HEAT, COMFORT AND WELL-BEING IN A CHANGING CLIMATE: LEARNING FROM COOLING PRACTICES IN MALAYSIAN HOUSEHOLDS

A thesis submitted to The University of Manchester for the degree of Master of Philosophy in the Faculty of Humanities

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Abstract

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Heat, comfort and well-being in a changing climate: learning from cooling practices in Malaysian households
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Deadly heatwaves are becoming more common due to climate change while heat-related morbidity is on the rise. Simultaneously, the need to curtail increases in domestic energy consumption during periods of hot weather has been challenging and the battleground is, in fact, against the use of air conditioning – known to be ‘notoriously’ energy-intensive, yet positioned as a protective device against heatwaves. The goal of this study is to continue reviewing the above paradigms and discussing the relevance of bringing the latter towards the context of tropical countries. As shown throughout the thesis, Malaysia is an interesting case study where comfort was once (and is still for some) achieved without cooling the air inside the home and well-being is fulfilled under the heat. As these meanings and constructs have gradually fallen in and out of favour, it is thus the goal of this study to push the latter approach in Malaysian households, which provides, I argue, a much-needed framework for exploring a socio-contextual underlying vulnerability to heat in the home among vulnerable groups of the population and to revive adaptation capacities from the past, to create future cooling practices that mimic traditional practices - a lesson to be learnt from a tropical country like Malaysia.

Drawing on the conceptual framework of everyday social practices, this will facilitate a better understanding of cooling practices in the home and mediate changes in practices to foster more, rather than less, sustainable ways for comfort and well-being in the local context. Methodologically, ethnographic interviews were conducted with households living with and without air conditioning. Adding depth to the information gathered, house tours were undertaken, households’ self-reporting comfort diaries included and temperature measurement taken as additional data gathering tools.

The analysed data is reported in three sets of findings. First, the use of air conditioning proves to be a more systemic emergence of modern cooling practices ‘scripted’ by how housing infrastructures were built, as well as the embodiment of standardised comfort values and skills that further entrench air conditioning as an instant and, sometimes, only way to gain comfort in the home. Such trajectories have been widely argued to be against the culture of keeping cool in the tropics, thus the second set of findings revisited ‘traditional cooling practices’ and explored their persistence in Malaysian households, beyond solely focusing on vernacular housing architecture that leaves us blind to other facets of the equation. Employing a social practice framework towards tradition-based cooling practices is a novel approach and, this study argues, necessarily complicates the matter and highlights the holistic make-up of such practices. The third set of findings address the final aims of the study; foregrounding the socio-contextual construction of vulnerability to heat in households’ everyday lives and to point to those ‘entanglements’ between elements in everyday living by which traditional cooling practices remain stable and create pathways of adaptation based on the ‘re-emergence’ of ‘non-air-conditioning’ from the past. The study argues such a turn is timely as currently in Malaysia non-air-conditioning is commonplace for the majority of households. Thereby bringing a nuanced understanding and preserving culturally-sensitive traditional cooling practices as a blueprint to future cooling practices against a changing climate.
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In loving memories of my late mother, Khalijah Abdullah
Chapter 1 Heat, housing, and well-being in a changing climate

Deadly heatwaves are going to be a significant threat in the coming decades, occurring more frequently and intensified because of climate change. In many places, mortality and the morbidity rate from extreme heat events are already projected to rise, while efforts to manage implications for well-being and increasing adaptive capacity remain in their infancy (Maller & Strengers, 2011). In particular, calls are repeatedly made for deepening social and contextual understanding of the way we approach the issue of vulnerability and adaptation to heat, especially with regard to the current prioritisation of air-conditioning as a protective device against heatwaves (Brown & Walker, 2008). Taking the context of households, this chapter begins with a discussion on vulnerability and adaptation in the home under projections for heatwaves. In bringing about what has been termed as the ‘starting point’ approach in assessing vulnerability and facilitating adaptation (Kelly & Adger, 2000), this study defines vulnerability in terms of the capacity of households to adapt to the heat in general, and heatwaves in particular, that pose a threat to comfort and well-being. The second section discusses material infrastructures in cooling, skills involved in moderating heat stress, and the common understanding of comfort, heat and well-being – factors embedded in methodologies of social practices and attainment of adequate cooling services (Maller & Strengers, 2011). This methodology is argued to be capable of generating an alternative pathway to adaptation in the pursuance of adequate cooling services in the home that diverts attention from the current focus on air conditioning. Thirdly, this chapter draws such a research paradigm towards the tropical regions where heat is a common feature of the everyday climate and securing adequate cooling services in the home – rather than air-conditioning coolth – is a matter of ‘need’. This case is particularly pertinent in Malaysia, a deep tropical country, whereby a thorough understanding of how vulnerability is created among households’ daily life is needed. This understanding is needed in the aim of bringing up adaptive capacity to heat away from air-conditioning. This chapter draws to a close by summarising the structure of the whole thesis.

1.1 Vulnerability and adaptation to heat in the home

The Intergovernmental Panel on Climate Change (IPCC) predicts that as a result of climate change, it is very likely that heatwaves will increase in frequency, duration and intensity. As heatwaves are becoming more common and severe around the globe, there will be a corresponding increase in heat-related morbidity and mortality (McMichael et al., 2009). In countries like Australia, annual deaths due to heat stress in its temperate cities are projected to soon overtake tropical ones in terms of heat-related mortality by up to two to three times (Maller & Strengers, 2011). Under the rising intensity and frequency of heatwave occurrences all over the world, the question of well-being under the heat is accentuated. Questions on who is vulnerable to heat and their demographic characteristics have already been answered by epidemiological research. Studies conducted around the globe have shown that older people, young children and
those with pre-existing chronic illness are among those most vulnerable to extreme heat (Brown & Walker, 2008; MMWR, 2013; Vandentorren et al., 2006). In addition, most of the elderly have pre-existing medical conditions, such as cardiovascular disease, type 2 diabetes or a mental disorder that requires attention (Brown & Walker, 2008; Semenza et al., 1996; Vandentorren et al., 2006) while young children are known to have less immunity and a reduced capacity for coping mechanism (MMWR, 2013). Other groups defined to be most vulnerable are those of low-income, socially isolated, and the homeless (Maller & Strengers, 2011; Semenza et al., 1996). Urban heat island effect is also reported to be increasing urban dwellers’ vulnerability to heat in the home (Vandentorren et al., 2006).

Nonetheless, there is an increasing need to deepen our understanding on vulnerability to heat, especially in terms of how vulnerability is created in everyday life. In their review of studies on this topic, Brown and Walker (2008) state that focusing on physiological factors alone in interpreting mortality and morbidity patterns in the heat would not be sufficient. They have presented the need to account for a range of social and contextual factors in interpreting these patterns to develop a fuller understanding on how vulnerabilities are created in the complexities of everyday living. At the household level, how cooling services were achieved in this regard is not only crucial as protectors for people but against further exacerbating the issue around heat at the environmental level. The widespread promotion of air conditioning as the protective solution to hot weather in homes further elevates buildings as significant contributors towards the excessive growth of energy consumption and greenhouse gas emissions (GHGs) (B. Li & Yao, 2009; Strengers & Maller, 2011). Furthermore, air conditioning usage in cities exacerbates the urban heat island effect, generating the need for additional cooling solutions and yet more energy consumption (Eskeland & Mideksa, 2010; Shove, Walker, & Brown, 2013). Given the fact that worldwide electricity continues to be mainly generated by the burning of fossil fuels and coal, the increase in air conditioning will result in billions of tons of increased carbon dioxide emissions; further exacerbating the issue of climate change (Sivak, 2009; Winter, 2013).

Despite the above arguments, there is already a widespread perception that achieving ‘thermal comfort’ is through the use of air-conditioner. As people have come to tolerate a narrower range of temperature now as a result, air conditioning has been a widely-established ‘one size fits all’ approach when it comes to meeting comfort. In fact, most scholars interested in demand reduction are currently positioning air conditioning to become an antagonistic actor in broader debates on residential energy conservation in general and cooling services in particular. The materials and discursive facets of the device are subject to debate on issues such as inappropriate building practices and homogenisation of comfort (Brager & de Dear, 2008; Shove, Chappells, Lutzenhiser, & Hackett, 2008; Wilhite, 2009). In his review on issues pertaining to air conditioning in Asia, Winter (2013) recognised the era of ‘conditioned-modernity’ and the arrival of a ‘Western model’ of adopting energy-intensive air conditioning in satisfying human needs for comfort (Agbemabiese, Berko, Berko Jr., & du Pont, 1996). Since its initial invention for industrial purposes
back in the 1920s, air-conditioning is now widely used in residential settings, increasingly synonymous with the achievement of household comfort. Moreover, an emerging view regards air-conditioning as a ‘barrier’ against harmful health impacts on the prospect of more frequent heatwaves. This conception of air-conditioning as a need creates new ideas for achieving bodily comfort through statistical representation of ‘numbered figures’ rather than subjective feeling and personal experience.

In some parts of the world, local knowledge on the achievement of comfort in the home is waning and ‘conditioned-comfort’ is creeping in (Harold WilHITE, 2009). In the housing sector, the arrival of air conditioning has made builders ‘less careful’ in designing houses, knowing that an instant solution for comfort is available. These notions are embedded in Agbemabiese et al.’s (1996) exploration of the ‘culturalization’ of air conditioning in the tropics, which attempted to search for alternatives for the achievement of comfort and well-being in the home away from air conditioning. Such a journey has now been successfully challenged by a discourse that sees air conditioning – an increasingly culturally ‘invasive’ and environmentally ‘costly’ approach – being promoted as the future solution for comfort and well-being in a changing climate.

In the face of the frequency of heatwaves predicted by the IPCC, discussions on indoor heat involve a juggling act between the sustainability of energy consumption for space cooling, on the one hand, and the well-being of households pertaining to excessive heat in the home on the other (MALLER & STRENGERS, 2011; NICHOLLS, MCCANN, STRENGERS, & BOSOMWORTH, 2017; NICHOLLS & STRENGERS, 2018)(BROWN & WALKER, 2008; GRAM-HANSSEN, 2010; WHITE-NEWSOME et al., 2012)(BROWN & WALKER, 2008; GRAM-HANSSEN, 2010; WHITE-NEWSOME et al., 2012)(BROWN & WALKER, 2008; GRAM-HANSSEN, 2010; WHITE-NEWSOME et al., 2012)(BROWN & WALKER, 2008; GRAM-HANSSEN, 2010; WHITE-NEWSOME et al., 2012)(BROWN & WALKER, 2008; GRAM-HANSSEN, 2010; WHITE-NEWSOME et al., 2012)(BROWN & WALKER, 2008; GRAM-HANSSEN, 2010; WHITE-NEWSOME et al., 2012)(BROWN & WALKER, 2008; GRAM-HANSSEN, 2010; WHITE-NEWSOME et al., 2012)(BROWN & WALKER, 2008; GRAM-HANSSEN, 2010; WHITE-NEWSOME et al., 2012). Air-conditioning continues to be promoted as a protective device against future warming of the planet and mounting anxieties on households’ health and well-being (NHS, 2013; NIOSH, 2015). Caution has been raised against this move; however, if a ‘lower carbon’ lifestyle needs to be nurtured (SHOVE, WALKER, & BROWN, 2014). Rising consumption and a warming world are thus leading driving forces in rethinking our quest for comfort. Fundamentally, an alternative pathway to comfort and adaptation to heat is needed – a pathway that not necessarily dependent on technological solutions or top-down interventions, but focuses on realising comfort and well-being by striving toward ‘adequate cooling services’ that is connected to the specificity of social, regional and cultural contexts.
1.2 Intervening in households’ cooling practices

Ten years have passed since Shove et al.’s (2008) special issue represented a series of long-term movements of thought emphasising how varied comfort is in different social-contextual settings. That has added to the long journey of the earlier movement of ‘problematizing air-conditioning comfort’ since Ackermann (2002). This has been a move away from universal codes and standards such as the American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE). They argue in favour of a dynamic approach that requires ‘unusual’ interdisciplinary attempts to show how infrastructures, conventions of body and self-evaluation and real-time interaction with the everyday environment in the production of comfort. These elements are engrained in their later conceptualisation of social practices, by integrating such concept in studying the diffusion of air-conditioning in daily comfort (Shove et al., 2013). One of the underlying conceptual shifts that this call embedded within is the concept of energy services. Energy services are defined as “the benefits that energy carriers produce for human well-being” (Modi, McDade, Lallement, & Saghir, 2005). Unlike previous concentration on meeting the provision of energy such as electricity, Sovacool (2011) outlined how focusing on energy services have humanised energy policy interventions, highlighting temporal and regional differences in realising energy services. This has reorient the direction of energy policy goals from guaranteeing that energy provision for the population tends towards new developments into ensuring adequate access to energy services, while securing the reliability of supply from low-carbon sources (Bridge, Bouzarovski, Bradshaw, & Eyre, 2013).

An alternative and a more ‘holistic’ view on searching for future low carbon comfort is argued by Shove et al., (2008) to lie within empirical understanding rather than standardised indoor conditions. Systems of practices and the temporal and social conventions of everyday living are presented as one way forward which emphasise meaning and the social construct of comfort rather than a universal standard while recognising ‘real-world’ adaptive strategies ingrained from everyday living. Besides, the prospect of more frequent heatwaves means providing comfort will need to compromise the well-being of the household. Understanding how vulnerability to heat is constructed through everyday routines and practices provides the potential for identifying alternative ways of managing heat through enabling people to modify their thermal environment without immediate recourse to air conditioning (Maller & Strengers, 2011). Although there is renewed interest around passive cooling design to reduce cooling services’ consumption in the home, Winter (2016) argues that such a term leaves us blind to the ways occupants and the material culture of indoor spaces are entangled in the achievement of comfort. Sustainable practices hence look more ‘complete’ in the search for viable alternative regimes to air-conditioning (Sahakian & Wilhite, 2014).
In the meantime, the call for a deeper understanding of social processes and contextual factors of household vulnerability to heat as well as capacities of households for adaptive cooling practices has led studies away from air conditioning towards exploring cooling services and adaptive practices of cooling. In taking this alternative pathway and where it stands, Shove & Walker (2014) view energy supply and demand as part of the ongoing reproduction of social practices. Approaching comfort from a practice perspective is argued here in the study as a more holistic way of (re)understanding its dynamics, how it changes in everyday life and provides a possibility to intervene and redirect changes in practices in a more ‘sustainable’ manner (Brown & Walker, 2008; Shove, Pantzar, & Watson, 2012). In most cases of practice intervention such as this, one of the important endeavours is to understand changes in practices. Indeed, Winter (2013) questions how entrenched current ‘air-conditioned-modernity’ cooling practices are in contemporary society? Shove et al. (2013) claim that the expansion of air conditioning across the world is best understood as an outcome of processes in which air conditioning is integrated into practices like simply finding comfort at home. Rather than conventionally mapping diffusion across socioeconomic status, they have argued for a more sophisticated interpretation of how air conditioning has given a new meaning to comfort and the places in which it is reproduced.

This conclusion opens up a possibility for more localised yet concerted efforts to stem the advancement of air conditioning and the energy demand associated with it. Given the fact that all cultures have had lived without air conditioning during some of their timescale, effort to curtail this ‘modern’ cooling practice and move towards future lower-energy alternatives for comfort is just a matter ofreviving cooling practices from the past. Seen from this perspective then, in tropical countries, cooling is a need. Increasing the adaptive capacity has emerged as an important research agenda, especially in the search for a lower-carbon alternative for realising energy services for comfort in the home and achieving well-being in the heat. This move will encourage new forms of intervention in the juggling act between managing consumption and the well-being of populations (Maller, 2015). Every culture provides useful ground for examining how the cultural norms of domestic cooling practices can vary across nations, and the different skills people possess regarding privately organising heat in the home and the different significant implications of how ideal domesticity is culturally defined.

1.3 Case study, definition and research questions

Having presented the issue of juggling cooling consumption and vulnerability to heat, and the potential of the theoretical lens of social practice in the search for a deeper understanding on vulnerability in this context and alternative lower-energy cooling practices to what we have now in front of us, urgent attention is needed to advance such a theoretical understanding towards the region where demand for air conditioning exceeds any other geographical setting – the developing countries in the tropics. Observation by Sivak (2009) has highlighted how projected levels of
increased personal income in rapidly developing countries in hot climates is likely to lead to a corresponding rapid increase in air-conditioning usage and hence energy demand. The trend is expected to continue till year 2030 (Isaac & van Vuuren, 2009; Sivak, 2009; Winter, 2013). He also hinted that the increase in domestic energy consumption for the cooling segment of households energy consumption in developing countries has already surpassed the growth of energy consumption the developed countries once had (Sivak, 2013). Correspondingly, a majority of air-conditioning companies have projected a definite shift towards a higher demand for air conditioning in developing countries, especially in the Asia Pacific region (Greentech Media, 2013). This has in fact been the case for emerging economies and Daikin (2015) estimated 70 per cent growth for air conditioning within these markets. At first glance, significantly more homes have become air-conditioned over the past two decades in Asia Pacific; a region in which air-conditioner demand has exceeded any other (JRAIA, 2017). Moreover, a special IEA report (2017) on Southeast Asia projected that by 2040, the cooling sector will account for more than 70 per cent of domestic electricity demand.

This is particularly pertinent in the case of Malaysia, in which while there is growth in air-conditioning usage in residential homes, abundant traces of persistence of ‘traditional cooling practices’ against heat in the home provide material for creating adaptive capacities away from technological fixes like air conditioning. As one of the rapidly developing countries of tropical Southeast Asia, Malaysia presents other significant ground to be explored on the subject matter where the prospect of more frequent heatwaves ahead is alarming, while research capacity regarding the quest for lower-carbon comfort and well-being is still in its infancy. Despite research concentration on this part of the world, the air conditioning continue to become ‘necessities’ and have not been questioned under the name of climate and rising quality of life. Now, I argue, is a crucial period for Malaysia in terms of where the direction of such a trend will ultimately finish up, following the ‘unsustainable’ footstep of conditioned-comfort that is already entrenched in countries like the US and Australia (Winter, 2013) (Figure 1.1). As far as these countries are concerned, the situation has worryingly been affecting energy demand in the residential sector, and hence presented as the potential future for Malaysian households if efforts to intervene in such practices are not put in place to cope with the situation.
As in many other countries with a similar hot and humid climate, the greater part of energy consumed by households in Malaysia relates to maintaining a comfortable indoor environment by the use of an air-conditioner in the home. It was reported that the cooling sector in this country accounts for 21 per cent of residential electricity use. Specific to the residential sector, the domestic air-conditioner is anticipated to be the main improvement area, especially in urban centres where energy use is high compared to rural areas. As far as comprehensive reporting is concerned, air conditioning has been mentioned exclusively on the issue of rising household energy consumption in a number of accounts (DOS, 2014; IEA, 2013; SEDA, 2015). Currently, in the move toward lower energy consumption for domestic cooling services, the government has introduced a programme to award energy-efficient certificates to air-conditioners with efficiency in their specifications.

This study takes the view that drastic action to curb such growth is needed and air conditioning as a ‘basic amenity’ in the national household census needs to be challenged. Therefore, it is essential that any effort to stem residential energy consumption starts with reducing dependence on this device as the main cooling method in the home. A system-based approach needs to be deployed towards influencing household cooling practices back towards less energy-hungry approaches. Drastic action has been discussed on a global scale to tackle this problem holistically, generally towards promoting low-carbon alternatives to remaining cool in the home. This study aims to discuss the context in which practices in relation to climatic heat and health as well as outline fruitful avenues to explore, especially on the journey towards increasing holistic adaptation strategies, rather than one-size-fits-all air conditioning. First, the application of social practices in the matter of energy consumption has redefined modern cooling practices as the source of rising energy consumption. Second, the focus given to practices broadens the horizon of current thought on reducing energy consumption for the cooling sector by looking at ‘traditional’ practices as a
‗whole,‘ and not just the materiality of vernacular houses as embedded in the passive cooling
eendeavour to reduce cooling services demand. I argue that such a narrow view of a technology
leads to solutions that heavily depend on materialistic adjustment and ignores a large amount of
embedded knowledge in skills of managing comfort without the use of air conditioning. Thirdly, the
refigured understanding of the modern and traditional and how the former emerged while the latter
persists, inviting solutions that are naturally ingrained in everyday practices. Observing non-air-
conditioning cooling practices in current households as a re-emergence of traditional cooling
practices, I argue that resurrecting such practices in everyday living is the way forward towards.
These three processes, I suggest, are constitutive of using a social practices perspective in
creating lower carbon cooling regimes in the context of Malaysia.

Generally, following policy on reducing consumption of cooling services has come down to
households doing their bit by opting for energy-efficient air conditioning, or by consuming air
conditioning ‘intelligently’. This is poised to be the prime agenda in coming years as the Malaysian
government is seriously looking toward creating a lower carbon society by 2035 (Gan, Komiyama,
& Li, 2013). Meanwhile, climate change is expected to increase the frequency, duration, and
intensity of heatwaves in the country, making it sufficiently difficult to juggle rising energy
consumption and space cooling due to a hotter climate. In March 2017, the Malaysian
Meteorological Department declared a heatwave in the northern part of the peninsula after five
straight days of above-average temperatures. According to the World Bank Development Report
2014, climate change is expected to hit hardest in developing countries, resulting in higher
temperatures, changes in precipitation patterns and more frequent heatwaves, posing risks for the
well-being of the population. Particularly in the tropical regions of the world, this means the current
level of hot temperatures will rise even further, bringing forward the issue of indoor heat in the
home and health of the population in countries like Malaysia, where frequent unusual hot days
have increasingly been reported from January to June this year (MetMalaysia, 2015a). Indeed, for
the past 20 years, records of the Malaysian Meteorological Department (MetMalaysia) indicate
frequent unusually hot days, known as ‘Equinox,’ whereby the temperature rises above average,
often as high as 38°C (The Star, 2015). On the mainstream agenda, initiatives have
overwhelmingly been based on divided technical and behavioural, in which technological
advancement and behaviour such as air-conditioning purchasing decisions and user attitudes.
However, choosing this route and leaving air conditioning unchallenged has proven to be less
effective as academia around the world has cautioned (Brown & Walker, 2008; Chappells & Shove,
2005; Strengers, 2008) with the increase in air-conditioning installation causing residential energy
consumption to rise and now subject to calls for energy conservation (Siti, Engku, Kamaludin, &
Radam, 2015).

Household comfort research conducted internationally suggests that cooling practices are
incredibly dynamic, changing, and culturally specific. It is, therefore, challenging to make
assumptions about them. Theory of practice has been deployed all over the world to examine local
contexts on cooling practices (Khalid & Sunikka-Blank, 2017; Madsen & Gram-Hanssen, 2017). Viewing cooling-related thermal comfort practices, referred to subsequently in the thesis simply as, cooling practices, through the lens of social practice theory highlights the socio-material richness of our behaviour and communities as well as their capacity to ‘explain how the complex change processes take place (Shove et al., 2012), dismantling the common perceptions thermal comfort studies have with regard to air conditioning. In this study, air conditioning is essentially referred to as the use of mechanical cooling devices by means of refrigeration to cool the indoor environment (Ackermann, 2002). The cooling effect is a significant differentiation from other devices such as fans, which do not cool the air and hence are not included within the term air conditioning. I denote these air-conditioning practices within households as modern practices to differentiate from non-air conditioning households, which I refer to as traditional practices. This distinction is made for the sake of simplicity as modern practices may include devices other than air conditioning.

In tropical countries such as Malaysia, households have a long tradition of living under the heat prior to the arrival of air conditioning. In fact, as of now, a slight majority still live without air conditioning and data shows that it will remain this way until 2020 (DOSM, 2013; Mahlia, Masjuki, & Choudhury, 2002a). This study makes the case for alternative low-carbon cooling practices ingrained from within their culturally-sensitive traditional practices of comfort, and to learn from their persistence before they vanish. As far as this study is concerned, such practices are less well-documented in Malaysia. Therefore, using Malaysian households as a case study, I ask below the overarching question:

**How can we understand cooling-related thermal comfort practices (cooling practices) in Malaysian households in terms of the emergence of modern air conditioning practices and the persistence of traditional practices, towards creating low-energy cooling practices while maintaining well-being under heatwave conditions?**

In contrast with dominant approaches focusing on technical and behavioural fixes, research on social practices emphasises the analysis of routines and elements underpinning practice. This study follows such an approach and contributes towards the growing body of literature by investigating social practices pertaining to cooling in the home and the overarching issues of energy consumption and well-being under hot weather. In doing so, this study uses social practice theory to analyse air-conditioning entrenchment, persistence of traditional cooling practices, and the realigned dynamics between those towards creating a ‘non-air-conditioning’ view of the future.

With these considerations in mind, the main questions I shall seek to address are:
1) How are modern and traditional cooling practices composed, conditioned and intertwined in Malaysian households?

2) How does the re-emergence of non-air-conditioning practices serve as a reference for future aspiration in the juggling act between comfort consumption and well-being?

1.4 Structure of the thesis

The thesis is structured into seven chapters including the present Chapter 1, which is the introduction. Chapter 2 begins by acknowledging two enterprising approaches to a low-energy comfort and well-being on hot days. The first approach seeks the most energy-efficient way to air-condition the indoor environment to achieve comfort and, to some extent, the achievement of health and well-being on hot days. Strategies of this kind assume air conditioning as ‘natural’ needs. The second line of inquiry introduces a more flexible and ‘explicitly adaptive’ strategy in engineering and design (Shove et al., 2008). Strategies of this kind bring forward the achievement of a more contextualised model of comfort that is sensitive to the socio-cultural setting, away from universalised codes and standards. I then consolidate these arguments within a case study on Malaysian houses and the country’s quest for sustainable cooling practices. In Malaysia, air-conditioning usage is rapidly increasing, and the question over the well-being of the population because of the heat is becoming central due to recent heatwaves, and the future additional occurrences of heatwave that have been forecast. To reduce energy consumption related to air conditioning new methodologies are required and social practices theory is presented as a way to analyse the ‘traditional knowledge’ of households living without air conditioning. Using practice-based methodology to understand adaptation to heat will provide a multidimensional, system-oriented understanding of how vulnerability can potentially be reduced, in a way that does not necessarily depend on air conditioning. Chapter 3 presents a discussion on the conceptual framework for analysis of social practices and the elements that constitute it. Here, both ‘modern’ and ‘traditional’ practices are analysed regarding these components to understand the composition and reproduction of cooling practices in Malaysia. I then discuss the methodology of the study, which mainly discusses the approach taken and the process of selecting households. I conclude the chapter by reflecting on my methods and ethical considerations involved.

The next three chapters form the empirical basis of the study. Accordingly, Chapters 4 and 5 present analysis on how elements that comprise cooling practices: materials, meanings, and competence, equally participate in embodying both ‘modern’ and ‘traditional’ cooling practice entities and characterise changes to how these practices unfold in the Malaysian households included in the case study. Indeed, in enhancing what we already know and drawing together what we have yet to know about cooling practices, these two chapters bring empirical investigation on households in the Malaysian context. Seeking a deeper understanding of how modern cooling practices are composed, Chapter 4 also considers how air conditioning entrenches in daily life by analysing its emergence in Malaysian households. I firstly discuss how the materiality of current
houses has ‘scripted’ the use of air-conditioners, and how this in turn propagates specific notions of meanings and actions that form particular air-conditioning usage. Following this, in Chapter 5, the traditional ways of cooling in the home are re-examined by interviewing households living without air conditioning. My objectives were to situate these practices within the practice framework and identify a broader discussion on their persistence. Both of these configurations ignite two questions: how can the emergence of modern air-conditioning cooling practices are contained? Also, how might traditional practices persist? In Chapter 6, I present the binary interpretations of the two practices which will lead us to understand the daily social and contextual factors surrounding the issue of vulnerability and adaptation to heat stress in the home. In this final empirical chapter of the study, I explore how households’ daily lives and everyday routines are implicated in the creation and reproduction of vulnerability to heat in the home and how these factors can be modified to contribute to their adaptive capacity (Brown & Walker, 2008; Maller & Strengers, 2011). For a tropical country like Malaysia, with long traditions and historical accounts of living without the presence of air conditioning, the steps to the solution rest upon resurrecting dynamism of traditional cooling practices in creating resilience under the heat and lower energy non-air-conditioning practices for the future.

Finally, in Chapter 7, I reiterate the critical contribution of this study to the cooling practices literature and social perspectives of energy consumption in general. I also seek to provide insight into how traditional cooling practices have ‘re-emerged’ as lower energy non-air-conditioning alternatives by dynamics’ of traditional practices and keeping these elements intact. The traditional cooling practices of these households reveal a need to develop contemporary forms of this ‘prior knowledge’ regarding comfort behaviour and preferences specific to the climate of Malaysia. This knowledge should not be regarded as inferior to ‘futuristic’ innovation such as wireless demand management devices or even nuclear power to generate efficient energy. Moreover, this innovative shift in thinking and understanding could be said to be ‘simplifying’ the question regarding households’ practice for cooling in the home towards ‘ordinary’ ways of living with heat. Most significantly, the literature on managing vulnerability and creating resilience to heat in the home might benefit from the adaptive capacity of the past from the context of Malaysia. I conclude by reflecting on the limitations and future direction of this research.
Chapter 2 Sustainable cooling practices and vulnerability to heat waves: a juggling act

In a changing climate, juggling cooling consumption in the home and maintaining the well-being of households against the heat serves as an aspiration for low-energy societies. In hot weather, maintaining household comfort in a lower-energy manner is prioritised in a growing stream of research. Meanwhile, the prospect of more regular and severe heatwave events as the climate changes has highlighted the issue of vulnerability to heat in the home. Over the past two decades, the quest for sustainability in realising the comfort and well-being of households under the heat and extreme heat events has produced literature divided into two main paradigms: one that upholds air conditioning as the solution and another calling for ‘adaptive capacity’ away from ‘conditioned-cooling’. In discussing both paradigms at work and pursuing the latter in the present study, this review of the literature examines how the call inspired by Chappells and Shove (2005) to reconstruct the notion of thermal comfort as flexible rather than fixed within a particular standard has shifted the focus towards realising the most fundamental basics; namely adequate cooling services and improving the health and well-being of households under the heat. This adaptive model of achieving thermal comfort is, in fact, embedded in the findings of the deepened understanding regarding how vulnerability to heat is created in everyday living, which is proven to be in line with identifying alternative ways of managing and reducing vulnerability to heat among households (Brown & Walker, 2008).

According to study, more than other parts of the world, the tropics hold a greater risk of deadly heat in the future because of year-round temperatures requiring less warming to cross the deadly threshold. Given current prioritisation of air conditioning as the solution for the concern raised above in this part of the world (Sivak, 2013), what is argued here is that it is imperative to advance work in this vein throughout the region. Promoting air conditioning as policy to mitigate heatwaves throughout most of the region has been argued by many to be a short-sighted solution that is not only unfeasible socioeconomically due to the large amount of poor households in the region, but also not environmentally beneficial in the longer term due to high energy usage further exacerbating climate change. More importantly, this study posits that concentration on air conditioning has obstructed the fact that the tropics hold rich knowledge grounded in adaptive measures embedded in its traditional cooling practices, which stem from long before the introduction of air conditioning.

The chapter starts with discussion on the issue of vulnerability to heat in residential houses followed by the need to look beyond air conditioning, and to focus on discontinuing energy-intensive services of cooling in the home through the enactment of social practices. I then summarise the chapter by reiterating the importance of advancing such a stance to the tropics and employing Malaysia as the case study. In the deep tropics, such as Malaysia, the concerns raised
above have prevailed. In 2016, the country suffered its worst heatwave in history when temperatures rocketed close to the 40-degree mark and indoor temperatures were recorded at one time to be at 35 degrees Celsius. As I seek to demonstrate, Malaysia is an interesting case study, where comfort once was (and for the majority still is) achieved without mechanically cooling the air inside houses and well-being is fulfilled under the heat. As these meanings and constructs have progressively fallen in and out of favour, it is thus the goal of this study to push the latter approach within Malaysian households, which provides, I argue, a much-needed framework to preserve low-energy cooling practices from the past, and towards the challenging future.

2.1 Vulnerability to heat in the home

The way we interpret vulnerability leads to consequences regarding how the issue of heat is addressed. Kelly and Adger (2000) have discussed at length to provide a theoretical discussion in an attempt to re-understand vulnerability, aligning how different outcomes of how vulnerability can be understood by viewing in starting and endpoint perspective. They made the case that current consideration is focusing on vulnerability as an endpoint of analysis. However, in their assessment a more engrained question arises when vulnerability is determined as the starting point.

What this perspective illustrates is that unstable practices and lack of technological aid are early indicators of vulnerability and are therefore presented as elements that may have to be addressed in order to not only help vulnerable people reduce their vulnerability but to allow effective adaptation to occur. Within these lines, it is crucial to understand that biophysical, social, political and cultural factors are prerequisites in creating adaptation to heat (O’Brien, Eriksen, Schjolden, & Nygaard, 2004). Viewing vulnerability to heat made it almost imperative to understand cooling practices. Brown and Walker’s (2008) review of this issue leads to a discussion on how a range of social and contextual factors are needed to extend understanding of vulnerability to answer the why and how question – how such vulnerability is being produced and why people in different social situations appear to be more or less able to cope with or adapt to periods of hot weather. A study by Vantendorren et al. (2006) indicated that the elderly at greatest risk of death during catastrophic heatwaves are those confined to bed and lacking mobility. With regard to living
conditions, buildings were typical old Malaysian houses’ without proper insulation and infrastructure arrangements with bedrooms located directly under the roof (Vandentorren et al., 2006). Moreover, a study conducted in the US identified additional factors related to living alone as a risk for heat-related death (Semenza et al., 1996). This study likewise highlighted how housing conditions play a crucial role during an extreme heat event: floor level and the number of rooms were found to be important determinants of risk. In the few examples outlined above, housing type emerges as a significant factor in the susceptibility of the target group to climatic conditions and as well as in planned adaptive strategies (Maller & Strengers, 2011). Residential environments are known to be an important determinant of health from the results of numerous studies. Lawrence (2004) reiterated how housing and health are both dimensional, in which both these subjects ought to be considered of the multiple factors that influence both, as well as the interrelations between them.

2.2 ‘Problematising’ air conditioning as adaptation for future extreme heat

Air conditioning is deeply complicit in contemporary society’s comfort tendencies and has expanded to become a ‘necessity’ nowadays (Shove et al., 2014). How has this come about? Initially, air conditioning as we know it was invented in 1902 had nothing to do with personal comfort. Both Cooper’s (1998) and Ackermann’s (2002) books later paved the way for the debate on air-conditioning usage and the issue of rising energy consumption in the home. Ackermann (2002) has been particularly influential in this regard, laying out the social history of air-conditioning’s cooling and marking them as ‘problematic’. In 2002, Ackerman wrote, on what was then to be the 100th anniversary of the first installation of air conditioning, exploring the idea that ‘cooling’ has been slowly embedded (and interchangeably) is now considered to be the same thing as comfort. This line of thought effectively means that to be comfortable, it needs to be cool – which throughout Ackermann’s book is presented otherwise by referencing the ‘classic' American lifestyle before air conditioning.

In less than a generation, air conditioning has grown to be perceived as the way (read: the only way) to achieve comfort in buildings. The air-conditioner is regarded as a principal innovation, whereby its application symbolises socioeconomic prosperity and ownership manifested in quality of life. ‘Air conditioning is among those things that made modern economies’ – as the saying goes. Undoubtedly, this has situated the air conditioner in a place where it is rarely called into question in policy efforts to cope with rising consumption as a direct result of its usage in the domestic setting. Perhaps, after more than generations-long use of air conditioning since its invention, we are now to witness its far-reaching and unexpected effects. Nevertheless, since we have been able to control the weather inside our buildings, we could not now live without it.Arsenault (1984) groundbreaking article in the 80’s presented as a modest first step in undertaking an in-depth study of air-conditioning and culture. He discusses American’s southern society to the forefront and how air conditioning has modulated the daily and seasonal rhythms that were once an inescapable part of
southern living. "The air-conditioner, the airplane and television have smoothed out harsh differences in climate, nearly abolished distance and homogenised popular taste... Americans are becoming much less regionally diverse...", Arsenault (1984, p. 599) quoted a 1970 New York Times editorial. Typical arguments on the diffusion of air-conditioning have generally centred on the interrelation between climates, affluent populations and their changing lifestyles. However, there is an underlying contention; that air-conditioning usage has grown beyond the said reasoning and now become a new social expectation, declining tolerance to heat, and is a 'homogenised technology' in day-to-day living (Healy, 2008; Strengers, 2010), creating an unsustainable culture in which populations are becoming too dependent on the air-conditioner (Healy, 2008; Shove et al., 2008, 2014). Walker, Shove, & Brown (2014) argue that temperature alone is not what is driving the 'need' for cooling and argue for insertion of the cultural, scientific and technical work in the discussion of air-conditioning diffusion into everyday practices of living at home.

There is a widely known fact that domestic air conditioning pushes energy demand to its limit and at this point, the air-conditioner is extensively used in the domestic sector of developed countries experiencing hot climate. During the past century, the device has become a staple of American life: 87 per cent of US homes are air-conditioned (HUD, 2010), eclipsing cooling and refrigeration in the residential sector and accounting for around 25 per cent of total electrical energy consumption, as reported by the US Department of Energy in 2012 (Brown & Domanski, 2014). In Hong Kong, air conditioning accounts for 25 per cent of total energy consumption in residential buildings (Chen & Lee, 2010) whereas in Australia, domestic energy usage for space cooling expanded to 73 per cent of households in 2011, the highest among the Organisation for Economic Cooperation and Development (OECD) countries (Chester & Morris, 2011). While most might argue that by making air-conditioners efficient and building houses that maximise their capacity and increase household energy-saving awareness is the way forward; from an energy consumption perspective, however, the use of 300-400kWh/sq.m per year to provide thermally comfortable buildings is simply too high (Strengers & Maller, 2011).

One of the inhibitors is in fact the fulfilment of the required thermal comfort standard. Technically defined as the condition of mind which expresses satisfaction with the thermal environment (ANSI/ASHRAE, 2010) satisfying thermal comfort of a household has become one of the most important aspects and manifestations of building quality houses (Willand, Ridley, & Maller, 2015). In terms of built environment sustainability, Winter (2013) argues that today's built environments endeavouring to create the optimum thermal comfort atmosphere have disseminated air-conditioning culture more widely and created a 'conditioned modernity' – a condition he suggests is dependency on air conditioning that has become more embedded in modern living. Interwoven with the initiative on energy efficiency and built sustainability is a growing framework to understand the way occupants regulate their indoor climate and why they act as they do – ingrained in the approach to tackle individual practices within air-conditioning usage. More recently,
engineers have also started to consider renewable energy for powering air conditioning (Al-Alili et al., 2014) but all these approaches maintain that air-conditioners are essential in whatever circumstances in the future and subsequently treated as unchallenged needs for comfort in buildings.

