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Modernity, materiality and domestic technology: a case study of cooling and heating from South Australia.

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This paper uses oral history as an appropriate method to reveal how residents in the 'green village' of Lochiel Park, South Australia, have changed their heating and cooling practices over their life courses. The analysis shows how concepts of modernity, largely drawn from Simmel, help analyse the narratives of the respondents and how these reveal both an increased reliance on technology in their life time and an increased involvement in the money economy. The narratives of the respondents at Lochiel Park express a paradox in which technological innovation has almost certainly enabled reduced energy use and reduced carbon emissions compared to the recent past, whilst also facilitating greater use of non-renewable energy sources compared to the period before the introduction of air conditioning. Based on the comments on residents, improved technology in building and in heating and cooling, is likely to remain the most viable strategy towards sustainable thermal comfort.

Key Words: Home, Sustainable Comfort, Green Village, Household Practices, Oral History

Using oral history accounts, this study examines the changing heating and cooling practices of the residents of an innovative housing scheme, Lochiel Park, that attempts to combine relatively high levels of thermal comfort with reduced energy use. The paper offers therefore, in the first instance, a contribution to the study of sustainable thermal comfort. The paper documents the changing relationship between heating and cooling practices and technology over the life of respondents and how these changes have affected and reflected changes in their life-styles and in their aspirations for the future. In contrast to other recently published work on thermal comfort, most of which originate from western or northern Europe (Ellsworth-Krebs et al 2019: Goodchild et al 2017: Greene 2018: Madsen 2018a:

2018b), the study is of thermal comfort in a climate where cooling practices and technologies are crucial.

Previous evaluations of Lochiel Park, by Berry (2013: 2014), Berry et al (2014) and Edwards & Pocock (2011) have used semi-structured interviews to document the experience of residents at either a single point of time or have covered a short period of say a few months or years. In addition, Sherriff et al (2019) have used oral history to suggest that the achievement of thermal comfort in 'low energy' homes in Australia depends on the continued existence of 'adaptive practices' whereby users adapt to varying indoor temperatures in varying ways, as opposed to a complete reliance on either mechanical or passive design technologies.

The aim here is different. It is to redefine and reframe questions about heating and cooling through concepts of modernity and materiality in housing. Modernity in social theory involves multiple themes. In relation to domestic life, comfort and the home, however, the most relevant themes are those associated with incessant, often rapid change (Berman 1988), the growth of a money economy (Giddens 2013) and the experience of living in a world characterised by technology and urbanised environments (Misa et al 2004). For the most part, the present account draws on Simmel (2002, [1903]: 2004 [1900]), a pioneer in urban sociology and one of the first social theorists to consider the modern age as a distinctive social condition (Frisby 1985). Simmel draws together the themes of change, the money economy, technology and the urban environment. Moreover, as will be shown, Simmel's ideas remain relevant in unravelling the changing relation between residents and the technology of the home.

Materiality as understood here refers to materiality in housing from the perspective of the user, in terms of its form, use and costs, rather than materiality in terms of ecological flows such as energy use, water consumption or refuse disposal. Materiality from the perspective of the user is nevertheless an obvious factor in determining whether low ecological impact homes are likely to be acceptable and likely to achieve their designed outcomes. Materiality has been a recurrent issue in recent studies of housing and the home by Australian housing researchers (Cook et al 2016: Jacobs and Malpas 2013: Nansen et al

2011) and those based elsewhere. Materiality is central to concepts of the home as a building and property and therefore to housing studies. With some exceptions, however (Madsen 2018b), materiality in housing has been mostly conceptualised for social and cultural analysis, rather than in terms of the ecological implications.

The aim is, therefore, to use oral history to illustrate tendencies, rather than to offer a specific evaluation of Lochiel Park as an innovative housing scheme. Modernity as understood in social theory refers to a social and cultural condition and as such enables a reflection on the changing, long-term interaction between technology, culture and society. Lochiel Park is nevertheless the setting in which the interviews took place and it is also the home to the respondents. The account will therefore start with a brief description of Lochiel Park as the case study site. The discussion continues with a discussion of the oral history method, its methodological and ontological assumptions and then its application.

The setting

Developed between 2008 and 2017, Lochiel Park was conceived as a leading example of nearly zero carbon housing for a warm, mostly temperate climate, with seasonal heatwaves. Within a predominantly owner-occupied housing market, the State Government of South Australia designed, developed and marketed Lochiel Park as a mixed tenure ‘green village’: a model of ‘sustainable living’ for developers and the public. Consistent with such principles, Lochiel Park is almost wholly surrounded by parkland, nature reserves and a stormwater treatment basin used as a sustainable urban drainage area and itself a nature reserve (Figure 1). In addition, along the footpaths and streets, there are areas of communally maintained gardening and examples of communally created public art (Figure 2).

The homes are mostly built to the property boundaries so that they present a continuous row to the streets. They also incorporate a private open courtyard rather than the backyard typical of Australian family homes. The urban form is therefore distinctive compared to nearby suburbs (Figure 1). The estate layout is also distinctive as it involves a combination of footpath access with rear access in the form of garage courts (Figure 3). All the homes, except the social housing apartments, have single or double garages.

