change would send through

these households, although my own research at the time suggested that residents felt invested in and prouder of the home following the upgrades. Mary in Wentworth provides another example of constrained choice- seemingly at the hands of the coal fire, driven not only by her own attachments to the fireside but by her husband's preference for radiant heat and their landlord's reluctance to foot the bill for modernisation.

Christine and Mary's stories also intersect with the concept of stranded assets. Mary comments directly on this issue- stating that the price of coal has recently become 'eye watering' due to a combination of it being a minority fuel and the recent legislation banning cheaper forms of coal (house coal) which are less clean burning. There is no future for burning solid fuels for home heating in the UK, with popular multi-fuel burners now attracting opposition on internal and external air quality grounds. Mary and her husband will find this increasingly difficult to sustain and face an uncertain future at the hands of a landlord that is not yet willing to support their tenants to move onto gas, let alone move to a low carbon source. In such circumstances, there seems to be a case for 'skipping' a transition phase and moving from coal to say, air source heat pumps or another low carbon heating approach, but it must also be recognised that this would represent an immense change to lifestyle and demand a vastly different skillset. There is some downward pressure on landlords through the Minimum Energy Efficiency Standards (MEES) which forbid the letting out of properties with an Energy Performance Certificate rating of E or worse. The properties at Wentworth undoubtedly fall into this category, but landlords benefit from many exemptions in the form of caps on the amount they are expected to invest to improve their properties and exemptions around heritage properties.

In the stories of Christine, Mary and others, we see the interplay between national policy frameworks and initiatives (i.e., Decent Homes, the house coal ban, MEES) (which in their own right represent 'mini transitions') and the enduring power of the property owner (landlord) as gatekeeper to tenants' access to a steady home and affordable warmth and all the attendant ontological benefits that brings. In all of this, the tenant sits impotent and without the might of the trade union behind them any longer. These webs of interdependencies call to mind the concept of the actor-network and the notion that for any actor to affect change, many others must act in concert (as an assemblage). However, actor network theory also reminds us that the interests of any one actor are never simple, and they themselves operate as configurations of different interests, influences, thoughts and feelings (assemblages in their own right).

Energy transitions and the reorganisation of disadvantage

Even with the benefit of coal, homes in Britain have always been cold. Until the introduction of gas central heating from the 1960s onwards, there was no expectation that every room would be heated, in fact most were not. Homes were draughty. In part, this was deliberate to help draw the fires, but with glazing expensive and highly taxed until the mid-19th Century, ventilation often went far beyond what was necessary to feed the fires. Cold homes were the norm and were expected. But, in the opposite of what we see today, the homes of poorer households may have been warmer than those of their wealthier counterparts due to smaller and fewer rooms and small windows. This is just one example of how changes to housing design and heating systems restructure and redistribute access to adequate and affordable warmth. We see this access ebb and flow over time, with rural communities traditionally having 'common' access to fuel sources such as woodlands and peatlands, but now reliant on expensive oil and liquid gas and exposed to crippling energy poverty. This sort of reversal of fortunes is also apparent in the experience of mining communities who once had abundant access to fuel and now as deeply deprived communities suffering fourth generation unemployment are disproportionately exposed to energy poverty.

It appears that when heating is affordable and requires minimal manual input, it fades into the background of our consciousness. The intricacy with which participants recall the era of the coal fire is contrasted starkly with the nebulousness of the gas central heating era during which heating faded into the background: invisible and taken for granted. Suddenly it is back in our consciousness. High costs caused by volatile fossil fuel markets relayed to us in real time via smart meters. The surge in solid fuel stove installations, mostly amongst middle class households, betrays a desire to bring heating back into our direct control and to rekindle the lost magic of the fireside.

Fire in our psyche?

Our homes have always been designed around the fire. Indeed, the word 'hearth' is derived from the Latin for focus. Until well into the 20th Century the fire *was* the focus of the home and daily lives as our only source of warmth, heat for cooking, light and smoke for preserving food and fumigating insects. When homes consisted of one room or 'hall', the fire was placed in the very centre, with smoke escaping through open roofs. Later, fires were built into walls, and chimneys carried away the smoke, making multi-storey homes possible.