While air-conditioning is undoubtedly a breakthrough innovation in modern society, allowing multiple-floor buildings to be inhabited even in the summer, has the time come to turn it off? Air conditioning has become a necessity but not a solution – ‘paraphrasing a Stan Cox opening sentence in his book “Losing Our Cool”. This is an important publication if you choose to follow the second route. The goal of more sustainable consumption has been a matter of policy since the oil crises of the 1970s and 1980s, leading towards a vital role for energy conservation on the sustainable development agenda. In terms of comfort, over recent decades, it can be observed that research and policy have focused mainly on the efficiency of air-conditioners and the built environments in which they are operational (Chua et al., 2013), so creating awareness of energy-saving behaviour among occupants (Rosenow, 2012). These have been constituted as the key challenges in the larger push towards sustainable cooling consumption. However, it is argued that such measures, widely pursued in policy and academia, have so far relied upon reducing the energy consumption of air-conditioners, thereby leaving the device unchallenged as natural needs out of natural desire (Chappells & Shove, 2005).

At present, social scientists and anthropologists are those coming out against current cooling practices in general, and air conditioning in particular. Indeed, there is growing literature problematising air conditioning and the ‘conditioned modernity’ it brings (Winter, 2013). Literature within this line stems from Chappells and Shove’s (2005) work to promote debate over the construction of comfort; reflecting how the current pursuit of ‘thermal comfort’ has come to be very narrowly defined and projects a scenario of consumption for the future. Chappells and Shove (2004) provide an excellent review of the paradigm, recalling both histories down the engineering and social practice pathways. They have suggested a more comprehensive framework to understand and cope with the consumption of comfort in the future. This is where debates arise over whether the indoor environments of some geographical locations should be refrigerated by means of air conditioning, and why such needs did not exist before (Chappells & Shove, 2004, 2005). Shove and colleagues have been actively engaged with said discussions regarding room temperature and cooling practices, to understand the culturalisation of air conditioning and how the culture of conditioned-comfort has spread all over the world.

Debate has progressed in rethinking air conditioning and thermal comfort (Nicol & Roaf, 2017), eliciting discussion on the means by which it has now become a well-established technology. Rethinking current cooling practices, spanning almost a century of work, as noted by Nicol and Humphreys (2002) dates back to the 1930s in the work of Bedford in relation to the
comfort of factory workers and was one of the first field studies on ‘natural habitats’. As a result, the need for standardised thermal comfort has been examined and challenged. There are at least 3 components of this research paradigm ingrained study of this kind; namely definitions and concepts regarding how people achieve comfort are flexible rather than fixed, they are localised and not universal, and finally, the view that the relation between ‘supply and demand’ is interconnected; hence technologies such as air conditioning act in both ways in providing comfort as well as ‘scripting’ demand for such forms of ‘cool-comfort’ (Chappells & Shove, 2005). For Akrich (1992), this ‘scripting’ is characterised by an object subtly prescribing or recommending certain practices and outcomes. They have traced the transformation of how indoor air has been ‘materially imagined’ over the last century in the US and is now in transition in other places, which consequently has a bearing upon the future of sustainability around the globe (Shove, 2010). Moreover, Shove et al. (2013) assert that air conditioning creates new cooling needs by eroding our existing heat tolerance.

Acknowledging alternatives and less energy-intensive methods of controlling the indoor climate are desperately needed, more specifically, attending to the institutions and social mechanisms by which expectations and norms of physical, thermal comfort are created, and harnessing opportunities for the introduction of low-carbon, tradition-based alternatives to air conditioning. This alternative prioritises ‘adaptive’ skills in dealing with heat and achieving comfort in the home. Accordingly, comfort needs to be redefined based on social constructs and settings, and away from universal codes and standards like the American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE) (ANSI/ASHRAE, 2004). Winter (2013) likewise proposes a wider debate about the ‘social and the intangible’ to alter the current path of electronic conditioning and envision a new material imagination of air. This would also include consideration on the historical context of comfort in different cultures. This particular area requires the enhancement of research, especially when it comes to sustainable forms of air conditioning for comfort.

More recently, air conditioning has gained ground within the narrative of well-being in the heat. Thus far, the air-conditioner has been widely presented as a protective device in the event of extreme heat, despite this remaining unclear due to the contradictory evidence of the past with Vandentorren et al. (2006) reporting that the presence of air conditioning was inversely associated with mortality from both heat and cardiovascular causes. Whereas Semenza et al. (1996) and a report by the US Centre of Disease Control and Prevention MMWR (2013) affirmed that air conditioning availability and usage during heatwaves does save lives. Maller and Strengers (2011) also reported a similar recommendation given by the Australian Medical Association. Although authorities promoting air conditioning in the event of heatwaves (Maller & Strengers, 2011) and health are consistent, especially regarding current heatwaves, and particularly in terms of urban indoors air-quality and getting us through heatwave events (NIOSH, 2015; World Green Building Council, 2014), there are however research findings that suggest ‘existing ordinary’ actions and
measures during heatwaves help to reduce the loss of life – which are not necessarily dependent on air conditioning. Shove et al. (2008) highlight how Japanese ‘cool biz’ initiatives, which encourage cooler styles of clothing and those which being outdoor rather than encased themselves indoor as the climate warms, as an example that is rooted in unique understandings of living with heat (Hitchings, 2011). Research by Vandentorren et al. (2006) concluded with similar emphasis on such factors, yet also highlighting specific physical arrangements of space including roofs being too close to the floor in attic rooms as essential cooling techniques. They found that actions such as adjusting the routine of daily showers, dressing lightly, and opening windows when the outdoor temperature is cooler than indoors are simple preventive measures that could reduce excessive mortality during hot weather. Finally, methods as those of increasing the efficiency of air conditioning have nowadays sustained the idea of conditioned-comfort and further entrench the device within the realm of well-being under the heat. By making these theoretical underpinnings explicit, Shove et al. (2008) are hopeful of triggering long-term movement, away from conditioned-comfort and developing a systemic understanding of what people ‘normally’ do in the event of heat.

2.3 Social practice and cooling services in the home

Predicated on the discussion above, reducing vulnerability to heat and managing cooling consumption in the home is, in fact, a juggling act. Trajectories towards the quest for ‘sustainable cooling’ and away from air conditioning in the home, while considering reduction of vulnerability to heat in this context, turns our attention toward theoretical reflection and the findings of work on social practices. In reorientating how we perceive consumption, Warde (2005) recognised that energy is used not for its own sake but as part of, and in the course of, accomplishing social practices. Having discussed this particular notion, Shove and Walker (2014) further the link that understanding trends and patterns in energy demand is in essence understanding how social practices develop, change and intersect. There has been much debate about how practices take shape, sustain and change in everyday life. In terms of cooling practices, air conditioning has been positioned as an uncontested need, a natural result of an equally natural desire (Chappells & Shove, 2005), and its widespread usage is subject to dominant technocratic and socioeconomic reasoning. The popular mantra is that air conditioning emerges as societies become affluent and can afford such a device (Shove et al., 2008). While such arguments do present ideas on how air conditioning has come to be a prevalent device it is today, we are yet to understand the fundamental reason for the lack of comfort households are experiencing. Ten years have now passed since Shove et al.’s (2008) special issue calling for a movement of thought on the idea of a ‘comfort zone of engineering’ and to embrace a more ‘dynamic’ perspective on comfort. The authors suggested that meanings and definitions of comfort are not fixed, but rather change and are perceived differently across locations, cultures and contexts. These paradigms lead to a shift in attention towards the practice of comfort itself rather than focusing on isolated attitudes, behaviours and choices (Shove, 2010), which are ingrained the current approach towards unsustainable consumption for comfort. Looking back on how humans previously cooled themselves is an important part of acknowledging ‘passive cooling’ (Healy, 2008) and considering other practices of
cooling (Shove et al., 2014). In the context of domestic households, housing has emerged as the focus of discussion due to the range of previously reported cases as well as our apparent ingrained adaptive cooling capacity that has been discussed before, which potentially can reduce vulnerability (Maller & Strengers, 2011).

In exploring the topic around understanding cooling in the home other than through the use of air conditioning, it is important to engage and widening response to the collective call by the first volume of ‘Energy Research and Social Science’, in exploring deeper social roles in the energy system. The underlying concept is that energy is used to realise energy services (Figure 2.2). Here, energy services refer to the services that energy and energy appliances provide (Modi et al., 2005). In the home, myriad of practices include lighting, heating for cooking, and space heating and space cooling that all directly contribute to economic growth and poverty reduction (Modi et al., 2005). The concept of energy services is therefore pivotal in recognising other routes to achieve comfort and well-being in the home. Further, supplying energy services with less carbon is a key element of climate change policy (Bradshaw, 2010). The conception of realising adequate energy services has consequently established routes towards ‘alternative’ ways of achieving comfort and cooling away from using air conditioning.

![Figure 2.2 Model of delivering energy services into home](Adapted from (Bouzarovski, Petrova, & Tirado Herrero, 2014; Modi et al., 2005))

This discussion so far has highlighted the juggling act between mainstream trajectories to cope with heat in the home through using air conditioning and how the current emphasis on ‘behavioural and technological’ intervention has been considered inadequate in giving a fuller picture. Sahakian and Wilhite (2014) considered how, from this perspective, individuals are perceived as being responsible and who either act as barriers or as catalysts for change. In recent years, growing literature regarding the application of social practice theory on researching consumption and vulnerability to heat in the home has shifted the focus towards everyday practices of cooling (i.e. routinised activities), specifically in relation to influencing cooling practices away from air conditioning (Maller & Strengers, 2011). Theory of social practices, rooted in the mid-20th
The theoretical framework of social practices, draws from the work of Bourdieu (1977), Giddens (1984), Schatzki (2002) and more contemporary sociologists such as Warde (2005) and Shove and Pantzar (2005a), distinguishing three intersecting theoretical concepts (components) that constitute a practice namely know-how, meanings and materials, or also referred to as practical knowledge, common understandings, and material infrastructures by author like Strengers (2009)(Figure 2.3). Social practice theory emerged as a significant conceptual framework to understand households’ everyday actions pertaining to cooling and adaptation to heat, which accommodates their complexities and differences in a localised context. In this conceptualisation, strategies to remain comfortable in the home are regarded as the outcome of socially shared, institutionally positioned and technologically mediated practices (Shove et al., 2014). Through this enriched perspective, it is essential to initiate thinking about elements (materials, meanings and know-how) and how to provide new combinations or replace elements in existing practices to propel them in healthier and less energy-intensive directions, in addition to encouraging the spread of new sustainable cooling practices. Social practices theory is posited to make a meaningful empirical contribution to this study in juggling the energy consumption of cooling practices and well-being in a changing climate (Chappells & Shove, 2005). In focusing on practices, the study moves away from Homo Economicus, which assumes that actors are fundamentally driven by material self-interest, and Homo Sociologicus that positions that actors as having the ultimate power of desire and ability to complete an action (Warde, 2005). “Rather than seeing change in the resource intensity of daily life as an outcome of individual choice, or seemingly external social and economic forces, it make sense to ask about how social practices evolve, and what this means for the use of energy, water, and other resources” (Shove & Spurling, 2013, p.3). In this study, practice is defined as;

"A routinised type of behaviour which consists of several elements, interconnected to one another; forms of bodily activities, forms of mental activities, things and their use, a background knowledge in the form of understanding, know-how, states of emotions and motivational knowledge; forms so to speak a ‘block’ whose existence necessarily depends on the existence and specific interconnectedness of these elements, and which cannot be reduced to any one of these single elements” (Reckwitz, 2002, p.249).

Study of practice, therefore, is to examine an interconnectedness of bodily routines of behaviour, mental routines of understanding and knowledge and the use of objects (Reckwitz, 2002). In addition, Shove et al. (2012) have further simplified this into three elements; namely materials, meanings and know-how, equally taking part both in characterising practice entities and...
in changes to how practices unfold. Each element is interconnected and cannot be reduced to any one of these single elements for the existence of the practices (Reckwitz, 2002).

Firstly, meanings are the ‘morals behind the behaviour’ that provide the cognitive movement of the body, skills and which elements to use (Figure 2.4) in the performance of practices (Shove & Pantzar, 2005a; Spurling, Mcmeekin, Shove, Southerton, & Welch, 2013). While authors in the area have termed the elements differently, with Warde (2005) and Strengers (2009) employing ‘engagements’ and ‘common understanding’ respectively, all authors highlight the importance of a form of mental activity that conveys a feeling of ‘oughtness’ in choosing ways of doing things. Hence, concern of this study are the meanings that represent intentions, perspectives, opinions, common sense, and all the states of mind in deciding appropriate ways of practising. In cooling practices, the ‘thermal comfort standard’ has found its way into positioning certain coolth into a common-sense understanding of comfort. Shove et al. (2008) however bring up how comfort is experienced differently in different locations; some practices might not involve cooling the surrounding air at all.

Figure 2.3 Elements of social practices

Adapted from Shove et al., 2012
Like a film script, technical objects define a framework of action together with the actors and the space in which they supposed to act” (Akrich, 1992. p. 208)

In discussion of materials, Shove et al.’s (2012) approach is to emphasise the constituitive role of things and materials in everyday life. Moreover, the authors acknowledge how practice theory and actor-network theory have a common position regarding the matter of materiality, or as Latour (1992) described ‘masses’, in which the latter argued that the material world pushes back on people because of its physical structure and design. Elements of materiality had entered the frame of practice theory earlier through the work of Schatzki et al. (2001) and Reckwitz (2002). Schatzki states that how understanding specific practices invariably involves apprehending material configurations. While Reckwitz uses the term ‘prefigure’ to illustrate that materiality makes some actions easier or harder, enabling or constraining certain practices. This process is described by Akrich (1992) as ‘scripting’, whereby an object prescribes or subtly recommends certain practices and outcomes. A washing machine, for example, ‘scripts’ a range of methods or ‘cycles’ used to produce appropriately clean laundry. Likewise freezers that alter the way we shop for fresh food and which require chilled facilities to be stored. The purpose of this study, material arrangements, or simply referred to as ‘materials’ throughout this study, are defined as objects, tools, infrastructures, hardware and devices, which practice is ‘intrinsically connected to and interwoven with’ (Reckwitz, 2002; Shove et al., 2012). The house and its infrastructures, and cooling devices such as the air-conditioner and fan, are largely studied as the material elements of cooling practices in the home. There are two dimensions of normality given; firstly, how the infrastructure of the building promotes the use of cooling devices such as air-conditioners, and secondly, how the
Prominent theorists have disagreed in their interpretations of skills (or know-how or practical knowledge). Early scholars’ understanding of practical knowledge, for example Bourdieu (1977) and Giddens (1984), refers to a deeply embedded layer of understanding that is replicated in nearly everything people do. What makes sense for a person to do at any given moment is, to no small extent, informed by what they have always done (Schatzki, 2002). Correspondingly, Shove and Pantzar (2005a) highlight forms of competence and know-how necessary for the doing of practices. Strengers (2009) defines practical knowledge as a submerged layer of information and understandings that inform everyday action; while Gram-Hanssen (2010) talked about knowing why and how to do something. In consensus, all can be said to agree on the embodiment of skill in how to do things being informed by an element of meaning. Regarding cooling practices; when a person feels warm, they draw on their skill to establish strategies such as taking baths, opening windows, reducing layers of clothes, shutting curtains and turning on the air-conditioner. Taking a shower, which would typically constitute a skill in cooling practices, is now regarded as a routine in everyday life around the world, which has been subject to scrutiny in lowering energy consumption in the home (Hand, Shove, & Southerton, 2005).

Within these, taking a shower and clothing have been practices in their own right. When the Japanese government introduced the so-called ‘Cool Biz’ programme back in 2005 as part of an effort to reduce electricity consumption, it was not only acting to limit the use of air conditioning, but recognised clothing as a direct counter-measure to maintain comfort by allowing a more lenient dress code for office workers. Shove et al. (2012) argued that this represents a concerted effort of targeting different ‘bundles’ of practices in order to reduce the intensity of air-conditioning usage. By emphasizing clothing as another way to achieve comfort and allow office workers to dress ‘comfortably rather than formally’, such an intervention appears to have not only successfully reduced CO2 emissions by an estimated figure of 1,140,000-tons (Ministry of Environment (Japan), 2006), but also conveyed the fact that air-conditioning usage is somewhat intensified by the clothing we wear. Therefore, Cool Biz is influential in the way it recognised that a concerted effort within a bundle of cooling practices that involved some practices of its own, for example, clothing and bathing, could then limit the use of air conditioning for comfort.

My opening contention is that the theory of social practices is still lacking in application to the context of tropical countries, in researching more deeply into cooling practices in the pursuance of a contextual understanding of vulnerability and adaptation to heat. Few studies have made use of such a contemporary framework (see, for instance, Khalid and Sunikka-Blank, 2017) in the matter of everyday consumption, deployed in the context of developing countries and nations that are predominantly rich with a myriad of cultures. Although the fact that the social practices framework
was historically developed in the Western context, it seems well-suited for analysing the development of cooling practices in the tropics, particularly in providing alternative ways to approach issues around heat and its challenges. On the matter of studying air conditioning in the tropics, this route is poised to be more ‘holistic’, but largely underexplored, especially given the richness of traditional practices embedded in the cultures of the tropics prior to the arrival of air conditioning. This avenue might prove to be significant in steering the current ‘conditioned-comfort’ pathway toward a more sustainable manner, which upholds ‘adaptive’ strategies for comfort (Nicol, 2004). Further, this study considers the merits of recent claims that consideration should be given to practices that incorporate elements beyond the behavioural and technological.

2.4 Advancing attention towards the tropics – greater risk, richer in ‘remedies?’

There is now a huge body of work rethinking consumption with respect to cooling in the home, with its recent theoretical consolidation resting outside the place where it matters most – the tropics. This is most obvious when contemplating the situation of rising frequency and intensity of heatwaves in these parts of the world, and where common ground in the reduction of vulnerability to heat is by promoting the use of air conditioning (Maller & Strengers, 2011). A recent study by Mora et al. (2017) points to the tropics bearing the greatest risk of more deadly heatwaves in the future. They go on to explain that although humid tropical areas will experience less warming than places in higher latitudes, those in the tropics will be exposed to the greatest increase in the number of deadly days over time because the higher relative humidity in tropical areas requires less warming to cross the deadly threshold. This is not surprising as the warning has echoed before (Fischer & Knutti, 2015; Mathiesen, 2015). Current scenario of global warming involves a global rise in temperature, contributing towards hotter seasons in tropical countries (Mathiesen, 2015; Sivak, 2009), while simultaneously being notably under-represented in the heatwave and health-related impact research. Campbell, Remenyi, White, and Johnston (2018) have reviewed studies within this line of inquiry and summarised significant findings that link heatwaves with mortality and morbidity across the region. In India, studies found correlations between heatwaves and all causes of mortality in the city of Ahmedabad (Azhar et al., 2014), and mortality specifically from non-infectious disease in Vadu (Ingole, Rocklöv, Juvekar, & Schumann, 2015). In Vietnam, the research linked heatwaves to all causes of hospitalisation (Phung et al., 2017). There are also studies that have covered tropical regions while examining specific causes, specific populations or high ambient temperatures, which found elevated rates of cardiovascular hospital admissions during high temperatures in Vietnam (Phung et al., 2016), elevated mortality for strokes and cardiovascular disease during high temperatures in Puerto Rico (Méndez-Lázaro et al., 2018), and higher mortality rates during the hottest season in Burkina Faso (Kynast-Wolf, Preuß, Sié, Kouyaté, & Becher, 2010). Outcomes of these studies lead us to suggest that this region, in fact, is prone to extreme heat health-related impacts, but is deemed as requiring better characterisation of the risks (Campbell et al., 2018).
As mentioned earlier, globally and likewise in the tropics, research on heat stress has relied upon large-scale epidemiological studies within the boundary of public health. These studies are important to establish who is the most vulnerable and provide cross-country comparison to establish patterns and initiate large-scale study. However, there are now calls for deepening understanding – the understanding built on “particularities of culture, built form, social organisation and social expectation that contribute to the production of vulnerability in context, rather than in the abstract” (Brown & Walker, 2008, p. 370). The research to understand these social and contextual factors behind vulnerability, and hence adaptation, stem from everyday routines and practices recognised by Brown and Walker (2008) to require doing studies in a specific context. In the tropics, complexities of ‘on-the-ground’ data are notably limited in current times (Maller & Strengers, 2011). Extending questions on why and how vulnerability is experienced in the everyday routines and practices in this part of the world not only provides grounded information on how vulnerability is reproduced in everyday life in a specific context, it will provide insight into detailed adaptation opportunities grounded from its past ‘ordinary’ adaptation, away from immediate recourse to air conditioning, which will otherwise goes unrecognised (Maller & Strengers, 2011).

2.4.1 Rich tradition-based cooling practices

In particular, a reorientation of focus towards energy services highlights roles of tradition-based cooling practices in the future energy system. Sovacool (2014) reiterated that how and for what purpose people use energy is a significant cultural and anthropological question and might be an area of importance moving forward to be explored. In the IPCC Reports (2007, p.12) there was recognition given to ‘indigenous knowledge’ as an invaluable basis for developing adaptation and
natural resource management strategies in response to environmental and other forms of change. This was later reaffirmed in the 32nd session of the IPCC (2010), indigenous or traditional knowledge may prove useful for understanding the potential of certain adaptation strategies that are cost-effective, participatory and sustainable. Green and Raygorodetsky (2010), who had been tracking such progress, have mentioned that no such types of information appear in previous IPCC assessments; the reason being that traditional knowledge either appears in grey literature outside peer-reviewed educational forums or remains in an informal form without proper documentation for the scope of IPCC processes. The call for comprehensive understanding of the socio-contextual factors behind vulnerability to heat will build on the adaptive capacity stemming from these traditional practices, which are embedded in the local practices of cooling and adaptation to hot weather for comfort and well-being (Brown & Walker, 2008; Maller & Strengers, 2011; Winter, 2016). This will not only reignite cooling practices of the past, but will also build on the dynamism that exists in past practices, which are in line with adaptive comfort and away from relying on air conditioning. This situation requires research and methods that aim to understand householders’ daily lives and, in particular, daily cooling practices in hot weather that are implicated in the creation and reproduction of vulnerability and how these factors can be modified to contribute to their adaptive capacity. As similar research is being done by Maller and Strengers, (2011), the present study will identify alternative pathways to adaptation that are not necessarily dependent on air conditioning. Outcomes of the study will especially highlight how each culture differs in realising energy services such as cooling in the home.

“...we must research and develop those 'simpler' and not-advanced technologies which majority of the people in the 'third world' use and live within...particularly with the indigenous technologies of cooling...” (Cain, Norton, Afshar, & Daraie, 1976, p.60)

At a glance, the literature on ‘traditional cooling’ has yielded what we can see as a huge interest in traditional cooling technologies before air conditioning in this part of the world. People living in hot climates have notably developed many different technologies for coping with the heat, many of which have been forgotten and ignored (Cain et al., 1976). The ‘traditional’ house responds to the climate in its design and architecture. Malama and Sharples (1997) noted that the roofs of traditional Zambian houses, which are round in shape and the wall plates, effectively reduce the indoor temperature during the hot season. In Singapore, a façade design, window-to-wall ratios and the use of shading were found to improve the comfortable indoor environment (Liping & Hien, 2007). Across these studies, however, understanding of cooling strategies by each culture is based largely on the aspects of ‘materiality’. In all of this, the journey is to highlight typologies of ‘vernacular architecture’, and ‘traditional cooling technologies’ in looking towards environmentally friendly materials, design and to outline bad architecture in facing a hotter climate (Mabaleka, 2010).
In their exploration on the question of practicality of this vernacular tradition in comfort, Foruzanmehr and Vellinga (2011) argued that the current discourse is too narrowly focused on the properties of buildings and warned against falling towards a ‘reductionist’ view that generalises these technicalities in thermal management based purely on performance indicators for future sustainable design for comfort. In their findings, cultural considerations at times tend to be more influential than the thermal performance of the house in respondents’ decision-making towards comfort. For example, they reported that thermal comfort and temperature variation surveys showed that the basement is the most effective feature of vernacular passive cooling systems, providing constantly comfortable thermal conditions during hot periods; and the data from their questionnaire survey and interviews confirmed its efficacy in this respect by indicating that inhabitants were aware of the fact that the basement is comfortably cool in summer and performs well in reducing the indoor temperature to a level that falls within the comfort zone. Nevertheless, the results of the questionnaire survey also showed that basements are no longer a preferred choice as a living area for residents in summertime, even during very hot spells. The results by their study revealed that very few people – only 8% of the survey respondents – selected basements when asked to identify passive cooling strategies. Instead, they are mainly regarded as useful storage places, and observations showed that they are today indeed commonly used for that purpose.

This has highlighted that investigating thermal performance needs to be enhanced with users’ perceptions and behaviour (Foruzanmehr & Vellinga, 2011). While varied in terms of their thematic scope and methodological approach of social practices, one related underlying idea that emerges from this line of study is the necessity to engage socio-cultural and practical factors in the understanding of the survival of vernacular traditions (Foruzanmehr & Vellinga, 2011). If conclusions about the viability of this tradition are to be drawn, Foruzanmehr and Vellinga (2011) argued that incorporating a holistic approach involves social, cultural, economic and environmental variables attributed to the extensive exploration of vernacular building traditions. I address this later on in Chapter 5 regarding the exploration of traditional cooling practices of Malaysian households, involving the complexities of traditional cooling practices, in which elements of meanings and skills are intricately related to the physical conditions of Malaysian vernacular houses. Such a thorough approach to traditional cooling practices has sought to harness important lessons embedded in tradition-based cooling. At this point, the understanding of traditional cooling practices as well as comparing them to non-air-conditioning practices could possibly be a crucial step, and just in time, to reignite practices from the past. Researching the elements of these practices, and preservation of each element within traditional practices, is crucial in the effort to re-emerge such practices at the current time.
2.4.2 Re-emerging these ‘remedies’ from the past

Previous section indicates potential knowledge areas that could be generated from past practices in terms of reducing vulnerabilities and increasing adaptive capacities in the event of heatwaves in the future. The question of how this pathway might be answered has started being explored. Changes in practices are processes that are essentially uncontrollable, but intervention can be made to influence the changes that are more rather than less sustainable (Shove et al., 2012). The issue of cycling in the cities of Amsterdam and London is discussed by Shove et al. (2012) and how both re-emergences have been influenced by the time factor and values. With regard to time, the timing factor for the authors is crucial in tripping such a transition in practices, which affects the pace of changes that are intended. When efforts to resurrect cycling practice in the Netherlands’ city of Groningen and London were compared, the proportion of cyclists on the road in the cities at the start of the effort were different (Shove et al., 2012). While policies are underway in Groningen to restrict car use and build up cycling infrastructures through compact land-use planning, 40 per cent of local trips are still made by bike. This statistic shows that cycling is considered a normal thing to do at the moment of transition to encourage a yet more sustainable mode of transport such as (more) cycling being triggered. However, that is not the case with London, where cycling only constituted 1–2 per cent of local trips being made during the start of the effort to promote cycling. Nevertheless, Shove et al. (2012) argue that concerted efforts such as the congestion charge (where cars have to pay an entrance fee to central London), improvement of cycling infrastructures, and investment in designing bike routes have coincided with a recent surge of cycling in the city, which might imply a positive effect underway as cycling will become more normalised as people participate.

(Bring to Malaysia) There is a call regarding the importance of social and contextual factors within the issue of vulnerability to heat in the home (Brown & Walker, 2008) as well as a localised, holistic, integrated approach (Foruzanmehr & Vellinga, 2011) in harnessing meaningful adaptive capacity from cooling traditions in this part of the world, hence this study extends such a methodological stance in the case of Malaysia. In discussing the context in which practices in relation to climatic heat and health as well as outlining fruitful avenue to venture in, especially in the journey towards increasing holistic adaptation strategies, rather than on-size-fit-all air conditioning, towards promoting low carbon alternative to remain cool in the home. These issues are reflected in Malaysia, a country in the deep tropical region, where in the space of four years two heatwaves were declared by the government with temperatures rocketing to 38 degrees Celsius, breaking local records and with many unusual hot days now being reported from January to June every year (MetMalaysia, 2015a). While an increasing trend of air-conditioning usage is prevalent, more than half of households still do not use air conditioning in any space of their home; prompting the perception that greater adaptive capacities lie hidden beneath the complexities of their everyday cooling practices.
In the next chapter, I zoom in to the case of Malaysia. First, the application of social practices in the matter of energy consumption redefines the increase of modern cooling practices as the source of rising energy consumption. Second, the horizon of the current view on reducing energy consumption for the cooling segment is extended by looking at ‘traditional’ cooling strategies as a practice on their own, consisting of the materiality of vernacular houses that is embedded in the passive cooling endeavour to reduce demand for cooling services. In addition, I expand exploration into embedded knowledge in skills and understanding of comfort in such traditional cooling practices. Third, while these two factors have reframed understanding of the modern and traditional, and how the former emerged while the latter persists, this invites solutions that are naturally ingrained practices from the past. I therefore argue that re-emerging traditional practices in everyday living is the way forward. The point here, and worth noting, is not to create nostalgia for tradition-based practices and their ‘golden era’ because, as Winter (2016) argues, this has little viability within today’s high-rise high-density cities. Instead, the aim is to point out to constitution of cooling practices – it is a social and material, tangible and intangible element – that forms longevity of non-air-conditioning comfort regimes of the future. These constitute the content of this thesis, and I will introduce this in the next chapter when I discuss the case study.
Chapter 3 Case study, methodology and analysis

Outcomes of the previous literature review indicate a tropical region highly prone to extreme heat and health-related impacts, while research capacity is deemed to be low (Campbell et al., 2018). In particular, it points towards lacking comprehensive approach towards constructing vulnerabilities to heat in everyday life in local context. Meanwhile, more in-depth study regarding adaptation in hot weather would bring about the realisation of air conditioning as a short-sighted solution and forefront the importance of harnessing alternative cooling practices in the heat. In light of the knowledge-rich cooling traditions in this part of the world, this study extends such a theoretical and methodological stance to the case of Malaysia, a deep tropical region, where in the space of four years two heatwaves were declared by the government with temperatures skyrocketing to 38 degrees; moreover, the breaking of local records with frequent unusual hot days have been reported from January to June every year (MetMalaysia, 2015a). While a significant part of the world where air conditioning is prevalent, more than half of households in Malaysia still do not use air conditioning in any space of their home; which prompts the notion that sufficient adaptive capacities lie hidden beneath the complexities of their everyday cooling practices. This chapter begins by zooming in to the case of Malaysia. Next, I discuss the principal methodology involving ethnographic interviews with the supplementary device of a house tour, self-reporting diaries, and temperature measurements. It was necessary to consider multiple instruments of data gathering to more comprehensively investigate the issue at hand, so as to provide as much information as possible to ensure in-depth analysis of an everyday living myriad of complexities that could influence participants’ practices. Finally, the chapter will review analysis of the data.

3.1 Zooming in Malaysian households

In a deep tropics country like Malaysia, heat is a common issue where the frequency of heatwave occurrences has increased in recent years. Records from the Malaysian Meteorological Department (MetMalaysia) indicate more frequent heatwaves between January and April (The Star, 2015). In 2016, Malaysia suffered its worst heatwave in history when the temperature soared close to 40°C and indoor temperatures were recorded at one time to be 35°C. The country has a three-tier colour-coded warning system for heatwaves that helps agencies take appropriate action. In January and February 2016, a level 1 alert of heatwave was issued in ten areas, nine in the east and one in the central region of its Peninsular (Al-Jazeera News, 2016). These ten areas recorded maximum temperatures between 35 and 37 degrees Celsius three days in a row. Consequently, in April on the same year, Malaysia was hit by its worst heatwave; a level 2 alert was issued with a record-breaking temperatures of 39 degrees Celsius, forcing more than 200 schools to close (Al-Jazeera News, 2016) – 40 degrees Celsius and above for three days the same would trigger the level 3 alert and be declared a national emergency (MetMalaysia, 2015a).
Table 3.1 Population Housing Census of Malaysia (DOSM, 2018)

<table>
<thead>
<tr>
<th>Demographic</th>
<th>2010</th>
<th>Projection 2020</th>
</tr>
</thead>
<tbody>
<tr>
<td>Population (million)</td>
<td>27.5</td>
<td>33.8</td>
</tr>
<tr>
<td>Households (million)</td>
<td>6.4</td>
<td>8.2</td>
</tr>
<tr>
<td>Households size</td>
<td>4.2</td>
<td>4.1</td>
</tr>
<tr>
<td>AC ownership percentage</td>
<td>22.3</td>
<td>48.7</td>
</tr>
</tbody>
</table>

With climate change expected to increase the frequency, duration, and intensity of heatwaves in Malaysia, the everyday issue of vulnerability and adaptation to heat warrants additional attention. Report on Malaysia by the WHO (2015) suggested that diseases such as malaria, cholera, and dengue as well as heat-stress are likely to rise with increased temperatures and changes in precipitation patterns (Air-conditioning use is on the rise) Meanwhile, significantly more homes have become air-conditioned during the past two decades in Malaysia. Generally, the penetration of residential air conditioning has been slow but began to pick up momentum in the late '90s. There was barely 1 per cent domestic ownership back in the 1970s, which gradually increased to 5 per cent by the 1980s, while during the same period air-conditioning had already installed by more than 70 per cent of households in the US (Lutzenhiser, 1992). This period from the 1970s to 1990s is when air-conditioning was expensive to install and run. Malaysian households’ fascinations with this form of mechanical cooling saw the number of homes with air-conditioners double from a mere 7 per cent in 1990 to 16.2 per cent at the turn of the millennium. Only in the new century did a significant burst of growth occur, which then rose to 22.3 per cent in 2010 and was projected to be approximately 48.7 per cent by the year 2020; a more than twofold increase (Kubota et al., 2011; Mahlia et al., 2002b) (Figure 3.1). In addition to that, the divide between urban, rural and poor households in air-conditioning usage is summarised in Figure 3.2 below.
As in many other countries with a similar climate, a significant part of the Malaysia’s energy consumption is the result of maintaining a comfortable indoor environment — that is, by the use of air-conditioners in the home. Household electricity consumption and air conditioning research conducted to a limited extent in Malaysia found that air-conditioners consumed the largest amount of electricity in the home annually. The residential cooling segment has already accounted for 29 per cent of household energy consumption with air-conditioners contributing to 17 per cent of yearly household electricity use (Kubota et al., 2011). Figure 3.3 illustrates how air-conditioner energy usage stands above other household appliances, and Figure 3.4 outlines its usage per 24 hours. However, this research by Kubota et al. (2011) pointed out that the high energy
consumption of air conditioning is not necessarily due to the level of ownership but usage patterns such as low temperature settings and long periods of operation.

![Energy consumption by device](Figure by Kubota et al., 2011)

**Figure 3.3 Energy consumption by device** (Figure by Kubota et al., 2011)

<table>
<thead>
<tr>
<th>Device</th>
<th>Hours of Usage (24 hours)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Refrigerator</td>
<td>24</td>
</tr>
<tr>
<td>Thermo pot</td>
<td>18.87</td>
</tr>
<tr>
<td>Television</td>
<td>8.23</td>
</tr>
<tr>
<td>Ceiling fan</td>
<td>7.91</td>
</tr>
<tr>
<td>Stand fan</td>
<td>6.37</td>
</tr>
<tr>
<td>Air...</td>
<td>5.9</td>
</tr>
<tr>
<td>Fluorescent lamp</td>
<td>4.87</td>
</tr>
<tr>
<td>Desktop PC</td>
<td>4.68</td>
</tr>
<tr>
<td>Laptop PC</td>
<td>4.23</td>
</tr>
<tr>
<td>Washing</td>
<td>1.68</td>
</tr>
<tr>
<td>Rice cooker</td>
<td>1.36</td>
</tr>
<tr>
<td>Water...</td>
<td>1.2</td>
</tr>
<tr>
<td>Electric...</td>
<td>1.12</td>
</tr>
</tbody>
</table>

![Household amenities' hours of usage / 24 hours](Figure 3.4 Household amenities' hours of usage / 24 hours)

Adapted from (Kubota et al., 2011)

The study of Kubota et al. (2011) provides a detailed overview regarding usage patterns of air conditioning in the home. It was found that 94 per cent of air-conditioners were installed in the main bedroom with primarily night-time usage, and in particular during sleep time. Only 10 per cent of households used air-conditioners during the day. The proliferation of air-conditioning usage is typically widely reported as a direct result of climate change, socioeconomic factors, as well as
reduction in cost of ownership (Yau & Pean, 2011). Climate-wise, Malaysia is characterised by uniformly high temperatures and humidity, receiving an average of 6 hours of sunshine per day, making the average air temperature between 23.7 and 31.3 degrees Celsius (Hussein, Rahman, & Maria, 2009; MetMalaysia, 2015b). On paper, Malaysia has high per-capita income, better income distribution, high technological development and a high level of education (World Bank, 2018).

In parallel with international research (Strengers, 2009), this study suggests that cooling practices involving air-conditioners are incredibly dynamic and varied. It is therefore very difficult to make assumptions about them. If energy-saving objectives in modern Malaysian houses seek to be addressed, understanding these practices, what they constitute, and how they are changing is clearly essential. In recent years, the diffusion of residential air conditioning has already received particular attention. In the matter of pursuing the rising energy demand for comfort and well-being under the heat, living ‘green’ has been prioritised in the Eleventh Malaysia Plan (EPU, 2016). The latest five-year national plan, spanning the period 2016 to 2020, has exclusively highlighted the need for households to live a low-energy lifestyle. As the main energy service in the home, cooling is in the spotlight and poses the most significant saving. This is thus poised to be the prime agenda in the coming years since the government is seriously looking towards creating a low-carbon Malaysian society by 2035 (Gan et al., 2013). As far as a comprehensive account is concerned, air conditioning was mentioned exclusively regarding the issue of rising household energy consumption in various reports (DOS, 2014; IEA, 2013; SEDA, 2015). As is often the case, following policy on reducing consumption of cooling services came down to households doing their bit by opting for energy-efficient air-conditioners and targeting the behaviour of consuming air conditioning in an energy-saving manner. Currently, in the move toward lower energy consumption for domestic cooling appliances, the government introduced a programme to award energy-efficient certificates to the most efficient air-conditioner for its specification. As the mainstream agenda were, current local initiatives seem to be on the pathway of divided technical and behavioural (Strengers & Maller, 2011). Initiatives have been structured towards technological advancement such as the efficiency of air-conditioners and the environment they serve. However, choosing this route and leaving air conditioning unchallenged needs to be proven to be less effective, as academia around the world has forewarned (Brown & Walker, 2008; Chappells & Shove, 2005; Strengers, 2008) with the increase in air conditioning further entrenching households into homogenisation in the conditioned-cool indoor environment. This study takes the view that drastic action to stem such progress and designating air conditioning as a ‘basic amenity’ in the national household census needs to be initiated.