Within the estate there are 103 dwellings, mostly two storey, three or four bedroom family houses, other than 23 apartments and 2 terrace apartments that are either owned by a social housing agency or sold to designated low income household. The average size of the properties is 203.3m², about average for new homes developed in South Australia in 2008/ 9 when the scheme was first conceived (Berry 2014, 165), but still large compared to new homes in the UK and to a lesser extent Europe (Gallent et al 2010: Morgan and Cruikshank 2014).

Energy reduction measures involve a combination of photovoltaic and water heating roof panels and elements of passive solar design, intended to promote passive heating in the winter, to protect against the summer sun and to encourage through ventilation. High efficiency appliances and equipment were also used. Under Australian 'Nationwide House Energy Rating Scheme (NatHERS)' energy performance criteria, all dwellings achieve a minimum 7.5 Stars out of 10 and are considered relatively low energy homes. Although most homes are not fully net zero energy or net zero carbon in operation, they are a substantial improvement on previous practice and are commonly called 'low energy'.

Oral history as methodology and ontology

Oral history offers a narrative method of research that has been seldom applied to case studies of domestic technologies and energy use (Brown 2017). However, there is a sufficient number of examples, dealing either with domestic heating (Goodchild et al 2014) or the impact of migration (Casey & Maye-Banbury 2017: Maye-Banbury & Casey 2016) to suggest that oral history is a valid method. Oral history encourages respondents to provide a chronology of events, whilst reflecting on the past and the present and on the difference between the two. Information is selected from the participant's accounts inductively to summarise the underlying trends and motives.

As a research strategy, narrative methods, including oral history have advantages in revealing the richness of human experience (Ambrose et al 2017: Brown 2017), in capturing both the physical and social aspects of daily life, as commended by Ellsworth-Krebs et al (2015) and in revealing the interaction between everyday practices and processes of social-

technical change (Greene 2018). The experiential aspect of oral history means, in turn, that it is well-suited to reveal the home as a sensory space, including invisible aspects such as smell, sound and temperature (Goodchild et al 2017). The sensory aspects of the home may also be examined through videos (Goodchild et al 2014) and through detailed ethnographic observations (Pink and Leder Mackley 2016). Oral histories have, however, the advantage of providing an account over time, viewing the past in the present. They provide first-hand accounts of daily life in the past of a type that is otherwise difficult or impossible to reconstruct, allow the personal and local to rise to the foreground and in doing so allow for individual idiosyncrasy and diversity (Goodchild et al 2017). Oral history is not intended to provide a replacement for stories of technological innovation but may be combined with archival histories that provide the technological or policy background. Oral history is also not well suited to testing specific hypotheses. Oral history interviews are relatively open-ended and the interpretation of the resulting transcripts has to follow what people say.

The interpretation of oral history also has to guard against an uncritical sense of nostalgia, viewing the past in a safely inaccessible but 'rose coloured' form, ignoring the realities of day-to-day life (Tonkin, 1995, 10). Depending on the exact context, nostalgia may also arise from modernity itself, from aspects that are implicit in the writings of Simmel but have drawn out more clearly by other contemporary and later theorists (Jedlowski 2012). Nostalgia may arise as a response to the unsettling impact of repeated change, to the disappearance of old assumptions, landmarks and landscapes (Berman 1988) as well as to the ambiguities involved in confronting the present with memories of the past (Terdiman 1993). However, nostalgia for the past, where it arises, is itself an indication of how people use the past to interpret their lives and the world around them (Thomson 2007, 55). The existence of apparently nostalgic accounts is not necessarily a criticism of oral history. Moreover, nostalgia and its sense of loss is neither automatic nor universal. As is shown in the accounts of heating practices collected in Ireland by Greene (2018), people may offer narratives of progress, of, for example, a welcome increase in material affluence. Respondents might also describe a mixture of loss and gain- for example a loss of community and a gain in material well-being. There are many possible variations.

As a side effect, an emphasis on the personal means that oral history accounts cannot be easily subsumed within practice theory as presented by Hargreaves (2011), Shove (2014) and others. Practice theory decentres the individual in favour of an abstract entity ‘practice’ that emerges, changes or declines either as a product of varied external factors or through its own logic. In contrast, oral history foregrounds the experience of the individual and assumes that consumption is moulded by both the biography of the respondent and the situations in which they find themselves, including their socio-economic and ethnic background. Practice theory is, in any case, not well suited to bringing out the visual symbolism and value of the home as architecture (Goodchild et al 2014). The elements of practice- know-how (skills), bodily activities, meanings, ideas and understandings, as well as materials and technology (Shove and Walker 2010, 476)- may nevertheless be related to the accounts of respondents. Oral history may still enable a consideration of household practices, activities and the sense of comfort as embedded aspects of daily life.

A characterisation by Gadamer (1989, 302) of oral history as a ‘hermeneutic conversation’ is instructive in indicating its logic. Hermeneutics draws attention to the intended meaning which lies behind the words as much as the actual words themselves. Moreover, hermeneutics implies a double exercise in interpretation: accounts are understood both as life stories specific to that individual and as thematic or ‘narrated’ stories that go beyond the immediate intentions of the respondent (Rosenthal 1993). As life stories, analysis encourages the respondents’ accounts to speak for themselves, albeit within the topic sheet derived from the term of reference of the enquiry. As a thematic, narrated analysis, the accounts are reinterpreted within a predefined framework of ideas that states the assumptions of the study and clarifies its values (Alvesson & Sköldbberg 2009, 91-105).

