

# Lower income challenges to low carbon living in Australia

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## Abstract

*In the move toward low carbon living, the challenges faced by lower income groups are often overlooked. Recent rises in electricity costs disproportionate to income make this a more critical issue. Based on findings from focus group discussions with 164 lower income households and 18 stakeholders across four different climate zones in Australia, this paper reveals the barriers that lower income households face in improving their residential energy efficiency and in achieving low carbon living. While limited financial capacity is generally understood as a significant barrier preventing lower income households from taking up technologies to achieve greater energy efficiency and transition to low carbon living, our findings show that a mix of financial and non-financial barriers exist. These include their ability to afford energy efficient household products, control over thermal comfort and energy efficiency levels of their homes, and lack of access to reliable information. These barriers are revealed to have significant impacts on the household finances, health, and social wellbeing of these lower-income households. The concluding discussion puts forward policy suggestions on how some current assistance and incentive programs encouraging low carbon living could be adjusted to ensure more equitable access, encourage uptake, and improve low carbon outcomes.*

*Keywords:* Lower income households; low carbon living; financial barriers; non-financial barriers

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## 1. Introduction

In recent years there has been a global move to transition energy production for residential consumption to more renewable sources. This is highlighted by reduction targets at the national and international levels of greenhouse gas emission, with many countries – most notably in western Europe and Scandinavia – heavily investing in renewable energy production infrastructure such as solar and wind farms [1]. In Australia, however, investment in renewable energy infrastructure has to date been limited, with coal-fired electricity production continuing to be more heavily subsidised than renewable energy production and promotion [2,3]. This reflects the scarce political support of renewable energy production in Australian politics, most visibly highlighted by a Wall Street Journal article which proclaimed that Australia was the first (and, to date, only) developed nation in the world to have repealed its own carbon pricing mechanism [4].

The low status of renewable energy production on the Australian political agenda has meant that electricity produced through sustainable means (e.g. solar and wind) is commercially retailed at a higher price than that from non-renewable sources [5]. Typically at 15-24% higher than non-renewable electricity, this has led 'green' electricity to be viewed as a premium product, and the differential is a significant financial barrier to lower income households taking up renewable energy.

According to international definition [6], recent Australian studies [7,8] highlighted that no Australian households could be classified as experiencing energy poverty or hardship. That is, no households were spending more than ten percent of their disposable income on energy. There is, however, emerging evidence of socioeconomically disadvantaged households experiencing energy deprivation [9]. Such a finding especially highlights the more qualitative outcomes of unaffordable access to energy.

Taking a qualitative approach, this paper reports on findings of a recent Australian study into the challenges that lower income households faced in transitioning to low carbon living and how these impacted on their quality of life. Participants recalled a range of financial and non-financial barriers, combinations of which have had significant impacts on these households' financial, health, and social wellbeing. The concluding discussion of this paper puts forward suggestions of policy redirections on how some current assistance and incentive programs encouraging low carbon living may be adjusted to ensure more equitable access, encourage uptake, and improve outcomes.

## 2. From energy poverty to energy deprivation

Over the last two decades, there have been extensive explorations of the impacts of energy costs on the household budget. The impacts were noted to affect socioeconomically disadvantaged households more especially as they generally had less flexibility within their household budgets to account for any sudden shocks or persistent increases. Attempts at measuring such impacts first emerged in the early 1990s, with Boardman's [6] introduction of the term 'energy poverty', denoting circumstances where energy costs accounted for ten percent or more of a household's disposable income. This definition, while relatively easy to calculate and for the general public to comprehend, has been disputed for being too simplistic and does not necessarily reflect varying local contexts and the wider, often more qualitative outcomes of energy costs on lower income households. According to Simhauser, Nelson and Doan [8], for example, no Australian households across the five income quintiles spent more than seven percent of their income on energy in the early 2000s, and as such none were experiencing energy poverty according to Boardman's definition. As several overseas studies (e.g. [10]) and the Australian study reported in this paper show, however, the outcomes of unaffordable energy costs may be more than financial and cannot easily be summed up in a simple index.