Therefore, any effort to stem residential energy consumption should start with reducing dependence on the device as the main cooling method in the home — a system-based approach needs to be deployed towards influencing household cooling practices back to less energy-hungry methods. The fact that a majority of households in Malaysia live without air conditioning at the current time’ poses a significant starting point. First of all, vast literature indicate that Malaysians
are tolerating higher thermal conditions, having been able to adapt to their local thermal conditions (Hussein et al., 2009). Many studies are now leaning towards the promotion of naturally ventilated buildings as the way forward (Hassan & Ramli, 2010; Hooi & Toe, 2013; Hussein et al., 2009; Rahmah & Zaki, 2008). The rise of an air-conditioned age means the era of brick houses has led to the ‘extinction’ of the need for the timber house and its ‘passive architecture.’ As the hot-humid climatic conditions developed during the last century, a local house designer has turned their attention to how previous ancestors coped with this climate with the absence of air conditioning. Despite the relatively high air-conditioner take up in urban areas, most rural Malaysians have lived without the device for some time now, and growth in its uptake was reported to be rather slow in this segment of the population (DOS, 2009). This report identifies low air-conditioning usage to be the intersection of two elements: rural areas and those living in timber houses. This effectively means that there is less possibility of owning air conditioning if you live in rural areas and have a timber house. This observation suggests that most of the population living in rural areas and more than half of those living in urban areas possess other strategies for coping with and adapting to heat that may not involve air conditioning.

Traditional cooling practices are argued to constitute more than just non-air-conditioning behaviour and vernacular houses, and have not been comprehensively examined before within the theoretical framework of social practices. Nonetheless, it has been noted and realised that the way traditional practices have been previously discussed means little likelihood of them being adopted, especially in the context of high-rise buildings and high density cities (Winter, 2016). Against the backdrop of vulnerability and adaptation to heat in the home today, reintroducing houses surrounded by a natural climate, like the rural village, requires spaces in cities that no longer exist — the cost to build a timber house nowadays is likewise beyond the means of many citizens. Hence, in focusing on traditional cooling as a social practice, this study looks into previous generations’ dynamic forms of living under heat before air conditioning but goes beyond ‘romanticising’ the past. Focusing on practices, in fact, bring systemic thinking to resurrecting the elemental nature of practices of the past, its point to those material and social dynamics that we now know, comprised in traditional practices. By tracing patterns of persistence in materials, skills and meanings that constitute traditional practices rather than the ‘technical and behavioural’, the critical task for re-emerging practices of the past is moving towards understanding the arrangement of materials, together with the sorts of meanings and skills required to stabilise past practices for the current times and current material arrangements. In this context, tracing the persistence of traditional practices in the form of non-air-conditioning practices of households, I argue, represents a relationship with the past that remains common and widespread; and hence enables traditional practices to remain stable in the form of non-air-conditioning practices.

Malaysia is an interesting case study to further explore in depth the binary conventions of modern and traditional cooling practices in the home. The three empirical chapters that follow discuss three themes demonstrating how they are applicable to exploration of modern air-
conditioning cooling practices and traditional non-air-conditioning cooling practices as well as the pursuit of creating socio-contextual knowledge and adaptive capacity in the case of Malaysia. I start with the opening contention that there is limited understanding of cooling as practice in households. Therefore, this study suggests the first step towards such an awareness, like all practice theorists would agree, is to create understanding both in terms of how modern practices emerge in everyday life and how traditional practices persist in households. A current significant portion of households living without air conditioning means that a future lies ahead away from conditioned-comfort. I forwarded this proposition to be the argument in the third and final empirical chapters of the study, looking at the dynamic between the twin suggestions of a future lower-energy alternative for cooling as an adaptation to heat and reducing vulnerability to heat in everyday living.

3.2 Ethnographic interview with house tour

In researching practices, the method employed needs to emphasise investigation into what people routinely do and why they do it in the flow of everyday life. Many years previously in Wilhite and Wilk (1987) prompted the use of ethnographic interviews to obtain a closer, more accurate representation of behaviour regarding household energy use. This development came at a time when the dominant approaches had been large-scale macroeconomic models as well as a microscale approach addressing individual psychology and behaviour to study issues of this kind, involving a full range of methods such as statistical reviews of end-user data, survey questionnaires, and interviews. Widely applied in anthropology and social sciences, an ethnographic interview implied a more open-ended form of interviewing through the adoption of a conversational mode with the respondents. This method in Wilhite and Wilk’s study in Santa Cruz, California subsequently gathered an in-depth understanding of the cultural context of energy use and variation in behaviour. The approach has of late become widely applied in researching household everyday comfort practice. In particular, many researchers have employed this method to gather a systemic understanding of comfort practices in the home in the context of everyday life. In Denmark, Gram-Hansen (2010) used a similar in-depth qualitative interview approach in researching the variation of daily energy consumption by households living in identical houses, which provided an understanding of different social, cultural and material structures of practices among households. Day and Hitchings (2009) applied similar methods in deepening understanding of winter warmth management in Birmingham, UK.

Particularly with regard to studying heat adaptation and cooling practices in hot weather, this kind of approach has been used regularly in recent times. Wilhite et al. (1996) previously implemented the approach in their study of cultural aspects of energy use in Japan and Norway, which highlighted the cultural and economic factors behind energy use with policy implications in coping with energy-intensive routines and practices in the home. Specifically, they demonstrated
variation of air-conditioning usage and how this affects the use of blankets during sleep as well as how people dress in the house. More recently in Australia, Strengers and Maller's (2011) ethnographic interview approach examined Australian households' cooling practices that yielded a deeper understanding of daily comfort practices in hot weather, which has informed peak demand management policy. In short, ethnographic interviews on cooling practices explore elements behind mundane routines such as thermostat adjustment, moving around the house, the use of cold water on hot days for drinking and bathing as well as those highlighted in the context of social practices, namely materials, meanings and skills. Through conversation with households in the course of everyday life, this method allows for recalling 'behaviours that people often do without thinking' and regarded as a 'holistic' approach (Day & Hitchings, 2009, p.6)

In light of the absence of more in-depth exploration of practices as crucial as cooling in the context of Malaysia as well as, this study believes, across all tropical countries; the same methods have been called upon and applied in my study in researching cooling practices in Malaysian households with the aim of providing a comprehensive understanding of these practices in the land where it matters most. Particularly, in highlighting cultural of the tropics in Malaysian households in daily life rather than an abstract understanding, the interviews were hence conducted in a less rigid and more conversational manner. There are numerous studies of this kind that have outlined the relevant types of indicators for designing the interview questions. In particular, this research has devised its questions from the studies of Brown and Walker (2008) and Strengers (2009). These two studies were utilised based on their similarities in terms of exploring the issues around heat vulnerability in residential homes and cooling practices. Questions have been categorised into four (4) themes; namely household biographies, housing characteristics, keeping cool and comfort strategies, and perceptions of well-being under the heat. Although a set of numbered questions organised in themes were prepared for the interviews (see Appendix 1), the flow of interviews was unrestricted without close adherence to the number of themes to be uncovered regarding daily practices and routines, rather than any answers that were thought about in advance. The technique of asking questions varied across households and closely mimicked the local custom of ‘Borak’ in nature. The performing of Borak, or ‘berborak’ — also known as ‘berbual’, is by definition a friendly, informal conversation, usually about things that are frivolous and unimportant (DBP, 2019). This format was appropriate for the type of information this study seeks to uncover, namely the routine cooling practices of everyday living. Berborak and berbual as the method of conducting interviews is popular in qualitative research (Hamzah, 2010; Jasmi, 2012). One of the householders interviewed at the conclusion of her sessions referred to these as ‘experience sharing’ rather than interview sessions as she had presumably thought.

"Oh, no worries at all... it was a relaxing session I must say, I was a bit scared at first, this is my first time involved in this kind of interview for a study, at this age, when I read earlier that questions could be needing a bit more brain activity at this early time of the day (laughter), but it
was more like me sharing how my day in the house goes, all the activities that I do every day, so it was comfortable in the end”

[Maznah, 56-year-old pensioner]

By his method, I could subtly repeat questions without householders being aware these were probing questions, ‘prying into’ their daily lives (Strengers, 2009). All interviews were conducted and transcribed in the Malay language. During the writing process, quotes were translated into English and scrutinised for accuracy by a lecturer in Malay teaching at a university in Malaysia. The study chose this particular geographical setting of the Peninsular as the region has relatively little or no variation in temperature (Hassan, Zin, Majid, Balubaid, & Hainin, 2014; MetMalaysia, 2015b). Less consideration was given to the geographical matter of selecting households since it was deemed irrelevant for the fact that hot weather thermal comfort and cooling is prevalent throughout the country. Nevertheless, the use of the Peninsular region forms uniformity of climate and variability of dry and hot spells factors (Mohd Deni, Jamaludin, Wan Zin, & Aziz Jemain, 2009).

A total of 24 representatives of households were interviewed, consisting of 12 households who use air conditioning and the remaining 12 who do not using air conditioning at home. Figure 3.5 below depicts the participants’ mapping across the Peninsular of Malaysia (Peninsular). The sample was designed to include people living in various types of houses, namely traditional ‘vernacular’ houses, landed properties, and apartment’s houses varying in rural-urban composition. The study identified ‘rural’ and ‘urban’ as its categories of locations for households. Urban relates to those areas with populations of more than 10,000 and acknowledged as special development areas (DOS, 2014). By including a low sample size, the aim of the study was not to generalise its findings statistically but to ensure that a detailed examination would be possible through in-depth interviews and observation. The sampling scheme can best be described as non-probability convenience sampling with controls put in place to ensure that the pre-determined characteristics would be made accessible. I employed such a random selection process to resemble the different practice entities and their performers. This uneven trajectory in researching practices is helpful to converge or diverge in various directions (Maller, 2012). The focus given was made to ensure that the sample would be a good blend of various socio-demographic characteristics embodied within a range of family structures and sizes. All interviews were conducted within the houses of occupants except for three cases whereby interviews took place at the participant’s workplace, followed by a visit to their home after work.
There was a notable gap identified between what people said they did and the things they were actively doing (Wilhite & Wilk, 1987). Due to this, a guided tour of each house followed the interviews. Tours were done with the householder’s permission and were limited by what the participant was prepared to ‘show and tell.’ The popularity of enhancing interviews with a tour in investigating everyday practices was noted recently (Cravioto, Yamasue, Okumura, & Ishihara, 2014; Khalid & Sunikka-Blank, 2017; Strengers & Maller, 2011). The tours successfully achieved their aims. Firstly, to prompt householders to elaborate further on their cooling practices by visiting the real context in which they were undertaken, hearing about these practices, and being physically shown what householders were doing at the time of the interview to achieve comfort. In a way, discussing air-conditioner usage in the space of the home where it was installed, such as bedrooms, provided an opportunity for a more detailed observation to be made and specific questions to be asked. For example, a tour of one of the timber houses yielded detailed observation regarding how the roofing in the bedroom was lower, thereby creating a room that was warmer than the other. During these tours, I took a number of photographs of participants’ houses and the devices used by households deemed to be related to cooling and cooling practices, provided that consent was gained beforehand. All households’ interviews were conducted between September 2016 and February 2017, which is typically just outside the warmest period of the year from March to June in Malaysia. However, temperature variability in Malaysia is negligible and sees highs vary around 32 and 33 degrees Celsius throughout the entire year; hence issues of comfort persist regardless of the season. Besides, the fact that interviews were conducted less than four months after the worst heatwave in history (Al-Jazeera News, 2016) presented the issue of cooling and comfort at the forefront of participants’ minds.
<table>
<thead>
<tr>
<th>Participant</th>
<th>Age</th>
<th>Occupation</th>
<th>Household type</th>
<th>House age, type, building material</th>
<th>Years in the house</th>
</tr>
</thead>
<tbody>
<tr>
<td>Seth</td>
<td>58</td>
<td>Pensioner</td>
<td>Couple, no children at home</td>
<td>56, stand-alone, timber house</td>
<td>45</td>
</tr>
<tr>
<td>Meck</td>
<td>29</td>
<td>Engineer</td>
<td>Widow, no children</td>
<td>52, stand-alone, timber house</td>
<td>20</td>
</tr>
<tr>
<td>Abbas</td>
<td>29</td>
<td>Corporate executive</td>
<td>Couple, two children at home</td>
<td>20, apartment, brick</td>
<td>4</td>
</tr>
<tr>
<td>Hidayah</td>
<td>40</td>
<td>Van driver</td>
<td>Couple, one child at home</td>
<td>17, apartment, brick</td>
<td>6</td>
</tr>
<tr>
<td>Nick</td>
<td>31</td>
<td>Lecturer</td>
<td>Single, lives with mother</td>
<td>8, middle-unit terrace, brick</td>
<td>2</td>
</tr>
<tr>
<td>Maznah</td>
<td>64</td>
<td>Pensioner</td>
<td>Couple, one disabled son at home</td>
<td>30, corner-unit terrace, brick</td>
<td>30</td>
</tr>
<tr>
<td>Syukri</td>
<td>30</td>
<td>Pharmacist</td>
<td>Couple, one child at home</td>
<td>2, middle-unit terrace, brick</td>
<td>2</td>
</tr>
<tr>
<td>Intan</td>
<td>32</td>
<td>Lecturer</td>
<td>Couple, one child at home</td>
<td>13, middle-unit terrace, brick</td>
<td>1</td>
</tr>
<tr>
<td>Sofi</td>
<td>24</td>
<td>Student</td>
<td>Single, lives with a family of four siblings</td>
<td>6, self-designed bungalow, brick</td>
<td>6</td>
</tr>
<tr>
<td>Mumtaz</td>
<td>31</td>
<td>Lecturer</td>
<td>Couple, two children at home</td>
<td>13, middle-unit terrace, brick</td>
<td>7</td>
</tr>
<tr>
<td>Diana</td>
<td>32</td>
<td>Marketing executive</td>
<td>Couple, two children at home</td>
<td>5, corner-unit terrace, brick</td>
<td>5</td>
</tr>
<tr>
<td>Lina</td>
<td>35</td>
<td>Laboratorist</td>
<td>Couple, three children at home</td>
<td>6, self-designed bungalow, brick</td>
<td>4</td>
</tr>
</tbody>
</table>

Table 3.2 Overview of characteristics of households with air conditioning
Table 3.3 Overview of characteristics of households without air conditioning

<table>
<thead>
<tr>
<th>Participant</th>
<th>Age</th>
<th>Occupation</th>
<th>Household type</th>
<th>House age (years), type, building material</th>
<th>Years in the house</th>
</tr>
</thead>
<tbody>
<tr>
<td>Exora</td>
<td>33</td>
<td>Home-maker</td>
<td>Couple, three children at home</td>
<td>60, self-built, full timber</td>
<td>2</td>
</tr>
<tr>
<td>Maria</td>
<td>83</td>
<td>Home-maker</td>
<td>Single, living alone at home</td>
<td>96, self-built, full timber</td>
<td>60</td>
</tr>
<tr>
<td>Samad</td>
<td>45</td>
<td>Clerical staff</td>
<td>Extended family - couple, three children, grandmother</td>
<td>45, two-story self-built, ground floor made of brick and first floor made of timber</td>
<td>25</td>
</tr>
<tr>
<td>Yusof</td>
<td>39</td>
<td>Farmer</td>
<td>Couple, three children at home</td>
<td>50, self-built, full timber</td>
<td>5</td>
</tr>
<tr>
<td>Raheem</td>
<td>77</td>
<td>Entrepreneur</td>
<td>Sibling</td>
<td>94, self-built, full timber</td>
<td>55</td>
</tr>
<tr>
<td>Amirah</td>
<td>68</td>
<td>Home-maker</td>
<td>Extended family - couple, married daughter</td>
<td>90, self-built, full timber</td>
<td>50</td>
</tr>
<tr>
<td>Ira</td>
<td>27</td>
<td>Corporate executive</td>
<td>Newly-married couple</td>
<td>3, rented as built apartment, brick</td>
<td>1</td>
</tr>
<tr>
<td>Amin</td>
<td>56</td>
<td>Police officer</td>
<td>Couple, no children at home</td>
<td>21, bought as built apartment, brick</td>
<td>20</td>
</tr>
<tr>
<td>Ros</td>
<td>41</td>
<td>Entrepreneur</td>
<td>Couple, three children at home</td>
<td>14, bought as built apartment, brick</td>
<td>1</td>
</tr>
<tr>
<td>Nash</td>
<td>48</td>
<td>Pensioner</td>
<td>Couple with one child,</td>
<td>24, bought as built apartment, brick</td>
<td>13</td>
</tr>
<tr>
<td>Rabi</td>
<td>60</td>
<td>Finance executive</td>
<td>Couple, no children at home</td>
<td>3, self-designed bungalow, brick and timber</td>
<td>3</td>
</tr>
<tr>
<td>Shaun</td>
<td>38</td>
<td>Security officer</td>
<td>Friend</td>
<td>25, middle-unit terrace, brick</td>
<td>6</td>
</tr>
</tbody>
</table>
3.3 Additional methods

Two further methods were employed to increase the richness of information gathered, namely self-reporting diaries and room temperature measurements. The use of self-reporting diaries is not uncommon: especially in a stream of studies whose priorities are in-depth, open-ended data gathering such as the fields of sociology and anthropology. Moreover, their application is not new to research concerning technology as Wilhite and Wilk (1987) utilised this method examining households’ energy-use behaviour. In this study, all participants were required to complete a diary log designed to record their daily warm sensations in the home and their specific strategies for remaining comfortable on an hourly basis. They were to record typical working days and non-working days to observe differences between the two conditions. I attempted to deliver the self-reporting diaries ledger to participants two weeks before the scheduled interview date. Whenever possible, a visit was made to hand the ledger directly to the participants. In the interview section, households were given clear instructions as how to fill in the ledger and a sample finished diary was also attached. All except four participants had completed self-reporting diaries before being interviewed. These four participants went on to complete the diaries during their interview sessions. Diaries’ aim was to record specific strategies within specified timeframes; for example, to answer specific questions such as: What are the time boundaries between the use of a fan and air conditioning daily? When windows are opened and closed everyday?
Figure 3.6 Daily sample log for households’ thermal sensations and cooling strategies

Besides, during the visits, I took time before the start of interviews to record the temperature of four different spaces in the home; namely the hottest, the most comfortable, the common space as well as external temperature. Room temperature was measured utilising a wall thermometer supplied by Laboratory Units, Geography Department, the University of Manchester, which confirmed its calibration status and validity of instrument. Thermal data of space in the home is one of the crucial factors in this research. In researching cooling practices, it was therefore particularly necessary to measure room temperature as one of the enrichments of the methodology. Apart from being able to determine the room temperature at given times during interviews, additional information when being used to make a cross analysis participant’s responses.
3.3 Analysis of data

My empirical inquiry aimed to analyse how household cooling practices, both modern and traditional, are composed, established and are changing in Malaysian households. Interviews were analysed using thematic analysis to gather information on the predefined themes of materiality, meanings, and skills. I use resulting data in different ways to illustrate and isolate between elements and how these elements hold together. In illustrating the tangible, I observed cooling devices and the arrangement of infrastructures of the houses during interviews and incorporated comments made on these infrastructures during the house tour. In illustrating some of the arrangements, I also made note of expression — satisfaction, feelings, emotions, anxiety, and others — in recognising the intangible part of the practices, namely skills and understanding, apart from responses made during the interviews. This analytic strategy provided meaningful depth and diversity in the local context regarding cooling practices in the home. Focusing on practices, rather than air conditioning and socioeconomic constructs, as the unit of analysis formed a core that stresses the importance of inter-relationships between ideas, practices, and materials of domestic organisation (Hand & Shove, 2007). These identify opportunities to engrain information bottom-up from everyday practices into the policies and programmes involved in reducing energy demand and managing vulnerability to heat in the home in daily life.

There are three groups of cooling practices synthesised from households interviewed in the study (air-conditioning users and non-air-conditioning users). The initial significant objectives were to understand modern cooling practices and how these emerged, primarily through conducting in-depth interviews on households’ air-conditioning usage in everyday life settings. Questions were asked concerning how and why participants use air conditioning in the home, in order to construct more robust and closer understanding of such practices, their composition and why they are currently used. According to the national census, around 95 per cent of the existing housing stock in urban areas are brick or brick and plank houses (DOSM, 2013). Poor ventilation in a building can be caused by poor design (e.g., low ceilings) and lack of air circulation features such as windows and ventilation holes, all of which are very apparent in new housing. These modern brick houses therefore require air conditioning to cope with the local tropical climate with their built fabric, unlike traditional wooden houses (Kubota et al., 2011).

My second concern was to explore traditional cooling and situate its establishment and composition within the framework of social practice. Most of the participants involved were elderly living in traditional vernacular houses and all actively engaged with various strategies to keep cool and comfortable in the home. This study assumes the elderly to be those aged above 60 years following the national standard (DOSM, 2018). While it has been argued that a socio-economic orientated trend exists, whereby low and middle-income households are preferring not to use air conditioning, more in-depth study found that the traditional Malay house typically found in rural
areas is not designed for air conditioning (Utaberta et al., 2015). Indeed, it was already a well-known fact that Malaysian vernacular houses are built for coping with hot climatic conditions (Kubota & Toe, 2015) and employ light materials such as wood and thatch in their construction and most importantly make use of natural ventilation (Kubota et al., 2011). Moreover, this traditional housing incorporates climate adaptation through its roof design, space below the house and surrounding planted trees (Hooi, Toe, & Kubota, 2015; Kubota & Toe, 2015). That being said, vernacular architecture was also crucial in the cooling practices of the past and it is argued that this requires a more in-depth understanding of the matter. Chapter 5 later discusses the composition of such practices and argues that there is a more elaborate explanation for the trend of persistence in these practices beyond vernacular architecture and behaviour.

The third and last form of analysis is to understand what Shove et al. (2012) referred to as ‘dynamics’ or Winter (2016) suggests is an entanglement, underpinning both modern and traditional practices to identify ways of bringing to the forefront the aspiration for non-air-conditioning cooling practices as a sustainable way for cooling in the home for the future. In this regard, the viability of traditional practices is put on centre stage, which yields a deeper understanding of which dynamics remain stable in preceding the current non-air-conditioning practices and which were displaced. This exploration in influencing future non-air-conditioning aspirations yields two important inputs in the juggling act between cooling consumption and well-being, namely the issues of vulnerability and adaptation to heat.
Chapter 4 Air conditioning and the emergence of modern cooling practices in Malaysian households

There is a growing emphasis that modern, air conditioning cooling practices are no longer climate-driven and their domestic usage is no longer justified purely by the notion of affordability. Once regarded as a luxury device, the normalisation of the air conditioner is now underway in domestic environments in Malaysia; something that was cautioned against by scholars concerned about a similar trajectory in countries like the US and Australia resulting in rising electricity consumption (Shove et al., 2013). Here, I return to the first set of research questions regarding the composition of modern cooling practices in Malaysian households. As discussed in the introduction, I refer to modern cooling practices as the current prioritisation of mechanically conditioning indoor air for comfort in the home. This chapter reframes the issue around air conditioning and situates its emergence in practices perspectives. I argue that the composition of modern cooling practices creates trajectories that see air conditioning as the only way to achieve comfort (Ackermann, 2002; Winter, 2013). Such a view is illustrated in the discussion of normalisation of air conditioning in cooling practices during sleep and by simply living at home. Utilising examples from interviews with individuals using air conditioners in their home, I show how material arrangements in the form of housing infrastructures ‘promote’ the use of air conditioning. As a result, air-conditioning usage ‘script’ know-how for households to achieve comfort, eventually creating embodied meaning that further entrenches air conditioning as an instant, and sometimes the only, way to gain comfort in the home. This chapter is divided into three sections representing three components of practices under discussion; namely the materiality of modern cooling, meanings behind such practices, and the know-how involved. The last section concludes with remarks that ultimately involves ‘problematising’ cool-conditioned comfort on rising domestic consumption in Malaysian households.

4.1 Air-conditioning in Malaysian households

Six in the evening and I was waiting outside Nick’s house, one of the study participants and a lecturer in his mid-30s, for our scheduled interview. A typical sunny evening with bright sunshine making it rather warm outside but not swelteringly hot like the mid-afternoon of typical Malaysian weather. Around 10 minutes later, Nick arrived in his car and on getting out was still wearing his office attire; a long sleeved-shirt minus a tie. “Sorry to cause you to wait in this heat”, he said in a hurry to let both of us enter the house, like running away from something unbearable, the outside environment. “That is all right”, I replied, “this tree does help”, I added while pointing to a shady tree directly in front of his house that I had stood under offering me some shade. We walked towards the door. Upon entering the house, I was asked to sit down on a sofa in the middle of the living room, Nick immediately asked, “are you feeling warm?” while grabbing a remote control and consequently turning on his air conditioner. “Not really, still OK for now” - I replied. As some time
went by, Nick asked whether I was comfortable while simultaneously lowering the thermostat setting of the air conditioner, in which I assumed, was at its usual setting. Asking Nick whether he was ready to answer some informal questions, we began the interview.

Figure 4.1 Tree in front of Nick’s terraced house

Researcher: Is this your usual routine back at home after work; to turn on the air conditioner?

Nick: Yes, sometimes, when I am too lazy to go straight to shower or in this case, I have a guest in my house (while smiling).

Researcher: And you have installed an air conditioner just here in the living room?

Nick: Yes, just in the living room, there are fans in every room upstairs. I use this room more often so I think that it might be better to install it where I am.

Researcher: I see. Normally, people install air conditioning in the bedroom and use it during sleep. How about you?

Nick: I use a fan to sleep. So far it is still OK. It is a bit warm (in the room), but I am OK, can sleep comfortably. Anyway, I can always come down and sleep here in the living room with air conditioning if I want to.

Meanwhile recruitment of Seth as a participant in the study was pure coincidence. A retired administrator at the government agriculture agency, his roadside traditional house had caught my attention as I drove by a week before, looking ‘majestic’ with its built architecture on a plain piece of land. A few days later, I decided to knock on the door and consequently the interview was set. This
was the very first interview of my four full months of fieldwork and the first in a traditional, timber house. Seth’s house is located in a rural area of Jeram, in the state of Selangor. As I arrived on the day of the interview, it was 11 in the morning and temperature was building towards the afternoon heat. Seth was already waiting on the verandah, wearing his pagoda (a sleeveless top) and long trousers. With a smile and a typical greeting of ‘jemput naik’, which means ‘come in’, I was invited to join him on the verandah of his old but well-maintained Rumah Limas (meaning a house with five main pillars). The main entrance to the house is through the verandah itself, where I could see drinks and cakes already served on the dining table. Our short initial conversation began:

*Seth: Can we do our interview here?*

*Researcher: Yes, why not. Is this your favourite spot in the house? You have a dining set over here. Having a meal out here on this verandah regularly it seems?*

*Seth: Yes. Sometimes, when it is in the afternoon, when it can get a bit warm inside the house or when a guest is around, we usually sit and chat over here. It is windy here.*

One of few traditional timber houses that have air conditioning, Seth’s air conditioner was installed by his son in one of the bedrooms for when he sometimes sleeps over. "Too warm to sleep", his son complained before installing the air conditioner. I asked about whether Seth found any use for it when his son is away – "Not at all" – he replied.
Another day, I was walking up to Hidayah’s top-floor apartment in a suburban area of Kuala Selangor; a tiring experience walking up the stairs of a four-level apartment block that does not have a lift. However, on the day I visited the fourth-floor apartment where Hidayah had been living for the past eight years it was quite windy; an advantage of living high up where the wind can often be felt more than ground-level units. It was a typical sunny day. Hidayah is a school van driver, while her husband works as a clerk in a multinational company. I was greeted and the interview was held in the living room, an open layout leading to the kitchen – a hint of wind from outside could be felt inside the apartment. All the bedrooms in Hidayah's place were air conditioned; one of which was occupied by her son, who had not come out of his room as of then.

As the flow of the interview proceeded, I asked about her son:

![Figure 4.3 Living room of Hidayah's place](image)

*Researcher:* May I ask about your son in the bedroom, is it routine for him to wake up this late?

*Hidayah:* Yes. On the weekend especially. That is usual for them to wake up late, and get to shower late in the afternoon.

*Researcher:* Does the air conditioning still turn on inside the room when they are waking up late like this?

*Hidayah:* Yes. He will stay in the room using the air conditioner throughout the morning (while shaking her head).

All the above situations provide examples of how diverse user practices are in relation to cooling; each constructed of different social, cultural and material structures. This construct
determines usage and non-usage of air conditioning at a particular space and time; thus demonstrating the integration of air conditioning into the everyday living and cooling practices of simply living at home, sleeping, relaxing after work, eating, and entertaining guests. These are the routes of ‘normalisation’ of air conditioning in Malaysian households; subtly integrated into daily cooling practices at home (Shove et al., 2013). Such observable ‘behaviours’ are just the ‘tip of the iceberg’ as it is the entity of practice – the social structure of behaviour – which will form a better understanding of behaviour and hence the necessity to be scrutinised (Spurling et al., 2013) Questions like, how does the air conditioner contribute to ‘scripting’ particular details of modern cooling practices? To what extent have the material arrangements of houses legitimised a specific meaning of comfort in these households and made such households prioritise a particular set of skills over others? The following three sections expand on the encounters with households detailed above and further analyse their daily cooling practices involving air conditioning.
<table>
<thead>
<tr>
<th>Participant</th>
<th>Where is AC installed?</th>
<th>When it is used</th>
<th>Usual AC setting °C</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maznah</td>
<td>All spaces except kitchen</td>
<td>Every day in the noon and night during sleep,</td>
<td>18</td>
</tr>
<tr>
<td>Meck</td>
<td>Bedroom</td>
<td>Only when it gets too warm, during sleep in the recent heatwave</td>
<td>19</td>
</tr>
<tr>
<td>Abbas</td>
<td>Bedroom</td>
<td>Every night during sleep</td>
<td>18</td>
</tr>
<tr>
<td>Hidayah</td>
<td>Bedroom</td>
<td>Every night during sleep</td>
<td>18</td>
</tr>
<tr>
<td>Syukri</td>
<td>Bedroom</td>
<td>Every night during sleep</td>
<td>21</td>
</tr>
<tr>
<td>Intan</td>
<td>Bedroom</td>
<td>Every night during sleep</td>
<td>20</td>
</tr>
<tr>
<td>Sofi</td>
<td>Bedroom</td>
<td>Only when it gets too warm; the recent heatwave for one or two hours a day</td>
<td>21</td>
</tr>
<tr>
<td>Mumtaz</td>
<td>Bedroom</td>
<td>Every night during sleep</td>
<td>16</td>
</tr>
<tr>
<td>Diana</td>
<td>Bedroom</td>
<td>During sleep</td>
<td>18</td>
</tr>
<tr>
<td>Lina</td>
<td>Bedroom</td>
<td>Every night during sleep</td>
<td>16</td>
</tr>
<tr>
<td>Seth</td>
<td>Bedroom</td>
<td>When Seth’s son is home, not used at all by Seth</td>
<td>16</td>
</tr>
<tr>
<td></td>
<td>Living room</td>
<td>Only when it gets too warm</td>
<td></td>
</tr>
<tr>
<td>Nick</td>
<td>Living room</td>
<td>During sleep and when necessary such as having guests</td>
<td>20</td>
</tr>
<tr>
<td></td>
<td>Living room</td>
<td>Every night during sleep</td>
<td></td>
</tr>
</tbody>
</table>

Adapted from interviews, household’s diaries, temperature measurements and observation during the visits.
4.2 Air conditioner, bricks and a ‘house that felt like a cave’

Attempting to describe the materiality of previous trajectories, I examined both the air conditioner and housing infrastructures as interchangeably ‘scripting and being scripted by’ cooling practices (Akrich, 1992). Modern cooling practices were posited as the precise outcome of function and purpose of what the air conditioner is designed to do (Chappells & Shove, 2005; Healy, 2008). One of the most obvious details about an air conditioner is how the temperature in a house is now at the household’s fingertips. It is a matter of choice the temperature a household chooses today, and they have the freedom to change it tomorrow. The air conditioner is a device that enables us to set our ideal climate, precisely. An excellent example is how a thermostatically controlled air conditioner equals a range of temperatures into the feeling of cooling in the home (Strengers, 2009).

Similarly, in this research, I found such practices manifested themselves clearly throughout all the households. This comes on the back of findings from our recorded interviews that none of the households had ever used a thermometer to measure indoor house temperatures. Among the reasons were said to be “not a routine thing to do”, “not necessary” and “not something important (to know indoor temperature)”. Although most of these households perceived temperature as irrelevant to the determination of their comfort in the home, they began to subscribe to a range of specific temperatures without realising:

“I am comfortable at 21 degrees Celsius normally during the morning, slightly higher during the night time, at around 23 degrees.”

[Maznah]

“Every day, I will set the thermostat at 16 degrees Celsius…”

[Diana]

The way a household denotes their ‘comfortable range’ by setting the thermostat of their air conditioner shows how the device subtly shapes household cooling practice. At this stage, a household is said to have ‘normalised’ themselves to a range of temperatures as their comfort level (Nicol, 2004; Serrano et al., 2016; Shove et al., 2014). Malaysian authority has also prescribed a recommendation for indoor temperature to be in the range of 23–26°C (Jamaludin, Mohammed, Khamidi, & Wahab, 2015). However, studies have shown that a neutral temperature was predicted at between 27–30°C (Harimi, Ming, & Kumaresan, 2015). These discrepancies are problematic and not consistent with households’ sensation of a comfortable temperature. Indeed, it is proven here in the study that air conditioning has shifted this general neutral level towards cooler temperatures. It is not far-fetched to claim that air conditioning has created the simplest way of ‘meeting’ comfort by
closely relating temperature to a range of numbers. This type of simplification ignores the acclimatisation to their environment humans can achieve (Dahlan, Yusof, Alexander, Salleh, & Alias, 2009) as well as the tendency for some subjective, cultural, dynamic variation in how cooling is experienced (Chappells & Shove, 2005). Mumtaz, a lecturer at the local university who is living with his spouse and two children discussed further on the matter:

Researcher: Do you have a thermometer in the house for indoor temperature checking purposes?

Mumtaz: No I do not; it is not something that I normally do, to check the indoor temperature.

Researcher: But what do you think about air conditioners with a thermostatic controller where you usually have to choose the numbered figure of a temperature to resemble your comfort level?

Mumtaz: That is the function that they (air conditioners) provide; as a user, I will just use the function that the device has provided.

Air conditioners accentuate the slightest difference in human thermal sensation. The temperature adjustment feature on the device allows this difference in thermal sensation to be represented by a numerical figure of temperature setting, something that Chappells and Shove (2005) argue to be the extent to which 'the device has managed to 'engineer' such subjective sensations as levels of comfort.

“I normally set the temperature at 23 degrees Celsius in the bedroom when I am about to sleep…but my wife will lower it down to 20 whenever she comes in later. She is normally used to the colder temperature and loves the air conditioner more than I do.”

[Syuk]

In regard to the materiality that has scripted the use of air conditioning, sociological and engineering scholars concur. In building science, it is a widely acknowledged fact that infrastructural changes have caused thermal housing conditions to be affected, hence the use of air conditioners (Cooper, 1998). However, looking from the perspective of everyday practices of cooling further refined our understanding. Instantly, we can see how changes in house layout, inadequate shade and a lack of openings and windows are just a few examples of how current house infrastructures discussed in the literature are ‘promoting’ the use of air conditioners (Nicholls & Strengers, 2014; Shove et al., 2008; Strengers, 2009; Winter, 2013). Table 4.2 below summarises the material character of space with an air conditioner.
Table 4.2 Specific material character of space with an air-conditioner

<table>
<thead>
<tr>
<th>AC</th>
<th>AC type</th>
<th>Fans</th>
<th>Window type in the space</th>
<th>Wall</th>
<th>Holes other than window and door</th>
</tr>
</thead>
<tbody>
<tr>
<td>Seth</td>
<td>Guest bedroom</td>
<td>Normal</td>
<td>No</td>
<td>Fully extendable</td>
<td>Timber</td>
</tr>
<tr>
<td>Meck</td>
<td>Main bedroom</td>
<td>Normal</td>
<td>Yes</td>
<td>Louvre</td>
<td>Timber</td>
</tr>
<tr>
<td>Abbas</td>
<td>Main bedroom</td>
<td>Normal</td>
<td>Yes</td>
<td>Full-width sliding door with balcony</td>
<td>Brick</td>
</tr>
<tr>
<td>Hidayah</td>
<td>All bedrooms</td>
<td>Normal</td>
<td>Yes</td>
<td>Louvre</td>
<td>Brick</td>
</tr>
<tr>
<td>Nick</td>
<td>Living room</td>
<td>EE*</td>
<td>Yes</td>
<td>Half extendable</td>
<td>Brick</td>
</tr>
<tr>
<td>Maznah</td>
<td>Living room</td>
<td>EE</td>
<td>Yes</td>
<td>Half extendable</td>
<td>Brick</td>
</tr>
<tr>
<td></td>
<td>All bedrooms</td>
<td>EE</td>
<td>Yes</td>
<td>Half extendable</td>
<td>Brick</td>
</tr>
<tr>
<td>Syukri</td>
<td>Main bedroom</td>
<td>Normal</td>
<td>Yes</td>
<td>Half extendable</td>
<td>Brick</td>
</tr>
<tr>
<td>Intan</td>
<td>Main bedroom</td>
<td>Normal</td>
<td>Yes</td>
<td>Half extendable</td>
<td>Brick</td>
</tr>
<tr>
<td>Sofi</td>
<td>All bedrooms</td>
<td>Normal</td>
<td>Yes</td>
<td>Fully extendable</td>
<td>Brick</td>
</tr>
<tr>
<td>Mumtaz</td>
<td>Main bedroom</td>
<td>Normal</td>
<td>Yes</td>
<td>Half extendable</td>
<td>Brick</td>
</tr>
<tr>
<td>Diana</td>
<td>Living room</td>
<td>EE</td>
<td>Yes</td>
<td>Full-width sliding door with balcony</td>
<td>Brick</td>
</tr>
<tr>
<td>Lina</td>
<td>Main bedroom</td>
<td>Normal</td>
<td>Yes</td>
<td>Half extendable</td>
<td>Brick</td>
</tr>
<tr>
<td></td>
<td>Guest bedroom</td>
<td>Normal</td>
<td>Yes</td>
<td>Half extendable</td>
<td>Brick</td>
</tr>
</tbody>
</table>
In Malaysia, the transition to using brick and concrete structures for houses was recorded during the 1970s. This changed not only the fundamental character of residences at the time, which were primarily constructed of wooden planks, but also the means of dealing with hot temperatures (Sani, 1990). During this period, air conditioning usage in domestic homes was predicted to increase, with an estimated 1% of households using air conditioners of some kind (Fernandez, Hawley, & Predaza, 1975; Mahlia et al., 2002a); allegedly in the houses of high-ranking officers (Yatim, 1990). At that time, discussion on the basis for using air conditioning was climate, and climate alone (Sani, 1990). Without doubt, the household experience of using air conditioning has now 'matured'; through back and forth activity within houses, experiencing other houses, comparing the thermal sensation in every space of the home:

"It is normal in houses like this (made of brick) to be this warm under the heat...at night; I can feel a bit of a warm sensation in the rooms if I do not close the curtain as the large sliding door glass can filter the heat – it's a little bit stuffy at times. Here in the living room is quite OK; I have not used the air conditioning here as much as in the bedroom."