The task of narration is to identify and bring together the various themes in the respondents’ accounts. Narration does not assume that oral history accounts are necessarily coherent. Moreover, hermeneutic interpretation may itself strive for multiplicity, variation and the demonstration of difference (Alvesson & Sköldbberg 2009, 183-184). Striving for multiplicity, variation and difference is as misleading as assuming coherence and unity, however. A more realistic assumption is to assume a combination of coherence and unity on

one hand, fragmentation and difference on the other, choosing the balance as appropriate to conditions (ibid, 139).

The combination of fragmentation and unity is, in any case, characteristic of modern society, as exemplified in the writings of Simmel. Writing at a time when the metropolis summarised both the cultural experience of modernity, Simmel (2002, [1903] 19) provides an account where life had become 'infinitely easy in that stimulations, interests and the taking up of time and attention present themselves on all sides', but also where the easy came at a psychological and economic costs. In the modern metropolis, the individual is reduced to a 'cog' in a 'vast enormous organisation of things and forces' (ibid, 18) and the logic of organisation is reinforced through the pervasive impact of a money economy and technology that, in turn generate and express social divisions and inequality (Simmel 2004 [1900] 331-332). The impersonal and competitive character of urban life is tempered by the ideal of home and the intimate and relaxed social relationships associated with the home (Simmel 1984 [1913]). Further, the development of technology is simultaneously a liberating force, freeing up time for other uses (Simmel, 2004 [1900] 290) and a trap 'making many things indispensable which could and even ought to be dispensed with' (ibid 488).

Simmel's analysis of modernity has limitations. It is mostly about the details of life and, has to an extent, been overtaken by other overlapping concepts that are similar in scope but stress large-scale societal tendencies, concepts such as 'commodification', as in the 'commodification of convenience' (Shove 2003) or the 'new commodity fetishism' (Hirsch 1977). Simmel's gender assumptions are also inappropriate, based on an anachronistic distinction between an intimate, feminine side of life and an urban, male side, with this latter male side being dominant.

It is not necessary, however, to accept all aspects of Simmel's writings in order to accept their ontological assumptions. Simmel focuses on the life and social interaction of the individual. Indeed, according to Simmel, awareness of the self is heightened in modernity. Equally, this emphasis on the individual runs alongside a recognition that the individual is, to an extent, 'a cog in a machine' and therefore subject to external constraints and forces beyond their control. The lives of individuals involve multiple, sometimes colliding themes

that constitute, from a hermeneutic perspective (Alvesson & Sköldbberg 2009, 139) a 'contradictory whole'.

Hermeneutics defines how the oral history accounts are presented in the following analysis. First, the section entitled 'The home, technology and modernity' frames the oral history accounts and summarises the sometimes contrasting themes that arise in existing literature on thermal comfort and domestic technology. Second, the section entitled 'Temporal comparisons: from childhood to the present' provides a narrative based on the oral history accounts, documenting how the lived experience of respondents has changed over their life time. A further section 'Thematic interpretations: aspects of modernity' returns, in a circular movement to the framing ideas and theories, so enabling an additional level of analysis in which the individual life-stories are set in context.

Framing the accounts: the home, technology and modernity

Oral history accounts requires a frame in which accounts can be set. Equally, and this is the lesson of concepts of modernity, the frame itself is likely to contain multiple and sometimes contradictory elements combining interpretations that are either progressive and optimistic, negative and pessimistic. As presented here, the two approaches are heuristic devices that enable a multiplicity of relevant interpretations to emerge in advance of reporting the oral history accounts. It is not realistic or credible to consider progress and technology as either wholly desirable or undesirable. The difference in emphasis in the literature is real enough, however.

Progressive views: Technology and comfort

In the conventional, apparently neutral or progressive account, oral history accounts may be set against the introduction and growth of domestic technologies in a market economy.

Different accounts give varying emphasis to the role of engineers, producers or consumers.

'Constructivist' or 'institutional' theories, for example, show how consumer demand is shaped by systems and networks of physical artefacts, organisations and legislation (Mika 1997:

Shove et al 2014). Equally, however, the shaping of consumer demand has its limits.

Technologies are only likely to become widespread as a response to demand.

The history of air conditioning has been documented in the most detail in United States. Cooper (2002), whilst presented as an example of constructivist theory, reveals the process of interaction between the networks of engineers and providers on one hand and consumers on the other. Air conditioning technologies were first worked out by engineers for use in large industrial, commercial and public buildings in the early 20th century. Engineers also worked out the various standards, safety and performance criteria that are necessary to the manufacturing and subsequent maintenance processes. Equally, however, before the technology could generate a widespread demand for use in the home, air conditioning and heating equipment had to be made to suit consumer expectations about the home in terms of size, design and costs (Arsenault 1994). The possession of air conditioning became, for a time, a status symbol (Ackermann 2010, 6, 125). However, as air-conditioning became more and more widely used and especially in areas like the South, with its long hot summers, it came to transform home life, promoting ‘comfort in its own living room’ and the ability of residents to sleep (Arsenault 1994, 625).