Critics of Boardman's [6] definition of energy poverty included Pachauri and Spreng [11], who noted that "like sustainability, energy poverty is not easily boiled down to one number and it is difficult to trace back changes in energy poverty levels to specific efforts since other factors such as general economic growth, social and infrastructural development also influence it". Liddell et al. [12] also criticised that the ten percent threshold may be an arbitrary benchmark, and suggested region-specific twice median measures may be more appropriate in some circumstances. A range of other, mostly quantitative, alternatives were also explored in other studies, including the total energy inconvenience threshold, the minimum end-use energy approach, the energy access index, and cost for maintaining adequate level of comfort [11]. Critics of these alternatives also abound, with Waddam Price, Brazier and Wang [13] noting that adequacy is a highly subjective concept so that despite two individuals spending the same amount on energy there could be vastly different outcomes regarding reaching an adequate level of comfort. This subjectivity was in addition to the differences in energy pricing from one retailer to another and the condition of the dwelling (which, for example, would impact the need for heating).

More recently, focus on the impacts of unaffordable energy costs has begun shifting to more qualitative measurements while acknowledging the potential subjective nature of such approaches. These include energy vulnerability, which takes a broader view into consideration to explore "the propensity of an individual to become incapable of securing a materially and socially needed level of energy service in the home" [14], and therefore take an almost predictive approach in assessing the sections of community that may be on the verge of experiencing energy poverty or hardship. Similarly, Bouzarovski and Petrova [10] described energy deprivation as the outcomes of energy poverty but also the "economic, infrastructural, social equity, education and health" matters that lead to inadequate access to energy. The South Australian state-wide blackout in late 2016 brought the term energy security to the fore, used in describing the need for dependable infrastructure to ensure consistent and reliable energy supply [15]. In an international context, energy security is more often used to describe the securing of energy resources, such as fossil fuel or river systems for hydroelectricity generation, and equal and fair access to these resources across population groups [16].

Irrespective, the prohibitive impacts of unaffordable energy costs, particularly on socioeconomically disadvantaged households, were agreed across this diversity of studies and approaches. This paper reports on recent Australian evidence concerning the challenges lower income households faced in the context of low carbon living and reveals some of the depriving impacts unaffordable energy have on these households.

## 3. Methodology

The project discussed in this paper took a qualitative approach, involving a mix of literature and policy reviews, focus group discussions with lower income households, stakeholder interviews and policy workshops, to explore the prohibitive factors that discourage lower income households from adopting low carbon living. Fieldwork was conducted across four distinct climatic zones throughout Australia [17], and involved eight capital cities and regional centres. In this project, lower income households were defined as those with income that fell within the two lowest family income quintiles of their respective state/territory's capital city population. Four specific household types, identified by Burke and Ralston [7] as being more likely to encounter difficulties leading to, among others, an inability to pay their energy bills, and therefore experience energy hardship, were selected as the focus of this study: young singles aged 18 to 35, single-parent families, larger households with five members or more (i.e. twice the Australian national household average), and older singles and couples aged 65 or older. Table 1 provides an overview of the location, climatic zones and low income households in the eight case study sites.

Table 1. Case study sites and selected characteristics [18].

Climate zone		Warm temperate – humid	Warm temperate – dry	Cool temperate	Hot humid summer, warm winter
State/Territory		NSW	SA	TAS	NT
Lower income threshold		\$1,499	\$1,249	\$1,249	\$1,999
Metropolitan	Capital city	Sydney	Adelaide	Hobart	Darwin
	No. of lower income families	462,438 (45%)	131,318 (44%)	23,266 (46%)	11,978 (49%)
Non-metropolitan	Regional centre	Raymond Terrace	Murray Bridge	New Norfolk	Katherine
	No. of lower income families	1,979 (55%)	2,361 (55%)	870 (57%)	687 (50%)

