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Addressing energy and mobility poverty in the Middle East: lived experience, spatial injustice, and temporary migrants in the United Arab Emirates

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ABSTRACT

Energy and mobility poverty are often experienced together by vulnerable and disadvantaged segments of society. Effectively addressing these issues requires identifying specific groups within unique contexts and devising context-specific interventions. Based on extensive original research, this study uncovers the energy, mobility and broader socio-economic challenges faced by working class citizens housed in Abu Dhabi's labour camps and how these challenges ultimately impact their quality of life and health. Our investigation focuses on the themes of marginalisation and spatial justice to show how labour camp residents often feel excluded from society and isolate themselves from the city and its activities. In exploring the subject of poverty and vulnerability, we show how low-income and living conditions are intertwined with energy and mobility poverty and, hence, the need for holistic solutions. To remediate these circumstances, we provide a set of policy recommendations, including increased monitoring of labour camp developers to ensure compliance with UAE regulations, guaranteeing that labour camps are part of urban planning and implementing safe soft mobility options so mobility can be achieved without requiring a personal vehicle.

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1. Introduction

Governments worldwide have agreed to “end poverty in all its forms everywhere” by 2030 with minimum impacts on Earth's life-support systems (United Nations General Assembly 2015). Poverty is related to volatile income and expenditures, greater exposure to trauma, premature death, lower social status, violence and crime and raising children who may face similar prospects (Balasubramanian, Burchi, and Malerba 2022; Bleakley 2010; Haushofer and Fehr 2014; Ridley et al. 2020). Further, experiencing poverty has been linked to causal effects on time discounting and risk-taking behaviour by individuals (Guiso and Paiella 2008). Such socio-behavioural impacts, for instance, have been exemplified by research showing that poorer households are more likely to choose earlier and smaller rewards over delayed, larger ones (Tanaka, Camerer, and Nguyen 2010). This poverty-induced, economically suboptimal choice pattern can lead to broader

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ramifications society-wide. For instance, it can cascade into and manifest as a key barrier to technology adoption (Mobarak and Saldanha 2022), which is particularly relevant in the context of energy transitions towards sustainable and equitable energy systems. Thus, poverty interacts in complex ways and strongly depends on context (Furszyfer et al. 2023; Furszyfer Del Rio et al. 2023). It also interacts across multiple dimensions, including economic, educational, health and social (Filho et al. 2021; Lade et al. 2017; Niu, Chen, and Yuan 2020).

More specifically, energy poverty, one of the central themes of this study, manifests in multiple forms, including when households cannot use energy services or maintain a comfortable temperature indoor (Cong et al. 2022; Kondash et al. 2021; Sovacool 2015) or due to the inability to access an adequate supply of energy services, heat or electricity (Bouzarovski and Petrova 2015). Therefore, although energy poverty is associated with income, it may also occur when households are not necessarily income-poor (Simcock et al. 2021) and is intrinsically related to domestic energy deprivation (Bouzarovski and Petrova 2015). Households experiencing energy poverty might spend up to three times more on energy services compared to higher-income households (Bednar and Reames 2020; Cong et al. 2022; Sovacool and Furszyfer 2022), while in some countries, vulnerable groups are more likely to be on more expensive payment methods and tariffs for energy services, such as prepayment metres (Boardman 2010; O'Sullivan, Chapman, and Fougere 2011).

Transport poverty, the other focal theme of this study, deals with problems related to mobility, affordability, accessibility and transport externalities such as air and noise pollution, unequal access to infrastructure services and traffic and pedestrian accidents and fatalities (Lucas et al. 2016; Upham, Sovacool, and Monyei 2022). From an overall perspective, transport poverty limits individuals' capacity to participate in society, exacerbates social exclusion, dictates restrictions on modes of transport, affects people's wellbeing and negatively influences individuals' productivity (Churchill and Smyth 2019; D. D. Furszyfer and Sovacool 2023; Groth 2019).

Energy and transport poverty are more likely to affect older people, low income households, people with pre-existing health conditions or disabilities, women, households with children or dependents and people from ethnic minorities (Furszyfer et al. 2023; Robinson and Mattioli 2020; Sovacool et al. 2023). Given the importance and relevance of local context considerations, such poverty phenomena can manifest in unique ways in different geographies.