A search for comfort is, moreover, a repeated theme in histories of domestic technology and interior design in Europe (Rybczynski 1987) and Australia (Webber 1996) show how ‘home’ and ‘comfort’ have a synonymous meaning and how changes in conceptions of comfort parallel changes in domestic design. A search for comfort also stood out as a major theme in oral histories of heating in the UK (Goodchild et al 2017), in an evaluation of a low energy home in Denmark (Madsen 2018a) and in other studies of Lochiel Park (Edwards & Pocock 2011; Berry et al. 2014; Sherriff et al 2019).

Comfort has layers and depths of meaning- privacy, ease of use, convenience in relation to household practices and pleasantness in relation to décor and ambience. Goodchild et al (2014) emphasises the definition of comfort as a subjective sense of domestic well being, including the ability to ensure flexibility in the use of different rooms during periods of winter cold. Ellsworth-Krebs et al (2019) have sought to define a coding provide for the analysis of comfort and have added companionship and relaxation to the different meanings. Madsen (2018a), in a slightly different interpretation, emphasises

comfort as a means of facilitating the work of ‘everyday practitioners performing homemaking practices’.

In addition, though this is mostly outside the scope of the present study, thermal comfort impinges on health. A distinction may be made between comfort as subjective well-being and discomfort caused by extreme temperatures (Rybczynski 1987, 225). Discomfort, in response to heat and cold, is a risk to health, unless those affected can find some way of mitigating the impact (Saman et al 2013).

Critical views: Consumption, materialism and artificiality

The downside, according to the critics, has been a tendency for mechanical methods of heating and cooling to become normalised and habitual (Pierce et al 2010), with the implication therefore that consumptions levels are excessive. Whether the use of mechanical methods has become normalised is, to extent, an empirical question. As an antidote to excessive consumption, the ethic of frugality has arisen in oral history accounts of heating methods in the UK (Goodchild et al 2017). Frugality means, as described by respondents, an attempt to restrain consumption to what is necessary, for either financial or environmental or other ethical reasons. Frugality also appears as a theme in the study of Lochiel Park, by Edwards and Pocock (2011). In this study, those of working age pursued busy lives that favoured energy consuming, time saving household appliances. Nevertheless, they still stated that they consciously considered whether they needed to use air-conditioning or not.

Excessive material consumption apart, another theme in critical accounts concerns the negative side effects of technology. Architectural critics such as Winter (2016) argue that an increased reliance on air-conditioning and other technologies in ‘ordinary’ commercial housing in Australia has led to a loss of non-technological methods of adapting to heat- for example building adaptations that involve passive systems of cooling. Others, for example Grunwald (2016), warn against the artificiality of controlled environments. Taking such criticism further, the implication is that life is increasingly encased in a synthetic, apparently self-contained and self-controlled high-tech world, divorced from nature. Such a scenario might seem remote. Yet a study of air conditioning in Singapore by Hitchings and Lee

(2008, 256) suggests that, for young middle class people, temperature control both at home and in other buildings has become so universal, so effective and so automatic that urban lives become ‘routinely removed from more earthly forms of unpredictable environmental experience’.

Modern technology and modern housing design are not always popular. Miller (2009) suggests that consumers buy time not just in the sense of convenience but in the sense of acquiring objects that possess the ‘patina’ of the past, have value for this reason and so stand against ‘the anonymity and massivity’ of modernity’. (ibid 168). Miller’s concern is with household possessions within the home rather than the dwelling itself, however. Images of the past may also offer an unwelcome reminder of ‘bad times’, if for example the scheme is associated with fuel poverty or cold winters or other unpleasant experiences. In contrast, Lochiel Park was designed to offer the hope and image of a more comfortable and sustainable future- a new type of modernity in housing and the built environment. The oral history accounts offer one way of assessing whether the hopes for Lochiel Park have been realised and how the ecological image of the green village relates to the prior expectations of its residents.

Temporal comparisons: from childhood to the present

In this context, as part of a larger, multi-disciplinary examination of the impact of Lochiel Park, a total of 17 oral history interviews were undertaken in February 2017. The number of people interviewed is 25 as eight interviews involved two people. Many of the respondents were in their 50s, 60s and 70s which meant that they were well placed to recount change over time. Eight of the interviews involved ‘seniors’ aged 65 years or more. Questions about income and occupational status were not asked. However, it was apparent from the life histories and the range of consumer goods in the home that the sample comprised relatively affluent people employed in or retired from professional, creative or business types of occupation. They were all owner occupiers. Residents from the social housing apartments were not interviewed as the dwellings had been completed more recently. Respondents,

especially the seniors, were very willing to talk, partly no doubt because they were aware of the novelty of the 'village' and its significance for sustainable housing in South Australia.

In keeping with the oral history paradigm, interviewees were asked open ended questions that take the respondent to the place in which they lived in the past, with the intention of revealing the details of daily life, in sensuous terms of the smell or whether they felt hot or cold. The interview starts, therefore, with their first memory of dealing with temperature changes in the home. Each interviewee then commented on the different properties in which they lived and was invited to recount the strategies and tactics for dealing with temperature extremes. Examples of the questions posed included: 'Can you remember how you kept warm?', 'Did it ever affect your family being too warm and too cold?' and 'What did do to try and stay cool?'