The 23 focus group discussions with 164 lower income households were conducted between December 2015 and June 2016 with six additional interviews conducted where interested participants could not attend the focus groups at the scheduled time or where sign-up to their respective group was low. Concurrently, 14 interviews with 18 stakeholders (frontline staff of charity and support service providers, housing providers, public agencies, peak bodies and advocacy groups) were conducted in the four case study states/territory between December 2015 and May 2016. These discussions focused on the participants' knowledge of carbon reduction schemes, their motivation for supporting (or not) low carbon living, the challenges and barriers they faced in reducing energy consumption, a self-assessment of their ability to implement further reductions, and challenges that non-profit organisations faced in providing and sustaining support programs. Almost half (49%) of the participants were of the older singles and couples household group, with single-parent families (35%), larger households (12%) and young singles (5%) comprising the balance. Most (87%) of the participants' main income source were different types of government benefit payments, with very few on salaries (11%), superannuation (1%) or personal savings (1%). As a result, most of our participants (82%) had income within the lowest quintile of their respective state/territory. Likewise, most also rented (42% in social rental and 35% in private rental) with few outright owner-occupiers (15%) or mortgagors (9%). This high representation of renters amongst our participants, and lower income households more generally, presents significant barriers to their adopting of low carbon technologies. All focus group discussions and interviews were digitally recorded and professionally transcribed. The transcripts were then entered into NVivo and thematically analysed using the discussion questions as a guide.

Four policy workshops with 31 public, private and non-profit sector representatives were conducted in the capital city of the four case study states/territory in August 2016. The aims of the workshops were to present findings of the focus group discussions and stakeholder interviews, and to discuss policy outcomes for improving lower income households' access to and efficiency of existing assistance programs, increasing the impacts of assistance through discussing potential new programs, and improving channels of information distribution. Prior to concluding the workshops, participants were asked to nominate up to three priority areas that would make the most significant improvement to lower income households adopting low carbon living and addressing energy deprivation. These nominations were post-coded and are discussed later in this paper.

#### 4. Findings

Discussions with lower income households and stakeholders highlighted a number of financial and non-financial barriers that lower income households faced in adopting low carbon living practices and technologies. This was in spite of overwhelming support for low carbon living among the majority of our lower income participants. Such support was often predicated on longer term views, such as providing a safe and healthy environment for the future generations, but also in the hope that with increased access to renewable energy, such as on-site production of solar electricity, some of the burdens on their household budget may be lifted. This second motivation particularly highlights the lack of information that most lower income households had on renewable energy, with many believing that the installing of solar panels on their roofs would provide them with an endless supply of electricity and they would be free from electricity bills from then on. This lack of information – on how solar electricity generation works, energy efficiency measures more generally, or assistance that they may be eligible for – was highlighted as a significant non-financial barrier to their adopting of low carbon living.

A number of the identified barriers – such as an inability to afford low carbon technologies – resonated with international evidence (e.g. [19]) while others – such as their rental tenure and access to assistance – were more Australia-specific. These discussions highlighted a range of impacts experienced by lower income households as a result of their inability to afford energy or adopt low carbon living, leading to a wide range of compensatory behaviours that negatively affected their physical, social and mental wellbeing.

#### 4.1. Financial barriers

For socioeconomically disadvantaged households, it is understandable that limited household finance may be one of the main factors prohibiting them from adopting low carbon living or impacting on their quality of life more generally. Financial barriers to low carbon living ranged from the high and continually rising cost of energy, which had flow-on, prohibitive effects on lower income households' abilities to implement energy efficiency measures. As Chester [20] reported, energy retail prices across all Australian jurisdictions had increased significantly since 2007, by at least 75% in most states/territories and more than doubled in NSW and Queensland. Such increases had far exceeded the increase of other retail goods and services (as denoted by the consumer price index [21]) and also increases in benefit payments, the main income source of the majority of our participants.