Our study uncovers and explains the links between energy and transport poverty and discrete socio-spatial structures in the United Arab Emirates (UAE). In contrast with other rapidly developing Asian economies during the latter half of the twentieth century, the UAE's rapid urbanisation has been driven by the wealth generated from fossil energy-based industries and a substantial influx of migrant and temporary labour forces. The latter results from insufficient domestic labour availability in terms of both labour force size and required skills (Baldwin-Edwards 2011; Dito 2010). Given that much of the migrant labour force is hired to perform manual labour tasks and is not intended to integrate into the broader society, labour practices have been criticised due to the poor treatment of such groups (Abdul-Aziz, Olanrewaju, and Ahmed 2018). Specifically, a critical discourse surrounding current labour practices has focused on the "Kafala" system, which links migratory freedom of movement—encompassing entry, exit, and duration of stay in the country—to a kafeel or local sponsor. Notably, historical trends reveal that the majority of expatriates have been subject to short-term visas due to the absence, until recently, of permanent immigrant incorporation policies in the country (Ali 2010). In this sense, the UAE government has recently implemented changes that establish a legal framework facilitating the acquisition of long-term residency and citizenship by immigrants. Additionally, there are policies aimed at attracting and retaining highly skilled workers and specialised talent (Lori 2011). Despite these positive shifts, it's worth noting that these policies do not significantly benefit the majority of imported labour engaged in what is typically classified as low-skilled, often manual, work.(Government of the UAE 2022a).

While importing labour, even highly skilled labour has fostered economic growth and provided the UAE with local markets for goods and services, these dynamics have also created regional disadvantages. For instance, it has left the UAE without adequate human capital for long-term

development and has convoluted its social structure by making the “local population” on a percentage basis among the smallest worldwide, representing only about 11% of the UAE’s total population (Dicce and Ewers 2021; Jamal 2018).

Although migrants to the UAE come from all parts of the world, most are low-wage earners from low-income countries engaged in multiple types of work, including, but not limited to, cleaning, domestic work, roadwork, security, construction, delivery and agriculture (Connor 2016). As a consequence, low-income workers often suffer from poor social conditions, with the published literature stating that this group face extremely challenging, and sometimes fatal, labour conditions with high death and injury rates and little assurance that employers will cover their healthcare needs (Chambers 2020; Humans Right Watch 2006). Despite the oftentimes challenging conditions experienced by low-income migrant workers in the UAE, policy research and documentation have ignored their experiences, particularly concerning energy and mobility issues. While these groups have limited options to access energy and transport services and thus represent an opportunity for effective and impactful research, they have been excluded from most academic discourse on energy and mobility poverty. In turn, conducting a rigorous analysis of these groups has been extremely difficult and, in certain respects, “almost impossible”, (Baldwin-Edwards 2011) resulting in a lack of reliable data on their daily practices, employment status, and living patterns.

Our study directly addresses this gap by uncovering the status, and linkages between, the energy, housing, mobility, health and general wellbeing of workers in Abu Dhabi, UAE labour camps. Based on a mixed method original research involving community interviews with labour camp residents and extensive visits to labour campsites, and a targeted literature review, this paper provides novel insights concerning temporary migrants’ accommodation and energy needs, mobility and transport patterns, and quality of life. Our discussion centres on the topics of (i) vulnerability and poverty (including notions of resilience and coping strategies); (ii) marginalisation; and (iii) spatial justice. In doing so, we also provide a number of policy recommendations and potential solutions to address the challenges uncovered.

2. Contextualising labour camps and their residents

Before presenting our research design and conceptual approach, we offer background and context for the conditions of labour camp residents and the accommodation where they reside, which we will refer to as labour camps. In addition, this section briefly presents an overview of energy and mobility poverty in the UAE alongside a short description of the UAE’s energy and transport systems.

2.1. A glimpse inside labour camps and migration in the UAE

While terms such as “collective housing” are used to describe migrant accommodations, in the UAE, “labour camp” is the term heard most often (Ewers, Diop, and Le 2020) and it generally refers to housing provided by companies with 50 or more workers that, on average, earn less than AED 1,500 (USD 408.4) per month (Government of the UAE 2022b). In these spaces, between six-to-eight individuals often share a room; however, these numbers can vary significantly (Reber 2021). Labour camps are typically located in the city’s outskirts, relegated to industrial zones or other marginal locations. Prior research posited that situating labour camps out of the public view is motivated by the belief that these groups represent a point of disequilibrium to citizen’s cultural security, a sentiment that incorporates class, gender, and racial anxieties widespread in host societies (Gardner 2010). This sentiment has allowed foreigners’ containment by reducing their mobility and increasing their surveillance (Khalaf and Alkobaisi 1999; Khalaf, Shihābī, and Hanieh 2015).