[Abbas]

Abbas has shared the warm sensation of living in a brick house that is a natural consequence of his lived daily experience. Yet, Hidayah’s perception is derived from an element of knowledge:

"I believe the biggest factor making our house this warm is the brick. I do not think it suits our climate."

[Hidayah]

Uttering these words is both a reflection of Hidayah’s experiences and knowledge as her husband works in the property industry. Indeed, her husband then further elaborates on her statement:

"Housing developers build houses according to their specification and budget, not really according to this warm sensation or anything... I remember when some Japanese delegates visited our office, and they had thrown in a question about why Malaysian’s used bricks as building materials, as they claimed that I do not have earthquakes or the kind of natural disasters to use such a strong material for the housing envelope. They suggested materials like bamboo woods instead, which is abundant and easy to plant as well, which I thought; what a great idea...we never got on with their idea and just passed the idea away; we cannot really get beyond the idea of using [materials] other than bricks and cement."

[Hidayah’s husband]
Currently, more than 84 per cent of houses constructed in Malaysia use brick and concrete as the main material (DOSM, 2013), which is largely acknowledged by the households interviewed to be the reason behind the heat they felt indoors. This conclusion is based on their experience of sleeping in timber houses. During interviews, evidence of such a dichotomy and interdependence between bricks and the decision to use air conditioning surfaced during conversation with several households that had either stopped over at a relative’s brick house or grown up in one. Such responses are not new as brick is widely known as a material with a high heat-storage capacity, which once heated in the morning, contributes towards a warm indoor environment during the night when the heat is released into the indoor environment. Despite such a fact being known, the use of bricks in housing has persisted as a ‘standard’ material due to its abundance and low cost (Sani, 1990). It is also less complicated for house builders to adopt standard designs and install air conditioning than customising homes to suit local climates (Ackermann, 2002). A few households expressed how they had known that the materials cause more heat in the home but were unable to resolve the problem as it was a standard feature of any newly-built house in the country. This is nothing new and is a widespread consensus. As Wilhite (2009) explains, the ‘need’ for cooling has gone hand-in-hand with new styles and methods of building with concrete and bricks:

“You know… brick houses, that common issue of not being a good heat reflector but do I have other choices? All houses now are made out of bricks.”

[Mumtaz]
Lack of openings such as windows and ventilation holes were also quoted by households to result in the creation a closed space that makes the circulation of air less free, hence requiring mechanically powered air circulation by the use of air conditioning to distribute the indoor air. Several households raised how they would like more windows in the house, of which one referred to living in a middle unit of a terrace that felt like a fully enclosed space due to the lack of capacity to have more windows:

“*This living room for me requires one or two more windows…* from that corner over there towards here, you could build one window at least, and at the staircase, another one (window) but there are none; it is not enough.”

[Nick]

Nick’s remark is in-line with the opinion of his mother, Ms Rania, who used to have a window-opening routine at her former house in the village, stating that the window at her son’s house has been inefficient in capturing wind, resulting in a feeling of indifference towards opening windows. This condition shows how the provision of windows and their opening need to be strategies to maximise air-flow as inadequate ventilation or air-flow feels ‘wrong’ to households and hinders them in even opening a window:

“I do not feel any different, opening the window or closing the window, its only one over there… it cannot do much about getting air in… for that reason, I have not felt like opening the window to be honest, ever since I was here.”

[Nick’s mother on a lack of window-opening routine]
In Malaysia, 90 per cent of air conditioners are installed in the bedroom and used during sleep (Jaafar & Croxford, 2010; Kubota et al., 2011). This statistic aligns with householders’ responses in which cooling using air conditioning during sleep is “necessary for comfortable sleep” [Abbas] and they would “not be going to sleep soundly without it” [Diana]. Moreover, households shared how they consider that bricks alongside several other housing features, such as tight room space and lack of openings, correspond to their preference for using air conditioning during sleep:

“When I lean against the wall during the night, I can feel some heat, not much, but it is warm. Moreover, I know how bricks work with all the heat and storage capacity and things. This must be one of the reasons for a little bit of warmth felt during night time in the house.”

[Hidayah]

Nowadays, there has been much discussion on how current housing infrastructures have ‘locked’ us into an arrangement that sees air conditioning as the way to find comfort and the air conditioner in turn, has ‘scripted’ contemporary cooling and cooling practices (Hitchings & Lee, 2008; Madsen, 2018; Shove et al., 2014). These have formed an integral element of materiality that has directly shaped modern cooling practice. Rather than being a passive bystander or external factor as formerly perceived, materiality often shapes the direction of human decisions and
practices through its materiality and function (Latour, 1992) – the process of ‘scripting’ (Akrich, 1992). These have been reflected so far in my encounter with households in the study.

4.3 Instant comfort and cosy sleep

As defined in Chapter 2, meaning is a perception, motive, intention and view which is mutually shared among different performers of practice (Shove et al., 2012). Meaning that what one ought to do to make comfort under the heat has long been associated with the method of cooling someone would opt for (Strengers, 2009). The interviews conducted with households living with air conditioning point to several different meanings; some are obvious through the responses, while more often these are ambiguous or embodied. I start with a discussion on the necessity-luxury binary of air conditioners as it was raised during the interview, reiterating the fundamental underlying meaning of modern cooling practices and the basis upon which they are established (Winter, 2013). As anticipated, most of the participants living with air conditioners talked about the necessity of the device: having one helped with coping in hot weather. As Shove et al. (2013) discuss, it is clearly observed that the transition of air conditioning to serve a basic societal function as we have seen in countries like the US and Japan is underway in Malaysia, where households talked about air conditioners as an essential everyday household appliance. A statement such as "I need air conditioning to remain comfortable…" [Intan], “It is a must to have an air conditioner, as it can get very uncomfortable in here…” [Lina], are among the popular themes when it comes to air-conditioning usage.

"It will be a bit hot and uncomfortable in my house during the afternoon time at 12 to 4.00 pm, and that is when the air conditioning will be necessary for us.”

[Mumtaz]

Nonetheless, the air conditioners role as a status symbol is now becoming less prevalent in Malaysia as more and more households are able to purchase the device. In addition, this is particularly pertinent when households discussed their pattern of usage. From a regular to a frugal user of air conditioning, Maznah’s and Sofi’s households respectively had their own norms and values that they shared on air-conditioning use. Maznah, a pensioner, living at home most of the time daily, has been a regular user and explains how he became accustomed to using air conditioning every day:

“Yes, this second living room requires air conditioning for me to stay comfortable. I will turn on the air conditioner when I am here, sewing or reading a newspaper. It can get uncomfortable to be in here for quite some time without air conditioning.”
For Sofi, a young executive in his mid-20s who had been working from home for a few months, he and his household are not really frequent users, even during sleep. When being asked why this was so, he could not really explain the reason as though a subtle line exists that informs the decisions of his household:

"All of us do not use air conditioning much as far as I am concerned. Not in the afternoon, not during sleep. We are kind of comfortable with fans for most of the time in this house. Even here (pointing to the living room where our interview took place), there is no ceiling fan, no air conditioner, and I think you can feel that it is fairly comfortable in here – that how I feel personally, not feeling like using the air conditioning because it is comfortable most of the time in the house."

Nonetheless, in most of the other households interviewed, air conditioning was considered ‘needed’ during sleep. All households in the study had installed air conditioning in their bedrooms; just one household had installed a device in the living room. The consistent usage of air conditioning for sleeping in Malaysian households corresponds to the development of cosy living in the Western world; scenario I refer to as ‘cosy sleep’. Common understanding of cosiness forms the core of most on comfort in the literature (Day & Hitchings, 2009; Gram-hanssen, 2010; Maller & Strengers, 2011). Defined by Wilhite et al. (1996) as ‘cultural energy services’, cosiness has
manifested itself in the practice of overcooling in meeting guests’ expectation of comfort (Strengers, 2009), and maintaining comfort expectation is considered socially necessary (Khalid & Sunikka-Blank, 2017). Against the background of air conditioning usage in Malaysian households being heavily centred towards sleeping time (Kubota et al., 2011), our interviews evidenced a benchmark for a lower temperature as appropriate sleeping ‘climate’ (one which households expect). The scenario of wanting extra coolth draw closely air conditioning in bedrooms and the perception of a good night’s sleep (Arsenault, 1984).

“I have only one (air conditioner), installed in our main bedroom… moreover, it is always turned on every single night right before I go to sleep.”

[Mumtaz]

“For now, I can only sleep with the air conditioning turned on. Not once without it. [Otherwise] it is not going to be comfortable.”

[Syuk]

However, as I progressed with the interviews, the responses began to shift, from typically equating comfort usage of air conditioning with a good night’s sleep, toward a preference for ‘extra coolth’. From preparing a room earlier with conditioned air, through to setting a shallow temperature while using a thick duvet during sleep, I found overcooling habits in household tendency of usage during night sleep. Two of the participants, Diana and Intan, shared how she and her family of one child have a preference for extra coolth when they sleep:

“I prefer a level of coolness in my bedroom… I (husband, wife and daughter) agree to turn on the air conditioning before I sleep; it almost feels like something automatic to do before we sleep now.”

[Diana]

“I will usually turn on the air conditioner in the bedroom a few minutes before us going to bed leaving the room to cool before I go to sleep; I set the thermostat at around 19–20 degrees Celsius.”

[Intan]

Our findings echo previous work by Jaafar and Croxford (2010) that comments on the use of a thick duvet during sleep. Despite the fact that such bedding is not meant for a warm climate
like Malaysia, the use of a duvet is becoming more popular within the current generation as they continue trying to find comfort in the overcooled bedroom. Two households living in modern brick housing in a suburban area of Selangor revealed during interview how they are ‘used to’ this thicker type of duvet while sleeping under air conditioning:

*Researcher: And you would say that 18 degree is comfortable for you to sleep?*
*Maznah: Yes, and will put on the duvet until morning (laughter).*

*Researcher: When you say duvet, did you mean the thicker type of blanket?*
*Maznah: Yes, love to wrap ourselves, especially in the middle of the night when it gets a bit chilly. Sometimes I do turn it off if that is the case, but most of the time I leave it until morning.*

We also return to Seth, who had an air conditioner installed by his son in one of the bedrooms of his ‘traditional’ house – a house constructed with features to sustain indoor comfort without air conditioning. Seth’s son currently works in the city centre has had an air conditioner in his house in the city for 4 years. Once a fortnight, he returns to Seth’s house for a sleepover and eventually installed an air conditioner in his room. While Seth did note that the room is the warmest among other spaces in the house, he reiterated his way of going about achieving comfort of he were his son:

“I know that room is the warmest because the roof structure is very low. It is my son’s room when he comes back to have a sleepover here. He is the one who installed the air conditioner in that room. The room is quite warm because the room roof is too near; the roof overhang is too close, making the space too tight between the roof and room space, which makes it easier to feel the heat from the roof. Instead, if I was him, I would be sleeping in the living room.”

[Seth on how he copes with a heated space]
Although Seth did acknowledge how the roofing of the room contributed towards the more heated space of the room that caused his son to install air conditioning, he also remarked about being comfortable sleeping in the living room. In the absence of his son, Seth has not used the air conditioning installed in the room even on the hottest day as he said that it is not his usual preference. This evidences the value Seth places on searching for comfort and the know-how he possessed while growing up; as opposed to his son who has already used air conditioning, so illustrating a difference in the meaning of comfort between them. Strengers (2009) described this as the way comfort practices, alongside reproduction through practical knowledge (faithful reproductions), are also actively configured by negotiation between the carriers of practices. This scenario also explains why most youngsters have used air conditioners early in their lives, which corresponds to the wider issue of younger generations experiencing more air conditioning usage than their parents. Hidayah has two grown-up teenagers that usually stay inside their air-conditioned room after waking up from sleep. We had the first-hand experience of observing one of her sons still having not come out from the room when we arrived at her house at around midday. The son later emerged for a shower and lunch at around 2 pm when we about to conclude the interview:

Hidayah: That (waking up and staying in the room with the air conditioning on) is usual for them to wake up late, get to shower late in the afternoon.

Researcher: Does the air conditioning still turn on inside the room when they have woken up late like this?

Hidayah: Yes. Always. He will stay in the room using the air conditioner throughout the morning.

[Hidayah on her teenage sons’ usage of air-conditioning]
Likewise, Sofi also noted that his younger sister had been a more regular user of the air conditioner than the rest of the family.

“My family and I rarely use air conditioning. We usually find it adequate just with fans in our rooms. My younger sister does use air conditioning more often. She keeps her door closed while doing her work in the room.”

[Sofi on his younger sister's air-conditioning usage]

These examples align with previous findings by Strengers (2009) on how some householders, in this case a younger generation who grew up using air conditioning, have developed and continuously engaged in the embedded understanding of finding comfort. In some way, this provides reference to the broader usage of air conditioning in future Malaysian generations. In my discussion on the preservation of meaning, I concur with how Pantzar and Shove's (2010) discussion on Nordic Walking highlights the dynamic relation between the status of participants and the meaning of practices that allow its growth. They had suggested that innovations in practice involve changing combinations of symbolic and material ingredients and know-how or skill. In relation to what I have discussed here, weak engagement with air conditioning is in fact innovation in cooling and cooling practices whereby the preservation of meanings and know-how restrict the use of air conditioning.

Above all, these are changes in ways of perceiving air conditioning as needs rooted in the significant shift of understanding in the cultural convention of comfort. Increasingly more people relate every day cooling to the practice of indoor conditioning of air. This scenario of conditioned-comfort (Winter, 2013) has come in an era in which the demand for instant results is seeping into every corner of our lives and expectation of it to be served at our convenience. People cannot wait longer than their patience will allow waiting for the things they want. From fast food, drive-through car washes to home appliances like washing machines and dishwashers, all revolve around accomplishing a task instantaneously. Accordingly, illuminated in our study is the household expectation of instant comfort; that is, wanting a 'cool-comfortable indoors’ to be available there and then (Barnett & O’Neill, 2010; Farbotko & Waitt, 2011). One of the participants was conclusive on the role of air conditioning in achieving comfort ‘on-time’:

"I think what is great about air conditioning is that it provides us with that instant comfort sensation whenever I need it. I need the coolness generated by air conditioning at some specific times of the day, like in the mid-afternoon when it is scorching hot outside, and I can have it by using the air conditioner.”
The drive for instant comfort has led to a shared preference of continually wanting to control the indoor temperature in a conventional manner of coolth, no matter what the outdoor environment might be (Ackermann, 2002). Healy (2008) has discussed this regarding ‘thermal monotony’ and how households have now subscribed to a narrow range of temperatures they are continually used to whenever the time of day; no longer is there a daily variation of warm afternoon, mild early morning and cool late night (Agbemabiese et al., 1996). For example, this understanding manifests in the household preference to use air conditioning in the mid-afternoon. Households shared how they would expect the afternoon to be a little cooler, so they turn on the air conditioning.

"I prefer to use the air conditioner in the afternoon when it is hot outside... I cannot stand it (the warm sensation)... I prefer it to be a little bit cooler..."

With all these meanings in mind, a subtle dependency has started to grow on air-conditioning usage, a condition whereby ‘a memory of experience’ interplayed with the decision to install air conditioning in a new home. The matter is made clear when households shared how their decision to install air conditioning in a new home was based on the ‘memory’ of discomfort felt in their previous house, before actually experiencing thermal discomfort in the new house.

"I had an air conditioner at my previous house so when I moved to this current house where I live, I installed the air conditioning straight away before I moved in... I knew we are all going to need it in the new house."

Researcher: For how long have you used the air conditioner?

Abbas: It is roughly around four years now. I bought and installed the air conditioner before I moved in.

Researcher: Oh, have you used an air conditioner before in the previous house?

Abbas: No. I have not used an air conditioner before, just thought that I would when I moved to a new and better home, and I did.
Several other households had purchased and installed an air conditioner in their new home despite not never having used the device previously, showing how air conditioning is slowly becoming accepted to create a socially appropriate home (Wilhite et al., 1996)

“I did not use air-conditioning when I was in Kuantan. I bought and installed one when I moved here in this new house. Everybody have one at least in their house”

[Lina]

Finally, other important information was disseminated during our interview. For example, in Japan and Australia, the notion of hospitality towards guests is apparent in the use of artificial cooling (Strengers, 2009; Wilhite et al., 1996). In this case, rooms will be chilled by air conditioning before the arrival of the guest to meet the comfort level expected of that guest. In fact, I personally had been at the centre of a manifestation of the matter, not once but twice, when households acted by lowering the thermostat on our arrival. One instance of this was with Nick at the opening of this chapter, and another with Maznah when she offered me one of her rooms to perform prayers. Before I entered the room, she turned on the air conditioner and laid down the prayer mat.

Figure 4.8 Air conditioner installed in the living room of Maznah's house

Regardless, ‘normalisation’ of air conditioning is undoubtedly now underway in Malaysian households. There is a building perception that air conditioning is understood to be a necessary installation in a home. As I discovered with several respondents, the decision to install air
conditioning is ‘automatic’ in nature. Syukri, a pharmacist, decided to install air conditioning in his new house straight away, indeed even before he had taken possession:

*Syuikri: I installed the air conditioner in the main bedroom of our new house.*

*Researcher: Is that before or after you moved in?*

*Syuikri: Before. When I started gathering all the stuff to move to the new house, I looked around for a new air-conditioning unit and asked for it to be installed straight away in the new house.*

*Researcher: But you have not moved in yet, do you think you are going to need it?*

*Syuikri: I am sure I will be needing it there as well (laughter).*

Several other households pointed to the same reasoning, that air conditioning would be essential on a daily basis in any house. For Abbas, moving the air conditioner from his previous house was based on the assumption it would be needed. Despite afterwards finding out that in his new apartment the room has a sliding door, which he could capitalise in to capture more air movement, he decided to use air conditioning instead:

*Researcher: When did you install this air conditioner?*

*Abbas: I bought these air conditioners from my previous house. I did not want to buy a new set.*

*Researcher: How do you find usage of it here in this house, is it the same as before?*

*Abbas: Yes, it is used every day during sleep, just like before. I knew that we would still need it at night anyway.*
4.4 ‘Learned’ practical knowledge

As discussed in the conceptual section, practical knowledge – also known as skills – is the social know-how accumulated from everyday experience that informs everyday action (Strengers & Maller, 2011). When a person feels warm, they will draw on their practical knowledge, which is information gained from empirical experience, to establish the practices they should undertake. This means that when a person's typical reaction to heat is to resort to air conditioning to keep cool, the skill set that they have will always revolve around making an air conditioner ‘work more efficiently’ than employing other available strategies. Over time, the circulation of everyday routines in living with air conditioning actively inform decisions on ‘better’ ways of living within the ecological efficiency of air conditioning, rather than the real goal of achieving comfort (Strengers, 2009).

Akrich (1992) has explained the scenario whereby know-how is derived from the script of the technical object. Here, the air-conditioning paradigm has led households to focus in the direction of its technically-compatible script (Geels, 2010). As a result, existing routines of air-conditioning practice tend to blind households to alternatives outside air conditioning to keep them cool in the home.

In this research, I uncovered two manifestations of such a matter; namely, window opening-closing routines and the prioritisation of space cooling for comfort. In air-conditioning practice, strategies as mundane as opening windows are slowly fading away or have been forgone entirely by Malaysian households to make way for a closed environment for efficient air-conditioning operation. Hence, the study has explicitly investigated this matter through its in-depth interviews with households regarding their pattern of air-conditioning usage and activities surrounding the practice. Almost every household instantly closed all windows when the air-
conditioning was turned on, stating reasons such as “to enable the air conditioner to operate efficiently” [Diana] “…to quickly cool the air” [Sofi] and “to let the indoor environment remain cooled for longer” [Abbas]. Hidayah, a home-maker, living with three children in a flat in a suburban area, described in detail how:

“I have all rooms equipped with an air conditioner. In the morning, I will usually open all the windows. When I turn on the air conditioner, I will close the windows to make the air conditioner work efficiently; of course, you have to close the windows for the cool air to trap inside.”

[Hidayah]

Over time, this everyday routine of air conditioning on–shutting the window of as become accumulated knowledge, which overrides the true function of windows and reduces the capacity for a household to adopt strategies for cooling other than air conditioning. A pensioner who described her family as heavy users of air conditioning mentioned how windows at her house have not been opened for quite some time now:

Researcher: When do you usually turn on the air conditioner during the day? Also, what is your window routine when the air conditioning is turned on?

Maznah: I am a bit of a regular user of air conditioning. I will use the air conditioner in the afternoon from 12 pm till 4 pm and during sleep time, around 11.30 pm till 8 am in the morning.

Researcher: How do you operate your windows during this time?

Maznah: The window will remain unopened from last night until tonight. As a matter of fact, I have forgotten when I last opened that window, I cannot remember at all for now (laughter).
An elderly participant shared how one of their adult children who has been ‘used’ to air conditioning in the town was driven to installing air conditioning in their traditional home in the village and started closing windows in the room (I will discuss this further in the following chapter):

Researcher: You have said that one of the rooms in this house has an air conditioner; who installed it there? Can you explain why?

Seth: My son is the one (of the adult children) who installed the air conditioner in that back room. He is usually back here once a month, having a sleepover, visiting me. When they are, they are always sulky about being unable to bear the heat (laughter). It is warm, you know, and they have this air conditioner in their house in the city, so they cannot cope with it…

Researcher: So you can cope with this heat?

Seth: As far as I am concerned, I can still bare the heat; it is normal, you can still open the window, you have the standing fan to use….but they are used to it (air conditioning), so they opt to install it.
I argue that the arrival of the air conditioner and how housing infrastructures were aligned to its usage are transforming the know-how of getting comfortable. I illustrate this view with the example of sleeping and a regular pattern of air conditioning usage. Secondly, how the aim to remain adequately comfortable in the home and the competencies involved has been skewed towards cooling the surrounding indoor space beforehand. This approach in itself has served households with a set of skills (and inhibits others) in which each household is inclined to concentrate on cooling their immediate space in order for their body to feel comfortable. Households illustrate such a scenario in their responses when they react by cooling a space for themselves, for example, when returning from work; in which an alternative strategy such as taking a shower, taking off clothes, turning on the fan can be done, which focus more on bodily comfort:

"I arrive home from work, usually the inside of the house is going to be a bit warm and stuffy due to the hot day, most of the time I will go straight to reaching for the remote control to turn the air conditioner on while I take a couple of moments refreshing myself on the sofa."

[Nick]

Here, I return to my argument on the emergence of practices in the introduction. My outline of this involved accounts of air-conditioning usage during sleep that were apparent in this study as well as Malaysian households in general. Air conditioning and sleep form a fundamental pattern of emergence, which I relate to the discussion on scripting skills by way of materiality and the role it has played in scripting know-how. I begin with my observation on the materiality of a bedroom and the know-how of sleeping comfortably. For Hidayah, who has lived and experienced sleeping in a
traditional house when she was growing up, the apparent difference is the feeling of stuffiness in the room when windows were closed at night:

"It is rather warm when you close all your windows, and you will need air conditioning to be able to sleep or else it will be a very uncomfortable night... it's a different story with the traditional house, it was very cold at night. Whenever I sleep back at my parent's house in Pantai Remis, the only thing I worry about is a blanket and mosquitoes... you will need a blanket when midnight comes; it is very, very cold..."

[Hidayah on differences between her current house and her childhood timber house]

Figure 4.12 A small and fully-enclosed room at Hidayah's flat

Hidayah's case suggests the limited space of a bedroom creates a boundary of restricted air circulation or stagnant air, hence the 'need' for an air conditioner. However, her comparison with the different experience of sleeping at her parents' traditional house enlightens us on the ways that features of a room subtly create the need for air conditioning during sleep. I took some notes on the features of Hidayah's room and compared these with features of rooms in the traditional houses I had visited:

"Hidayah's house contains three rooms; all three are installed with an air conditioner. In a relatively small apartment, our observation notes that these three rooms are all restricted in size. There are no other ventilation openings except windows. If these windows are closed at night time, it will create, presumably, a space lack of moving air. We asked this of Hidayah, and
she did acknowledge a sense of stuffiness in the room if the windows are closed. There is a fan in one of the rooms, but not all. Hidayah uses air conditioners every day; a fan is used as well during sleep.”

[Field notes on a tour of Hidayah’s house]

Responses regarding stuffiness and stagnant air in rooms are not new. It could perhaps be more comfortable with simple ventilation holes like those in traditional houses or merely by using know-how that opening some of the windows is crucial for comfort (Daghigh, 2015; Passe & Battaglia, 2015). Eventually, over time as households have become used to sleeping under air conditioning, such a practice has developed into an ‘automatic’ routine that is rarely negotiated and mutually agreed among householders; ‘I do not know, it is an automatic thing nowadays for us, whenever we go to sleep, we will turn on the air conditioner straight away [Syuk]. This routine will go on to create a new embodied understanding that will ultimately develop into taken-for-granted practical knowledge (Giddens, 1984; Strengers, 2009), undermining the established ‘skills’ such as opening windows. This scenario began to be observed where in some instances, particularly in households who had been using air conditioning for a substantial period, to open the window for comfort ‘felt like an odd’ thing to do. As (Shove et al., 2012) have argued that as infrastructures fall out of use, the know-how associated with them tends to fade away.

In brief, this materiality-know-how relation where housing infrastructures lead to the prescription of air conditioning also applies in the broader discussion on how air conditioning has become necessary throughout the spaces of the home such as the living room. For Maznah, her experience of living in a traditional timber house during childhood, and in fact half of her life spent without air conditioning, proved insufficient with regard to how she now regularly finds herself using air conditioning. Moreover, she finds it hard to remain comfortable without air conditioning in each space in her house:

_Maznah: I use fans, it is enough to create an airy environment in the living room of my previous house, we have sliding doors which when I open them, invite more air than windows. _

_Researcher: How about this house? Do you find it airy as well if you open the window over there that I can see at the living room? _

_Maznah: Not much. That is why I am not opening those. It is not that airy if I open them anyway. _

[Maznah's routine of opening windows and doors]

Comparing Maznah’s experience of two houses in which she has lived, reveals she uses air conditioning more regularly in her current house than the previous one. She particularly mentioned the open environment that she felt in the previous house as opposed to the current house. At one
point, she contrasts her current experience with living in her previous house where air-conditioning use was not as regular as now, quoting features like windows and sliding doors to give an open environment and help her family to find comfort merely by the use of fans:

"Back then was as warm as it is today, but I think we were comfortable with what it was at that time and we got used to it... on how we lived and gained comfort for ourselves at that time, we could feel rather warm, but it was still OK for me then I guess."

[Maznah’s acceptance of a warm climate back in her childhood]

She added that although such feelings still resonate in her mind, she found her current house has not enabled her to ‘materialise’ those feelings. Conversation with Maznah shows that meanings of acceptance as well as knowledge of moving air are still available within households, but the material arrangements do not allow those values to materialise. The arrival of air conditioners hence creates the emergence of modern practice, replacing material elements of traditional practice and making links to a new set of beliefs and skills in Maznah’s new house. For Maznah, although she has been brought up in a house constructed of timber and not using air conditioning, her experience of living with air conditioners has made her now resort to air conditioning as a necessary amenity in all spaces of her house. She installed air conditioning in the living room, dining room as well as bedroom, with the exception of the kitchen.

Collapse of the established childhood memory of how to achieve comfort experienced in Maznah’s case was driven by the arrival of an air conditioner. Prioritisation of conditioned-comfort overshadowed traces of know-how that we sensed as still existing within Maznah’s actions for comfort. Despite the reliance on air conditioning, she has developed in the last five years while living in the current house, Maznah allowed, for example, our interview session to take place in an open space of her house that she had recently finished completing. Since then, it has been commonplace for her to have lunch there and, in my case, to have a chat with guests. At the conclusion of our interview session, I was even invited to stay for lunch, and it was this open space that the host chose for the meal to be served (Figure 4.12).
Following my observations on air conditioning and sleeping, all these examples show that pathways of emergence are not straightforward. Indeed, most of the accounts involve an understanding of materiality we have previously heard about air-conditioning usage such as small spaces, lack of openings and inappropriate textiles chosen for blankets and curtains in the bedroom. Nonetheless, deeper observation reveals that this reasoning has highlighted another layer of understanding, that is, how those ‘lacking’ in materiality in fact lead to the demise of embodied know-how that was built upon long personal histories and experiences of adapting to heat in the home. This form of ‘traditional knowledge’ is apparent when most of the households who were brought up without air conditioning are comparing their experiences of sleeping in their current house with experiences of sleeping in their traditional house when they were growing up. Shove et al. (2012) talk about this; in scripting human and non-human actors, objects and infrastructures determine boundaries of know-how. As a result, certain aspects have been delegated to the air conditioner to take charge as embodied skills of households become restricted to the script of the air-conditioner. These findings support Strengers’ (2009) findings that faithful reproductions of practices can occur from life experiences and interaction with physical infrastructures.

Figure 4.13 Interview location at Maznah’s house
4.5 Conclusion: the bigger pictures

Air-conditioning technologies have gradually slipped into the realm of ‘normal’ ways of achieving comfort at home in the households interviewed. In this chapter, I have presented the bigger picture regarding modern cooling practices, focussing on how aspects of materiality meanings and skills determine the usage pattern of air conditioning. Table 4.3 summarises such variation and the elements that constitute such variety. For example, variation in the way air conditioning is used is not necessarily a matter of independent choice or affordability, but how housing features such as windows and ventilation holes have scripted or restricted know-how to allow movement of air inside the house. I demonstrate that these modern practices emerged due to the normalisation of air-conditioning usage through the changing convention of how households view comfort and cosiness in their daily activities such as sleeping, meeting guests and relaxing at home. The material infrastructures promote these air-conditioning uses that lock such practices in place, leading towards air conditioning as the only way to achieve comfort at a specific place in the home, such as the bedroom. The air conditioner then, in turn, has scripted household ways of sleeping with ‘improper’ use of thick duvets that originated in countries with colder climates. Through time, accumulation of this routine of using air conditioning for cooling has resulted in ‘learned’ practical knowledge that focuses on making indoor environments effective for the coolth generated by the air conditioner.

<table>
<thead>
<tr>
<th>Ways of living at home with air conditioning</th>
<th>Material</th>
<th>Meaning</th>
<th>Skill</th>
</tr>
</thead>
<tbody>
<tr>
<td>Frequent use of AC</td>
<td>Air conditioner, window, door,</td>
<td>Cool air provides comfort instantly</td>
<td>Closing windows and doors, drawing curtains,</td>
</tr>
<tr>
<td>Entertaining guests</td>
<td>Air conditioner, window, door, living room</td>
<td>Being nice to guests</td>
<td>Turning on air conditioner specifically for guests</td>
</tr>
<tr>
<td>During sleep</td>
<td>Air conditioner, window, door, bedroom, fan, blanket, small tight room space,</td>
<td>Used to sleeping with particular coolness, overcooling</td>
<td>Turning on air conditioning right before sleep, sleeping in the room</td>
</tr>
<tr>
<td>Extreme heat event</td>
<td>Air conditioner, window, door, room</td>
<td>Well-being</td>
<td>Staying in the room, indoors</td>
</tr>
</tbody>
</table>

This has reinforced the perceived conundrum such that we need air conditioning because we use air conditioning. Is there a way out of this circular ‘trap’? The collective message that has been projected from previous scholars is that it will not be easy (Wilhite, 2009). Chappells and
Shove (2005) suggested that the way to cut the entrenchment of air-conditioning is by embarking on an alternative approach that upholds diversity in the meaning of comfort and the infrastructures that keep such diversity in place. It is therefore beneficial from now on to start to think about a variety of people’s expectations of comfort rather than a standardised range of temperatures to be met. Perhaps, in concluding this chapter to pave way for the next, I have followed the call for a reassessment of certain assumptions and norms in ways that lead to a systemic creation of alternative pathways to energy-intensive mechanically conditioned comfort and attending to the mechanism of tradition-based cooling strategies (Genus & Jensen, 2017; Winter, 2016).
Chapter 5 ‘Traditional’ cooling practices and their persistence in Malaysian households

The conclusion derived from the previous chapter is that future understanding of comfort in the Malaysian households interviewed looks set to follow the pathway that recruits householders into normalising air conditioning for comfort into daily living at home. In taking a look back into tradition-based practice that once constituted normal practices in Malaysian households, which I refer to here as ‘traditional’ cooling practices, this chapter embarks on a journey with households who have grown up and continue until now living in a ‘vernacular’ house; a house and infrastructures that have been designed to withstand local climatic heat. Drawing on the social practices perspective that reveals connections between elements in the make-up of ‘behaviours’, I argue that traditional cooling practices in the home stemmed from embedded reproduction of the meaning and experience of living in hot weather, which later informed skills in adapting to heat and cool in the home including how houses were constructed and the infrastructures within were arranged. As much as this information has been investigated within architectural and behavioural studies, investigating traditional cooling through a perspective of practices reveals interconnections and the flow of practices from the past that are well preserved.

This chapter includes four sections, comprising an introduction and three others on elements meanings, materials and skills of traditional cooling practices. In the first section, I make an introductory remark to go beyond the current focus on the vernacular architecture and its environmental properties, to account for the complex way in which this material is intricately connected with a socio-cultural dynamic that forms a more holistic understanding of traditional cooling practices. Nevertheless, in the following section I discuss material aspects of the vernacular house and its infrastructures in a way that avoids structural analysis; to focus on its connection with upholding values and skills in everyday life. Next, I consider the element of meaning, arguing that preference for outdoor air and acceptance of all its ‘natural’ weather characteristics such as heat is an embedded understanding of cooling practices of the past. Thirdly, I examine the skill that was coordinated to adapt to rather than ‘alter’ the indoor weather, producing strategies such as prioritising bodily comfort. Furthermore, relationships between inherently different but related practices are considered, discussed in the literature as a ‘bundle of practices’ (Shove et al., 2012) that strengthen traditional cooling practices – such as bathing, clothing and going out. Towards the end of the section, I conclude by bringing forward the importance of the dynamic relationship between elements of practices referred to in traditional cooling practices that benefit the future aspiration for non-air-conditioning practices and reducing vulnerability to heatwaves.
5.1 Traditional cooling practices

In the literature review, I have summarised the call towards a better understanding of ‘vernacular’ tradition in the study of sustainability by shifting the approach towards more thorough and comprehensive studies that investigate the qualities of particular vernacular traditions in their specific environmental and cultural contexts (Foruzanmehr & Vellinga, 2011). In proceeding towards such a call, this chapter on traditional cooling practices approaches tradition-based cooling strategies that are argued here to account for the dynamic and complex environmental, technical, social, cultural and economic dimensions of such practices. With that in mind, I approached households living in vernacular houses that have not used air conditioning all their lives.

"House nowadays are lacking everything" is the opening statement of Yusof’s interview, where he affirmed his opinion about housing conditions in general. He stated this when asked about how he felt about his current house compared to the one he occupied in back in the city. Yusof is a 39 year-old man who previously lived in an apartment in the city of Shah Alam where he stayed for six years, met his wife, got married and returned to the village to reside in his current traditional house. Continuing the statement above, he commented "my house back in the city had a lack of space, a lack of satisfaction in living; the neighbourhood is not that great". In trying to direct the conversation towards comfort and cooling, I asked "How about comfort, how do you find it in terms of keeping comfortable here in your house compared to the previous one because as I note, you don't have air conditioning installed there either?" He replied, "I enjoy living in this house not only because of the house but the surroundings. I already lived here in my childhood, so it's close to me. If you have lived before without air conditioning, you will be OK without it. Some of my relatives came here, and complained that their house is warm and they have to air-condition their home… but I personally don't like air conditioning". If I were to give you an air-conditioning unit and the money to run it, would you install it here in the house? – I teased. "I don't need it for now; it is comfortable now, so why would I need to have air conditioner? I have not used it before, but I think it's too cool for me". Why do you think it is so? Have you not tried it before? – I asked; "I do not know... but I have been used to living like this (without air conditioning) since childhood, and have also not used it to this day, so on some warm days, some heat is OK for us". He added, "this house is just OK if there is some wind, then it's OK. Open these windows here and there (pointing towards the living room windows and kitchen windows), they will remain open for a long period during the day and are closed at dusk. Some wind from outside; if there is none, turn on that fan over there (pointing towards a standing fan close to where we had our interview), it's enough for me", Yusof reiterated. As I sat down, my attention rested on the arrangement of the furniture to be as close as possible to windows in several settings; the sofa in the living room was directly adjacent to windows in the living room area, and the kitchen table where we conducted our interviews was where the kitchen windows were located.
It was drizzling throughout the morning when I was scheduled to interview Raheem, a retired government worker, at his house named ‘Villa Sentosa’, one of the oldest houses in the Kampung Morten (Morten Village) in the middle of the city of Melaka (Malacca). This village is hailed as a ‘living museum’ for the fact that its population maintained its traditional characteristics for many generations. Mr Raheem’s house is conspicuous among the others as it is the biggest house in the village of over 200 houses. As I approached the house with an umbrella in hand, I was greeted by Mr Raheem; “Quick, come up, or you will get soaked”. Tropical rain is rough; wearing ‘hoodies’ is not enough. In a hurry, I climbed up the stairs. Old Malay houses have these elevated characteristics, which are beneficial during the rainy season to keep the damp away and protect against flooding. When I stepped into the house, all windows and doors were wide open, and a standing fan located at the corner of the living room was turned on. Are these windows normally open? – I asked, while noticing the holes along the top of each wall of the living room, just below the roof. It was very bright in the living room as the sunshine was able to penetrate every hole and windows that were wide open; “Yes, all these windows will be open like this every day”.