There was great variability in the amount our participants paid for energy, ranging from \$200 to over \$2,500 per quarter. This variability was a result of both their household types (larger households tended to have higher bills), health circumstances, and also their location, with those who lived in the Northern Territory, due to their air-conditioning needs during the humid summer months, and South Australia, which has a higher proportion of electricity produced from renewable sources and therefore a higher retail price than in other states/territories, having higher bills: "I pay \$1,200 every three months. That's just in electricity" (single-parent, NT). The majority of our participants, however, typically paid between \$400 and \$700 per quarter. With a lowest income quintile equating to approximately \$600 of weekly income or less, a \$700 quarterly electricity bill would represent around ten percent of our participants' total income, and a higher proportion still for those with larger bills.

As an outcome of relatively high energy bills and tight household budgets, most participants said they could not financially afford many low carbon technologies. For example, only two-fifths (39%) of our participants had low energy whitegoods, with many often sacrificing energy efficiency for a product that was lower in retail cost, as this participant explained: "you can go to ALDI and get a fridge for \$200, but it might not have the same stars as if I go to Harvey Norman and get the one with the five stars. But it's \$800, it's like well it's either \$200 or \$800, I have to go with the \$200 because I don't have the money to go and buy the expensive one" (young single, NSW).

While there are loans and assistance schemes available for most lower income households to access, conditions that are applied may discourage some to not take up the offer. The No Interest Loan Scheme (NILS), for example, was designed to assist lower income households in purchasing a range of essentials (such as whitegoods), health and wellbeing products (such as hearing aids) or in some instances even significant bills (such as car registration). Most NILS now come with environmental performance conditions where applicants must purchase energy efficient products in order to qualify. Many of our participants, however, recalled that conditions attached to such programs mean that they often could not access them in their time of need. For example, NILS applicants had to have lived in the same residence for at least three months and show evidence that they had the financial capacity to repay the loan in order to qualify. For an applicant who recently moved into a new residence and required a fridge, for example, they may not be able to access NILS for an energy efficient one but may instead choose a lower priced fridge, as highlighted in the quote above, rather than waiting for three months.

#### 4.2. Non-financial barriers

In addition to financial barriers, a range of non-financial barriers also prohibited many lower income households from adopting low carbon living. These barriers were typically more varied than financial ones, with tenure noted as the most significant. This was especially because the majority of our participants were renters and that Australian tenancy legislations prohibit tenants from making modifications and upgrades without explicit permissions from their landlord. Much like experiences overseas, landlords were often noted as being unwilling to implement energy efficiency measures and upgrades. This is more commonly referred to as 'split incentives', where the direct benefactor may not be the immediate cost-bearer [22,23]. As a result, many of our participants who rented lived in dwellings that were not energy efficient with only very few, mainly social renters, benefiting from such upgrades: "the landlord wasn't interested in insulation. We offered to put solar panels but he wouldn't hear of it and not interested in insulating the ceilings which is a pity" (older couple, TAS).

Other non-financial barriers that discouraged lower income households from adopting low carbon living included personal pride and embarrassment, leading to their unwillingness to ask for help, and a lack of access to reliable information. The latter barrier, especially, was noted by a large number and wide range of participants, not knowing what kind of information to look for and with most information being made available online only being the most significant challenges. Many participants found that information sheets that they could access were often jargon-laden and the contents could not be easily understood: "most of this... don't know where to go or it's a bit over our head. It has to be simplified" (older single, TAS). As many of our participants noted, lower income households may not be able to afford a home computer and internet connection, and as a result often missed out on information that was only available online: "I don't have internet hooked up at my place either

because it costs too much. I can't afford it. It's a luxury" (young single, NSW). Some, especially those in the older cohorts and/or those who had been out of the workforce for extended periods, may also have limited computer access and literacy to search for such information online.

As identified in international literature, many socioeconomically disadvantaged individuals may also lack the personal capacity to effect change. This links partly to the personal pride and embarrassment barrier as mentioned above – "coming from working full-time... I've always been able to rely, I've always been able to pay my bills and put petrol in my car and buy food and stuff. Now not to be able to do that, it's kind of embarrassing, isn't it" (young single, NSW) – but may also reflect their familial commitments (such as caring for a family member), skill and/or knowledge limitation. As such, they may be "lacking scope of action and partly also lacking knowledge about how energy-intensive certain actions" were which "often leads the subjects to believe that they [were] already exhausting employing all possible means of saving energy" [19]. This was certainly the case for the majority of our participants when asked what more they thought they could do in further reducing their carbon footprint, with further limiting their electricity use being the predominant response rather than means to achieving greater energy efficiency.