Inside labour camps, residents receive basic amenities, including electricity and running water, while access to nearby shops to buy essential goods may be limited (Rahman 2011). Typical building structures in labour camps encompass worker’s bedrooms, executive bedrooms for managerial staff, toilets, a washing area, and sometimes a kitchen and a dining area and/or mess hall. Nonetheless, the

degree to which such labour camps are capable of addressing workers' needs has been the subject of critical analysis, and found potentially wanting from a psychological perspective (Annisa 2020). The number of migrants living in labour camps can vary significantly, ranging from a few dozen to many thousands.

Due to the typical short-term duration of labour contracts, which often last between two to three years, a camp's size and residents' composition change relatively quickly as a function of employment demand. Thus, living communities in labour camps are characterised by their dynamic and heterogeneous nature (in terms of ethnicity and nationality of workers) (Le, Pancratz, and Diop 2019). Labour camps are, therefore, heterogeneous temporally and spatially along demographic characterisations. Most workers are reported to experience a monotonous lifestyle (Chambers 2020), although such living conditions have also been reported to minimise exposure to discrimination along traditional means, such as race or caste, and to enable the formation of social support networks among peers of the same or similar ethno-cultural backgrounds (Bruslé 2012).

2.2. General aspects of transport in the UAE

Abu Dhabi is not a conventional city; instead, it is more like a "set of cities", composed of multiple disconnected centres with limited space for pedestrian circulation (Elshehtawy 2008). Such urbanisation practices in Abu Dhabi can be considered a form of biased infrastructure development and "geographical distancing" (Marvin and Graham 2001). The UAE, in this context, represents a clear example of "splintering urbanism" — similar to Los Angeles —, where there is a high dependence on private transport driven by cheap petrol. Perhaps that is why, historically, personal cars have been the predominant mode of transportation in the city and wider region (Plessis 2019), leaving low-income workers as the main users of the public transport system (Mohammad and Sidaway 2012). Abu Dhabi has a high resident-to-car ratio; consequently, significant traffic congestion can occasionally occur in the city regardless of road expansions and transportation infrastructure, although such problems are exacerbated in the neighbouring Emirate of Dubai. In this Emirate, there is one vehicle for every two individuals, positioning vehicle density in the city as one of the highest in the world (Ahmad 2020). However, the high resident-car ratio is not the only factor influencing traffic jams in Abu Dhabi. For instance, research indicates that the inability of expat drivers to adjust rapidly to the driving culture contributes to the country's traffic issues (Awadalla and Albuquerque 2021). Although dated, another study corroborates this point and shows that drivers in the GCC region only comprehended 56% of the traffic signs (Al-Madani and Al-Janahi 2002). The same study notes that having limited options for modes of public transportation in Abu Dhabi has put pressure on residents to own a car.

The UAE's culture of single-car use has turned the city into an unfriendly place for pedestrians. For instance, research (Albuquerque et al. 2020) reports that pedestrians are highly overrepresented in the transport injury data, depicting how vulnerable pedestrians are to suffering injuries as a consequence of the Abu Dhabi road network design. Another study by the same team concludes that the high number of injured pedestrians is due to their lack of knowledge of Abu Dhabi's road network. However, and more importantly, the study notes that Abu Dhabi grid blocks are often too large and provide very poor connectivity. In turn, pedestrians are pushed to cross the road at mid-block when no crossing is provided. Hence, pedestrian-oriented design is lacking in Abu Dhabi, so steps toward improved pedestrian safety are needed (Awadalla and Albuquerque 2021).

With regard to making potentially changes in Abu Dhabi's transportation system, governance structure is the key consideration. The transportation system in Abu Dhabi is governed by several key entities that work together on urban planning and mobility management. At the present time, the Abu Dhabi Department of Municipalities and Transport (DMT), which was established in 2019, is the overarching authority responsible for managing urban planning and transportation in the Emirate. Under the DMT, the Integrated Transport Centre (ITC) handles public transport, parking, and traffic monitoring. The DMT administers the Surface Transport Master Plan (STMP),

first unveiled in 2009, which drives the development of sustainable transportation infrastructure in Abu Dhabi. In line with the STMP, the DMT launched the Transportation Mobility Management (TMM) Strategy 2030 to encourage the use of sustainable transport modes, create an efficient multi-modal transportation system, and reduce congestion and emissions. Other key entities involved in transportation planning include the Department of Urban Planning and Municipalities, Abu Dhabi City Municipality, Al Ain City Municipality, and the Western Region Municipality. These authorities work with the DMT on implementing transportation plans and municipal services across the Emirate. In short, Abu Dhabi's transportation governance structure is intended to provide coordinated planning and implementation of transportation initiatives but has many layers, which makes any change a potentially lengthy process.