By the 1500s, most of our neighbours in Northern Europe had left us behind, having adopted stoves (closed units for burning fuel). But in Britain, we clung tight to open fires fuelled by wood or peat, depending on what was available. Dung was also used as a last resort. As coal was extracted on a larger scale from the 18th Century and became easier to move around and cheaper to buy, so it became our primary fuel. Compared to wood and peat, coal burnt efficiently and produced more heat per tonne than wood. The extraction of coal came to dominate the economies and societies of coalfield regions from this point until the end of the 20th Century and continues to be a defining feature of the culture of those regions today, despite the demise of the coal mining industry in Britain. In such areas, there was little reason to hold back on coal consumption while the industry thrived- the more burned, the better.

What has been recognised for some time is the emotional connection to the fireside and its critical importance to feelings of wellbeing and happiness in the home. Many commentators have noted the particular strength of this connection in Britain and fireplaces have continued to be built into homes as ornamental features even where they're no longer relied upon to heat the home. It seems that our lives have revolved around the hearth for so long (estimates suggest somewhere between 120,000 and 700,000 years) that perhaps it has become part not just of our architectural tradition but of our psyche?

Our early findings from the Rotherham area suggest that this emotional connection to the fireside undoubtedly still exists, and participants alluded to finding ways to indulge their urge to build and enjoy a fire, even once modern heating systems were in place in the home. We see this in the accounts of retired couples in Whiston who have installed multi fuel stoves purely for pleasure, in Sue's installation of a log burner in her summer house and in passing references to the purchase of chimineas and fire pits for the garden.

What can actor network theory tell us about how we should approach home heating transitions?

Descriptions of the coal fire or range as 'the centre of the universe', as expressed by several participants, again brings to mind actor-network theory and its contention that it is the relationships between the human and non-human actors that create the phenomenon and that both types of actors have equal value and agency (generalised symmetry). In ANT there is no complete distinction between the social, the natural and

the technological. We see all of these components in the human-coal-range scenario, and all are interdependent and entwined in an assemblage.

In the pre-central heating era, there exists total interdependency between the fire, fuel and human. If a range sits in a home that is uninhabited, it is just an object. If humans are present but there is no coal to power the range, then it is just a potential source of heat. If there is a range, coal and no human then it remains just a potential source of heat. If all three components are present (and the human has the skills to exploit the potentiality of the range) then the range becomes a heat source and the human becomes warm and reaps the attendant benefits. The principle of generalised symmetry remains completely intact in this manual heating scenario utilising relatively primitive technology. However, as technology evolves, the principle arguably becomes compromised, with human agency reduced and all actors no longer equal. This can be seen in relation to GCH supplied via the gas network, where we have the non-human actors of the boiler, control panel, radiators and gas supply (the latter requiring no human handling at point of use). Once installed, the control panel requires a minimum of one interaction with a human and without further interaction will continue to communicate with the boiler (when triggered by the thermostat) which will draw fuel from the network and burn it to heat water and distribute it via radiators until the equipment fails. The option of exerting more agency over the system is available to the human but not essential until the point that the system fails (this is exemplified in Carol's account of leaving her control panel well alone). The same is largely true in relation to air source heat pumps- our next method of domestic heating. Looking deeper into the workings of the system, human actors are still heavily involved in enabling the gas network, the extraction and distribution of gas and so on, but under future Artificial Intelligence scenarios, our role will become greatly diminished. It may be argued that the principle of generalised symmetry remains intact until the point where human agency is superseded by AI, because we have the potential to interact with our modern heating systems (i.e., GCH and ASHPs) more than the minimum necessary, yet they are capable of proceeding without us for an extended period of time.

From an evolutionary perspective, if we are in control of our environment then we have a better chance of survival. When things feel out of control, biochemical processes kick in that signal to us that we are facing some kind of danger. Applying ANT to the case of domestic heating reveals how the established power dynamics between human and non-human actors is disrupted by advancing, increasingly abstracted technologies. To make the march of technological advancement in heating systems more acceptable and less likely to evoke feelings of losing control, do we need to integrate a more manual component, even if it effectively amounts to a placebo? Would a soft AI voice telling us that everything is okay be sufficient? Or do we need to know there is always a route to warmth, even if the complex technological systems on which we depend break down? The multi-fuel stoves that more affluent participants enjoy offer this, as does the chiminea in the garden.