### 4.3. Impacts

The combination of financial and non-financial barriers left many of our participants with limited capacity to cope with the escalating costs of energy and adopt low carbon living. For renters, there were particularly few options for recourse. As a result, many made significant compromises in their daily living, which, in both the short and long run, have considerable impacts on their physical health as well as mental and social wellbeing.

As a means to combating escalating energy costs, many participants reduced their food budget. Some sought assistance from charitable organisations – "I just find it easier to go there and ask for a food voucher or food assistance, and then just use your money to pay for your bill" (young single, SA) – while many others simply went without: "I mainly skip meals. I've gone four days without eating because I've had a bill I've got to pay" (older single, TAS). In more desperate situations, several participants also compromised on their medication by foregoing it or finding cheaper alternatives: "Well you get cheaper medications." (older single, SA). In all these instances, paying a utility bill, and paying it on time, was prioritised by our participants, especially so to avoid any additional late payment fee or forfeiting on-time payment discounts that a small number of our participants managed to negotiate with their energy provider.

In addition to going without essentials such as food and medication, many of our participants tried to minimise their energy usage, by not leaving lights on, not leaving appliances on stand-by, minimising their use of the air-conditioner, heater, clothes dryer, hot water systems and even cooking, sometimes to extreme measures: "I've got ceiling fans in my bedroom and in the lounge room. I find that they do work but when it gets to 42, 43°C, you haven't got a hope" (older single, NT). The foregoing of heating and cooling affects more than just personal comfort but can also impact their physical health, with several participants reporting increased incidences of illness in the absence of proper thermal comfort: "in winter of course, the chill gets in. I had pneumonia three times last year, so yeah, the heating is definitely a must" (older single, NSW).

Beyond physical health, the effects of unaffordable energy also impacted on the social and mental wellbeing of many of our participants. Several participants said they were constantly stressed about not being able to keep up with their outlays: "It is psychologically damaging to be always stressed about living in poverty" (older single, NSW). Many more reported missing out on social opportunities, with weekly free meals at their local charity often their only social connections: "you can't go and have... do gown the street and have a coffee, a cappuccino and a muffin or something" (older single, SA). Several also missed out on important family events such as their children's birthday or birth of their grandchildren because they lived in a different part of town or interstate, and financial stress in keeping up with bills prevented them from doing so: "my youngest daughter, she's pregnant, just about to have a baby. I won't be able to go and see that baby unless it's in that week where it's budgeted. She wants me to be there when the baby's born and unless it's in that week it's not going to happen" (single-parent, SA).

Not being able to provide for their children was particularly hard on parents. One single-mother broke down in tears when recalling not being able to afford heating so her daughter could study for her exams in comfort, worrying that it would impact the daughter's future prospects and thereby remain in their socioeconomically constrained situation; others noted that their children sometimes missed out on school excursions or after-school activities because they could not afford the fees. A few also said they often had to skip holiday celebrations – "at Easter, I feel ashamed to say it but my daughter got one Easter egg. One round egg, that's all I could afford for her" (single-parent, NSW) – and going on vacation was simply out of the question for most.

## 5. Addressing the barriers

Through the focus group discussions, stakeholder interviews, and particularly the policy workshops, a number of ways to addressing the barriers to low carbon living and impacts of energy deprivation were discussed. These means of moving forward were typified by two approaches to encouraging and adopting low carbon living. One is bottom-up and has more immediate impacts, the other top-down with potentially longer-lasting outcomes.