Designs and policies prioritising personal car use have also pushed low-income workers who want to maximise their income to live near the city centre or have options for mobility access to get to their workplace (Annisa 2020). Otherwise, vulnerable users often struggle to find accessible modes of transport as walking remains a challenge when temperatures reach well above 35°C. Moreover, other means of transport remain limited in Abu Dhabi. For instance, soft mobility options, such as electric scooters and bicycles, are still lagging compared to other countries in Europe, America and Asia. Both options could represent a viable solution for low-income residents regarding mobility access. Simultaneously, as infrastructure for buses and metros develop, soft mobility options become more relevant as a first and last mile solution, as has happened in other countries (Plessis 2019). For instance, electric scooters could represent a good solution, especially during summer when temperatures make it extremely challenging to walk. Such options, which are contextualised in the literature in the framework of "last mile" mobility options (Kumar et al. 2022), may however face significant technological, infrastructural, economic and socio-cultural barriers in the case of remote labour camps. Issues related to limited driving range, lacking charging infrastructure at the labour camps, affordability and limited knowledge dissemination on the use of these vehicles, respectively, illustrate some of the barriers amenable to intervention via policy tools.

2.3. General aspects of energy in the UAE

The UAE, which has the seventh-largest proven oil reserves globally (EIA 2020) remains heavily dependent on oil since it constitutes about 64% of its government revenue and provides high-wage public sector employment for its citizens (International Monetary Fund 2016). As a federal entity, the UAE does not have a unified utility provider; instead, the Emirates has three utility providers, each of which maintains different electricity tariffs that vary depending on usage, nationality and industry (The Emirates National Grid project 2020). In the UAE, electricity demand has increased in the last two decades by about 310%, reaching its highest record between 2015 and 2019 (Abuzaid, Moeilak, and Alzaatreh 2022). The residential sector accounts for the highest electricity demand due to the excessive use of air conditioning units (Giusti and Almoosawi 2017) and UAE's extreme climate, where the average temperature in summer is 42 °C (Taleb and Antony 2020).

These circumstances may well explain why approximately 90% of the country's electricity consumption is attributed to the buildings' sector (Krarti and Dubey 2018a), where air conditioning systems represent 70% of annual peak electricity consumption (Griffiths 2017). Although energy waste is found in the UAE, there are options to reduce energy demand (Furszyfer, Sovacool, and Griffiths 2021). For instance, Lin and Azar suggest passive design features in buildings to reduce cooling loads and promote energy conservation behaviours (Lin and Azar 2019; Lin, Afshari, and Azar 2018). Taleb (2014) indicates that using passive cooling strategies could improve the thermal performance of UAE's residential buildings. Finally, Krarti and Dubey (2018) note that retrofitting the current building stock can effectively reduce energy consumption and carbon emissions by 4.5 million tons/year per year. Such policies ought to take more relevance in light that the power capacity is expected to increase by about 4.2% between 2020 and 2030, reaching 55.2 GW by 2030 (Jamil, Ahmad, and Jeon 2016).

2.4. An overview of energy and mobility poverty in the UAE

Energy poverty in the GCC is not directly tied to income poverty, as the region's nearly universal electrification is often coupled with varying degrees of electricity subsidies offered by national and regional governments. Thus, both *accessibility* and *affordability* dimensions must be addressed. Another important aspect to consider when revising residential energy use is the practice of bundling utility charges (water and electricity) with rental costs. The fact that these are charged together increases the price significantly and makes it more challenging for a householder to afford energy services.

Although a recent overhaul of national legal and regulatory systems has introduced more progressive perspectives on co-habitation in the country, including the right of mixed-gender co-habitation without familial ties (Nowais 2020), the lack of protection for workers sharing private dwellings, when coupled with the practice of lump sum rental dues inclusive of utility charges, may lead to scenarios of energy vulnerability. That is, tenants may not be able to openly express objection to either service provision quality or opaqueness of costs for fear of retribution targeting their accommodation status. Such scenarios can construct potential energy poverty situations despite neither *accessibility* (from a supply infrastructure perspective) nor *affordability* (from a cost of provision perspective) being *a priori* factors. In the case of labour camps, the main topic of this paper, energy use in worker dwellings, which is not paid for by the workers themselves, is dictated by the extent to which labour camp developers and operators adhere to UAE labour camp requirements as outlined in UAE regulations (Government of the UAE 2022b). This again reinforces the notion that energy poverty is not necessarily a consequence of either accessibility for affordability.