The arrival of technology

The order in which the questions were asked in turn determines the order in which the responses are summarised and presented. The early memories of respondents were varied, partly because they were talking about different parts of the world and different climates. The unifying theme was that technologies were relatively simple, though not effective in relation to cooling. The internal temperature of the home could not be adequately controlled before 1960s and 1970s, but a variety of low cost and low energy solutions were available- using relatively cool spaces around the home, making piecemeal home improvements and, in a few cases, using dietary coping mechanisms such as drinking copious amounts of water and increasing the intake of salt. Two respondents stated that without these dietary adaptations they would feel unwell in periods of extreme heat.

In the following account, a male senior recalls how his parents went about cooling a home in the suburbs of Adelaide during the 1970s.

'It was a three-bedroom, study, kitchen and lounge/ dining home. We had a covered outside veranda. We had trees in the garden so our kids were able to play outdoors in the shade. We had fans in all the rooms. We had one air conditioner that cooled the lounge/ dining, kitchen open plan area. It didn't cool the bedrooms. We also put whirly birds ... that blow around with the wind and they suck the hot air out of the roof space. That's a very cheap option. The other thing was that we got the gully breezes...

Around about 8-8.30 you felt this breeze coming down the hillsides, down the gullies and you'd open up all the windows and put the fans on.'

Similarly, a female respondent remembers her father taking various steps, also in the 1970s, to promote natural cooling through the creation of shade and reducing the absorption of heat into the roof space. The majority of respondents made reference to the practice of 'sleeping out' during hot weather which simply involved taking mattresses and blankets out onto a lawn or veranda to sleep at night time. Most of those that recalled it had fond memories of sleeping out not least due to its connotations of adventure and a break from normal practices.

'The kids thought it was fantastic. We'd all sleep outside if it was really, really hot. But then we got an air-conditioner.' (Female senior)

Going to the pool or the beach or even introducing an 'above ground' pool to your garden were also widely recounted coping techniques that- like sleeping out- could also be fun and would bring families together in the shared pursuit of seeking relief from the heat. Again, these practices were generally referred to in the past tense, suggesting they were now less common. There were also indications that cultural factors may be at work including increased levels of concern about personal safety associated with sleeping out or leaving doors and windows open.

Several of the residents' accounts make clear that their children are now firmly accustomed to air conditioning and are unlikely to consider alternative approaches to keeping cool.

'One thing I notice about our children and that's from observation of a lot of the next generation they don't use things like opening and closing windows and doors to heat or cool their house. They will just turn on the air conditioner instead.' (Female senior)

This same respondent went on to say that, without air conditioning, no 'housing would survive' an extreme heatwave, 'unless it was an underground house.' Of course, people had survived in the past without air conditioning. Expectations had changed, though some respondents also suggested that periods of extreme heat were now more frequent.

When asked about heating and cooling, most answers concerned cooling. Heating devices are nevertheless also used in Adelaide in the winter and the same contrast emerged between the apparent simplicity of the past and an increasing reliance on technology. In the past, wood would be available through scavenging or could be bought at low cost. Clothing offered another solution. One female senior remembered how her ‘mum would knit me really warm jumpers’. Electric and gas heating and electric blankets at night now did away with the labour involved in knitting a jumper or making a wood fire and cleaning up afterwards. It might still have been possible to buy and wear more clothes in the home and use additional blankets at night and this would save energy and reduce costs. However, as a male senior noted, ‘you don’t always feel like doing it.’

Moving to and living in Lochiel Park

As the last remarks suggest, the accounts were ambiguous and inconsistent in the treatment of environmental issues. The environment figured strongly in accounts of why people had moved to Lochiel Park and why they enjoyed living there. Oral history encourages respondents to speak freely about their home and even though the questions directed the respondents towards the heating and cooling technology, the respondents also raised, spontaneously, the characteristics of Lochiel Park as a place, rather than just a technological apparatus. They praised the green setting of the ‘village’, they liked seeing wildlife in the trees and the water retention areas, they welcomed the friendly community atmosphere and appreciated the community created mosaics that had adorned the concrete drains. One retired man commented ‘When people come to visit they say, "oh you have no idea you're so close to the city when you come down in here." It's just coming into a different world’. Another female respondent stated that the street trees and the ‘urban forest’ made the estate ‘noticeably two or three degrees cooler’.

For some, living in Lochiel Park had the effect of either reinforcing previous pro-environmental attitudes and behaviours or making them more aware of environmental issues. A male senior, speaking on behalf of himself and his wife stated:

‘we didn’t come in it because of the environmental issues, they were the furthest from our mind but we have grown to probably understand and enjoy it.’

Another, male senior, active in the community gardening activities, also actively used an 'ecovision' smart meter display, stating 'I read my meters every day. I read my export meter, I read my import meter.' He went on, however: 'people think I'm a fanatic', suggesting that the pursuit of green consumption patterns was a minority concern.

Concern about the local environment did not therefore necessarily manifest in the pursuit of green, energy saving life styles. Moreover, other respondents were explicit about the limits of sustainable consumption and sustainable housing design. One home contained four people, two parents and two grown up children. The mother commented,

'I'm all for energy efficiency and I'm all for doing the right thing but not when it's compromising your lifestyle.'