### 5.1. *Living in the information age*

The bottom-up approach focuses on improving the platforms and contents of information currently available. As noted above, currently available information on low carbon living was often not easily accessed by lower income households. The platform through which the majority of this information is made available (online) was noted as a significant barrier as many lower income households could not afford regular and reliable internet connections but also had limited capacity to searching for relevant information. To this, a range of suggestions were put forward by our lower income and stakeholder participants, most noticeably that a multi-modal approach needs to be taken to provide relevant and important information through a number of platforms. This resonates with Brunner, Spitzer and Christanell's [19] assessment that many socioeconomically disadvantaged households may lack the capacity, not just in realising the energy intensiveness of their home appliances and actions, but also in effecting change. Suggestions ranged from including information on their bills, hard copy leaflets made available at places where they frequent (e.g. charitable organisations and community facilities like libraries and community halls), or included in the newsletter that they receive as part of their welfare benefit payments.

Concurrently, information needs to be simplified to aid a broader range of individuals to understand. Some of the information leaflets we came across were often text-heavy, sometimes jargon-laden, which required additional investigation or clarification from technical professionals. In response, a number of organisations, including government agencies and non-profit organisations, have begun producing materials that are more infographics based, especially colourful infographics that may stand out better among a number of other leaflets. It would also aid a wider range of individuals, including those with lower levels of literacy or English proficiency, to receive the message. The South Australian Government, for example, produced a trifold leaflet with a number of colourful graphics, such as a clip art of a fridge with “-15°C to -18°C” indicated next to the freezer section and “3°C to 5°C” indicated next to the refrigeration section. This need to simplify how information is communicated was highlighted by three-fifths of our workshop participants as one of their top priorities, with comments like this: “provide simple, targeted information and advice via existing trusted channels” (Darwin workshop).

The highlighting of trust is especially important. Most of the suggestions put forward by our focus group participants as places where they would like to receive information, whether as direct mail-outs or places they would visit for information, were trusted sources such as a local charity or community centre. Making information available at these trusted sources would not only aid in the messages being successfully communicated, but would also increase the likelihood of individuals in seeking assistance and information, with pride and embarrassment a lesser barrier due to the familiarity of these trusted sources.

### 5.2. *Political will power*

The top-down approach focuses on government leadership, and especially the need to reform a range of different assistance programs. Among our participants, most vocalised a deep level of frustration towards the Australian Federal Government in their lack of political will on the matters of renewable energy and climate change, as exemplified by these participants: “they’re not very assertive. They’re supposed to be our leaders” (single-parent, SA); “change their policy, decide they want to run clean energy sources, not necessarily solar on its own but clean energy in general” (older single, NSW). Suggestions from the focus groups, interviews and workshops called for a number of concession reforms, from those that have direct impacts on reducing households’ carbon consumption to ones that are more indirect in encouraging low carbon living.

At present, most lower income households qualify for energy rebates, applied as a discount to their bills. Rebates are available through a federal scheme; some states/territories also provide rebates and concessions for households with special needs (such as those on a life support machine) and give the rebates via different means (e.g. quarterly direct debit or one-off vouchers). Additional discounts may also be negotiated with retailers on an individual basis. One of our older focus group participants in NSW, for example, was able to receive a 24% discount for early or on-time payment, which amounted to a significant saving. One energy advocate said, however, “a pay-on-time discount is useless, mostly because they’re not going to have the money, you know, to pay up front, direct debit. No one’s got the money to do that if you’re in that spot”. Indeed, the older participant went on to explain that if he was late on his payment, he would not only forfeit the negotiated discount but would

also be responsible for paying a late fee. This could amount to a significant financial burden on what would be an already disadvantaged household.

All utility retailers are legally required to setup and manage hardship programs to assist customers who may struggle to keep up with their bill payments. These programs often assist by putting customers on payment plans, so instead of quarterly bills they may be making smaller, fortnightly payments. Some retailers and charitable organisations also provide one-off vouchers that would cover part of the bill. As one charity worker explained, however, such vouchers often come with extraneous conditions, and their impacts may be less than intended: “when we do e-vouchers we have to ring. The bill has to be overdue before we can do that”. In the case described above, he would have forfeited his negotiated discount plus incurred a late fee before being eligible. In the end, the amount covered by the one-off voucher may be less than the additional cost incurred.