Figure 5.1 Yusof positions his dining table close to windows
This routine of opening all windows and doors is essential for households living without air conditioning so far as I encountered. Indeed, it was the same when I arrived at Exora’s house. A home-maker with four children, Exora lives in a four-room house located in a rural village in the state of Perak. The doors and windows again were all wide open, including the kitchen door as well. As I parked my car on the driveway, two of her children were running in and out of the house and up and down the staircase onto the elevated flooring; a common sight with this old architecture. An outer shaded space and sofa was observed right outside the front door surrounded by potted flowering plants. As I stood in front of the opened door, I called upon a common salutation of peace. Exora came towards the door and replied, “Waalaikumussalam” (May peace be upon you as well). She immediately asked, “Can we do our interview here on the verandah? It’s a mess here inside my house; these kids are playing around with everything” – while pointing at the living room of the house (laughing). “Sure”, I replied, “I have had some households spend most of their time out on this kind of balcony on hot days and prefer to sit on their balconies at times”. “Memang pun” (meaning ‘indeed’ in the local language) – she replied while laughing. That explained the sofa placed outside. During the interview process, her children were running up and down again and this time one of them went straight under the house, where my eyes instantly followed and saw a set of three swings in the space underneath (Kolong). “It’s like a playground down there”, I smiled. Exora replied that is one of the comfortable spaces to beat if it is too hot outside and a windy day like this; “even I too relax there at times”, she added while smiling. She continued; “Today is quite warm but windy, so it’s OK, it will be unbearable if there is less wind”. How do you cope then if it is one of those days? Are all these windows open because it is one of those windy days? – I asked. "No, I'll always open these windows every day after waking up at around 7–8am. If it's getting a little bit too hot outside we will just use the fan; I'll take a quick shower in the afternoon, the kids will not wear tops, sometimes only in their underwear (laughing). We'll just stay inside the house and gather around the fan in the living room,” she added. Unlike
Raheem and Yusof who had grown up living in the so-called ‘vernacular’ houses of old, Exora has rented her traditional house for the past four years and lived in the relatively similar traditional timber house of her mother, located about 30 minutes' drive from her current house.

Figure 5.3 Verandah at Exora’s house

Ten years ago, Chappells and Shove (2005) ignited the debate on the future of comfort and called for a move away from meeting a specific range of comfortable temperatures and to embark on a more searching debate about comfort and the way of life associated with it. They gave an example similar to the episode above to be among a few points to make us ponder about the future’s vision of a more elastic concept of comfort, ‘to produce indoor environments that are culturally satisfactory rather than technically optimal’. Movement between the spaces of a home in search of a more comfortable spot serves as a mundane strategy that might justify our lower carbon society in the future; a society that is full of adaptive capabilities. These adaptive capabilities go beyond tangible factors such as built materials and architectural design, but ‘entangle’ with intangible practices forming a wider heritage of comprehensive, coordinated ways of thinking and making use of these tangible things to act upon the heat (Winter, 2016). In understanding practices prior to air conditioning in the tropics, these three examples of traditional cooling practices in households provide an introduction on routines, physical beings and actions in keeping cool and comfortable in the home as well as the dynamics of everyday living. The rest of this chapter goes on to discuss the cases of six households that I categorised to observe traditional cooling practices. Table 5.1 summarises the overview of household characteristics.
Table 5.1 Overview of households’ characteristics regarding traditional cooling practices

<table>
<thead>
<tr>
<th>Participant</th>
<th>Household type</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>Exora</td>
<td>Couple with four children</td>
<td>Rural</td>
</tr>
<tr>
<td>Maria</td>
<td>Extended family</td>
<td>Rural</td>
</tr>
<tr>
<td>Samad</td>
<td>Extended family*</td>
<td>Rural</td>
</tr>
<tr>
<td>Yusof</td>
<td>Couple with three children</td>
<td>Rural</td>
</tr>
<tr>
<td>Raheem</td>
<td>Couple</td>
<td>Urban</td>
</tr>
<tr>
<td>Amirah</td>
<td>Couple</td>
<td>Urban</td>
</tr>
</tbody>
</table>

* Extended family is one with more than one nuclear family (a couple and their dependent children)

Malaysian society is known to have a long socio-cultural history of living without air conditioning and its existence is empirically captured in the households that have been living in traditional houses and have not used air conditioning all their lives. In focusing on the relationship between the socio-cultural dynamic and materials, the key task is to understand how these are connected as a nexus of elements representing enduring ‘comfort regimes’ that can be advanced as future alternatives to air conditioning and conditioned-modernity (Winter, 2013). More importantly, this knowledge should address the institutional and social mechanisms of tradition-based cooling practices that we know go beyond the behavioural and technological realms. Moreover, concentration on vernacular architecture and passive cooling currently ought to be enhanced by this study’s concentration on practices. Dynamics of social practices each have a historical trajectory that this chapter tries to capture within the notion of traditional cooling and cooling practices. The common understanding of traditional cooling practices is an element of ideas; motives and views that create the feeling of what is necessary to initiate non-air-conditioning behaviour; it creates the meanings of traditional practices to go with practical knowledge or know-how (this will be discussed in the next section). The recognition of such elements embedded in traditional practices enhances the understanding of socio-cultural richness in living without air conditioning. It also accepts the view that performing practices always involves more than the material infrastructure as well as a simplistic view of behaviour. Altogether, focusing on the cooling practices behind non-air-conditioning reveals a more comprehensive model of the ‘mental activity’ of such practices.

Traditional practices is the term I decided to use to note a holistic approach using social practices to study low-energy, non-air-conditioned traditions for cooling, which stem from a whole nexus of elements; namely common understanding, material infrastructures and practical knowledge. Diverging from representational accounts of individual behaviour alone and the superiority of technical know-how of the built environment such as the vernacular house, I argue that such technologies and infrastructures interact with common understandings and skills in the performance of the practice. What has been beneficial with this is it offers an explanation of their composition, which is more than being utilised today.
5.2 Timber, holes and the house designed by life experience

In examining the materiality of traditional cooling practices in Malaysian households, regional literature tends to focus attention on vernacular architecture (Hosseini, Mursib, Nafida, & Shahedi, 2014; Ju, Kim, & Ariffin, 2015; Man, 2017; Hussain & Samad, 2017). This growing interest carries the dynamic value of the vernacular including specific socio-cultural, intellectual and functional identities of a house (Sim, 2011), in which the practical point of view is a crucial point. There is an agreement among scholars that material infrastructures of vernacular houses are not built upon a spontaneous or random act but have been based on the accumulation of raw, local knowledge garnered from generation-long experiences (Sim, 2011). Winter (2013) suggested that it is indeed beneficial to delve into the architecture of the vernacular and housing built-design before the arrival or air conditioning, especially in highlighting the material culture of tradition-based, low-energy cooling practices: the route taken by this section. In the previous introductory section, I have outlined several examples of how these houses, their designs and infrastructures have roles in the cooling practices of daily living. There are three facets of these materialities that I particularly want to extract from the previous examples; the use of timber as building materials, the significance of holes, and the design based on everyday experience of living under the heat.

In a tropical country like Malaysia, timber from its rainforest provides primary material for homes. The use of timber as the main material to build traditional vernacular houses creates the first layer of support acting as a heat barrier that does not absorb heat during the day (Passe & Battaglia, 2015). So, houses made entirely of porous materials of a low or negligible thermal capacity allows the house to withstand the warm tropical climate. In the first half of the nineteenth century, the building of homes in Malaysia was primarily done by individual craftsmen often with the help of the homeowner. Moreover, the homeowner was often directly involved in designing the layout of the house, sourcing raw materials from the forest, and assisting with the construction process. This scenario demonstrates the close relationship between a house and its owner; also a prerequisite for personal thermal satisfaction in the house. Indeed, it is shown that almost all the traditional houses were built by the participants’ family. craftsmen used locally grown wood and bamboo, burnt and cut into lengths of plank to build the walls and structure of a house:

"During that time, it was normal to help build your own house, design it differently here and there… My father-in-law built this house; he got the wood all the way from Pahang (a state in Malaysia known for its thick rainforest). He, with a group of friends, went and cut down trees and brought them back here before paying a Chinese craftsman to build this house. His father cleared the land for about a year or so, while at the same time paying a Chinese carpenter to cut the wood into manageable pieces before constructing the house. The carpenter came all the way from Kedah (a northern state in Malaysia)."

[Seth on the materiality of his traditional house]
The Malaysian climate is suitable for the growth of many species of trees from which most of the timbers are sourced. During interviews with older generations living in traditional houses, it was clear that they were aware of the type of tree from which the structure of their house was made. For example, Amirah and Samad named *Chengal* and *Merapoh* respectively as the timber used in their houses. They both knew about this by the fact it was their father who built the house. Rattan and bamboo are among other types of timber also used to build traditional houses (Hanafi, 1994). The use of locally sourced timbers as building materials was regarded by households living in traditional houses as helping them to feel ‘comfortably-cool’ throughout the evening until their night’s sleep and for most of them, late night was ‘very cold’ and they would need to use a blanket. While previously I found households who associated air conditioning with a good night’s sleep, there were also households who are able sleep soundly without air conditioning, and in fact hinted that a blanket would be needed as towards midnight the room could get rather cold. Yusof, for instance, sleeps soundly during the night:

“If the night is usually cold here in the village, comfortable to sleep... except for certain nights, there are some hot ones but normally it is just comfortable to sleep here in this house...I use the fan but will turn it off around midnight.”

*Yusof on sleeping soundly without air conditioning*

“A group of students once wanted to sleep here in my house, so I allowed them, for study purposes they said, then it became quite cold around midnight... they never expected that” (Laughter).

*Amirah on how cold can it be for those who never experience it*

“I usually get up in the middle of the night looking for a blanket to cover my body – if I don’t, it will be hard to sleep again.”

*Maria on the use of blankets during sleep, even without air conditioning*
Table 5.2 Infrastructure of traditional ‘vernacular’ houses under study

<table>
<thead>
<tr>
<th>House</th>
<th>House type</th>
<th>House age</th>
<th>Built-material</th>
<th>Roof material (originally)</th>
<th>Window type</th>
<th>Total windows*</th>
<th>Bedrooms</th>
<th>Microclimate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Exora</td>
<td>Self-built bungalow</td>
<td>60</td>
<td>Timber</td>
<td>Asbestos (Nipah leaves)</td>
<td>Louvre</td>
<td>17</td>
<td>1</td>
<td>Vegetation, roadside</td>
</tr>
<tr>
<td>Maria</td>
<td>Self-built bungalow</td>
<td>60</td>
<td>Timber</td>
<td>Zinc (Nipah leaves)</td>
<td>Fully extendable</td>
<td>17</td>
<td>2</td>
<td>Vegetation</td>
</tr>
<tr>
<td>Samad</td>
<td>Self-built bungalow</td>
<td>45</td>
<td>Combination</td>
<td>Zinc (Rumbia leaves)</td>
<td>Louvre</td>
<td>13</td>
<td>2</td>
<td>Houses, roadside</td>
</tr>
<tr>
<td>Yusof</td>
<td>Self-built bungalow</td>
<td>50</td>
<td>Timber</td>
<td>Zinc (Nipah leaves)</td>
<td>Louvre</td>
<td>14</td>
<td>2</td>
<td>Vegetation, farm</td>
</tr>
<tr>
<td>Raheem</td>
<td>Self-built bungalow</td>
<td>94</td>
<td>Timber</td>
<td>Asbestos (Rumbia leaves)</td>
<td>Fully extendable</td>
<td>14</td>
<td>2</td>
<td>River, city centre</td>
</tr>
<tr>
<td>Amirah</td>
<td>Self-built bungalow</td>
<td>90</td>
<td>Timber</td>
<td>Asbestos (Rumbia leaves)</td>
<td>Fully extendable</td>
<td>12</td>
<td>2</td>
<td>River, city centre</td>
</tr>
</tbody>
</table>

*count by two-panelled window, per house
Walls made from timbers have been known to provide an excellent heat barrier during the day and do not retain much of that heat, which therefore results in a cooler house interior during the night (Ramli, 2012). Timber has been widely used in vernacular housing in tropical countries until now; however, it is no longer an option due to cost and lack of supply (Sani, 1990). The next important element to consider is roofing. In most of the traditional houses in the study, the thatched roof was crucial as it helps to shade the house from direct solar radiation using vegetation, which is a material known to filter the surrounding heat (Vandentorren et al., 2006). Also known in the local language as attap, thatched roofs are customarily made from Daun Nipah (Palm trees) and Daun Rumbia leaves. The absence of such leaves being used nowadays as roofing material was primarily mentioned by households to be the result of current unbearable heat in the house, hence jeopardising their comfort. The day has gone when roofs were made from straw and leaves, which one of the interviewed householders Maria have who once lived under such a roof described as providing “enough shading even under the noon heat”. Other householders also shared their experiences of such roofs:

“…this house was previously built with Rumbia. However, it is hard to obtain Rumbia nowadays, so I have to settle for this asbestos type of roof; it is better than an aluminium zinc roof, which is a lot cheaper but it will be very, very hot during the afternoon… this asbestos one is better than zinc, but not better Rumbia, you will be very comfortable all day long regardless of the heat outside…”

[Raheem on Rumbia roofs]

Two householders, Maria and Yusof, shared how their fathers both sold Daun Nipah for a living back in the days it was still being widely used. Both shared how the making and selling of roofs was a profitable business and how their parents are able to make a livelihood from selling it:

“My parents sell Nipah roofs for a living. They sell one section of Nipah for 50 cents (£0.10p), you need around 100 to 150 pieces to complete one full house roof and this needs to be replaced with a new one every two to three years because the Nipah leaves will dry out while naturally shading your house.”

[Maria]

“The demand for Nipah roofs was good back then. My father sells it based on orders. Because, you know, a roof is not always wanted everyday wanted every day, just occasionally; a Nipah roof can be used for between 2 to 6 years before it requires changing. So he will work if there are orders…he is the only one selling in this village – so it was profitable for him and us at that time.”

[Yusof]
Household responses concur with structural studies on the advantages of using a natural leaves like Daun Nipah for roofing, which does help to maintain the climatic condition of spaces (Umar M.Z et al., 2017). Nonetheless, the use of leaves as roofing material did not continue over time with the practice becoming obsolete due to a lack of demand, despite many households here interviewed in the study relating excellent experiences of living under such roofs on hot days. The use of climate-compatible materials enveloping traditional houses, such as for walls and roofs, work in the background to create an adequately comfortable indoor environment for households. While the usage of such materials in the mainstream building of houses has ceased, the replacement materials have not been comparable in terms of how they cannot help with heat alleviation, which leads to reduced capability to withstand the climatic heat. During the house tours, I also observed how the spaces under the roofs are left open as well as openings on the roof ends for air movement into the house: a point that I shall take into the next section of the discussion.

As outlined in the previous section, to really understand traditional house design, there is a need to go beyond the structural view and environmental performance of buildings, to see how the design is positioned in the daily flow of adaptation to heat and cooling oneself in the home – a ‘pragmatist’ approach to architecture and design (Guy, 2010; Yaneva, 2015). Practical understanding of the vernacular house is important as it runs parallel with the basis on which these houses were created – from the knowledge of daily experience of living under hot weather (Yun, 2014). In my encounters, households in this part of the world preferred the air they can sense if it is moving around them. One of the central elements that uphold traditional practices for comfort is the way infrastructures are aligned to promote an open environment inside the house. The foundation is to allow air to move freely in and out of the house as well as good circulation within the house. **Openings** in the form of windows and doors provide natural ventilation by supplying and removing air from the house whenever they are opened. Householders describe how the windows and effectiveness of those windows in letting wind into the house maintained their comfort.

Returning to Exora, she shared how she and all her children will always decide to stay at the living room as the number of windows in this area means it is the space that provides the most comfort.

"On windy days like this, it is a very nice feeling to be here in the living room… everyone usually will be here regardless of whether its windy or not because this is the most comfortable place to be in the entire house."

[Exora]
Apart from windows, the abundance of holes in traditional houses is another example of a feature that works in the background to allow the free movement of air within a space. When Exora first stayed in a traditional house, she was amazed at the proportion of holes the house had. Exora also admitted that she thought about using air conditioning but not in her current home as she deemed it unsuitable. She shared how a lot of windows help to create an airy environment:

“Air conditioning here in this house will not be suitable. Is there any timber house that you have come across using an air conditioner? For me, it is not suitable. During windy days, there is a pleasant feeling in the house, and it is very cold during the night because of all those holes. The kids already know that the space under the house is the best place to be if it is getting too hot. I placed the swing under there so we can sit down there…”

[Exora on a traditional house without air conditioning]

Other than windows and doors, openings in the form of holes enhances the free movement of air in the background; continuously allowing air to slip in the house when windows and doors are closed. These ventilation holes are so important that they are available in all the traditional houses I visited, in different forms but all related to serving the same purpose – continuous ventilation day and night. One participant Yusof, whose house 50 years old, recalled how he felt inside the house prior to having a fan, which perhaps indicates the importance of these holes in cooling practices.
“If I remember correctly when I was single, I was 17 or 18 years old that time, there was not a single fan in this house… I had not used any fans during sleep, or while in the house, but for as long as I remember, I can feel the air moving; yes, it is comfortable to have the air circulating…

[Yusof]

Figure 5.5 Ventilation holes in the form of decoration in Meck’s house

Another participant, Seth, is a knowledgeable 60 year-old retired government agriculture officer living in a 70 year-old Rumah Limas (essentially, this means made of 5 pillars) ‘masterpiece’ in the suburban area of Jeram, Selangor. In his account of the house, Seth captures how carefully these interrelated elements have been constructed and combined for the movement of air:

“At that time there was no air-conditioner we had never heard about it as well as far as I can remember… so it (the house) was built purposely to capture as much wind coming from that direction. Around 200 metres in this direction is the sea (showing the direction from one of the main living areas). The wind comes from here; so many windows are facing that way leading straight to the kitchen. No walls between the windows towards the kitchen, the room’s walls are to the side; this house only has one room, just for the parents. Few partitioned walls means the air can move freely inside the house. The immediate surroundings of the house have purposely been left empty without tall trees, to avoid obstruction to movement of the wind outside.”

[Seth]
There is no doubt that the number of windows and openings within Malaysia's traditional houses provide air movement that is vital to support a household's understanding of natural air, which I have discussed earlier in the section. In fact, a prior study found that those able to make use of such features, for instance, windows opening during times when the outdoor temperature is cooler than indoors, reduced their vulnerability to heat in the home (Vandentorren et al., 2006). Other than needing input from households, holes in traditional houses embed such standard features that ‘automatically’ allow movement of air during night time when windows are closed by occupants. These holes remain to allow movement of air from the cool outside. Parallel to what has been discussed in the architectural study by Sahabuddin M.F.M (2012) on how the ‘air house’ features of traditional Malay dwellings allow every breeze to slip in and out freely, which has enabled traditional practices to hold ground. Utaberta et al. (2015) in their assessment of spaces in vernacular houses relate how spaces are not intensively segregated within the house. On facilitating moving air, spaces of the home are combined without many form of partitioned wall or room, maintaining an open layout and lack of walls to segregate the space. At the same time, the arrangement of openness allows flexibility in using space, interchangeably changing the function across the spaces of the home; hence moving around the house involves seeking a comfortable space to perform activities. During the interviews, I matched what householders said they do in specific spaces in their homes and determined that their preferred common area within the house concurs with the comfort level rather than a fixed function of the space. The trend towards open and airy environments for comfort has also made households capitalise on extending spaces of houses. In traditional vernacular houses, spaces such as the Verandah and Kolong provide an ‘escape’ space for households when the house interior becomes too hot; while in more modern houses, balconies and shaded extensions are mentioned as places where households similarly find comfort:
“Previously, we did not have many rooms in our house. As you can see, our house now has two; in fact, some of the old houses only had one room for the parents as well, which was not a problem at that time. All the children were keen to sleep in the living room anyway. As I recall, it was more comfortable sleeping in an open space like the living room, something that we sometimes still do”

[Seth]

These spaces are always considered to ‘better’ in terms of thermal environment, simply because they are actually ‘outside’ of the house and shaded by the house envelope. As an example, Yusof shared how his family sometimes ‘escape’ the afternoon heat by having lunch in the ‘Kolong’ space under their traditional house, which was referred to by a few other households to be their escape space whenever the house became uncomfortably warm. Indeed, the Kolong is well-known for its air-circulation characteristics identified in previous literature as a source of cool air in an under-house environment (Utaberta et al., 2015).

“It will be scorching hot even inside the main living room during the afternoon. There (pointing under the house), the most cooling space of all, the kids will quarrel among each other for the swing (located at the Kolong).”

[Exora]

“The hottest period is around noon to 3.00pm, and if it is unbearably hot inside, I have lunch under the house (at the Kolong).”

[Amirah]
The Verandah is documented to be the first point of contact for guests to the house and is the preferred space for households of traditional houses to chat and spend some time with visitors due to its good ventilation (Yuan, 2002); however, its role in providing an escape from the heat is rarely discussed in the literature regarding its crucial role in providing comfort. Yet in my interviews, it is one of the most quoted places to rest and escape the heat:
“When it is getting really hot inside, I just take off my clothes, turn on the fans or just go to the Verandah to catch some wind…usually, if it is midday, I just bring along my lunch and have it there…”

[Samad]

Figure 5.9 Verandah, an open space within the house structure (Maria)

In another example, Raheem, who has been living in a house that will turn 100 years of age in the near future, expressed how he achieved comfort merely by sitting down around the courtyard area inside his house:

“One aspect that enables me to feel comfortable is how natural ventilation works in this house, which for me does not require any effort…other than all these windows needing to be opened daily…at the back, there is a courtyard which I can show you later when we walk around the house. The courtyard attracts wind from outside into the house. You can feel like you are outside of the house. My family and I do some activities there like having meals and as well as chatting with a guest if they have come from the back door…”

[Raheem and the courtyard at his house]

This section shows how the specific location around the house that were traditionally used in daily life correlate with how people maintained coolth and comfort. An era when advancement in technology had not reached current levels and all these traditional infrastructures were designed by everyday practices – the experience of moving around the house and understanding which location and arrangement was most suitable for achieving comfort. Utaberta et al. (2015) have discussed
how traditional households were flexible in the use of spaces in the home, in which comfort as one of the reasons for doing as such. Spaces have a very loose definition in the vernacular typology of houses. Activities, customs and ritual are not fixed to any particular space; something that goes against the new housing typology of fixed activities for space (Sim, 2011). Our findings show how households regularly switch the spaces used for eating and sleeping in seeking comfort. A long tradition in the pursuit of a more comfortable place to sleep is the use of living rooms due to the open circulation of air in a more extensive space (Sahabuddin & Gonzalez-Longo, 2015). Arrangements of traditional houses that create cooler and warmer spaces, for example, semi-enclosed spaces like Verandahs and Kolongs, suggest the household activities for particular spaces according to the level of comfort they provide (Utaberta et al., 2015). Households interviewed in my study concur with such findings as they search for an 'escape point', to spaces with an open airy environment, to be the place to eat, hold a short meeting with a guest (the one that we experienced) and relax when the day becomes hot; an act of 'escapism' in traditional cooling practices.

This extensive list of examples demonstrates how housing infrastructures of various kinds uphold traditional practices by prioritising adaptive strategies in the achievement of considerably satisfactory comfort. Situating daily comfort around mundane 'technologies' like windows and shading was proved by the households interviewed to be personally satisfying and deviates from the norm of mechanical cooling. In particular, (Winter, 2013) reviewed the paradigm of the built environment, something that is of major significance when it comes to housing and its infrastructures, and how discussion of it goes hand in hand with cooling services and household demand. Moreover, It is now understood that carbon emissions scaled for a naturally ventilated house are 67 per cent lower than for an air-conditioned house (Sahabuddin & Gonzalez-Longo, 2015). Unlike modern cooling practices that rely on air conditioning, physical arrangements in the form of building materials, infrastructures and design determine how comfort is achieved. There is a long tradition and historical account of how traditional practices have been upheld; especially those that fall within Malaysian ‘vernacular' architecture and known to be climate compatible', which householders closely adhere to in the configuration of comfort in the home. As a practical matter, the use of locally-sourced and climate-sensitive raw materials such as timbers for housing form a first layer of defence toward heat; for example, walls constructed from timber and roofing once made of leaves. The availability of many windows and openings also helps in terms of allowing movement of air in and out as well as within the compound of the vernacular house. Practice theory views this arrangement of ‘things' to be an active part of enabling the traditional practice of non-air-conditioning to be upheld by householders. So how then did these physical arrangements of the home prescribe households’ traditional practice of embodied skills and understanding? In the next two sections, I discuss how certain types of strategies were enabled by a range of features of the home and how some other features subtly shape the 'invisible' force behind traditional practices.
5.3 Living with the weather – outdoor air and a bit of heat

Hosseini et al. (2016) outlined how socio-cultural meanings behind the technicalities of Malay vernacular architecture were left unnoticed, overshadowed by the physical design, structure, features and materials used that dominate the discussion of traditional ways of achieving comfort in the past. As I have discussed earlier, it clearly shows how the trend of socio-cultural meaning is embedded in materiality. Traditional practices are not just associated with wanting comfort, they represent the significance of living ‘side by side’ with nature and all its qualities, being adaptive to what is around us. Most of the time, these meanings and values are embodied within the practitioners of practice and often hard to explain due to their intrinsicality (Strengers, 2009). Findings from previous studies have noted how comfort can be achieved by a far lower level of coolth than it is nowadays the case with air conditioning (Busch, 1992). Locally, study after study has shown that Malaysians have adapted to heat by an increased tolerance to higher temperatures, satisfied by air movement alone by way of fans in naturally ventilated conditions (Daghigh & Adam, 2008).

The desire to remain intact by means of outdoor air and live with the weather is the first contention of the desire of households. Concepts of freshness conventionally associated with the quality of air have found their way into the realm of traditional cooling practices (Shove et al., 2012). Home represents the boundary between indoor and outdoor air in which the flows of exchange between the two are crucial for comfort. In traditional practices, movement of air inside and outside houses has been a significant factor for comfort but Winter (2013) considers it has received insufficient attention, especially with regard to the meaning attached to this air. Common understandings of appreciation for outdoor air were pervasive through the traditional cooling practices among households interviewed in this research and were also related to a householder’s definition of ‘natural’ air. Firstly, I observed that most of the householder’s daily practices enhance the inflow of air into their houses. They equate a feeling comfort when they have a flow of air (or wind) into their houses. Exora, a 33 year-old home-maker, who lives in a traditional house in Pantai Remis, Perak expressed what it feels like to have a flow of air running through her house. It was 10.30 in the morning at the weekend, and all Exora’s children were watching tv in the living room when a breezy air interrupted our conversation and she remarked:

“...If it is a windy day like now, today, it is a nice feeling to have…a very nice feeling, it is comforting.”

[Exora on a windy day in a traditional house]

Outside air has been imagined as something that is felt to be missing when not flowing into the house, and even though invisible is appreciated when one can feel its presence. This tone of
romanticism regarding outdoor air is evident in similar statements by three elderly participants, Amirah, Raheem and Maria. They mentioned how their preference for outdoor air was something ‘natural' and hence valuable in the daily creation of comfort:

“Natural air helps to make me comfortable whenever inside the house; I normally keep the windows open more than I closed them...”

[Raheem]

“That window at the front of the house will always remain open... let the outdoor air flow naturally in and out.”

[Amirah]

Air has been the way daily living is structured including letting in ‘extra' outdoor air when welcoming guests. When I arrived at Maria’s traditional house, she greeted me as I seated myself. Instantly, she stood up and unfastened two more windows, adding to three that were already wide open; therefore, all five windows within the space of our interview in the kitchen area were open.

Researcher: I can see that there are many windows in this area alone. Do you often open them all every day?

Maria: Yes, I will open most of them daily. The one over here (pointing to the window nearest the table) will be opened when I have a guest in the house like you today, to let some more wind come in.
Several households closely associated their preference for outdoor air with factors such as time and house surroundings. For example, household reports of preferring outdoor air during early morning was usually followed by a comment about greenery and sea winds. Most of the households interviewed living in rural areas has relied upon a perception that outdoor air is fresh, unpolluted air; hence strengthening the comfort they experience living with outdoor air. Maria shared how she loves to open the windows from early in the morning due to the freshness of the air and how she understood the importance of vegetation surrounding her house.

“I open my windows to let the outdoor air slip inside the house. It has been my routine, and I will open the windows very early as the air is fresh at this time. Those small trees outside my house, I planted them to make use of the space with a bit of greenery. The big tree in the corner (pointing out the window), I planted that when I moved here, it has been there and grown, and now it is a big tree, which also provides some shade as well from the Sun..”

[Maria]

There is a known correlation between the notion of outdoor ‘natural’ air and green landscapes; this falls between a more substantial discussion on the rural and urban environment and also a more direct examination of the microclimates surrounding homes. Rural areas are widely understood to have the luxury of greenery that makes the air less-polluted, and hence is preferred by households (Geetha & Velraj, 2012; Passe & Battaglia, 2015). Sovacool and Valentine (2011) relate how remote communities in Sarawak (a state in Malaysia with the most extensive forest reserve) prefer the fresh air generated by the forest and directly equate their growing need.
for fans and air conditioning with being relocated to new settlements outside the forest. On a smaller scale, the microclimate of houses generated by smaller plants and trees, customarily cultivated by rural households, has also helped in the creation of fresh air. Here, the role of microclimate is to cool the surrounding air before it enters the house (Du, Bokel, & van den Dobbelsteen, 2014), which reduces the risk of death in the event of a heatwave (Vandentorren et al., 2006).

Preferences for outdoor air break the boundary between indoor and outdoor spaces. Moreover, households prefer an imagining of outdoor air, freshness and nature while living indoors. Particular words used in different contexts by households should not be mistakenly perceived as 'spontaneous', but rather a symbolic representation of how air is imagined by households, which hence determines their preferences for them to be 'invited in' their home or otherwise. As expected, rural households tend to be appreciative of outdoor air as 'natural', regardless of the temperature. While the literature cites the importance of the provision of natural air as being extensively indisputable, these findings concur with such arguments in the creation of a comfortable environment in the home. Putting this into perspective, Steele and Vizel (2014) explain the home is mostly air by volume, where the atmosphere can be unsettling if one thought it to be empty, which in reality is filled with air to sustain the residents’ own lives. While Malay vernacular architecture is about spaciousness, the preference of households to allow outdoor air to flow into the house is proven to be fundamental to the understanding of comfort for those living without air conditioning (Sahabuddin, 2012). And the factor of materiality that promotes the movement of air is indeed a crucial material component in upholding such perceptions (Djamila, Chu, & Kumaresan, 2013).

In traditional practices, acceptance to local climate was manifested in a number of ways in householders’ cooling practices, rather than alteration that is prevalent in how households seek comfort nowadays. For example, nearly all households when talking about hot conditions during the afternoon adopted a ‘tone of acceptance’ to the natural warmness and had a variety of underlying reasons for doing that; some understand how Malaysia’s climate works thus accept its warmness, some are just used to it since childhood, and others draw value from being grateful while comparing themselves to those who are less fortunate.

"Afternoon is the hottest it can get in the house, especially if it is not a windy day… but it is warm each midday every day here, so you have to adapt I guess, if you do not have an air conditioner, you can do something else…like me, I will take a very quick bath and relax in front of a fan watching TV…"

[Lina]
Researcher: How do you cope with the afternoon heat if that is the hottest time?

Samad: It is normal. The heat is acceptable to me, and it is bearable, I will take off my clothes... settle in at a place that is the most comfortable for me.

[Samad]

“You have to live with some difficulties, it is just some heat in the afternoon, and you have a colder evening and night afterwards... it is nothing if you compare it to those in Africa with a much hotter climate, sometimes more than 50 degrees and the river is drying up... this is far less than for those out there…”

[Yusof on being grateful that Malaysia climate is ‘not that hot’]

Several interviewees, especially the elderly, drew attention to some people’s dislike of air-conditioned environments. Maria, a single lady, shared how she felt when visiting her son’s modern house in the city, which is fully equipped with air conditioning in every room. She mentioned how she dislikes the feeling of living without natural air-movement and described fewer openings and tightly closes compound form the material side of the story.

“I’ve been to my daughter’s house, and she installed it... I don’t think I like the feeling of sleeping under it, I ask her to turn the air conditioner off, and I just open the room door.”

[Maria]

“I have been living my entire life without air conditioning. Yes, it is probably nice and cool (with air conditioning), but the climate of Malaysia is not that warm like in some parts of Africa I believe (laughter). My household is still OK with it, at least for now.”

[Seth]

Common understanding is fundamental to traditional cooling practices as it serves as the first step towards gearing up households toward adapting strategies. In tropical countries like Malaysia where heat remains relentless in everyday living, households tend to be more accepting of the heat and can adapt to higher temperatures than those who live on other continents (Brager & de Dear, 2008). In addition, a hint of religious values have emerged that drive routines surrounding the cooling practices of households. One unique finding is how religious values have historically shaped the daily routines of closing windows at dusk to avoid the devil entering a house. Such insight occurred during our interview with Maria when I probed further into her daily window opening and closing routines.
Researcher: Do you sometimes leave your windows open throughout the day and on into the night? Maybe when it's got so hot that you would need to leave them open; are there any days like that?

Maria: No, I will not. They’re always open early morning and closed during the sunset. There is a religious basis for that as well. It is not good to leave windows open, for the devil not entering your house. You know right? (She was probing me into saying that surely I know about the thing that she just said)

Researcher: Yes. I think I heard about the (religious) saying on that. But I think it is more about the insects, mosquitoes, that we close our windows at night.

Maria: But we (older generations) tend to sleep in the Kelambu, so it not really an issue. Kelambu gets us away from all those insects at night. The insects could get in from the holes anyway if the windows were closed (pointing at the holes surrounding the wall). For me, our forefathers have a bit more of a religious understanding than our generation that do this (closing windows during sunset) all their lives; and we just followed their routines as we were growing up watching them do that.

Even though these ventilation holes do invite mosquitoes and insects into the house, the usual response would be to create a barrier against the insects as opposed to closing windows entirely as is commonly quoted by households to be the reason why they close windows at night. The use of ‘Kelambu’, a type of clear cover placed around the bed to form a barrier against mosquitoes and other insects during sleep (Figure 5.11) was raised by Maria.
In trying to obtain further detail on the basis for such an argument, I probed for similar evidence with other households. Whether using air conditioning or not, the majority of households indicated that they knew about such a religious basis for closing doors and windows during the sunset to avoid the devil coming into the house. One participant also noted how she does not allow her children to play outside during sunset on the same basis:

“That’s right. We should close windows during the sunset…our religion taught us that…and I will call all my kids to come in as well during the sunset; it’s not a good practice … on the same reason I close all my windows at night…the devils are out there scavenging during that time…”

[Lina]

Religious understanding about closing windows at dusk was so pertinent that every participant I interviewed had known about that, but some merely said that they closed windows during the sunset more obviously for the sake of avoiding insects. Another older participant went on to give his view that because knowledge is so embedded in society, it transpires in everyday action without much thought, seemingly like an automatic thing to do during the sunset from an unconscious mind.
Although opening windows at night offers great adaptation to heat in the home from one perspective, religious recommendation to close windows from dusk is accepted widely and is absorbed into routines. Hence, ventilation holes offer an excellent alternative in traditional houses for night-time ventilation. When a value in this regard appeared in interview, I probed certain participants on any religious values that they uphold in their daily lives that help them to get through the heat and find coolth for themselves. Several other excerpts below indicate the religious values that drive the actions of participants. One is the highly regarded meaning attached to the period before early morning prayers, around an hour or so before sunrise, during which some households opt to open their windows. One of the direct benefits of such a routine is that the early morning fresh breeze will enter the house. Participant Yusof mentioned the word ‘barakah’, which essentially means ‘blessed’, after mentioning his liking for the early morning breeze.

“The window will be wide open every morning until sunset…it is a routine which I will normally do …I like the cold early morning air, barakah time…”

[Yusof]

When asked about the term barakah he had just used, Yusof replied that he likes the period after the early Morning Prayer or Subuh prayer, and feels it very refreshing to be the in the early morning air like that, and is why he referred to his time the breeze as barakah. In other examples, routine ablution before each prayer was also mentioned by Maria to help her refresh herself on the hot days:

“I take a light shower; most of the time before the Subuh prayer, Asar prayer and even the ablution and makes me feel fresh on the hot days.”

[Maria]

Ablution is the ritual cleaning of several body parts such as the face, arms, hands and legs, and some parts like hair, wiping some water on the surface of the hair. Khalid and Sunikka-Blank (2017) in their exploration of domestic social practices also indentify the theme encompassing how a society that deeply values religious belief transfers its teachings into daily practices. They found that Friday’s obligatory prayers hinder some individuals in proceeding with the laundry on this day and also involved adjusting their time for cooking and having a meal until after prayers. The religious reasoning behind actions and statements has proved to provide crucial guidelines especially in a society that deeply values its beliefs and upholds its teachings – something that has been related to sustainability, which I will discuss in the next chapter.
5.4 Practical knowledge of prioritising bodily comfort

Despite the material arrangement of houses that possess suitable structures and features to suit the Malaysian climate, Malaysians have adapted them in a somewhat efficient way into their daily strategies of living with the climate according to their beliefs and culture; we otherwise refer to this as practical knowledge. Households draw on their practical knowledge to perform a variety of common strategies based on know-how that is both mundane as well as unique (Chappells & Shove, 2003; Kammen & Dove, 1997); a range of adaptive strategies rooted from the understanding of acceptance to climatic conditions. These adaptive strategies are accumulated through everyday experiences (Strengers, 2009). What has been central in our encounter is that all these adaptive skills have been observed to prioritise bodily comfort; practical knowledge that I posit has engrained a household tendency for strategies like clothing adjustment, quick showers, moving around the house and opting for a standing fan. Relating to the first encounter with Exora earlier in the chapter, ordinary routines such as opening windows have become a daily habit rather than a response to heat. Households reported never missing the opening of windows very early in the morning every day and let them remain open throughout the day until dusk, which is one overlooked strategy. Some households, especially in rural areas where they have been confident regarding the security of their neighbourhood, even allow their house doors to remain open throughout the day:

"Windows will be open on a daily basis, never failed, except when I'm not at home."