In another property, a male respondent stated:

'while we would like to do all sorts of innovative green and slick things you've got to make sure that what you invest in it is not so far out of the mainstream that you lose the value of the house or others don't realise what the value of the house is.'

For most respondents, the attractions of energy efficient, low carbon housing were as much about finance as green life-styles.

Question: 'What about costs of energy, is that something that you're concerned about?'

Answer: (female senior) 'No. Well we've got solar panels. Our last electricity bill was \$162 credit you see so no.'

For this respondent, living in Lochiel Park had eliminated concern about energy costs. For others, energy costs had been reduced but not as much as they had hoped. The potential savings were a major reason why residents had move there. One couple explained how the home in Lochiel Park cost more to buy than the value of their old home, but

'we hoped that that would be a positive because we'd spent so much on bills up there.'

The retired status of many respondents or their imminent retirement was also a factor.

In the words of a male respondent

'Because of retirement my issue was recurrent costs, outgoing bills, paying for things, quality of life and all of those sorts of things and we thought I'm sick of maintaining this place, it's 100 years old. It always needed work.'

The prospect of a fixed income on retirement concentrated the mind of this respondent and his wife about how to reduce outgoings in the future.

Energy costs were lower, not just because of the solar panels, but because the occupants used air conditioning less often. Respondents still used the air conditioning, however and had to make repeated judgements as to when it was necessary. Because, moreover, many were retired, as in the following quote from a male senior, they had more time to work out alternatives to air conditioning.

'there are a lot of levers to pull here and because we're retired, we've got time to actually do these things at the right time. You know, pull the blinds down etc. Whereas, in the past we might well have gone out on a really hot day with everything [blinds] up and come back and it was stinking hot, but that was all because we'd forgot because we were out working and rushing around.'

By implication, therefore, effective air conditioning suits people with a busy life-style.

The houses at Lochiel Park, though easier to keep cool than elsewhere could still be too hot for comfort, especially in the upstairs rooms during the extremes of summer heatwaves. In response, one female respondent reported that she and her husband had bought some foam mattresses and, together with her visiting grandchildren, slept downstairs whilst the heatwave continued.

Air conditioning had, in any case, advantages in promoting social interaction and family life, as is recognised in the following comment:

'Fairly soon after we came here, we were having visitors so we had the air-conditioner on in here and the air-conditioner on in the front room so that people could move around a bit.' (Female senior)

Another, male respondent commented

'we look after the grandkids a fair bit and we have set it up for them, in a way. We've got computers up there and TV's and stuff like that. They were here last weekend, for example. They are upstairs. There's two bedrooms and a bathroom upstairs. It means we can accommodate family or we can accommodate friends at any time we feel comfortable.'

Without multiple air conditioning units, socialising and family life would be confined to fewer, downstairs rooms and would be much less pleasant, if not impossible. The younger generation in any case expected air conditioning whilst using their computing equipment.

Assessments of the modern home

As part of their accounts of their life experiences, respondents were asked to reflect on changes in the built environment. In addition, the interviews included an additional series of questions that went beyond history to ask the respondents to reflect on what improvements might be made for the future. As a result, the interviews generated information about the respondents' views of modern housing design.

In considering possible improvements, the answers commonly concerned the limitations of the air conditioning systems, in particular of the low energy evaporative technologies with which a few properties were equipped. In addition, however, the answers showed support for passive cooling and heating devices. The residents lamented the absence of the kinds of design features associated with the homes of their youth, features such as generous eaves, verandas and pergolas (open, outdoor constructions) designed to promote shade. Critical comments were made of the building and design practices elsewhere in Adelaide. A male senior commented:

‘There are new houses being built in one of the streets just up here and I’m looking at it and saying, ‘There is an energy sink- all the walls are exposed, they’re not shaded, the sun is going to heat the outside of the brick [...] I don’t know how the government still allows builders to build homes like that.’

In addition, some criticised the homes at Lochiel Park for not going far enough in the direction of passive design and, in particular, of not providing sufficiently deep eaves or a shade giving pergola. Three respondents reported that they had installed small pergolas, at least demonstrating the flexibility of the design of these particular properties.

The use of two story homes at Lochiel Park, rather than the one storey bungalows common elsewhere in the Adelaide suburbs was sometimes criticised on the grounds that the upper floor becomes too hot in the summer. However, another respondent, a female senior praised the ‘European’ feel of two storey dwellings. Within the constraints of the existing

plot size, removal of the upper floor would, in any case, have greatly reduced the available floorspace and this would probably not be generally welcomed.

Thematic interpretations: aspects of modernity

Once individual accounts are summarised as a series of temporal comparisons, they may be reinterpreted as a series of themes that return to the main aspects of modernity. In addition, because this second level of interpretation is a return, a coming back, presentation of the various themes is best undertaken in reverse order. Discussion of the responses will therefore start with the experience of moving to Lochiel Park and whether it realised its promise and lives up to its image. Subsequent paragraphs deal with the critiques of contemporary heating and cooling practices and finally, then make comparisons with more neutral accounts that are mostly concerned with household activities and design standards.