All of these financial assistance schemes that lower income households could access are squarely aimed at providing financial relief; none actively encourage lower income households to take up low carbon living such as by purchasing renewable energy from a retailer. Indeed, none of our 164 focus group participants purchased renewable energy despite more than one-third receiving energy rebates. The higher cost of renewable energy was noted as a considerable financial barrier. As such, there were suggestions from a number of our participants that current subsidies to the coal industry need to (at least partially) be redirected to further promote renewable energy so that their retail price is more competitive to that of non-renewable energy as a way to encouraging uptake. This is especially important for households such as apartment residents and renters where it is difficult to produce renewable energy on site.

With very high proportions of lower income households being renters, there needs to be particular impetus in overcoming the challenges of split incentives. The most common suggestion was applying conditions to housing investment assistance such as negative gearing to mandate environmental and social outcomes. This discussion in our Sydney workshop explicated the point: “you can retain a negative gearing benefit if you are subsidising the ‘rent’ in inverted commas, which is what they keep saying is the whole purpose of negative gearing. Do it more intentionally and say that, as part of this process, re-evaluate negative gearing to make it actually achieve the outcome that it was intended to achieve and include environmental outcomes as part of that”. Such conditions would improve the energy efficiency and thermal comfort levels of rental properties, allowing renters to spend less on heating, cooling and general energy consumption.

Support for concession reform among our workshop participants was strong, with more than half (52%) stating this as one of their top priorities for making the most significant improvements. Many, however, conceded that such drastic changes may be difficult to achieve. Using the introduction of minimum standards for rental properties as an example, our discussants recalled the amount of time taken to see minimal changes to conditions, and even then very few conditions concerned energy efficiency or thermal comfort: “it’s a dialogue that’s been going on for 20 years” (Hobart workshop). Both the UK and New Zealand have recently implemented minimum energy performance standards for rental properties, following mandatory energy performance disclosure (including for rental properties) by all European Union states under the energy performance of buildings directive [24].

## 6. Conclusion

Energy prices in Australia have increased exponentially in recent years. This was especially the case since studies like that by Simhauser, Nelson and Doan [8] declared that no Australian households across the five income quintiles experienced fuel poverty or energy hardship according to international standards. Concurrently, research began to explore the more qualitative aspects of unaffordable energy on everyday households through terms such as energy vulnerability and energy deprivation that highlight the wide ranging impacts high energy costs have on the general public that could not be easily measured via simple indices such as Boardman’s [6] early coining of fuel poverty.

As highlighted through the study reported in this paper, many lower income households across different Australian settings were experiencing the negative impacts of energy deprivation, physically, mentally and socially. The increase in energy prices particularly has led many households to adopt a range of compensatory behaviours to minimise their usage in the hope of lowering their costs. While a number of programs like the Federally-funded energy rebate were set up to assist lower income households, these were found to provide little relief, especially in encouraging these households to adopt low carbon living.

A mix of political inactions, misdirected financial assistance and inaccessible information was found to have limited lower income households’ ability to adopt low carbon living, with the severity of energy deprivation introduced as a side effect along the way. Political inactions, especially in terms of prioritising environmental outcomes proved to be the main sources of frustrations many of our participants felt contributing to some of the compensatory behaviours they introduced to combat unaffordable energy costs, and especially in their inability to

contribute to a low carbon future (despite strong ideological support) and provide a decent standard of living for their families.

A number of suggestions to redressing the barriers and challenges were put forward by our participants. These included a mix of top-down approaches that required political commitments (such as by changing the ways assistance is currently provided) as well as those that are more bottom-up that facilitated lower income households in helping themselves (such as in improving the content and means of providing low carbon information). In order for socioeconomically disadvantaged households, such as those on lower incomes as highlighted throughout this paper, to successfully adopt low carbon living and contribute to a low carbon future, a collaborative approach involving both top-down and bottom-up strategies must be prioritised.

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