[Seth]

Other than that, practical knowledge of traditional cooling practices is centred towards achieving bodily comfort. As discussed widely, adjustment to clothing remains one of the essential variables in the achievement of comfort. In our interviews, a wide range of clothing adjustment strategies continued to be applied by households in different times and spaces, reflecting sensitivity to daily temperatures and even seasonal fluctuations of temperature. The uses of lightweight fabrics and ‘hollow attires’ are widely observed by households in Malaysia. One of the participants, Yusof, is living in a rural area in his traditional 50 year-old timber house and shared how his decisions on clothing varied according to the time of day as well as seasonally. He discussed how he likes to use kain sarong pelekat, a long tubular-shaped (having a hollow bottom) garment usually worn in the house by both men and women (known as kain sarong batik for the female type of Sarong). Yusof also uses a pagoda, a simple term used informally to refer to basic, round necked, light fabric shirts that sometimes the skin colour of the wearer can be seen from the outside.
"If no guest is coming, I will typically go topless throughout the day (laughter), it is hot you know why…together with this ‘kain sarong’...in the earlier part of the evening, I will normally still be topless, but I will put on a ‘pagoda’ during sleeping time; it is cold in the middle of the night...a blanket is needed, even more, when the rainy season is coming, the night will be colder if it is raining during the day, I will definitely not go topless during the night."

[Yusof]

Several other households discussed the difference in clothing used. During bedtime, households reported wearing shorts [Zira, Arvin], sleeveless tops [Zira] and kain sarongs’ [Exora]. Male householders reported being topless during sleep [Arvin, Shaun], while on hot days women wore sleeveless tops [Amirah]. For the elderly, they would normally wear light cotton top, which according to one of them "is very comfortable and ‘airy’" [Maria]. This variation in clothing selection persisted across all the households interviewed and was concentrated on getting comfortable at the bodily level. All in all, this demonstrates how some form of know-how exists in clothing adjustment, which is how households actively negotiate and select what to wear, so as to get as comfortable as possible.

“When it gets hot, and we are about to go to sleep...I normally go to sleep shirtless and in shorts.”

[Raheem]

“The kids will normally feel the sensation of heat than us (the parents), and they will take off their clothes whenever they feel hot…”

[Ros]

“When I wake up in the middle of the night… If there’s a sign of coolness, I will grab my blanket...and sometimes I even sleep with long sleeves…”

[Seth]

“I will go topless if I am at home, and there is no guest…”

[Samad]

These excerpts concur with a long list of the documented literature with regard to the material culture of textiles and clothing adjustment for the achievement of comfort. A comparable study by Strengers (2009) found clothing adjustment was more apparent in households living without air conditioning rather than households living with the device. In Indonesia, Sarong as a
‘super skin’ is used to create warmness for infants, while at the same time giving comfort to the elderly (Allerton, 2007). Meanwhile in Malaysia, despite recognising clothing adjustment as another way to restore comfort, it is framed as ‘adaptation’ to air conditioning rather than another choice for comfort other than air conditioning (Mishra & Ramgopal, 2013; Sekhar, 2016)

In bathing, participants in our interviews preferred bilas badan (direct translation: rinse the body), a type of light bathing that indicates less use of water and usually does not involve the use of soap. The Malay word bilas itself signifies a quick run through of water throughout the body and ordinarily such types of bathing are intended to refresh rather than clean. Loosely attached to the religious practice of daily prayer, Maria shared how he has been taking bilas badan four times a day before daily prayers except for Isya (early night). On other notes, most of the households mentioned that they would have a quick shower in the afternoon on the non-working day whenever they feel uncomfortable. This quick shower is done on top of a daily routine of bathing in the morning and evening before dusk; the two most widely quoted practices across all households in this study.

Researcher: How many times do you usually take showers in a day?

Maria: I will rinse my body around four times a day before daily prayers; before Subuh (early morning), before Zuhur (afternoon), before Asar (early evening) and before Maghrib (dusk).

Researcher: That is quite a lot of showers you take each day.

Maria: Yes, to be more comfortable. Just a quick shower, without the use of soap or anything. I already have already used it today.

[Seth on taking a quick shower and not using soap]

Seth: I take a bath around three times daily; in the morning upon waking up, in the afternoon around 1 to 2 pm when it is scorching outside, and at dusk before 7 pm. I particularly like the afternoon one, when you pour that cold water from the kolah onto your body; it instantly felt the coolness of that water felt very good

Researcher: So you like the coldness of the water from that Kolah?

Seth: Yes, I never felt the same whenever I take a shower with running water.

[Seth]
“…whenever I feel uncomfortable, I would normally go straight to take a light bath, a few scoops of water running over your body, and I will be fine for a few hours…”

[Yusof, on traditional practice]

In this sense, the adaptation to heat is connected to the water sector. As discussed in the literature, a lot of studies pertaining to water consumption and its own sustainability challenges have solely been focusing on the social practice of bathing/showering, which constitute its own set of elements that it upholds (Strengers Y., 2009; Wilhite H. et al., 1996). In particular, the practice has received attention due to the current endeavour to reduce water consumption in a parallel move with conserving energy consumption in cooling practices (Martin Hand et al., 2005). As mentioned previously, the act of bilas badan, or light showering, was commonly quoted by elderly households in this study to be the way to combat uncomfortable feelings of heat in the home and represents a ‘substitute’ for air-conditioning usage for some.

"I would normally go straight to shower when I arrived home, but now I will sometimes have a rest on the sofa and turn on the air conditioning (Laughter)

[Nick on air conditioning and bathing]}

An example such as this describes air-conditioner conditioned bathing, and in most cases nowadays restricts bathing frequency. Shove et al. (2012) refer to this as the deformation of connections between practices in which one’s connection is no longer sustained. In households interviewed, as expected, Malaysian bathing patterns are similar to those living in other warm-climate countries, whereby households were reported to bath regularly when it was deemed uncomfortably hot (Strengers, 2009). However, one method, bilas badan is, or should I say the skill of bathing, does not necessarily involve using large amounts of water. Kolah (Figure 5.12), the infrastructure used to store water for daily household usage, originally gained its supply from gathering rainwater. During those days, it was a primary source of clean water to overcome water supply shortage due to the lack of infrastructures. Coincidently, it has also makes the water colder that is usually running through the tap. Seth, Yusof and Exora, made a similar statement about how Kolah air means the water stored is older than usual and bathing is more ‘satisfying’ on a hot day. I was invited to dip my hands inside the Kolah and pour its water onto my feet, my experience of which I recorded in a field note as seen below. A recent study by Nicholls and Strengers (2018) also shows that a similar type of cold bath is preferred for infants under the extreme heat as an alternative in a home without air conditioning.

"I bathe more than twice a day, it's rarely only twice... there needs to be one in the afternoon when it has got scorching; with that cold water from the Kolah air, it is satisfying…" (Laughter)
“One of the best feelings after a tiring fieldwork day is when I wash my face using water from the Kolah; it is refreshingly cool, and the water is indeed colder than that running directly from the pipe, as I tried both in Yusof’s bathroom… I try to imagine taking a quick shower with this water under the afternoon heat… I’d say it will be enough to cool my body for a few hours…”

[Field notes on cold water in Yusof’s bathroom]

Besides, the households reported moving between spaces to perform activities such as relaxing, eating and sleeping, which they deemed to be comfortable. The presence of different spaces with different thermal sensations enables households to do so, and this returns us to the fact that the household is continuously looking for space with better air circulation. As a result, households align their activities as per spaces that were deemed more comfortable to them at given times during the day. Indeed, I have been in the situation of doing interviews at the spaces chosen by participants that they deemed to be more comfortable to them; two interviews were conducted in the dining area and four were on the Verandah as opposed to the living room for guests. Two householders, Amirah and Yusof, shared how they will have lunch at the Kolong sometimes when it becomes hot inside the house:

“Sometimes I have our lunch over there… (Pointing at the under house spaces), it is more comfortable down there.”
A few elderly households also reported being comfortable sleeping in the living rooms due to an open environment created by the availability of ventilation holes and an open layout of living hall that creates better air circulation, which was described by those living in modern houses lacking such features. Seth shared how his children all opt to sleep in the living room as opposed to in the bedroom due to better air circulation, although air conditioning is installed in the bedroom.

"My husband sometimes sleeps at the living room with the kids, if it is too hot inside the room…"

[Ros on living in a flat]

"… I will usually sleep over here (pointing towards a pile of mattress in the living room), inside the room if it is a bit warm."

[Maria, traditional practice]

These excerpts concur with a large body of literature that outline movement by households between spaces with different comfort levels. Chappells and Shove (2005) find that households decide to relax in the spaces at which comfort would be achieved. They also recorded how households can tolerate some areas of their house that can be less comfortable than others; hence they move in search of comfortable spaces. In their detailed account of functions of space in traditional Malay houses, Utaberta et al. (2015) have outlined how traditional society has loosened the boundaries of space and activities. This scenario means that some activities like sleeping might not only be performed in the bedroom and eating will not always in the kitchen; they will align their activities according to the comfortability of the space. A few householders who have been living in a traditional house have shared how the living room was always used as a sleeping area.
Maria dragged his bed into the second room to sleep

All households were asked about what they perceived to be the hottest and coldest space, which later matched their common space in the home. Table 5.4 summarises the data. It was observed based on the observations and measurements recorded during interviews in which households were aware of the most comfortable space in houses and spent more time in that particular space as their common space. This input is fundamental to how households move about inside the house by realising which spaces in the house are most comfortable to them. Foruzanmehr and Vellinga (2011) have reported similar observations on how households were spending most of the time in a space that they deemed comfortable.

Table 5.3 Temperature measurements during interviews

<table>
<thead>
<tr>
<th>Name</th>
<th>Outside</th>
<th>Hottest</th>
<th>Coolest</th>
<th>Common space</th>
</tr>
</thead>
<tbody>
<tr>
<td>Exora</td>
<td>35</td>
<td>31 - Verandah</td>
<td>30 – Main hall</td>
<td>Main hall</td>
</tr>
<tr>
<td>Maria</td>
<td>33</td>
<td>30 - Verandah</td>
<td>29 – Second hall</td>
<td>Second hall</td>
</tr>
<tr>
<td>Samad</td>
<td>33</td>
<td>32 - Verandah</td>
<td>29 – Main hall</td>
<td>Main hall</td>
</tr>
<tr>
<td>Yusof</td>
<td>34</td>
<td>31 - Verandah</td>
<td>30 – Second hall</td>
<td>Main hall</td>
</tr>
<tr>
<td>Raheem</td>
<td>32</td>
<td>30 - Verandah</td>
<td>28 – Main hall</td>
<td>Main hall</td>
</tr>
<tr>
<td>Amirah</td>
<td>32</td>
<td>29 - Kitchen</td>
<td>29 – Second hall</td>
<td>Second hall</td>
</tr>
</tbody>
</table>

Concentration given to cool one’s body rather than immediate space in the house (such as cooling the whole bedroom) persuades households to opt for a cooling device that can be more directed toward their body, such as the standing fan. Although standing fans were also used to cool spaces, five households explicitly drew our attention with their responses regarding how they can take such fans with them when moving around the house to reach spaces which have no
ceiling fan – almost 95 per cent of Malaysian houses are equipped with this popular type of fan. Another participant reiterated how the standing fan feature of an adjustable head allows direct fanning toward the body, which for them makes all the difference under the heat.

"... this fan, (pointing at the standing fan), where you can point its head in the direction facing you, for me is better than the ceiling fan when it becomes very hot inside the house, and you want the wind to be directly blowing at you…" 

[Raheem]

Researcher: I can see that you have a standing fan in each halls and rooms other than a ceiling fan.

Yusof: The (standing) fan has been moving everywhere within the house. I use it more often than the ceiling fan, especially when guests are around and all sit here.

[Yusof]

Wilhite (2009) believes that the inclusion of household’s ‘local knowledge’ is important in coordinating negotiations with experts in building comfortable homes that are more efficient than those that can be provided by modern climate conditioning. Wallenborn and Wilhite (2014) warned about a similar concern in that resorting to the standardisation of indoor climate through the increasing use of air conditioning drives a decline in know-how in adapting to heat. Linkage
governs practical knowledge in the form of adaptive strategies towards why (meanings) and how can it be achieved (materiality) as presented in the previous section. Traditional cooling and cooling practices engaged households in a routinised method to deal with indoor environments such as opening windows and doors. Households then will strategise for bodily comfort such as to change clothing, *bilas badan* (bathing) and moving around to find comfort for themselves. Mishra and Ramgopal (2013) claimed that households enact these adjustments systematically based upon their ease of doing it at the time of the uncomfortable feeling. Above all, the enhancements made have truly satisfied households’ comfort levels to the extent that we now know, a culturally and spatially set of negotiable aims (Utaberta et al., 2015).

### 5.5 Conclusion: broken links

This chapter has provided a comprehensive investigation into traditional cooling practices in the specific context of Malaysian households. I have moved beyond a focus on the properties of vernacular housing into incorporating the interrelated dimension of social and cultural involvement. This approach has highlighted meaningful and systematic lessons for traditional cooling practices, particularly in our move toward future aspiration of providing cooling services in the home with less energy. What I found is that, in achieving so, it will take much more than technical fixing of housing built environments and features. Put simply, the best designs of windows are still in need of households' know-how on the effective opening-closing routines that very much depend on households understanding of their usage for comfort. Table 5.4 summarises the interrelations between elements of traditional cooling practices.

<table>
<thead>
<tr>
<th>Table 5.4 Composition of traditional cooling practices</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Outcomes</strong></td>
</tr>
<tr>
<td>----------------</td>
</tr>
<tr>
<td><strong>Air circulates in the house</strong></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td><strong>Bodily comfort</strong></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td><strong>Sleep comfortably</strong></td>
</tr>
</tbody>
</table>

This endeavour on traditional practices in households highlighted the complexities of a network behind traditional cooling practices beyond individual elements of housing design and built material and ‘behaviour’. The embodied skills possessed could not be taught but were realised
through values that stem from childhood reproduction and experiences. At the same time, these childhood experiences exist from knowledge derived from the experience of local climate and understanding which physical environment of the home best suits us. This concurs with the practices philosophy of interconnectedness between elements, and no practices stand without the ‘existence’ of those elements. On the other hand, in describing instances on the persistence of traditional practices, the element of meanings and know-how were being highlighted as opposed to a sole focus on the design aspects of vernacular houses that are apparent in the literature. I have shown how significant the arrangements of elements are in the emergence and persistence of practices. However, in order to pursue the idea of ‘re-emerging’ traditional practices in today's society, a broader discussion is needed, *one that takes us back and forth, in and out of the material and social, the tangible and the intangible* (Winter, 2013, pg 259). Upon reviewing both modern and traditional practices in Malaysian households, I posit the next step is to understand how these two sets of practices change between each other. Perhaps we should challenge how we view the persistence of non-air-conditioning and the emergence of air-conditioning practices in Malaysian households.
Chapter 6 Dynamics of re-emergence and heat vulnerability day-to-day

The thesis has reframed understanding of cooling practices in Malaysian households through the conceptual lens of practice; viewing these cooling practices as 'entities' that are composed of elements — namely materiality, meanings and skills. Chapter 4 recognised the composition of modern cooling practices and how this emerges; bringing about dependency on air conditioning as a ‘necessity’. Consequently, Chapter 5 revisited traditional cooling practices, analysing their composition and persistence. Within these understandings of the two chapters, we know that changes do not happen 'en masse', but rather practices reproduce themselves by actively linking and breaking the elements within. On that note, I come to the third and final aim of the study: confronting the 'real world' issues of changing climate; managing cooling consumption; securing well-being in the heat, i.e., juggling adaptation and vulnerability during heatwaves. While it seems such practices are well past their time, I argue that exploration of traditional cooling practices thus far brings to the fore the proposition that the process of 're-emergence' of practices is involved in giving shape to and the form that current 'non-air-conditioning' cooling practices take. This brought about identifying the 'entanglements' between elements in everyday living as highlighted by Winter (2016) through which these traditional cooling practices remain stable and re-emerge in the form of non-air-conditioning practices. In this chapter, I unpack the process of the re-emergence of ‘non-air-conditioning cooling practices’ based on the dynamism from the past. By doing so, I am considering how the meanings, materials and skills of traditional cooling practices in the home circulate and interact, and hence form underpinning pathways to the creation of current non-air-conditioning practices (Winter, 2016). This effectively answers questions regarding which households are able to sustain traditional practices in current times, what role housing arrangement has is within this, as well as looking at how values and skills from the past are retained by some households and disappear in others (Foruzanmehr & Vellinga, 2011). Intertwined with the above discussion will be how the concept of practices sees socio-demographic factors, geographical location and financial status playing a role in changes of practice. Finally, I conclude by drawing attention to the richer understanding of heat vulnerability in the home yielded from the entirety of these discussions and determining how widespread such a phenomenon is.
6.1 Traces of re-emergence of traditional cooling in ‘non-air-conditioning’ practices

In regard to the persistence of practices, many scholars have agreed that the historical arrangement of elements offers many important insights into projections for the future. The recent view of contemporary social practices, influencing practices towards a more rather than less sustainable direction, brings to the fore a conceptual alternative — a discussion on routes and pathways through which practices ‘re-emerge’ as lower carbon ways of life for the future (Shove et al., 2012; Shove & Walker, 2014). The elemental composition that this thesis has constructed so far in the previous two chapters helps to uncover these routes for elements of practices involved in the process of preserving practices through time, space and materials. This sort of thinking helps to reveal the viability of practices such as traditional cooling within the present-day context. As Winter (2016) reiterates, his concern is that thinking within this line of argument is not merely to create the nostalgia of a ‘golden era’ where practices such as those traditional cooling practices existed. Instead, the aim is to gain valuable insight into the dynamics between elements and how these relationships remain stable as the core of ‘non-air-conditioning’ practice in the future. This effectively means to consider “dynamics of partial preservation and occasional resurrection in avoiding the simplistic assumption that the new to take the place of the old” (Maller & Strengers, 2015, p. 148). In tracing these dynamics, this section addresses what Shove et al. (2012) and Maller and Strengers (2015) referred to as the ‘re-emergence’ and ‘resurrection of practices’ respectively, where the underlying discussion is to answer the question regarding which households are capable of maintaining traditional practices in the current times we are living in:

A change in any of these three pillars can shift a habit and indeed influence our overall dispositions. A change in more than one aspect would most likely lead to the dissolution of the habit. Addressing only one pillar may not suffice (Sahakian & Wilhite, 2014, p. 28).

As Sahakian and Wilhite (2014) argue above, each element of practices — meaning, material and skill — act as an anchor to the persistence of a habit. Traditional cooling practices highlighted in this study, within their ‘pure form’ of materials and social conditions, have been acknowledged to bring few benefits within contemporary cities that are dense and comprised of high buildings. However, the material and social contextual underpinnings of the practices by which some relationships remain stable in current generations’ non-air-conditioning routines, thus serve as a valuable blueprint for the future. In discussing pathways of arrangements that are able to retain dynamic of tradition-based cooling practices, I explore two themes; firstly, re-emergence shaped by meanings and secondly, re-emergence shaped by materiality and skilful acts. Table 6.1 below summarises the elemental comparison between modern and traditional cooling practices. A comparison between modern and traditional practices benefits the summary and consequently traces the pathways that the longevity of elements of traditional practices inhabit – the re-emergence of ‘non-air-conditioning practices in current times’.
<table>
<thead>
<tr>
<th>Elements</th>
<th>Details</th>
<th>Modern cooling practices</th>
<th>Traditional cooling practices</th>
</tr>
</thead>
<tbody>
<tr>
<td>Materials</td>
<td>Building material</td>
<td>Bricks, cement</td>
<td>Timber</td>
</tr>
<tr>
<td>Indoor compound</td>
<td>Require a tightly closed compound with an opening that can be controlled like windows that can be closed</td>
<td></td>
<td>Require as much moving air as possible</td>
</tr>
<tr>
<td>Shading and outdoor microclimate</td>
<td>Microclimate does not really matter as the indoor system is closed</td>
<td></td>
<td>Shading in the form of trees and adequate shading around the house, shading from direct solar radiation, maintaining a cool outdoor microclimate, and</td>
</tr>
<tr>
<td>Escape space</td>
<td>Air-conditioned room, air-conditioned outdoor place, i.e., shopping mall</td>
<td></td>
<td>Verandah, house surroundings</td>
</tr>
<tr>
<td>Windows</td>
<td>Window availability limited one or two panels per walls</td>
<td></td>
<td>Holes, windows, doors</td>
</tr>
<tr>
<td>Holes</td>
<td>Few openings in the form of holes</td>
<td></td>
<td>Holes embedded in the structure</td>
</tr>
<tr>
<td>Meanings</td>
<td>Comfort</td>
<td>Instant with air conditioning</td>
<td>Have to work for comfort,</td>
</tr>
<tr>
<td></td>
<td>Temperature</td>
<td>Number of degrees Celsius</td>
<td>Temperature does not matter</td>
</tr>
<tr>
<td>Skills</td>
<td>Expectation</td>
<td>Higher heat tolerance</td>
<td></td>
</tr>
<tr>
<td>-------------------------</td>
<td>------------------------------------------------</td>
<td>--------------------------------------------</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Coolth, expect cooler temperature than local</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>climate</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sensitivity</td>
<td>Sensitive to changes in temperature, local</td>
<td>Adapt to the local climate; a little heat will not hurt</td>
<td></td>
</tr>
<tr>
<td></td>
<td>climate</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cooling prioritisation</td>
<td>Space cooling, getting space cooled for the</td>
<td>Bodily cooling, getting the body cooled</td>
<td></td>
</tr>
<tr>
<td></td>
<td>body to be comfortable</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Skill regarding air</td>
<td>Closed compound</td>
<td>Opening windows early in the morning, using a standing fan and directing it to the body,</td>
<td></td>
</tr>
<tr>
<td>Sunlight</td>
<td>Avoiding sunlight at all times</td>
<td>Going outdoors in the morning sun and realising that afternoon and evening sun is hotter; drawing curtains to prevent sunlight coming into the house</td>
<td></td>
</tr>
<tr>
<td>Movement</td>
<td>Stay longer in space that has to air-condition</td>
<td>Moving around the house to find the most comfortable spot</td>
<td></td>
</tr>
<tr>
<td>Sleep</td>
<td>Turn on the air-conditioner, sleep with a thick duvet or blanket</td>
<td>Sleep without blanket: not accustomed to sleeping in the blanket in hot weather</td>
<td></td>
</tr>
</tbody>
</table>
6.1.1 The strength of embedded meanings and practical knowledge

In the previous chapter, I have discussed how generations that are growing up without air conditioning, in which values and meanings such as perceptions of heat and sweat are ‘normal’ rather than negative, remain intact within their everyday aspiration for comfort. Shove et al. (2012) consider how meanings around cycling to commute are not entirely lost in the Netherlands and have contributed towards the resurgence of cycling as a chosen practice in its society today; however, this resurgence comes with a different arrangement of materiality — designs of bicycles and networks of roads. Schatzki (2013) suggests this can be a kind of ‘unity in difference’, whereby subsistence or composition of practices greatly differ but yield practices compatible with ‘mother practices’ from the past. It is discussed here as well how timing factors are important in reigniting this value from a ‘state of limbo’ (Maller & Strengers, 2015).

In this study, timing refers to an ageing population still retaining value they have grown up with — childhood reproduction of meaning and skills (Strengers, 2009). In my encounters with elderly households, they all shared a strong reproduction of thought, of having a dislike of air-conditioning coolth as it is uncomfortable to them. As I have already stated regarding the meaning of traditional practices, elderly households living in timber houses possess a very strong value toward non-air-conditioning that stems from childhood experience: Meaning that is retained and remains intact as they travel to different places. The strength of this value drives them to not opting for air conditioning even in materiality that promotes its usage. In my discussion on the emergence of modern practices in the previous chapter, I encountered how far meaning can subtly shape the use of air conditioning in households. In contrast, however, in a number of other households I found that a deeply embedded value on how comfort was perceived can act in the persistence of traditional practices; how comfort is viewed as adaptation and working around this to get the best out of the local climate. Meaning is the most subtle element that influenced households to exemplify their typical daily know-how of living with heat, which is historically embedded in a long tradition of living under a hot climate. For example, the prioritisation of moving air around the house has dictated and sustains a strategy as common as opening windows, which we understand has been partially lost in modern-day practices. The concentration given to bodily cooling to remain comfortable in the home has also encouraged households to move around the space and take regular showers. These mundane activities form embodied habits that are sometimes hard to explain. This is particularly obvious in the elderly or middle-aged householders throughout this study.
Table 6.2 Overview of households’ characteristics of 'non-air-conditioning' cooling practices

<table>
<thead>
<tr>
<th>Participant</th>
<th>Household type</th>
<th>House type, material, age</th>
<th>Immediate environment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Zira</td>
<td>Couple</td>
<td>Apartment, brick</td>
<td>Urban</td>
</tr>
<tr>
<td>Arvin</td>
<td>Couple</td>
<td>Apartment, brick</td>
<td>Urban</td>
</tr>
<tr>
<td>Ros</td>
<td>Couple with three children</td>
<td>Apartment, brick</td>
<td>Urban</td>
</tr>
<tr>
<td>Nash</td>
<td>Couple with two children</td>
<td>Apartment, brick</td>
<td>Urban</td>
</tr>
<tr>
<td>Rabi</td>
<td>Couple</td>
<td>Bungalow, combination*</td>
<td>Urban</td>
</tr>
<tr>
<td>Shaun</td>
<td>Couple</td>
<td>Terraced, brick</td>
<td>Urban</td>
</tr>
</tbody>
</table>

* Combination of brick and timber

Here, examples are introduced concerning elderly households I interviewed that have persisted in maintaining this know-how to achieve comfort in the home. Raheem has noted that opening windows and letting air sip into the house every day is an already embedded everyday activity that keeps him and his household comfortable.

"I will find it weird and not normal to wake up in the morning and leave all these windows closed… you will not feel comfortable… it is the first thing to do every morning, and it is something you have to think about, it just needs to be done because it is a usual thing to do."

[Raheem and embedded routines]

Similarly, for Maria, at 85 years of age, her full-life experience of living in her traditional house has shaped how she finds comfort. Maria’s life of adapting to the heat and wanting moving air made her uncomfortable with air-conditioning coolth and an enclosed space. Even though she was at a different house, this value was embodied within her and influenced her to adjust in seeking comfort. When at her son’s house for a sleepover sometimes, she describes a sense of discomfort regarding the tightly closed space of the home, which she refers to as ‘cave-like’.

"My son has an air conditioner in his room which I would rather not use as I do not like its coolth… it is too cold for me at times… and the room feels a little bit stuffy and enclosed, like a cave (laughter). What I usually do is, I will open all of the windows and also doors leading to the living room… I feel much better that way… At night, I will use a fan and open the window a little bit sometimes."

[Maria on sleeping in an air-conditioned house]

In addition, the strength of these values also tends to shape the frugal use of air conditioning. Previously, while Nick’s mother had reported being not impressed with the arrangement of windows in his house, she still refrained from using the air-conditioner by opening...
the sliding doors in the living room instead, which had never been opened by Nick himself. Nick’s mother also proceed to do various activities; namely opening the sliding doors early in the morning, being outside sometimes in the morning and evening for light gardening and ‘ambil angin’ (meaning to take a breather outside and clear the mind), which she had regularly done at her own house back in the village.

“I dislike air conditioning and prefer outside air... As I will normally take a breather out there doing gardening back at the village, I tend to be out as well at around 10-11am in the morning, doing light gardening if there is any, or just to be outside. It is rather warm in the house this time of the day. I usually open the sliding doors; Nick never opened those (laughing) but since the window is not attracting enough wind, maybe because being in this middle unit in a terrace [it is] so hard to capture wind, I guess...”

[Nick’s mother on her activities at her son’s house]

In sharing these details, Nick’s mother shows how she holds true to her dislike of air conditioning by adopting routines that she typically uses at her own house in the village, even at this time in different housing and arrangement of infrastructure. I also note that although according to her previous account regarding windows lacking in number and less wind passing through, she managed to arrange the sliding doors to allow more air into the house. This series of actions have shown how know-how can go a long way in sustaining traditional practices, even in a more modern house. In another example, Amirah reiterated the same feeling of romanticising the movement of air within the house that is more preferred to her.

“I like it like this more, allowing air to seep in through these tiny holes... for me, it is better, I am used to this since my childhood until now... this is what I saw my late parents doing every day, and I repeat it as my [own] routine. I am comfortable just opening all these windows every morning...”

[Amirah on persisting with her window opening routine]

Almost all households interviewed shared the same stories when it comes to the persistence of meanings. In this preservation of know-how, we can observe how these elderly householders referred to their childhood experiences and upbringings that now influence current practices. This discussion concurs with what Strengers (2009) described as faithful reproductions that explain practices concerning householder’s upbringings and life experiences. Persistence led by these factors was therefore incredibly consistent, as they have become embodied activities that transform into layers of tacit knowledge that are rarely questioned. Therefore, in a sense, the elderly represent existing knowledge in the persistence of traditional cooling practices. Not only enduring as the ways materiality upholds traditional practices but meanings also ‘travel’ as the elements re-
assemble in a different setting (Shove et al., 2012), which indeed also means in the ‘modern house’.

Shaun is a householder living in a terraced house in an urban area of Shah Alam. He lives with his housemate, a single man, and both share the rent every month. Shaun works as a security officer in the local mosque in the city. When asked why he did not equip his house with an air-conditioner, he mentioned about how he still finds it sufficiently comfortable by opening windows and bathing as well as sleeping topless and finding a cooler spot to sleep rather than his room. Shaun shared that he has taken a long time adjusting to his current house without air conditioning, especially during sleep time.

"In my village house, sleeping is just about wearing basic tops and turning on a fan… here in this house, I find I'm like an idiot sometimes, wandering around my bed struggling to sleep, the fact is that my room has no window at all, worsening the situation… what I usually do is if it is that bad, I take showers whenever; most of the time I will go topless, wearing shorts, and I regularly sleep not in the bedroom, but here in the living room…"

[Shaun on what he does to achieve comfortable sleep]

As we can see, Shaun recalled his knowledge and experience back in his village, where he had been used to actively navigating a variety of strategies to remain comfortable. Upon being asked why he continues with these strategies without ever thinking about using an air-conditioner, he merely replied, "we live here in Malaysia where we just need to accept some heat". This revisits acceptance as an underlying value of how for some, a level of heat is considered normal and as Shaun used to navigate heat without air conditioning, he is able to reproduce this strategy for the time being. Similarly for Nash, where his response to heat has been one of ‘normality’ and did not bother him as much as being bothered about the ‘unusual’ coolth of air conditioning. Nash related his brother’s feeling of discomfort with the warmth of his house, while he felt as comfortable as usual.

“My brother uses an air-conditioner in his house. When he was here, even though I had opened all the windows widely, he was still uncomfortable. You know, when you are always using air conditioning, at home, at work, you do not get used to even a little warmth. When he was here, he would be uncomfortable at some point whereas I am okay; it is just another normal hot day… although we are sitting in the same place, same time, he is usually not comfortable. For me, some warmth is usual, I can stand it, I am used to it… and when I was at his house, the situation would reverse, I would be the one who felt uncomfortable (laughter), I am not used that kind of coolth, to sleep inside an air-conditioned room…”

[Nash and how he viewed warmth and coolth]
Nash goes on to specify that he thinks his own apartment is just comfortable enough to sleep in, although he also recalled sleeping in the middle of the afternoon under the Nipah roof at his childhood home and still felt comfortable. A Nipah roof, as discussed in the chapter 5 on traditional practices, is a roofing material that can now be said to be fully departed from mainstream norms. Nash suggests that it may be better to sleep under that type of roof if still being used today.

"That time, when we slept under the Nipah roof… this Nipah roof is by nature like the shade of a tree, when you stack the Nipah roof, the sun’s heat cannot penetrate at all, let alone sun rays… it was comfortable and cool even in the afternoon… even cooler at night. Unlike the houses we live in today. I think we have not found the same roofing quality as Nipah or Rumbia… traditional houses, now they use zinc as a roofing material, and it is very hot inside the house in the afternoon. The combination is no longer right."

[Nash recalls his experience of sleeping under a Nipah roof]

He expressed that his current house has been comfortable to sleep in as the nature of the apartment means the roof is not an issue. Nash also added that the reason for him not using air conditioning is that he liked the outside breeze and could not imagine having to close windows for comfort.

"I like to let breeze come into the house, so opening windows is a must… I lived on a farm before, and we had many trees. These trees are making a breeze from outside, cooler. Because they are so shady, they shade the sun’s rays as well the surrounding of your house. My neighbour in that apartment (pointing at an apartment in a different block), I never see him open that window, he uses air conditioning… I cannot see myself doing that, living in a closed space like that."

[Nash on opening windows]

Against this background, Shove et al. (2012) suggest that meaning ‘travels’ and realigns with different arrangements. In this instance, value existed in memories and led into normalising the same know-how, even in different housing infrastructures. This forms patterns of persistence even in a material setting of modern houses, which we know promote air conditioning. The dynamic relation between householders as practitioners of practices and the meaning of the practices sees persistence from a perspective that relates to the involvement of cultural values embedded in wider society. This position explains how these households have to manage their resistance to using air conditioning and continually return to their faithful childhood know-how that subtly influences their non-air-conditioned practices, even in a different material setting (Strengers, 2009). The continuity
of these practices was facilitated by the duration and intensity of the experience in their usage, even considering the different or contrasting arrangement of materials in modern homes (Maller & Strengers, 2015). These relations between meaning and know-how preserve traditional practices in non-air-conditioned houses. This particularly shows how meaning is embedded in those who have grown up without air conditioning and has ‘followed’ them, being reproduced again in a different materialistic configuration. Maller and Strengers (2014) relate this condition to discussion of a ‘practice memory’ as an enabler of such a relationship that now exists in more modern housing. While this memory is vital to the survival of non-air-conditioning practice, various issues arise with a housing characteristic also widely considered by the literature, namely the house that does not script households in adapting better to heat (Maller & Horne, 2011).

The key, as Shove et al. (2012) observed, is timing. In particular, I found timing is important due to the value factor still retained within households: The practice has not become fossilised in time (Shove & Pantzar, 2005b) and is able to be resurrected (Maller & Strengers, 2015). One perspectives to look at this instance is the how the significance of these memories for participation in traditional practices and how this ‘practice memories’ (Maller & Strengers, 2015) has a bearing on the frugality of air-conditioning usage. Across the householders interviewed in this study, most found they had a ‘natural’ tendency to use their air-conditioner less, although the device was available to be used. For instance, Meck lives in his stepmother's 60-year-old traditional house in Kuantan where there is one air-conditioner that arrived from her former home and is installed in his bedroom. Although the room is equipped with an air-conditioner, Meck’s described his air-conditioning usage as "occasionally and not on a daily basis", but recent heatwaves had prompted more use of it.

Meck: There is one air-conditioner installed in my bedroom, but I have not used it much that often... even on a every normal day like this, I will find a fan to be adequate... just those recent unusual hot days in April, at that time I needed to use it quite a lot during that period but any other time I will spend my time in the living room, top off every day, making sure the windows are all open....

Mother: He’s usually the one who opens the windows very early in the morning. He cannot stand the heat and feeling of non-movement of air in the house.

Researcher: So what strategies do you prefer to become more comfortable in your home, even though you have an air-conditioner? Taking off clothes, opening windows - any other strategies?

Meck: I love to shower too... this house uses water from the well and the water is cold, great to shower with.

Mother: Meck was brought up in this house, so he is comfortable here and has been used to this all the time. This house was without an air-conditioner until a few years back when I installed the device brought over from my previous home.
From my observation, despite air conditioning being available, it does not find regular usage. This was proven to be the case when they did not close the ventilation holes in the room. Meck’s prudent use of the air-conditioner can be understood from his experience of living without the device, which he clarifies when I asked further about his views on air conditioning in the home.

"I do not like to use air conditioning myself, and now that I have a new-born daughter, I will not impose the use of air conditioning on her as well. I also prefer not to make her too used to it. I use a fan and prefer that way, making sure all these windows are open."

Meck’s embodied preference for the movement of air and open space has led him to dislike air conditioning and these preferences could be derived from his more extensive experience of living without an air-conditioner. By having such a set of values, he engages in limited use of air conditioning as a result. This type of ‘weak’ pattern of emergence of modern cooling practices confirms Shove et al.’s (2012) notion regarding when the value of experience which has not entirely diminished, but will become embodied value that will follow on the practitioners. This value contribute towards restricting one’s air-conditioning usage and making one’s to tend to not using air-conditioning. An embedded meaning behind a long tradition of non-air-conditioning cooling practices in Malaysian households is driving the revival of such practices in households, particularly those who are growing up experiencing life without air conditioning.

6.1.2 Material arrangement and skilful act

The persistence of traditional cooling practices is a result of the subtle alignment of vernacular housing infrastructures that is sensitive to the historically embedded know-how. In this section, I discuss how materiality plays its role in the persistence of skilful acts, upholding actions rooted in traditional cooling practices. Particularly, housing infrastructures that resemble traditional houses can still promote know-how from the past in the current generation. At the Ecovillage at Currumbin Valley, Australia, for instance, air conditioning has not been permitted because of its high energy consumption and what has been implemented regarding cooling practices is to reposition the meaning of comfort to the era before the arrival of air conditioning; where materiality has been ‘forced’ to meet passive design to ensure occupants’ comfort (Strengers, 2009). Householders buying a house in the community are well aware of the ban of air conditioning and are left with no other option than to manually manage their comfort without air conditioning, and the design of the houses helps them to do so. Strengers (2009) reviewed the cooling practices in the
area and recorded how residents manually managed heat flow in their houses through various skilful acts, some of which are very basic such as opening windows as and when is needed. These activities signify a passive house design would also require input in terms of know-how in the achievement of comfort. Unfortunately, attention given in the study of design features of vernacular houses have left them being perceived as determinant, sometimes the only reason, for the persistence of such practices among households living in those kind of vernacular house. In her study on the vernacular architecture of Malaysia, Sim (2011) concludes that the concept of the vernacular house is constantly evolving and is not limited to the past but lives on in contemporary architecture in the form of the current architectural pursuit of ‘passive cooling’ for comfort.