In relation to whether the move to Lochiel Park realised prior expectations, those interviewed were aware of the distinctive rationale and innovative characteristics of the scheme. As owner-occupiers, they had made a decision to move. There was, therefore, no sense of resentment of being forced to live in unusual and poorly designed homes, as been noted in the UK for eco homes developed by social housing agencies (Goodchild et al 2014). For many, and this applied especially to retired households and those close to the point of retirement, Lochiel Park was attractive because it promised and delivered lower fuel costs or maintenance costs. Investment in the purchase of a home at Lochiel Park was therefore a means of saving for the future and especially for older residents a means of saving for retirement.

These climate control and financial advantages in turn influenced attitudes towards the aesthetics of the home. Respondents expressed support for the passive cooling features of traditional architecture, much in the same way as suggest by Winter (2016) and again confirming the analysis of Miller (2009) that consumers commonly buy or seek to buy the aesthetics of previous generations. However, the residents did not show enthusiasm for living in old homes. The preference was for an aesthetic that accommodated the best of all

worlds, a home that looks like a traditional home but is well built and possesses modern technology capable of delivering comfort at a reasonable cost.

Expectations about comfort had also become over time more demanding and the combination of mechanical and passive control measures in the home were expected to conform to these higher expectations. An ethic of frugality was only explicitly mentioned on a few occasions, certainly less than was the impression in the earlier study by Edwards & Pocock (2011). In addition, though this is not fully revealed in the interviews, contemporary life-styles with their reliance on home entertainments, home shopping and home working almost certainly make it more difficult to adapt to heat through behaviour change alone, as they involve specific arrangements of equipment and furniture that are difficult to move around or to move outside in the evening. Home computers were a notable feature in many of the homes when visited for the interviews. A separate appliance and equipment audit conducted as part of other studies at Lochiel Park confirmed this, with many homes having a defined 'home office' space.

Householders made use of air conditioning, albeit with some explaining that they tried not to become reliant on constant use. The habitual use of air conditioning had not proceeded to the point that its use had become unconscious, as Pierce et al (2010) suggest. Respondents talked about when and in what circumstances it was needed, albeit in a way that varied between those interviewed. Expectations about acceptable temperature levels were more varied than is suggested by the standardised assumptions of heating and cooling engineers (Sherriff et al 2019). In addition, technological change had not wholly encased people in an artificial environment, as Hitchings and Lee (2008) argued is the case for young people in air-conditioned Singapore. The repeated endorsement of the green setting at Lochiel Park suggests that, in relation to the external environment, residents wished to maintain a contact with nature.

The trend towards ever stricter and more effective indoor temperature control was, nevertheless, still apparent. Respondents pointed out the technological limitations of the air conditioning units or the limitations of the passive design elements, suggesting that temperature control could be improved. They also reported that the younger generation was

less likely to use those behavioural mechanisms. Respondents commonly reported that they had benefitted from the 'survival skills' of their parents' and grandparents' who lacked the option of using technology to support heating and cooling. Those survival mechanisms were not being passed on.

Air conditioning as a specific technology supports and modifies activities in the home, as might seem obvious and is also a theme in practice theory. As Madsen (2018a) suggests technological innovation ensures a greater ease of use and convenience in home making activities. Solid fuel heating, usually in the form of wood in South Australia, involves labour in the preparation and subsequent cleaning of fires and this is avoided by gas fired and electrical heating systems. Low tech cooling practices such as closing blinds or moving mattresses to a cool spot or related do-it-yourself upgrades are, depending on their exact characteristics, either a distraction from other tasks or substantial time consuming exercises.

However, the range of activities in the home goes beyond specific homemaking tasks, such as 'doing laundry, baking, relaxing, showering and caring for family members' (Madsen (2018a, 2). In Lochiel Park activities include socialising with others and the companionship of family life, to use the terminology of (Ellsworth-Krebs et al (2019). The relevant activities also involve entertainment both alone and with other and the use of computers. The respondents' references to socialising suggest that cooling technologies have changed the pattern of social and family life, moving this inside the home, without necessarily leading to a loss of such contacts. The extent of socialising is influenced in any case by many aspects of modern life, of which cooling technologies are only one element.

However, cooling is not simply a reflection of practices. Respondents treated thermal comfort as desirable for its own sake, irrespective of household activities and practices. They talked about being hot or cold as a physical, bodily sensation to the point that some reported that, in the past, they would feel unwell if they did not consume enough salt and liquids in heatwaves. They talked, in other words, of avoiding discomfort as well as achieving comfort either as a positive sense of domestic well-being (Rybczynski 1987, 225). Moreover, the sense of comfort and discomfort was characterised by seasonal variations, a theme also noted by Madsen (2018b) when discussing the milder summers of northern Europe. Sleeping

emerged as the most frequently mentioned household activity or practice, if activity is the right word, exactly because this was disrupted by excessive summer heat.

In the background to the accounts, supportive institutional arrangements are necessary for innovative heating and cooling technology, as is recognised in constructivist approaches by Cooper (2002) and Shove et al (2014) amongst others. The respondents revealed a knowledge of these background factors when noting how building standards had changed and become more stringent during their life-time, but not sufficiently stringent in the views of some.