Passive Houses aside, it is hard to avoid increasingly complex technological solutions to home heating. Turning solid fuel into heat is a physical and chemical process and requires little more than a container for the fire. Harnessing the heat in the air or the ground to heat buildings requires additional actors in the form of technology that translates a latent heat source into warmth in the home, but strips us of our agency in the process. This technologically dependent route to warmth favours the digitally included.

I would also like to introduce to this debate the concept of Lifeworlds which was developed by proponents of phenomenology, Husserl, Heidegger and Merleau Ponty. The primary contention of the concept is that our lifeworlds are comprised of an entwinement of events, objects and emotions. In recognising the significance of events

and emotions, which contribute to shaping the actors that ANT recognises, it represents a complement to ANT in the context of domestic heating, where we find respondents' accounts brimming with emotional responses to the sensory experience of heat (especially in its most tangible forms), the care it enables, its cultural significance and the way it organises labour. An energy policy specialist and a historian are particularly well placed to identify the policy events and associated politics and corporate interests that shaped the dominant forms of heating available to us and the associated fuels and infrastructure. These events and influences are hugely influential in shaping our experience of the home environment, work, and the quality of the environment around us and the biosphere on which we depend and much more. However, events and politics are not explicitly linked by participants back to their underlying drivers and determinants, with the focus overwhelmingly on the intricacies of everyday domestic life. A debate remains, however, as to whether policy, political and corporate influences might be accommodated by ANT through the concept of actors, but certainly the influence of emotion represents a limitation of ANT in this context.

5 Emerging policy reflections

The transition to electric heating will not be the first major change to home heating that many of us have experienced; many remember the shift from burning coal or wood to central or district heating. JUSTHEAT is documenting how major changes to home heating and heating technology over the last ~70 years have been designed, managed and experienced, how they have impacted our lives and what lessons we might learn for the current transition to low carbon systems.

We do this through oral history interviews where members of the public in case study locations around the UK, Sweden, Finland and Romania tell us in detail about their memories of keeping warm at home throughout their lives and the ways their lives have been affected by changes to home heating systems and routines. These lived experiences contain valuable clues for policy makers designing low carbon heating transitions.

This matters because current approaches to the heat transition are patchwork and - at best - focused on urgency, at the cost of effective change. By listening to the voices of communities that are rarely given a platform, we can unlock public consent and find ways to make the next heat transition faster, fairer and more popular. That is crucial for the successful decarbonisation of the UK.

5.1. What policymakers need to know

Observations of recent history show that we have massively underestimated the social and cultural barriers to making the heating transition happen. If we do not change our approach now, the transition will be dogged by a lack of public consent which will make it slow, expensive and unpopular.

To unblock the barriers to public consent policy needs to change in three key ways:

- **Community ownership of energy is key:** Heating fuels of the past were tangible: wood was gathered from common land; coal miners were given coal as part of their salary; gas stoves were installed alongside gas heating - all pumped from the north sea in a much-vaunted economic miracle. Electricity is less tangible and the ownership model more fraught – especially in light of recent energy price crises.

  Community energy schemes and part ownership of developments has largely been dismissed as a niche concern or nice-to-have. That approach means we are missing out on the potential for ownership of the generation capacity to both bring down bills and make the appeal of EVs and electric heating more tangible.

- **Devolution is essential: let local areas tailor programmes more substantially.** It is clear from our research that experiences of the last heat transition vary hugely – even between neighbouring villages. Past experiences of heat transitions are a big driver of how consumers will react to the next transition but the level of granularity needed to achieve a tailored approach means that Government must devolve more power down, especially to local authorities. Similarly, Local Area Energy Plans and Regional Energy Strategic Plans must resist the urge to treat an entire authority as a homogenous whole: this will be counterproductive.
- **Flip the order: do the off-gas-grid homes first.** In general, policymakers of the past decade have assumed that off-gas-grid homes will be the most complex and expensive to fit with decarbonised heating. Though some of the houses themselves may present technical challenges, communities that have not recently been through a heat transition are more likely to see this one as an improvement. Moreover, this approach is inherently just – as it ensures that those left behind during the last wave of innovation are not left out once again.