Moreover, the persistence of traditional cooling practices has been ensured by household’s dynamic interactions with various architectural features of more modern houses. There is no doubt that the design of vernacular houses is aligned with living with heat; however, more modern houses with features that resemble this function can also create pockets of persistence that exhibit know-how from the past. To a certain extent, this also requires households to be willing to utilise these features, such as windows, to help them achieve comfort including which spot in their house is ‘cooler’ than the other. In this case, the know-how of moving around in finding comfort would not have been possible with houses that have not provided such features as having spaces that are more thermally comfortable than the rest of the space of a home. Arvin, who for most weeks lives in an apartment in the suburban area of Kuantan, found how the high availability of windows and potential of attracting enough air to flow into the house has encouraged him to open windows more often, as he can feel the positive effect of such a routine, especially during sleep. By contrast, he also shared his discontentment with movement of air through a fan in his wife’s house, "[a] fan is not enough; it feels like the air is stale and feels stuffy inside the room". Mr Arvin’s wife has another house not far from his apartment where they sometimes have a sleepover.

*Researcher: Do you prefer to use an air-conditioner or not to?*

*Arvin: Of course I like to use air conditioning, cool and comfortable (Laughter). I use air conditioning when I am there because it can get hot in the room, without air circulating, but not here (in his apartment). If I open the window here, I can feel the wind, and it does not get that stuffy in here. In my wife's house, there are windows. But there is less wind, even if we open those windows, so we rarely open them as a result. Normally, it is warm during the night, so we opt for air conditioning... Also, at night, who wants to opens the window? So we normally use air conditioning during sleep, but not in here.*

*Researcher: So I can say that you feel the need to use air conditioning if you are at your wife's house but not this apartment? Is that right?*

*Arvin: I find it airy most of the time... Not sure whether it is due to it being a high-rise flat or this area in itself as a windy hillside, or due to being close to the seaside, behind that hill is a beach, so the wind blows from there, especially during the night... I even open these windows during sleep.*
During a tour of his apartment, I observed the arrangement of holes and windows around the space. The windows in the living room were as wide as a wall panel (see Figure 6.1), and holes were located between the windows and ceiling. Here, I shall argue for the contentment that using a fan for cooling purposes brings if it is situated in the appropriate infrastructural architecture that supports it; however, in the case of Arvin’s apartment, the architecture facilitated as much moving air as possible.

This scenario has also illustrated that in order for the opening windows routine to be appreciated and continuously implemented by households in the future, the essential elements to have are types of window to efficiently capture as much wind as possible as well as an appropriate orientation for the house. This is shown by the case of Zira, who always opens the sliding door of her apartment towards the balcony as she explains that these features help to improve the movement of air in the living room, hence keeping her and her husband comfortable in the space. According to Zira, when they are both in the living room, it is crucial to open the sliding door leading to the balcony in order for them to feel more comfortable. My observation on their living room also noted the unrestricted layout without any partitions leading to the kitchen, which greatly helped moving air directly from the balcony to circulate around the living room area. In regard to Zira’s main bedroom, however, they both seem to highlight the need for air conditioning due to feeling some heat due to the “tight space and lack of air movement.”
“Normally, I will open this sliding door (leading to the balcony) whenever we are here. It will remain open throughout the day usually, and sometimes throughout the night if it is warm inside. We can feel the breeze coming through, especially in the morning and at night; it does a better job of allowing wind so at least at the living area, for now, that sliding door has helped make this space more tolerable to stay for a longer period. In the room, yes, I probably need to install (air-conditioner) soon; for now, not enough windows are in the room, it feels a bit stuffy”.

[Zira on how he uses sliding doors]

Figure 6.2 A wide layout living hall and sliding door to a balcony at Zira's

In some observations, a spacious layout like at Zira's apartment also indirectly provides comfort by technically allowing better air movement. Although this was not pointed out to them directly, the embedded sensation of having a spacious layout is the avoidance of stuffiness they stated to feel while in the room. This has led us to how current housing architecture that consists of partitioning of space based on function is also creating small spaces in houses, which is fundamentally not suitable for warm countries to have. This is a widely seen phenomenon across houses, especially considering almost all households tend to leave the living room, arguably the most open space in typical Malaysian housing. For Hidayah, while she had installed air conditioning in all bedrooms, she explained that the spacious layout discouraged her from installing air conditioning in the living room, while at the same time she also related that the living room "is more comfortable" than bedroom due to the open space and feeling of movement of air.

"I cannot install it (an air-conditioner) here… it is not suitable in my opinion, the space is too open, making it hard to air-condition the space effectively… it's open up to over there (pointing
to the open layout of the room that leads all the way to the kitchen area) Anyhow, the living room is not the problem as it is still OK (comfortable) to be here in the afternoon... it is just the room that is the problem for us.”

[Hidayah on why she did not install air conditioning in the living room]

Figure 6.3 Open layout and air-conditioner installation in Hidayah’s

Hidayah also recalled how she felt as a child when sleeping under a roof made of Nipah.

“I remember, when I was around 10 to 12 years old, sleeping under the roof made out of Nipah, it’s was comfortable… so comfortable you could sleep under it until the afternoon heat.”

[Hidayah on her childhood Nipah roof]

I observed this kind of ‘deficiency’ in most of the modern homes I went into and compared how rooms were built in traditional houses. Stories that were told by some households living in timber houses related how late night felt “colder than sleeping in air conditioning” [Seth, Exora] provides us with a clue. Moreover, this attests to the naturally cooling effect at night of having openings in the form of holes to facilitate air flowing through houses. Details such as apertures between rooms and other parts of the home are unique features that we also observed.
Figure 6.4 Spaces are not entirely segregated in Exora's

How households make reference to themselves as navigating through these other practices to balance their comfort without air conditioning is something to ponder. Regarding traditional practices, I have discussed how a water storage system such as Kolah that made the water colder than usual, which provides insight into materialistic elements and going for a cold shower is a skill that needs to be emphasised in resurrecting the relationship with practices ingrained in traditional cooling practices. For households growing up in traditional houses and having come across this type of Kolah, recalling the coldness is effortless so they prefer cold showers whenever possible. Recalling Meck, who likes to take a light shower from the well because the water is cold. Table 6.5 shows detail of showering routines among non-air-conditioning households.

Table 6.3 Showering routines of non-air-conditioning households

<table>
<thead>
<tr>
<th>Household</th>
<th>Frequency</th>
<th>Time</th>
<th>Bathroom material</th>
</tr>
</thead>
<tbody>
<tr>
<td>Zira</td>
<td>2</td>
<td>Morning; After work</td>
<td>Shower head</td>
</tr>
<tr>
<td>Arvin</td>
<td>3</td>
<td>Morning; When it is warm; After work</td>
<td>Kolah</td>
</tr>
<tr>
<td>Ros</td>
<td>2</td>
<td>Morning; Dusk</td>
<td>Kolah</td>
</tr>
<tr>
<td>Nash</td>
<td>3</td>
<td>Morning; When it is warm; After work</td>
<td>Kolah</td>
</tr>
<tr>
<td>Rabi</td>
<td>2</td>
<td>Morning; When it is warm; After work</td>
<td>Shower head</td>
</tr>
<tr>
<td>Shaun</td>
<td>2</td>
<td>Morning; When it is warm; After work</td>
<td>Kolah</td>
</tr>
</tbody>
</table>
Showering is a separate social practice in its own right and having composed of elemental on its own. Those households that were identified in the study as concentrating on getting showers are those who able to thrive in the tradition-based practices to live on in current times. This corresponds to with the previous discussion regarding how stabilised materials arrangement can influence comfort feeling and obdurately reproduces know-how from the past. Shove et al. (2012) explain how objects and infrastructures determine the boundaries of know-how. In the persistence of the window opening routine, for example, we can see that the know-how of when and how to open a window is closely related to how a specific type of window could allow in more breeze than another (Wafi, Ismail, & Ahmed, 2011), which has consequently preserved households’ interest in its operation. For younger households living in more modern typologies of housing, typically constructed of bricks and spacious, although they do not possess a strong childhood memory of living without air conditioning, they have learned to use materialistic support for non-air-conditioned practice to thrive within. The materialities of the house much often resembled those materialities of the vernacular houses (Ramli, 2012). A better window system, housing with extensive space rather than being confined, availability of a balcony substituting for a Verandah to name a few, are essential features I extracted from the interviews with households. By outlining changes in cooling practices this way, it further cuts through and provides specific explanations of the nature and pattern of re-emergence such practices. The table below summarises how modern housing arrangements resemble those of the vernacular in terms of the skilful acts they have enabled.
Table 6.4 Materiality of modern houses that uphold traditional cooling practices

<table>
<thead>
<tr>
<th>Modern dwellings</th>
<th>Traditional dwellings</th>
<th>Values or skilful acts upheld</th>
</tr>
</thead>
<tbody>
<tr>
<td>Greenery microclimate</td>
<td>Rural microclimate</td>
<td>Reducing heat surrounding the house</td>
</tr>
<tr>
<td>Air-conditioned room</td>
<td>Verandah, house surroundings</td>
<td>Escape spaces available in the house rather than outside</td>
</tr>
<tr>
<td>Window design availability limited to one or two panels per wall</td>
<td>Holes, windows, doors</td>
<td>Movement of air freely in and out of the house</td>
</tr>
<tr>
<td>Sliding door</td>
<td>Fully-open windows and a large number of windows</td>
<td>Opening sliding door allowing movement of air</td>
</tr>
<tr>
<td>Front porch</td>
<td>Verandah</td>
<td>Opening the door to the corridor on hot days allowing moving air</td>
</tr>
<tr>
<td>High ceiling</td>
<td>High ceiling</td>
<td>Movement of air</td>
</tr>
<tr>
<td>Wide and spacious layout</td>
<td>Less segregation of spaces</td>
<td>Free air movement within the house</td>
</tr>
<tr>
<td>Balcony in a high-rise apartment</td>
<td>Verandah</td>
<td>Allowing more moving air inside the house. Others failed to use the balcony as escape space</td>
</tr>
</tbody>
</table>
Table 6.5 Materiality of modern houses that go against traditional cooling practices

<table>
<thead>
<tr>
<th>Modern dwellings</th>
<th>Traditional dwellings</th>
<th>Values or skilful act uphold</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Brick walls</strong></td>
<td>Timber wall</td>
<td>Bricks cause indoors to heat during the night; timber does not. Realised by almost all households but they are left with no choice</td>
</tr>
<tr>
<td><strong>Urban microclimate</strong></td>
<td><strong>Rural microclimate</strong></td>
<td><strong>Urban heat island</strong></td>
</tr>
<tr>
<td>Air-conditioned room, air-conditioned outdoor place, i.e. shopping mall</td>
<td>Verandah, house surroundings</td>
<td>Escape spaces available in the house rather than outside the house</td>
</tr>
<tr>
<td>Window availability limited one or two panels per wall</td>
<td>Holes, windows, doors</td>
<td>Movement of air freely in and out of the house</td>
</tr>
<tr>
<td>Normally no holes</td>
<td>A large amount of holes</td>
<td>Limited movement of air</td>
</tr>
</tbody>
</table>
6.2 Socio-economic as a ‘secondary factor’

Prior to focusing on practices of cooling, socioeconomic factors resonated strongly in determining air-conditioning ownership and usage. In this line of argument, both the declining cost of air-conditioners and their increased efficiency has subsequently reduced their running costs in the home and ‘recommended’ the break out the device from their initial niche status into the mainstream market and is now affordable to everyone (Geels, 2010). Therefore, rising household income has been seen as a motivating factor in installing air conditioning as a means to improve living standards (Agbemabiese et al., 1996; Marcotullio & Schulz, 2007; Sivak, 2013). In the local context, air-conditioning uptake is perceived as a ‘direct’ result of the climate (Hussein et al., 2009; Kubota et al., 2011); yet increasing demand now even exceeds countries with hotter climates such as Saudi Arabia in the Middle East and Ghana in Africa (Greentech Media, 2013). The more widely regarded reasons tabled include the low price of air-conditioners, higher household incomes (Kubota et al., 2011) and low electricity tariffs (ISIS, 2014; Islam, Shahbaz, Ahmed, & Alam, 2013; Jaafer & Croxford, 2010). However, Strengers (2009) found that motivation for air-conditioning usage emerged mainly from perceptions that houses were uncomfortably hot and that the declining cost of air-conditioners and increasing affluence in society enabled purchase of the device in response to this underlying issue – a ‘secondary factor’ as she put it.

Galvin and Sunikka-Blank (2016) have pointed out that current discussion on practice lacks engagement with socioeconomic issues. Socioeconomics is well documented by mainstream literature to be the cause of air-conditioning spread, an idea that was challenged by practice theorists to be over-simplistic and failed to account for the fundamental issue of uncomfortable indoors (Reckwitz, 2002; Warde, 2014). In this section, I generate two discussions; firstly, regarding affluent households who have neglected air conditioning altogether as well as householders who installed air conditioning in every room of their home but have ‘turned it on only a handful times’. In both scenarios, I seek to show that households were prioritising certain values about feeling comfortable that they hold true, which then translated into adaptive strategies they carried out as a result. While distancing our remarks here from a category such as middle-income households, I found that household responses in terms of socioeconomic status are tightly attached to an understanding of ‘necessities’ rather than air-conditioner ownership itself. This has been highlighted by Withite et al. (2000), who state that ‘necessary’ consumption often becomes a mark of social accomplishment. In most cases, households interviewed in the study at first often provided judgements of affordability to own and run air-conditioner as their main decisions to opt for using air conditioners, but through observation and responses in interviews, the decision to use air conditioning mainly plays around the fact that they lack of comfort in the first place.

So how does the present exploration into cooling practices thus far view this relationship? While the study does not reject rising income and the declining price of air-conditioners (due to
mass production) increasing the likelihood of households to own an air-conditioner, there are only two cases whereby such a factor comes second to the issue of ‘uncomfortable feelings’ that lead households to use air conditioning. I visited Rabi, a pensioner who started her own consulting company, and in particular a household which has built its own house based on the intention of manifesting the materialities of the traditional houses where she had grown up. During my visit, Rabi shared at length her experiences of living in a timber house during while growing up and how she remembered routines in the house that influenced her basic know-how of achieving comfort in her current house.

"As far as I can remember, there was nothing stressful about a warm feeling in the house back then (in the traditional house of her childhood). I grew up in an old timber house and know pretty well about its features…so, ten, fifteen years back when me and my husband, when we bought this piece of land, when it came to designing the house, I wanted to bring back that kind of architecture, resembling my old traditional house…how we felt living in that kind of indoor environment, airy, heat does not get stuck inside the house. We used to live in a brick house before this, I knew that brick houses trapped heat and we experienced that. We told the architect that we did not want to use air conditioning and we would like to have natural ventilation and all kind of that stuff… the architect knew better I think, and he grasped our idea, and so he designed this house…

[Rabi recreates the function of traditional houses]

As I began to tour her house, I observed its physical qualities and frequently noticed the characteristics that resemble traditional houses. I captured the photo of the living hall below (Figure 6.4). Interestingly, the house did not have any windows. The house had doors on each side, with a hollow roof overhang. The wall between the living room and other rooms did not reach the roof but stopped at a level that allowed air movement between them. The living room was very wide with rooms that were more spacious than a usual house. There were also ceiling and standing fans in every room.
Figure 6.6 Resembling the materiality of a traditional house in Rabi’s

Rabi is one of the few householders who had the financial capacity to design and build a house based on the materiality of a vernacular home. The rationale for using minimal timber has been accompanied with a good understanding of the design of vernacular houses. While this can be said to be an example of those who possess the financial capacity to recreate traditional houses, in most other examples I have presented above, materialistic adjustments to achieve comfort in the home are not necessary based upon financial resources. For example, Ros, previously, who moved house just to find a site opposite her apartment that does not face the evening sunlight, did not commit to significant financial cost.

When people asked Seth about his vernacular house, he emphasised it was his opinion that having a traditional-styled house made from wood is not really a matter of choice, it is directly related to cost. In addition to the lengthy construction process, it is more expensive due to the skill of the carpenters involved — if they still have the expertise. Instead, increasingly more families have purchased houses that are built from modern construction materials like steel, brick and concrete. Seth shared how he predicts that building a home similar to his would cost almost the same as buying a ready-built modern brick house.

“...many people want to build this type of (timber) house; they know it is comfortable to live in a wooden house compared to a brick house. It is just the cost that hinders them from doing so, I know, it is too expensive nowadays to build this kind of house. Even to get the wood can cost up to RM300K (£60K), not including wages and everything. Even then, the type of wood, I do not know whether they can still get a durable, hardwood like the one this house is built with. You will also need a piece of land first (laughing). So people have to settle with ready-made
homes, the brick houses. It is not that people do not want to build a wooden house; the cost is too high now to make one.

[Seth on the financial barrier to building a traditional house nowadays]

Recalling Sofi, as a frugal user of air conditioning despite having sufficient financial resources, (and similar to Rabi), Sofi’s house was designed by his father. Living in a self-designed house for Sofi’s household ignites tradition of the past in which houses were self-made based on occupants’ needs, especially around comfort (Yuan, 2002). While he noted that choices his father made regarding the use timber in some elements of the house might be just a matter of preference rather than to alleviate the heat, he felt that these elements were more effective in providing comfort; for example, in the living room where our interview took place. I recorded my observation in the field note below:

Sofi lives in a self-designed house with a mixture of traditional features like the use of timbers in the elements of flooring, stairs and roof overhangs with full windows and sliding doors. Both the main and second living rooms have plenty of operable windows, nine and seven windows respectively, equipped with awnings. The availability of tall shading trees at the front porch and side garden bring good shading features to the house, similar to those of a rural setting with their natural greenery. Although the house is made of brick, shading created by these tall trees cool the air of the surroundings, I feel comfortable inside the living room during the interview at 4pm while the evening heat is here. The living room has no air-conditioner installed, just a ceiling fan and a standing fan. Only one ceiling fan is on during the interview. The house has an extended sitting area outside, covered by extended roofing.

<Field note on Sofi’s living room during the interview>

During this observation, I found that the features of Sofi’s house resembled those that materialise in traditional practices and are ordinarily available in vernacular houses. Although the house had six rooms each equipped with an air-conditioner, it was their frugal daily use that caught my attention. While my initial observation of the visit gives rise to the interplay between materiality and know-how, the fact that Sofi shared his frugal pattern of using the air conditioning was particularly interesting. In probing the matter deeper, I asked Sofi on how he views his and his household’s use of air conditioning in the home and why this is more frugal than others. His initial response was, “I do not know. We do not use air conditioning that much; I cannot even recall the last time I turned it on…I have not turned it on at all in last month (March) that’s for sure”. I also asked about his experience in his previous home of living with or without air conditioning.

“We did not have an air-conditioner in our previous house, nor in our grandparents’ house back in Penang… both my father and I can be said to have experienced living without air conditioning
before, we lived without an air-conditioner more than we lived with one, and we just thought that we do not need to use it that often… we equipped this house but do not use it that much. Even when sleeping, I take off clothes sometimes, but most of the time, even if I sleep with jeans on, I still find it comfortable enough and do not use air conditioning when we sleep. My parents are the same; only my youngest sister uses air conditioning during sleep."

[Sofi on his air-conditioning usage]

Figure 6.7 Windows and some timber elements at Sofi's living hall

We considered earlier how this scenario concurs with Shove et al.'s (2012) discussion on how materiality stabilises and reproduces know-how from the past, which in Sofi case is know-how about living without air conditioning. Moreover, their experience without air conditioning has shaped the way Sofi's household does not directly equate air conditioning with comfort. Taking part in a particular practice therefore forms a stable value that drives strength of rejection in some households towards air conditioning in searching for comfort, which can go a long way towards shaping their pattern of air-conditioning usage. This relates to Maller & Strengers (2015) discussion about trajectories of practices through recruitment, learning and doing. Sofi's household undeniably can afford to pay for their use of air conditioning; however, they have resorted to not using it that often due to the embedded value they hold with regard to comfort in the home. The two cases discussed above highlight what Strengers (2009) meant by socioeconomics as a ‘secondary factor’ in air-conditioning ownership and usage. The primary factor, this section has shown, is the feeling of comfort itself and the availability of adequate materialistic support and skill necessary to cool oneself. Those households who have been able to comfort themselves without air conditioning are less likely to use air conditioning despite having the financial capacity to do so. Therefore, the re-emergence of traditional practices in the form of non-usage of air conditioning and frugal use of the device is not directly influenced by finance.
6.3 Deeper understanding of vulnerability to heat in the home

As hinted in the literature review of Chapter 2, it was an unhelpful idea that placed air conditioning as the solution to well-being at the prospect of heatwaves and was argued to be overly simplistic, ignoring a more contextualised means of understanding and explaining human action in relation to health and well-being on hot days (Maller, 2015). Regarding the short-sighted solution, Maller and Strengers (2011) maintain that such a move is not a technically feasible option in the short run due to cost of running it daily that will be incurred by households, and causes peak demand problems in countries where its usage has become dominant and the only solution under the heat; in addition to being environmentally unsustainable in the long run due to its energy-intensive nature. Particularly in the tropics that have year-round warm temperatures, scientists have warned against the promotion of air conditioning as the dominant and only solution without considering other adaptive capacity. While a strand of literature has talked about how air conditioning and health are connected, especially in terms of urban indoor air quality and getting us through heatwaves (NIOSH, 2015; World Green Building Council, 2014), the previous discussion highlights how households glide through their daily lives, adapting easily to heat in the home. In the next section, I bring this detailed understanding to revisit three categories of people identified as vulnerable groups; namely the elderly, young children, and people with disabilities and medical conditions.

6.3.1 The elderly and ‘practical wisdom’ of living well in the heat

Wisdom really does come with age. This is not merely a plain old saying, but scientifically proven to be the case with the elderly with regard to the matter of knowledge and accumulated experience. Li, Baldassi, Johnson, and Weber (2013) confirm that experience and acquired knowledge offset the declining ability to learn new things in the elderly — which is the case in terms of cooling practices of the elderly when it comes to living with heat in the home. In the previous chapter on traditional cooling practices, I discussed how the elderly that have lived in traditional dwellings subscribed to a routine of adapting to heat that is well-suited to the infrastructures available in those houses. Daily life revolves around navigating through infrastructures that have specific roles to play in the presence of heat as a normal day-to-day condition in the local climate. In the everyday event of heat, they know where to go within their house, what to wear, whether it is the time of the day to take a light shower, how to sleep in the heat, when to open their windows — these are all ordinary things they do under the heat, which stem from values or meanings shaped by the daily flow of everyday life. Accumulation of this knowledge then transpires into something tangible; how they design houses, where to put windows, how many, facing which way, and other design that suits their living in great detail. In this case, the use of ‘fully-extension’ types of window, which captured as much air as possible to flow in and installing many in one section, alongside the routine of opening windows early in the morning and closing them at dusk. Night comes, and holes around the wall take over in providing air flow from outside and throughout the...
house — a never-ending sequence of how infrastructures and skills work alongside meanings against the background of cooling practices from the past.

In posing questions on a recent heatwave that struck Malaysia and gathering more detail for understanding of the construction of vulnerability of these groups of the population, I highlight two themes for discussion; firstly, how they view air conditioning as a protective device in such extreme heat events and secondly, how allowing movement of air throughout the house is essential to health.

"We live longer if not using air conditioning…"

[Amirah]

This quote was uttered by Amirah, a few of her initial words when asked about the deadly heatwave ahead and the suggestion to use air conditioning as a protective device. Amirah’s strong rejection of air conditioning did not surprise us. All elderly people we interviewed, regardless of whether they had lived in air-conditioned spaces or not, tended to reject using the device. These elderly drew attention to feelings of dislike and distrust of standardised air-conditioned coolth and closed spaces. Among the reasons uttered were having lived their entire life in traditional houses, being totally estranged from air conditioning, and feeling ‘poorly’ in an air-conditioned environment and enclosed housing. Amirah continues from the above ‘catchy’ quote and proceeds at length with her ‘argument’.

"I do not like the closed environment of the factory where I worked previously, and we were kept in the building with air conditioning while doing packaging work, you know, air-conditioners prevent you from sweating… the air-conditioner absorbs it all…it makes your body dried up…it makes me feel ‘sick’…that’s why I will never use air conditioning in my house; I have been living well without air conditioning most of my life here in the house. I do not like it, feel suffocated inside such conditions…”

[Amirah’s feelings towards her well-being inside air conditioning and a closed space]

With regard to sweat, it was considered ‘unhygienic’ by some but for Amirah, it has always been a regular day-to-day thing.
“If I am sweating, I normally just sit down and relax in front of the fan… alternatively, I take a bath… Anyway, sweating as usual…”

[Amirah on sweating]

When Maria shared her experience of living in her son’s air-conditioned house, she spoke in a similar manner and observed feeling that those who live in such houses ‘look pale’. Her son installed an air-conditioner in all the bedrooms. “I do not really like sleeping in the air-conditioned room” – she began her story. Maria’s own house is fully timbered while her son lives in a brick house in a suburban area in nearby Kuala Lumpur. Despite her son turning on the air-conditioner for her, she asked him to turn it off a few minutes later as she could not bear the coolth. I tried to ask about the temperature of the air-conditioner that her son put on, but she could not remember. She explained how she felt that the air was stiff and noted that it was a bit warm afterwards, so she opened the room door leading to the living room.

“I felt like living in a cave…I felt a bit stuffy inside the room…no wonder they (referring to those using air conditioning) look pale. I personally do not like air conditioning, making me feel like I’m catching a fever; I cannot bear its coolness.”

[Maria shared her experience living in her son’s house with air conditioning]

She uttered the following short comment after sharing her experience of sleeping at her son’s house; “I only stay for less than two days normally at his house, then I will ask him to send me back to my house here (laughing)”. This was not the only such remark that I heard from the elderly in the study regarding lacking comfort in houses other than their own. This serves to demonstrate how physical design such as lack of openings causes feelings of stuffiness and the use of air conditioning to circulate the air has, in turn, made those who are not used to it feel uncomfortable. This has, in fact, been documented before; how the physical design of a house initiates the feeling of discomfort and leads to a ‘feeling of ill-health. For example, the typology of Western houses, which prioritises the segregation of space and Western-derived air comfort cooling systems have been known to be incompatible with the ‘norm’ of residents in the tropics (Busch, 1992).

Similarly, Nick’s mother also shared how she did not like some features of Nick’s house such as his windows and the lack of activity that can be done while staying over. Nick’s mother, Mrs Rania, often comes by for a sleepover as Nick is single and lives alone in his two-storey house. “Just accompanying him while he still single, so that he does not feel lonely…maybe one day when he gets married, he will not want me to come here this often”, said Mrs Rania cracking a joke during the interview. She is quite a friendly and fun lady.
“This house feels like it does not have windows…even when you open that window (pointing towards a window near the dining table), you cannot feel any wind coming in…luckily there is this sliding door here; I will always open it regularly if I am here in the living room”

[Mrs Rania, Nick’s mother]

She went on to discuss her routine at Nick’s house.

“If Nick has gone to work, it is quite boring when you have to stay in the house, like an idiot, doing nothing (laughter). It feel like I have got nothing to do here. If at my house, I will probably be outside around this time, watering my flowers, sitting down outside the house, looking around… I have put some potted plants there in the front porch, tried to do a mini garden. Hopefully, Nick can take care of those…”

[Mrs Rania, Nick’s mother]

She also explained how she does not turn on Nick’s air-conditioner at all. On one occasion when she felt quite warm in the house, she opened the sliding door and went upstairs to lie down on her bed. “It’s a bit cooler upstairs in the afternoon, only in the evening will it be a bit warm upstairs…because the window is facing the sun setting down…evening warmth” – she mentioned. These examples show how living without air-conditioning the elderly become accustomed to a routine they normally follow wherever they go — losing control over these routines, as a result of being away from the materiality they are used to, causes them not to be able to practice the strategies they usually follow in the event of heat. Brown and Walker (2008) referred to a similar situation in their study where they discuss the loss of habitus when residents in nursing homes lose authority over dressing according to the weather due to being dressed by others. In this case, it involves clothing as materiality and dressing up as skills not able to be performed by the resident.

In both cases above, it was the lack of housing infrastructures, namely an ineffective windows system and lack of outdoor spaces, which were disclosed by the elderly to disrupt their normal strategies such as window opening routines and sleeping at night. Movement within and outside the home, to do activities as outlined in the discussion of traditional practices, form a distraction and perhaps adaptation when it is getting too hot inside the house. As we can recall with Seth and his movement to the verandah and Maria who sleeps in the living room, movement and activities form in types of adaptation to heat. Similar to Maria’s case, Mrs Rania does not opt to use air conditioning during her stays at Nick’s place. She will still opt for the adaptation that she is familiar with at her own house.
For Raheem, the sweating issue did not bother him as he felt accustomed to it and used a fan without moving very much for a while to cope with the situation.

“If I am sweating, I normally sit down and relax in front of the fan… or I take a bath… Sweating is just a normal thing; I would not equip my house with air conditioning just because of sweat…”

[Raheem]

However, one of the elderly interviewed, Maznah, shared how she found more regular use for air conditioning during a recent heatwave.

Researcher: The recent heatwave, March last year, how did you cope with it? Did you catch any illness during the time? Did you feel stressed at all?

Maznah: It was a bit easier to get thirsty, so I drank plenty of water. And this air-conditioner, I used it more than ever (laughter).

Researcher: Other than air conditioning? Any other things you did?

Maznah: Stayed at home a lot and did not really go out that much when it got too hot outside.

These comments are in line with previous research that has shown households already accustomed to air conditioning find it hard to cope with heat with the absence of the device. Responses such as this go to show how normalised air conditioning can be with someone and how they then prefer to 'encase' themselves in an indoor environment of coolth (Hitchings & Lee, 2008). These also precede findings that the "inadvertent environmentalists" value in the elderly are holding them from being more vulnerable in the heat and adapt well to heat in the home (Hitchings, Collins, & Day, 2015). Returning to the previous example, Vandentorren et al. (2006) outlined how living conditions, including the type of building, floor level, and number of rooms, were found to be important determinants of risk. Likewise the study of Semenza et al. (1996) pointed to housing condition (building type or living on a higher floor); and the presence and use of air conditioning in the home or private institution.

Table 6.6 below summarises the set of diverse skills the elderly hold in maintaining well-being on hot days. In the chapter 5, households shared how they felt 'better' under the heat by actively engaging in a range of strategies such as regular light bathing, being topless at home, drinking cold water, and going out of the house for activities. Recognising these are related to
‘active practices’, whereby the elderly are actively involved in a range of strategies to comfort themselves, will eventually help reduce their vulnerability to heat in the home.

### Table 6.6 Elderly responses to heat in their own home and in others

<table>
<thead>
<tr>
<th>Elderly</th>
<th>Do you currently have AC at home?</th>
<th>During the recent heatwave, did you opt (or think of installing) air conditioning?</th>
<th>How did you cope with the recent heatwave?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Amirah</td>
<td>No</td>
<td>No</td>
<td>Drank cold water and slept in the living room</td>
</tr>
<tr>
<td>Maria</td>
<td>No</td>
<td>No</td>
<td>Had five light showers, used a standing fan whenever she was within the house</td>
</tr>
<tr>
<td>Raheem</td>
<td>No</td>
<td>No</td>
<td>Drank water a lot and stayed in the house with the fan turned on for longer hours</td>
</tr>
<tr>
<td>Seth</td>
<td>Yes</td>
<td>No</td>
<td>Took a bath in the afternoon, topless and wore ‘kain’, sit on the Verandah</td>
</tr>
<tr>
<td>Maznah</td>
<td>Yes</td>
<td>Yes</td>
<td>Turned on air conditioning and stayed indoors</td>
</tr>
<tr>
<td>Rabi</td>
<td>No</td>
<td>No</td>
<td>Light shower, used a standing fan in addition to the ceiling fan, slept</td>
</tr>
</tbody>
</table>

These findings concur with Day and Hitchings (2011) regarding concerns over the welfare of older people in managing their cooling practices, in their case, in maintaining winter warmth. In their study, older people themselves have certain value that they uphold to improve their ability to keep warm rather than following any advice or campaign. From Table 6.6, it is clear that when they have not been ‘exposed’ to the use of air-conditioning in the home, the adaptive capacities of our elderly participants remain intact, although they find it hard maintaining their habitual cooling practices in modern houses. While building materials could be a factor that contributes to a house being warm at night or the infrastructure is lacking, it does enable the elderly to practice ordinary skills they previously used in the home. For most elderly households living without air conditioning their entire lives, an air-conditioner can have many adverse effects as their bodies are ‘not used to’ the coolth it generates.

#### 6.3.2 Parental reliance on air-conditioning know-how in caring for infants, young children and the disabled

Meanwhile, air conditioning is widely positioned as an essential device for infants and young children due to those groups being considered as vulnerable and particularly sensitive to hot and cold temperatures (Nicholls & Strengers, 2018). Intan and Diana both raised issues with the device. Here, Intan mentions how his daughter was unable to sleep without air conditioning due to the issue of rashes.
Intan: The air conditioning is for our daughter, not us.

Researcher: Why?

Intan: She will get rashes, a bit itchy if she feels warm.

[Intan shares how his eldest daughter sleeps without air conditioning]

For Diana, her routine is to always use an air-conditioner during sleep. She and her two daughters sleep in living room on the ground floor as to accompany her husband who sleeps in the room on the ground floor as well. Her husband uses a wheelchair due to an accident and could not climb the stairs, hence having to sleep in the room on the ground floor for the past five years.

“Normally, I will turn the air-conditioner off in the middle of the night, at 3.00 am or so... I noticed whenever I failed to do so; they (her two children) always catch a running nose the next morning... now I always set the auto-timer so that the air-conditioner turns off automatically at 3.00am...”

[Diana]

For some, their know-how about taking care of children during periods of heat might be as simple as being topless and to increase fanning. When I arrived at Ros’s house, one of her daughters was sleeping at the living room, close to the window, under the ceiling fan, topless with shorts on and with a light blanket over her. As I was greeted and started our conversation, the child was still sleeping and I was prompted to ask about her.

Researcher: She looks like she is used to sleeping here in the living room? She has not been awakened by our voices.

Ros: Yes, she sleeps here (in the living room) during the afternoon. It is a bit warm inside the room.

Researcher: I can see her topless as well, is it usual for her to sleep like that?

Ros: Depends... depending on whether, if it is hot or not I guess. Sometimes she did tell me if it was hot, so I took off her top. Sometimes she even sleeps just on her nappy (laughter).

[Ros on her daughter being topless during daytime sleep]
Some other households were more specific in their sharing of material elements that we are now familiar with regarding their children's care on hot days. What all these examples have in common is the fact that there is a wider landscape of comfort and well-being over know-what (Royston, 2014). This is the emphasise on experienced-based know-how as important elements of health in heat. From the finding, we can observe that even though air conditioning increasingly plays a major part in households caring over children and vulnerable groups, there is a significant amount of opinion ‘quietly' opposed to such a relation.

In other households, there was an ingrained belief that health is a broader issue than air conditioning alone and that the device is used for comfort rather than for well-being. Sofi, who we met earlier, gave his opinion:

“Our house provides enough shade for us from extreme heat. I do not really think its the air conditioning but the way I live when the heat is prevalent. I drink so much water that all adds up.”

[Sofi on the strategies he finds healthy in hot weather]

In addition, dependency on carers by the disabled and bedridden was also found to be a route to increasing vulnerability in the heat, especially when it involved reliance on air conditioning. During the fieldwork, two of the participants discussed having to take care of householders who are vulnerable; one was bedridden and another had suffered a stroke and uses a wheelchair – which
was totally unknown to me during the recruitment process for the study. Maznah’s oldest son is 35 years old and is bedridden. He has lived in his bedroom for ten years, accompanied by two home helpers.

"I have a disabled son, he cannot walk and stays in his room every day...in his room, sometimes that room becomes very warm as the windows are not always open due to his condition...so I normally leave the air-conditioner on for him in the room 24 hours a day, seven days a week...always on…"

[Maznah on the continuous air-conditioning needs of her special son]

The fact that her son would develop rashes if sweating was making Maznah keep the air conditioning on for him every single day. Instantly afterwards she mentioned that this air-conditioning usage alone resulted in her electricity bill amounting to as much as MYR800 monthly (£160 per month), something that is unusually high for Malaysian households. "Can you afford that, or do you find that burdensome?" I asked. "It is high, but so far I can still afford it" she replied.

Maznah: Nothing can be done. He needs the air conditioning, if not his body develops rashes all over.

Researcher: How about the windows in his room? Do you try opening those sometimes?

Maznah: I have not opened the windows in his room for quite a long time now… I think all the windows in this house have not been regularly open, except some which I think can attract wind the most like the one over there (pointing towards windows not far from the interview spot)

Maznah was notably dependent on air conditioning in her daily life and had implemented the same thinking towards caring for her bedridden son. Although opening windows is not part of her daily routine, Maznah was prompted to open windows if she considered sufficient wind could be captured and felt. This demonstrates not only the importance of having windows, but also their design and orientation to most effectively attract wind in mediating vulnerability to heat among a vulnerable group like the bedridden. In the study by Vandentorren et al. (2006), being confined to bed or lacking in mobility were strong risk factors for death during heatwaves.

Another case, however, illustrates a different approach. Seth's sister has had a stroke and is partially bedridden. Although her lack of mobility means she needs a wheelchair to get around, this does not prevent Seth's wife from taking his sister outside the front door to relax and look around at the peak of the afternoon when it is warm inside the house. During my visit to Seth's house and
halfway through our interview on the verandah, Seth’s wife came by pushing his sister on a wheelchair through the living room door leading to where we sat. I greeted her and she was keen to join us. Normally, I was told, his sister would come to their house for a sleepover at the weekend as she did not live far away. I was introduced by Seth’s wife as a university researcher visiting while researching about their house. "I love this house, I was small when our father built the house…he was still very small then (referring to Seth)” – Seth’s sister remarks joining in our chat. At times, I was inclined to ask about her condition and was particularly interested to hear her responses to the topic at hand.

Researcher: May I ask you about how do you find living in this house under the hot weather? How do you cope with it?

Seth’s sister: Rooms are a bit warm here in this house, so it’s better like this, I will normally not stay in the room that much, I will ask her (Seth’s wife) to push me around, sometimes chatting with her when she is cooking in the kitchen; most of the time I will be here in the living room, on the verandah at other times, trying find where the most comfortable place to sit is, it’s a bit warm if you stay in the room so I've asked her (Seth’s wife) to push me here just now…to drink water, rinse my face and feet.

[Seth’s sister]

In this case, while her health condition hindered her mobility, Seth’s sister refused to sit in one place and regularly changed the spot as she pleased. This has helped her to cope with the heat and possible stress of having to be in one place under heat in the home. There were also other cases where participants had experienced adverse health effects through the excessive use of air conditioning, or in some cases overcooling. Ros, for example, explicitly mentioned how she opts not to use air conditioning because one of her children has asthma and the air conditioning does not provide a good environment for her condition.