Conclusions

To an extent, the classification of different elements of materiality could have been generated from a literature review alone. The materiality of the home may be summarised under the following headings:

- the ease of use as a means of supporting household activities and practices;
- the sensuous experience, including aesthetics, its ‘feel’ and the discomfort associated with extreme temperatures; and finally
- the associated costs and financial implications.

The significance of the oral history accounts is to suggest that, over time, finance and costs and, more broadly, the abstract logic of money have grown in significance in a way that parallels the analysis undertaken in early 20th Europe by Simmel (2004 [1900]) in ‘The Philosophy of Money’. The technology of the home has not just operated in the context of a material, commodified culture. Domestic technology has an independent existence that has reinforced tendencies towards commodification. Technology of a type that is expensive to buy and sometimes to run has replaced relatively inexpensive ‘low tech’ solutions. This shift leads, in turn, to a change in the skills and ‘know how’ necessary to maintain comfort, with more emphasis being placed on the ability to understand and use technology, to earn an adequate income and for some the ability to afford a good quality home or to afford, organise and undertake home improvements.

References to affordability and income is a reminder that, in the absence of countervailing measures, technological dependence is also likely to lead to new social divides and inequalities. The character of those divides varies over time. When air conditioning is an expensive luxury, it may act as a visible status symbol, as was noted, for example in the US by Ackerman (2010). In contrast, once air conditioning becomes commonplace and perceived as a ‘necessity’, even a seasonal or occasional necessity as was the view of the respondents in Lochiel Park, the associated inequalities rest on the process whereby the affluent are able to purchase a better quality of life. The divide becomes about the practicalities of everyday domestic life, about affordability in use and about the gap between those who have access to affordable technologies and those who do not.

Technology as a source of inequality is an argument for its wider diffusion, rather than abandonment, however. Living in Lochiel Park offers a relatively affordable and relatively high level of thermal comfort and these practical advantages have worked against a sense of nostalgia amongst the respondents. Nostalgia was occasionally apparent, for example when respondents discussed previous cooling practices that involved the family, such as sleeping outdoors or visiting the local pool. Times had changed and previous patterns of home life and family life had been lost, as is a theme in theories of modernity (for example as elaborated by Berman 1988). Loss does not mean a desire for the restoration of old living patterns, however. The respondents gave no indication that ‘low tech’ cooling and heating practices would be willingly revived. Expectations about comfort, technology and practices in the home are intertwined, as is an assumption of practice theory and in a way that is difficult to reverse. Especially for those of working age, the pressures of time management are potent forces in the background of the accounts, as Edwards and Pocock (2011) noted in their report. In addition, the skills involved in coping with high temperatures within the home are being lost. Oral history accounts therefore supplement practice theory for which skills and know how are an essential component.

Equally, oral history helps explain why there is no apparent desire for the relearning of such skills. The residents, especially the older generation, remember the past and its negative associations. Oral history evokes memory as a factor in contemporary practices in a way that

cannot be easily revealed by an a-historical research method or through theories, including practice theory as commonly presented, that downgrade the experience of the individual.

The desire for affordable thermal comfort and for easier, more time efficient methods of temperature control predates the respondents' move to Lochiel Park. Consumer expectations have increased, leading to a paradox in which technological innovation at Lochiel Park has simultaneously applied low energy technologies, whilst also facilitating their use compared to previous decades. The homes are significantly better in terms of energy use and carbon emissions than the relevant building energy standard in Australia at the time of construction. It is another question, however, whether the residents have a lower carbon impact in comparison to the past when they used 'low tech' adaptations to the vagaries of the local climate and used no air conditioning. The logical inference of the respondents' comments is that, despite the 'green' aspirations of some, technological innovation at Lochiel Park have not led to a complete reversal of long-term trends towards increased energy use.

At the same time, the search for ease of use raises issues about the impact of domestic technologies on human physical activity as is implied by the study of Hitchings and Lee (2008) in Singapore. It is possible, for example, that air conditioning has a doubled edged impact, offering protection against extreme temperatures but also encouraging a sedentary 'easy' life-style that is largely conducted indoors and is itself potentially detrimental to health. Some of the comments in the study, for example, about socializing hint that such a shift has already happened to some extent. The risks of a sedentary lifestyle and other possible risks are outside the scope of the present study and deserve more consideration and research.

The obvious advantages of technology in creating a comfortable home run alongside a series of negative aspects. Technological solutions are expensive; they lead to a loss of older, simpler 'low tech' expertise; innovative 'green' solution may still be insufficient to reverse long terms trends towards higher energy consumption and though this requires further research, comfort within the home may encourage sedentary life styles. However, the comments of the respondents suggest that there is no obvious alternative other than to

persevere with technological innovation within the context of existing institutional and economic arrangements, generating the support of consumers and working out ways in which the disadvantages can be minimized or avoided. Technology creates a world that is very different from the past, but much depends on the exact details and context. Technology and technological innovation are very varied. The essential task in relation to sustainable comfort is to unravel the variety of technologies that are available and appropriate. Because technologies and society are tied together, technology has moral implications and efforts should continue to promote cost effective low energy and zero carbon housing that go beyond what is commonly available.

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Figure 1: The setting. Source: Imagery ©2019 Google, Map data ©2019 Google.



Figure 2. Landscaped path, with communal garden. Source: Author.



Figure 3. Garage court and cul de sac. Source: Author.