Ros: It is not that I do not want to use air conditioning at all, but it is because of my child’s condition, she has asthma and needs a good circulation of air to be comfortable, and air conditioning will make her own condition worse.

Researcher: How about you? How do you find not being able to use air conditioning here in the house?

Ros: I personally feel better with more air from outside as well, rather than a enclosed space.

[Ros on her child’s condition]
In another similar example, several other households not accustomed to air-conditioners mentioned about catching a fever when they slept in an air-conditioned room.

“The coolness of air conditioning… I always catch the flu if I sleepover in a relatives’ or friends’ house who has installed an air-conditioner.”

[Nash]

These examples have highlighted how maintaining health and well-being under the heat manifested itself in various ways in householder’s responses. The fact that this research encounters more discontent with air conditioning for the betterment shown how unstable the assumption that air-conditioning as a protective barrier against heat events to be brought forward. Our findings supported by other empirical research proves that air conditioning causes discomfort for tropical society (Agbemabiese et al., 1996; Royston, 2014). Households’ responses lead to the assumption that the ability to be flexible in achieving adequate comfort in the home does offer the way forward. Therefore, effort to secure the health and well-being of the home should be on the basis of securing adequate cooling practices rather than conditioned-coolth.

6.4 Conclusion – re-emergence of adaptive capacities from the past

Most scholars now agree that the critical task is to influence the formation of alternative comfort regimes to energy-intensive air conditioning that we are now confronted with. The conclusion derived here is that sustainable practices unexpectedly re-emerged. This chapter has refined the way of looking at current air-conditioning practices by recognising the dynamic relationships between intrinsic practices’ elements -materials, meanings and skills - that constitute a step towards understanding patterns underlying this unexpected re-emergence. The question then is not to ask how to build timber houses in the modern era. It instead concerns how houses were previously built; their features and relationship with the skills involved in the creation of comfort, and these past practices might then inform how modern houses should be constructed to recreate the same skills as before. Ultimately, the time for these practices to re-emerge is now, as the traces of values and meanings are well- embedded in large segments of these generations. By understanding the re-emergence of practices in these ways, it reveals a more realistic movement going forward to reignite sustainable cooling practices of which does attend to current challenges – not merely nostalgia of traditional practices (Winter, 2016). The fundamental draw of such a discussion, alongside many scholars who for the past decade have considered practice theory and climate change policy, is that policy intervention now aims to increase the chances of more rather than fewer sustainable ways of life persisting and thriving (Shove et al., 2012). As Chappells and Shove (2005) have indicated, concepts of comfort are created and reproduced through and as a consequence of the intersecting actions of an extensive cast of players, all of whom have a part to
play in constructing the future. Understanding everyday practices draws attention to various socio-contextual details that lead towards vulnerability, barriers or facilitators of adaptation. The broader perspective concerning the vulnerable cases of the elderly, young children and disabled discussed in this chapter ultimately points towards a necessity to understand the question of housing infrastructures and skill in moderating heat in daily life. Hence, I reiterate the relevance of focusing on every day cooling practices as a knowledge base to yield an in-depth understanding of heat vulnerability in the home and to influence adaptive capacities that stem from tradition-based cooling practices in the tropics. I posit that only by understanding such changes, can we then more critically engage with a degree of influence and contribute to redirecting household practices towards a low-energy direction.
Chapter 7 Discussion and conclusion

I began this thesis by echoing the call for an alternative approach to the issue of juggling increasing cooling consumption in the home and well-being out of the hot weather. In using Malaysian households as the focus of the study, I made the case for re-examining the dynamism of the country’s traditional cooling practices for the future. Choosing Malaysia as a case study is in response to the prospect of rising energy consumption in sustaining cooling services in the home and further projected increase of heatwave events in the future. Informed by ongoing debates on taking practices as the centre of arguments, I explained how learning from cooling practices in Malaysian households offer great avenues for reducing dwellings’ energy consumption while maintaining a comfortable and healthy indoor environment. My aim has been to construct a more in-depth understanding of the practice of cooling in the home in Malaysian households, which is constructed through everyday routines and provides the potential for identifying alternative ways of managing heat through enabling people to modify their thermal environment without resorting to air conditioning. To achieve this aim, I focused the study on understanding current cooling practice arrangements in the home, how this is changing in Malaysian households and the extent to which this has contributed to shaping consumption and opportunities to produce better outcomes regarding well-being under hot weather.

Through this enquiry, I analysed the composition of more energy-intensive, modern cooling practices and the less energy-hungry traditional practices. Then I focused on investigating how modern practices emerged and the traditional practices persist in households. Finally, I discussed how exploration of the two practices informed the way that vulnerability to heat is created in everyday life and consequently identified adaptation capacities in pathways of re-emergence of traditional practices as the way forward for lower-carbon cooling practices of Malaysian households. In the following section, I outline the key contributions of this research in addressing the three research aims proposed in Chapter 1. In focusing on the composition of modern and traditional practices analysed, I determine how these are changing and produce the new alternative pathway of re-emergent of practices. As the thesis draw to a close, I conclude with a reflection on the research design and process, limitations of the study and suggest future directions.

7.1 Key contribution

This study was concerned with the lack of social science perspectives in research on energy consumption, comfort and well-being in tropical countries. In the context of households, such an endeavour in the literature has so far proven to contribute towards a long-term approach to cope with rising energy consumption for space cooling and well-being under the heat, dismantling energy-intensive air-conditioning usage in the home and creating alternatives to it. In particular, this
route delves into households’ every day cooling practices and resurrects ‘ordinary’ cooling strategies as the future aspiration for comfort and well-being in the home. The situation is particularly pertinent to Malaysia; whereby consumption for the cooling sector in the home continues to rise as air-conditioning usage increases with the frequency of heatwave occurrences. Meanwhile, at the heart of Malaysian society, rich tradition-based practices in living with heat lie hidden, ‘practically’ preserved in the elderly population living in the climate-sensitive material infrastructure of the home.

In intervening in change for sustainability of cooling practices in the home, the shared agenda is to go ‘beyond behaviour change’ (Strengers & Maller, 2014). Hence, this research provides such a framework to study how Malaysian households can be influenced to adapt to a non-air-conditioning future of cooling for the benefit of energy and well-being in the heat. In doing so, this study builds on the conceptual framework of everyday social practices (Gram-Hanssen, 2010; Shove et al., 2012; Strengers, 2009) and applies this framework towards household cooling practices. The study investigate both modern and traditional practices of cooling in the home, reframing understanding of their emergence and persistence, and bringing forward an alternative systemic understanding to the matter of advancing towards lower carbon comfort regimes as well as reducing vulnerability to heat among households. I have summarised such an approach into three key contributions; firstly, in terms of advancing usage of the theoretical framework for practices in the study of energy consumption in the home, Second, the use of the practice framework in researching traditional cooling in the tropics uncovers the depth of this ‘raw knowledge’ that not only goes beyond the current attention given to materialistic features of vernacular houses, but also in finding out how intricately connected the elements within such practices can persist through time. Finally, the third contribution concerns the practicality of the practice framework for deepening our understanding on how vulnerability is created in everyday practices aspiration for low-carbon comfort as well as healthier households in the event of heat.

7.1.1 Systemic understanding on the rise of use of air conditioning

Social practices theory provides a systemic understanding of practices, how they are constituted and how it changes (Shove et al., 2012). For those advocating practices as units of analysis, this study is a closer examination of the rationale behind the diffusion of air conditioning in residential homes (Shove et al., 2013) – beyond a broader discussion on the rising quality of life and affordability of air conditioning. In particular, these studies provided details on how people regulate and use their air-conditioning system. Obtaining substantial information on the practices of using air conditioning in the home is essential to present a more accurate picture of why and how air-conditioning has been spreading rapidly in the everyday living; beyond widely perceived reasoning such as higher income and rising living standard. Detailed information such as who in an household, whom opts for air-conditioning installation, where in the house the installation is
preferred and why they opt to do so in specific other than being financially able, and how the situation inside households is regarding differences of air-conditioning use, such as thermostats and length of use, are all considered potentially substantial information gathered with this kind of research method. As such, the first consideration for this research was to develop local studies in energy consumption and conservation, especially with regard to cooling services in the home. Much research on examining cooling practice has been drawn from developed countries; despite the fact that developing countries are expected to be affected the most by climate change. I therefore focused attention on the Southeast Asia region where residential cooling has been growing tremendously.

Specifically, I chose Malaysia where the residential cooling sector has been increasing rapidly and the practice of cooling in the home was diverse, with less than 50 per cent of households using air conditioning. This study identified that local ‘ordinary’ adaptations that are not necessarily dependent on the adoption of air conditioning may otherwise go unrecognised. In addition, the study considered how future campaigns might engage more directly with narratives of local adaptation and ways of living with local climates in their unique cultural setting. Within such an exploration, is the composition of modern and traditional cooling practices that I have analysed in Chapter 4 and Chapter 5 respectively. In brief, changes in social practices occur as the internal bonds between elements remain or are broken, with the arrival of new items in some elements and the demise of others. For example, the collapse of expertise prioritising moving air is closely associated with the reduced number of windows in modern housing. In another example, the desire for instant comfort prioritises air conditioning as the primary device for this purpose, designed to provide comfort at one’s fingertips whatever the time of day. The emergence and persistence of these practices in everyday living are not however merely composed of single elements whether material, meanings or the preservation of know-how, but arrangements of components that are reflected in their establishment and design (Schatzki, 2013).

In Chapter 4, I presented my analysis of modern cooling practices in households interviewed within a social practice framework to provide a more in-depth exploration of the growing usage of air conditioning in residents’ homes. In that move, I effectively place air-conditioning usage in the broader context of practices, in which comfort and well-being under the heat is achieved (Walker et al., 2014). Much clarification is needed, for example, on the importance of air-conditioning usage in bedrooms during sleep time. Why not in the afternoon, the hottest time of the day? Proposing a more profound question such as this offers an alternative focus and goes further than merely asking why air-conditioning use in Malaysian homes is on the rise: the question concerns how it is being used or the extent to which it is being used. At the moment, the discussion has rarely ventured beyond climate and the rising quality of life. It is easy to subscribe to such a perception and never doubt that such reasons are wrong. Nonetheless, as we discuss in the literature, there is a question of how and why needing to be answered, which are intermingled answered in this study.
Systemic understanding of air-conditioning rise thus reframes indoor comfort as a series of entanglements and affordances and we begin to see air conditioning as an actor within a wider series of entangled relations and dependencies. The need for air-conditioning hence is not necessarily the need that arises from a natural desire, but rather a social organisation of everyday life that leads to it being seen as the way to achieve comfort and well-being in the home under the heat. As discussed previously, air conditioning has become a ‘necessity’ for comfort under tropical climate conditions and is increasingly promoted as the protective device for well-being under extreme heat. It is widely perceived that socio-economic arguments presented as the most viable explanation for the ownership of air-conditioner in the home. Households own air-conditioning because they can afford to own and pay for using them. Although the explanation is true, it however lacks justification regarding how households become uncomfortable within the home, making them to opt for air conditioning. In making a clearer case, it has been found in this study that even affluent households with a strong economic background are reluctant to follow the path of using air conditioning while reportedly being ‘similarly’ comfortable while at home.

In my encounter with households, I have provided a glimpse of how of cooling practices might be steered towards a more sustainable direction that we have in front of us. Firstly, I am drawn towards the notion of ‘passive practices’ as a result of the growing integration of elements of modern practices. In Chapter 4, I investigated the idea that household know-how in modern practices now revolves around air conditioning and making its operation as efficient as possible in the home. This scenario transpired materially in current housing that has fewer natural ventilation features. Consequently, households describe being comfortable staying in one closed for a longer time, air-conditioned space in the home, with all windows closed. Hence, this lead to a notion that how air-conditioners and housing infrastructures were reconfigured, such that the achievement of cooling requires fewer (or inhibited) adaptation activities – which I refer to as ‘passive practices’. Secondly, a broken link between elements of traditional practices also contributes towards bringing down the ‘active practices’ that previously existed in traditional cooling practices.

7.1.2 Persistence of traditional cooling practices – beyond ‘vernacular’ architecture and passive cooling

Tropical cooling practices go beyond ‘vernacular’ architecture. This study reveals that survival of cooling practices of the past has been crucial on intangible components as much as it is tangible. In local literature, passive cooling ought to be the way forward to reduce domestic energy consumption (Kubota T.J, Doris H.C, & Dilshan R., 2011). Current ‘passive cooling’ initiatives in housing design prove to be insufficient to influence finding comfort in a less energy-intensive manner. Current endeavour for passive cooling as an alternative to air-conditioned comfort seems to be concentrated on the material improvement of the built environment. This scenario signifies
the same technical apparatus to solve a significant issue which involves a larger social, contextual and cultural understanding of cooling practices. While the housing sector is urged to incorporate as much vernacular architecture as space in designs as it can to present something 'meaningful' in the practice of cooling in the home, focus should also be given to the preservation of previous generations' know-how and understanding, embedded in what I refer to as 'active practices' for cooling and comfort. The suggestion is to therefore move forward and take on such an understanding in our ways of influencing lower carbon change in the form of encouraging 'active practices'.

Practices perspective taken on by this study regarding the cooling practices in the home sheds light on the future lower carbon society through our reframed understanding on the matter of active and passive practices. The drive towards low-carbon comfort can be achieved under the notion of 'active practice', which involves activities of mind, skills and technological arrangements actively linking together, and each element actively operating to recreate the traditional cooling practices that existed in the traditional generation in the tropics. In the study, older households share the understanding that a myriad of elements are involved in achieving comfort and how they directly result 'naturally' leads towards the reduction of air-conditioning usage. This scenario can be seen with how air-conditioning usage is centred towards certain activities such as sleeping — the combination of elements involved in the reduction of air conditioning in finding comfort. On a fundamental level, this study found that energy consumption falls when households prioritise comforting their bodies (bodily comfort) rather than opting to cool the spaces of the home for the purpose of their comfort (space cooling).

This study introduced the speculative notion that the tropics hold remedies for reducing vulnerability to heatwaves by means of adaptive capacities hidden beneath their traditional cooling practices. This study introduced the speculative notion that the tropics hold remedies for reducing vulnerability to heatwaves by means of adaptive capacities hidden beneath their traditional cooling practices. A more holistic approach, such as a contemporary theory of social practice, “has been influential in rethinking the ‘possible, plausible and worthwhile’ ways of intervention in complex challenges like those of climate change” (Shove et al., 2012, pg 116). I argue that policy approaches to rising cooling consumption and reducing vulnerability to heatwaves in this part of the world should be based on resurrecting elements of traditional cooling practices. These already being discussed by Shove et al. (2012) on how policy could go on targeting on removing ‘bad elements instead of bad behaviour’ that promotes energy intensive air-conditioning and stimulate re-emergence of non-air-conditioning practices based on the dynamics of traditional practices. Residents in this part of the world have long been associated with their own ways of coping with heat as they have been living without air conditioning consistently in their lives. Skills, meaning and materiality that were embedded in these traditional practices served as valuable input for intervention to reduce vulnerability to heat and create adaptation measures against the heat. In following the path of focusing on practice, interconnection rather than a linear process of attaining
comfort is revealed, gathering together different elements from the tangible to the intangible, from the physical to the social. While acknowledging that Western-derived comfort models of using air conditioning might save lives with the prospect of more frequent heatwaves ahead, elements of locally-derived practices unique to the culture form specific ways forward with regard to how comfort and well-being can be achieved differently than those of air conditioning.

Chappells and Shove (2005) in their conclusion have urged that the role of policy is to help facilitate the creation of these environments and encourage debates that consider, or social innovations that shift, existing comfort conventions and meanings. This, I argue, is the most important and also the most challenging element, which is arguably uncontrollable and is how to reposition households' understanding back to the 'pre-conditioned' era without air conditioning – seeing comfort without air conditioning as a relatively normal situation. I argue here that the time is now for Malaysia, as the traces of values and meaning are pretty much embedded in large segments of its population. In further refine dominant arguments about how vernacular architecture helps to inform initiatives on passive cooling, I present the broader context of the discussion by way of advancing a traditional cooling practices dynamic as non-air-conditioning 'active practices'. This analysis is significant in its own right in the context of introducing low-energy practices towards cooling and comfort in the home to the current generation. In particular, recent efforts toward promoting passive cooling need to be enhanced by concentrating on the 'intangible' parts of the equation found in this study; to become the central position that drives the persistence of practices. From the theoretical to issues of the 'real-world', this study calls for identifying the most sensitive ways of steering societies towards a more sustainable thermal future (Russell Hitchings, 2009). It is proposed that working on linking elements that 'existed' in traditional practice towards creating non-air-conditioning cooling practices of the future is the way forward. Insights gathered through analysing such practices, their constituent elements and how these change have led to renewed ways of dealing with reducing energy consumption and working on better configurations for improved health and well-being out of the heat within the home. Indeed, there are real benefits in expanding the view on traditional practices in Malaysia, and tropical countries in general, to highlight the whole picture of tropics-based, low-energy cooling practices in the home.

However, I am aware and it is worth pointing out that not all past practices – or element of it - are more sustainable than current varieties. Concern has been raised about the knock-on or rebound effects of some strategies in dealing with the heat that might involve consuming additional resources (Sahakians & Wilhite, 2014). Regular bathing in adapting to heat, for example, uses more water. The study highlights that households describe regular bathing on hot days as being the subject of arguments concerning rising energy costs and water consumption (Gram-Hanssen, 2010). In literature on households’ everyday practices, bathing or showering is considered a separate social practice which should be subject to lowering of water consumption (Shove & Walker, 2010). In advancing the possibility of creating a low carbon future, Urry (2011) introduced the notion of ‘innovation’ and acknowledged the importance of a ‘system' behind such a drive. In
his discussion of the mobility system, he argued that the system is non-linear, systemic and unpredictable and required synchronisation of more than one ‘agent’. In discussing driving as a social practice, Shove et al. (2012) argue that the early days of driving cars consisted of different types of practices with individual arrangements of elements. Signalling, overtaking, and starting the car engine are such mechanical operations in and of themselves. Over the last century, component practices have merged whereby driving is now recognised and enacted as a single entity of such practices. Recalling my previous discussion on traditional cooling practices, I found that such network existed – a system in the form of ‘bundles’, working hand in hand between cooling (ventilating) space and comforting the body.

The social practice of showering (or bathing) is the first obvious and widely recognised method for achieving thermal comfort in the home. Moreover, bathing or showering has been classified as a practice on its own in several other practice studies (Cohen-Mansfield & Parpura-Gill, 2007; Maréchal & Holzemer, 2015; Shove & Walker, 2010; Spurling et al., 2013). In the study, as shared by one of the households, traditional practices involved regular bathing and in the past water was freely supplied by digging a well and taking a shower directly from this supply. In addition, the water was by nature cold without the involvement of heating systems as currently. Unless we follow the example of utilising these ‘free water supplies’, adopting bathing and showering on hot days will continue to increase water consumption at the expense of reducing energy consumption and not opting for air conditioning. Therefore, promoting this resource as a future adaptation measure against heatwaves needs to be done with some caution. Nevertheless, where these practices intersect as outlined above is a rich area for study and one that in fact remains understudied (Sahakian & Wilhite, 2014; Warde, 2005). The rebound effect exists in almost all practices as houses contain a myriad of different practices – cooking, lighting, heating and so on, which require different resources as practices are all interrelated and viewed as a system (Sahakian & Wilhite, 2014).

7.1.3 Vulnerability to heat in the home

Globally and in Malaysia, reports consistently highlight the elderly, young children, disabled and people with pre-medical conditions as the vulnerable groups to heat-related morbidity and mortality. A previous notion holds that vulnerability studies have ignored how well-being and quality of life are defined in different localities and contexts (O’Brien et al., 2004). Here, heat is often referred to as ‘negative’ effects and damaging for well-being, although in the elderly heat is considered part of day-to-day living; yet their lifetime reproduction of cooling practices to be adopted are presented as barriers to their well-being, in contrast to air-conditioning, which these groups found to be uncomfortable. In this view, housing as a social determinant of health clearly plays a role in creating resilience, in providing diversity in responding to climatic heatwaves,
offering tools to navigate adaptive cooling practices that are embedded in the elderly (Lawrence, 2004; Maller & Strengers, 2011).

The present research explored how housing arrangements and skilful acts moderate or make these vulnerable groups more at risk under heatwaves. For those groups who belong to households in which air conditioning has become embedded in their structure of practices for cooling, in which all or either one of the elements of materiality, skills and meaning have shifted towards conditioned comfort, air-conditioning is presented as a systemic protective device and the heat burden can never be lifted without the prescription of air conditioning. By contrast, for those holding on to non-air-conditioning practices, vulnerability to heat can be mediated by adaptive capacities that involve action measures that are based on skills and values that hold true in getting comfortable. Habits such as being topless in the house, moving around the house for comfort, as well as routines that include bathing and window opening, as mundane as they are, are never ‘second class’ on the way towards sustainability in achieving comfort to the more advanced technological innovations like solar powered air-conditioners and energy-efficient ceiling fans. That is a persistent situation whereby studies of sustainability tend to separate and, to some degree, uplift scientific and technological aspects above the philosophical and sociological. What this research suggests is that comprehensive understandings of practices from the past have a place in the future. Nowadays, the way people can be comfortable without air conditioning is through ‘scientific’ knowledge yet to be embraced. Intervention in practices in households ‘naturally’ eliminates the need for air conditioning and constructs well-being under the heat in a more culturally and historically refined manner (Nicholls & Strengers, 2018).

7.2 Reflection on research design, limitations and future directions of the study

This study follows pathways that focus on the practices people engage in to mitigate vulnerability to heat rather than individual attitudes, behaviour and preferences. In the study, I engaged in understanding the cooling practices of households in the tropical country of Malaysia, to comprehend local householders’ day-to-day cooling practices that have been proven to be successful in mitigating vulnerability in the context of other geographical settings (Strengers & Maller, 2011). The decision to focus on households practices as the scope of the research was made based on the growing usage of residential air conditioning, as well as the importance of housing as being one of the determinants of health. Although the methods employed are the best possible approach presently to answer the research aims of the study, I also noted some methodological concerns that are worth discussing. Firstly, the study could have benefitted from a longer timeframe for its ethnographic exploration and participant observation in the households under study, excluding the interviews, to better incorporate the historical boundaries between modern and traditional practice by the researcher being present as those practices were played out. However, due to the time constraint, I could not proceed with such an approach but enhanced validity by recruiting participants that have historically used the different practices in the past years'.
Moreover, additional tools, namely tours, daily cooling diaries and temperature measurements were employed to further enhance the method of the study in gathering rich information. Secondly, further testing in more significant sample size would have strengthened the generalisability of the findings of the research towards large segments of populations (Harold Wilhite et al., 1996). The study might also have benefitted from a large-scale survey to gain a fuller picture of the phenomenon before proceeding with an in-depth ethnographic investigation. Nevertheless, the study design was intended to illustrate sufficient diversity of households’ cooling practices across a small sample by careful selection of households’ participants. While the sample size in this study can be regarded as relatively small, a larger sample size is likely to uncover greater diversity and consequently reinforce the study findings (Strengers & Maller, 2011). Thirdly, the exact temperature present during interviews was often greatly exaggerated in households’ responses. Thus gaining an accurate response to questions has proven to be a limitation to this kind of study when households reminisced about the feeling of heat and responded accordingly. The absence of a heatwave during the period of fieldwork was the first of a number of difficulties that were encountered, other than occasional rainy days when conducting the interviews. However, as a heatwave had occurred barely three months before the interviews, households could still recall this accurately in their responses.

This study was deemed to be of minimal risk to participants and the likelihood and magnitude of discomfort anticipated for participants in the research would not be greater than any ordinarily encountered in daily life. Providing informed consent and protecting anonymity and confidentiality as requested is the primary ethical issue identified in the study. First of all, participants were made fully aware of the nature of the study by being provided with the participant information sheet. Throughout the interviews, effort was made to be mindful of the potential discomfort that can be caused while examining daily household routines and heat-related well-being issues. At the start of such questions, I reiterated the basis of possibly sensitive questions; for example, in discussing sweating issues and bathing and kept reminding participants that they could refuse to answer any question without stating a reason. All households are also represented by an acronym to maintain anonymity. Nonetheless, this study continues to build on existing work in furthering the call for a more contextualised understanding of vulnerability as well as bringing an alternative pathway forward for cooling in the home under hot weather, other than air conditioning. In the short term, this study helps to uncover everyday heat adaptation and cooling strategies which might not have been previously known. In regard to the longer-term prospect of frequent heatwaves ahead, this study contributes towards a systematic and comprehensive understanding of ‘traditional’ cooling practices on the tropic and helps to create a framework for building a pathway to re-discover ‘raw’ adaptive capacities and build resilience under the heat upon that knowledge. In the future, more study is needed to revive complex tradition-based cooling practices in the tropics and resurrect this dynamic into policies to cope with heatwaves.
I conclude on a cautionary note, reiterating that Malaysia is currently at the intersection of either facilitating its households’ trend towards lower energy consumption of cooling services or risks following the path of entrenchment of air conditioning in the common expectation of comfort. Failure to identify the right path poses not only the deepening entrenchment of energy-intensive air conditioning, but risks absorbing it into the definition of future protective devices against the warming climate. For Malaysia, reviving its traditional cooling practices serves as the basis for future aspiration for non-air-conditioning cooling practices in the juggling act between reducing vulnerabilities and increasing adaptive capacity in the event of heatwaves in the future.
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# Chapter 9 Appendices

## Appendix 1 Interview Guides

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<th>Theme</th>
<th>Questions</th>
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<td><strong>A. Biographies</strong></td>
<td><strong>A1. (INTERVIEWEE INFO) Please introduce yourself</strong> (name, age, and profession?)&lt;br&gt;<strong>A2. (HOUSEHOLD INFO) How many family members living in the house?</strong> (Their name, age, and relationship to you?)&lt;br&gt;<strong>A3. (HOUSING INFO) Please briefly describe the house you occupy</strong> (House age, bedrooms, layout, built characteristics, microclimate?) (Field note)Photo&lt;br&gt;<strong>A4. (LIFESTYLE INFO) How long have you been living in this house? How much time is spent indoors during the week and weekend?</strong> (How about other households? What are you and your family's activities during indoor and outdoor?) (Field note)</td>
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<td><strong>B. Subjective Comfort Assessment</strong></td>
<td><strong>B1. Do you frequently check the indoor temperature of your home?</strong>&lt;br&gt; - Why or why not?&lt;br&gt; - Do you find a numbered figure useful to determine comfortable level of yourself? For example having a wall thermometer in the house to know temperature so that you can do something to make it cooler/warmer.&lt;br&gt;<strong>B2. When do you feel uncomfortably hot in your house?</strong> (Field note)&lt;br&gt; - Any specific time in a day?&lt;br&gt; - How do you know that you are feeling hot?&lt;br&gt; - Experience through the recent heat wave?&lt;br&gt;<strong>B3. Which part of your house is the hottest and coolest?</strong> (Field note)Photo&lt;br&gt; Why do you think it is so?&lt;br&gt;<strong>B4. Are there other members of the household who is always complaining about the heat more than others?</strong> (Field note) - Explain why&lt;br&gt;<strong>B5. Where in the house and when he/she always complained of heat?</strong> (Field note)Photo&lt;br&gt; - Is it the same as you? If not, why?</td>
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<td><strong>C. Keeping Cool Strategies</strong></td>
<td><strong>C1. How do you keep cool and comfort in the home?</strong>&lt;br&gt; - Let say, you felt uncomfortably hot/warm now, what is the first thing that you will do usually?&lt;br&gt;<strong>C2. If you will turn the air conditioner at home, can you explain?</strong> (Field note) (Diary) (Photo)&lt;br&gt; - Usual thermostat setting, time of usage (Skills)&lt;br&gt; - Other follows up reaction after AC? Windows? Blinds? Clothing? (Skills)&lt;br&gt; - How many and where did you install it in your house? (Meanings, Materials)&lt;br&gt; - What type of AC? When did you install them? (Meanings)&lt;br&gt; - Why had you decided to install them? (Change)</td>
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<td>C3. If you avoid A/C in first (if there is any) OR if you go straight for any other adjustment than A/C, can you explain? (Field note)(Diary)(Photo) *There a lot of households nowadays will go straight for air-conditioning when its hot, why havent you one of them?</td>
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<td>C4 For both preferences, whether strategies on AC or NV, do you think you could permanently maintain these practices? Explain</td>
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<td>C5. Are there any other unique techniques that you do in addition to air conditioning, fan, or opening window, to remain comfortable in the house? (Field note)(Photo)</td>
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<td>C6. Where did you learn these techniques?</td>
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<td>D1 Do you think your house protects you well under heat?</td>
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<td>D2. Do you often sweat in the home because of the heat? (briefly, explain your condition and how you cope with the situation)(Field note)</td>
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<td>D3. Do you often easily feeling thirsty in the home because of the heat? (briefly, explain)</td>
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<td>D4. Do you often have difficulty in sleeping at night in the home because of the heat? (briefly, explain)(Photo)</td>
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<td>D5. Is the heat in the home has put pressure on you or any of your household? (briefly, explain)(Field note)</td>
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<td>D6. Is the heat in the home affects your health or any of your household? (briefly, explain)(Field note)</td>
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Appendix 2 Letter to households

Dear participant,

My name is Tarmizi Amin and I am undertaking PhD study at the University of Manchester in the School of Education, Environment and Development (SEED). The working title of my research is “Heat, Comfort and Health in Changing Climate: What Can We Learn from Household Space Cooling in Malaysia”

My PhD explores how households in this country adapt to heat and space cooling practices in their home in the prospect of changing climate ahead. More specifically, I’m interested in how your strategies to reduce heat arise in different type of housing in this crucial time when heat wave was reported to happen more frequently in which could be harmful for your health. Apart from that, I hope to use this knowledge to inform house builder and policymakers on future design of the house to suits adaptive strategies and reducing our growing dependence on the energy-intensive air conditioning. It is due to the fact that this practice is directly attributed to the rising residential energy consumption, causing strain on cost of residential electricity and unsustainable in the long run.

I expect to involve around 24 households in my research. Your participation is purely voluntary. You have been approached to participate in my research because you are deemed knowledgeable and fall within the pre-determined categories of participants required for this study. If you choose to participate, you will be asked to spare some of your time to undertake the following research activities:

1) The first day visit:
   - An introductory interview, where I will ask you to talk about you (and your family members) general biographies.
   - A diary sheet will be given for you to record timely heat adaptation and space cooling strategies for two days (a working and a non-working day).
   - Setting date for the second visit.

ii) The second day visit
   - Collection of the completed diary
   - Interview where I will reflect on your diary entry and ask a series of thematic question

I will not be asking or expecting you to reveal any private information other than required within the study scope. The audio recording of interviews will be securely stored in archives managed only by myself. In adherence to the University of Manchester Data
Protection Act, the data will be kept for five years before being destroyed. Your data will not be available to any third parties. The interviews will be coded and any quotes or other information that you pass onto me will be referred to anonymously in my future analyses and publications, unless you agree otherwise. A report of the project outcomes will be provided to the School of Education, Environment and Development (SEED) the University of Manchester and the School of Social Sciences, Universiti Sains Malaysia (USM). The notes, transcriptions and other data I collate from my research activities with you and your household will be made available to you by online access. You are free to withdraw yourself from the project at any time, and to withdraw any unprocessed data previously supplied.

I will be able to provide you a small financial compensation of MYR 100 (GBP17) per households for participating in my study.

If you agree to participate in this research, please read and sign the consent form attached to this letter. Professor Stefan Bouzarovski and Dr. Saska Petrova who are located in SEED, the University of Manchester, United Kingdom, are supervising this PhD project. If you have any further questions or comments about this research, please do not hesitate to contact me on the email address/contact number below.

Regards,

Tarmizi Amin
PhD Researcher,
School of Education, Environment and Development (SEED)
The University of Manchester

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<tr>
<th>Name</th>
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<tr>
<td>Tarmizi Amin</td>
<td><a href="mailto:mohdtarmizi.mohdamin@postgrad.manchester.ac.uk">mohdtarmizi.mohdamin@postgrad.manchester.ac.uk</a></td>
<td>+447729859036</td>
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<tr>
<td>Prof. Stefan Bouzarovski</td>
<td><a href="mailto:stefan.bouzarovski@manchester.ac.uk">stefan.bouzarovski@manchester.ac.uk</a></td>
<td></td>
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<tr>
<td>Dr Saska Petrova</td>
<td><a href="mailto:saska.petrova@manchester.ac.uk">saska.petrova@manchester.ac.uk</a></td>
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Appendix 3 Participant Information Sheet

You are being invited to take part in a study as part of a student project aimed to understand heat adaptation, space cooling practices and vulnerability to heat among household in Malaysia. It is for the fulfilment of Doctorate Philosophy of Human Geography at the University of Manchester. Before you decide it is important for you to understand why the study is being done and what activities it will involve. Please take time to read the following information carefully and discuss it with others if you wish. Please ask if there is anything that is not clear or if you would like more information. Take time to decide whether or not you wish to take part. Thank you for reading this.

Who will conduct the study?
Tarmizi Amin,
School of Education, Environment and Development (SEED),
Arthur Lewis Building, University of Manchester, UK.

Title of the study?
Heat, comfort and health in changing climate: what can we learn from household’ cooling practices in Malaysia

What is the aim of the study?
The main purpose of this study is to explore the dynamic between housing, heat and health of household through the social practice theory, in which offers a multidimensional, systems-oriented understanding of heat adaptation, vulnerability to heat and well being against heat in the home. Consequently, it identifies ‘on-the-ground’ ways vulnerability can potentially be reduced in day-to-day context while at the same time promoting well-being of household.

Why have I been chosen?
This review will take into account three factors, namely; type of home, household size and the use of air conditioners. You are within those criteria the study is looking at. By participating in this research you will have the opportunity to contribute new knowledge to our understanding of daily heat adaptation, practices of space cooling and thermal comfort in Malaysia. You will also be assisting in finding out who is the most vulnerable to heat in the home. This will ignite new ways to increase adaptive capacity of vulnerable household in Malaysia to heat. Who knows, you might even learn something interesting about yourself and your household!

What would I be asked to do if I took part?
You will be asked to complete two-day diary entry (in which one on weekday, another during weekend) as you continue doing your everyday routines. Diary is the simple note on timely basis to record your daily heat adaptation and space cooling strategies in the home. At the distribution of the diary, a short interview to explain the research. Upon collection of the completed diary, and discuss your diary entry. The first interview will take place at the beginning of the research to brief
the instruction on diaries taking and to gather initial information about household biographies. In diaries instrument, participant will provide the required data – by recording their everyday adaptation to heat, space cooling strategies and their well being indicators towards heat – in timely manner without interference from researcher. The researcher will not stay in the households’ homes during the research period. The second interview will take place during the collection of the diaries and represent an opportunity to reflect upon the content of the diaries. Both interviews will take place in your house as to give comfort to you.

What happens to the data collected?

As accordance to the United Kingdom (UK) Data Protection Act 1998 and the University of Manchester’s Data Protection Policy, you will be assured that all the data collected will be lawfully processed. All information obtained in this study will be immediately transcript and stored in the personal data storage protected by password. Following transcription, all recordings of the interviews will be permanently erased to ensure confidentiality. The results will be made available to you in an appropriate format required, either by printed copy or access to this information online.

How is confidentiality maintained?

You will be assured that all the data collected will be treated at the highest degree of confidentiality. Data and results obtained from the study should only be used in the ways for which their consent has been given. Only me as the researcher will have access to notes and audio recordings from the interview. These will be stored for a period of 5 years following the interview. At that point, they will be discarded in a manner that ensures continued confidentiality.

What happens if I do not want to take part or if I change my mind?

You are free to withdraw yourself from this project at any time, and to withdraw any unprocessed data previously supplied.

Will I be paid for participating in the study?

I will be able to provide you a financial compensation of MYR 100 per household for participating in the study.

What is the duration of the study?

In total, fieldwork will take around 90 days, beginning from July 1st to October 1st, 2016.

Where will the study be conducted?

The study will be conducted in the comfort of your own home.

Will the outcomes of the study be published?
The outcomes of this research will be published in peer-reviewed academic journals. They may also be presented at academic conferences. A report of the project outcomes will be provided to the School of Education, Environment and Development (SEED) the University of Manchester and the School of Social Sciences, Universiti Sains Malaysia (Science University of Malaysia).

Contact for further information

This PhD project is being supervised by Professor Stefan Bouzarovski and Dr Saska Petrova who are located in SEED, University of Manchester, United Kingdom. If you have any further questions or comments about this research, please do not hesitate to contact either myself or one of my supervisors on the numbers or email addresses stated in the letter.

What if something goes wrong?

If there are any issues regarding this research that you would prefer not to discuss with members of the research team, please contact the Research Practice and Governance Coordinator by either writing to 'The Research Practice and Governance Co-ordinator, Research Office, Christie Building, The University of Manchester, Oxford Road, Manchester M13 9PL', by emailing: Research Governance@manchester.ac.uk, or by telephoning 0161 275 7583 or 275 8093
Appendix 4 Ethics Approval Letter

School of Environment, Education and Development
The University of Manchester
Oxford Road, M13 9PL Manchester
www.seed.manchester.ac.uk

Re: MB/SEAG83/July 2016

Student ID: 9547233
Sent by email to: mohdtarmizi.mohdamin@postgrad.manchester.ac.uk
PhD Human Geography

27 September 2016

Dear MohdTarmizi

School Ethics Advisory Group (SEAG)

Title: “Housing, Heat and Health in Changing Climate: What Can We Learn from Household Space Cooling Practice in Malaysia”

I write to confirm that the Chair is now satisfied that you have addressed the concerns of the SEAG.

The SEAG has therefore given the research project a favourable ethical approval using the preapproved University Research Ethics Committee (UREC) template.

It is the Advisory Group’s practice to inform investigators that they should not deviate from the agreed protocol without seeking further approval from SEAG.

If anything untoward happens during your research, then please make your supervisor aware. They can then raise any issues with SEAG on your behalf.

Best wishes during the research.

Regards,

Dr David Lawson
Senior Lecturer Development Economics and Public Policy
Former Chair of SEAG
Appendix 5 Sample field note from interview

FIELDNOTE AC09

1. Date
2. Time
3. Place
4. Specific

1. Date
7. Specific words, phrases, summaries of conversations, and insider language
8. Questions about people or behaviours at the site for future investigation