Another differentiating aspect in the discussion of energy poverty in the UAE is the impact of fuel poverty (i.e. access to fuel for mobility purposes) in the overall energy poverty scenario. While most temporary and migrant workers may be exposed to mobility poverty (due to lack of choice, autonomy, and ownership of transportation modes and vehicles), lack of fuel access does not necessarily drive such poverty conditions. That is, even with the removal of long-term, historical subsidies to local fuel supply that have been scrapped in recent years (mostly for fiscal but also for environmental considerations), the lack of transport access makes discussions of fuel pricing as a driver of energy poverty moot.

3. Research design and conceptual approach

We sought to implement a research design to capture the human elements and lived experiences of the four main themes above (living conditions in labour camps, migration and segregation, energy use and transport). In order to better understand the spatial injustices and lived experiences of low-income migrants residing in labour camps in Abu Dhabi, we explain our conceptual approach and research design in this section.

3.1. Mixed-methods research design

Since there were no secondary datasets, to the authors' knowledge, showing the nexus between energy and mobility poverty of low-income migrants residing in labour camps, we developed our own. In this sense, our research approach consisted of (i) observations and site visits, (ii) household and community interviews inside labour camps, (iii) and a targeted, narrative literature review to provide background and contextualise our results.

Given the persistent exclusion of transport and energy planning documented in Section 2, we determined it important to conduct direct interviews with low-income workers living in labour camps. We conducted 46 *household and community interviews* in five labour camps situated in different locations, namely Mussafah Industrial Zone (n = 2), Mafraq Industrial Area (n = 2) and Mohammed Bin Zayed City (n = 1). The locations were determined based on the size of the labour

camps and their accessibility. Since these locations are often difficult to access, our case study selection was mostly driven by granted permission to access the labour camps and conduct interviews. The same applies to participants who agreed to be involved in the research project, we only interviewed those who felt comfortable participating. Participant profiles are summarised in [Table 1](#).

The data collection took place in March 2022, and although interviews were conducted in English, sometimes, when the participant did not speak fluent English, we got help from camp members to translate the interviews. Each interview lasted between 10 and 60 minutes. All interviews were recorded, fully transcribed and then coded. Our data analysis techniques were inductive, and we adopted an empirical method —not guided by any specific conceptual framework— to avoid bias in the results. Our interview guidebook and questions are presented in Appendix I and it is based on previous studies conducted by the research team.

Our research mostly entailed an ethnographic approach; that is, the researcher used a cultural lens to understand the living conditions of temporary migrants living in labour camps better. Like other studies (Furszyfer Del Rio et al. 2023; D. D. Furszyfer and Sovacool 2023; Sovacool and Furszyfer 2022), therefore, our research lies in examining the social and cultural dynamics of communities in foreign environments. We echo the importance of conducting ethnographic studies presented in reference (Eriksson and Kovalainen 2014), as the main aim of employing this method was to analyse and observe how people interacted with each other and their environment to understand their culture, coping mechanisms and ways of living better. Once the household interviews were completed, we undertook a thematic analysis of the results. Thematic analysis is a “*type of qualitative analysis*” employed to “*analyse classifications and present themes (patterns) that relate to the data*” (Alhojailan 2012). Thematic analysis hence deals with a pattern of recognition that involves finding fundamental themes (in this case, people’s lived experiences relating to mobility, housing, energy and health) via the careful reading of the material (Fereday and Muir-Cochrane 2006). Like other social science approaches, such as content analysis, phenomenology and ethnography, thematic analysis separates meaning from data and comprises the sharpening, recording, pinpointing and/or evaluation of recurrent themes (Javadi and Zarea 2016). In our case, our thematic analysis can capture, in detail, varied understandings regarding mobility, housing, energy use and health.

As [Figure 1](#) depicts, our labour camp selection included a mix of residency types and living conditions, such as “luxurious labour camps” which are close to entertainment and shopping facilities far removed from Abu Dhabi city, to arguably discourage residents from entering the city in the first place (Elsheshtawy 2008) —, and female camps, for which access is extremely difficult and houses the group whose working and living conditions are the least well known.

Throughout our study, we use original photographs collected during the site visits and field research, including some that reveal the faces of labour camp residents. We got explicit permission from the participants to use these images. Our study did receive formal ethics approval from the Social Sciences & Arts Cross-Schools Research Ethics Committee at the University of Sussex, with Reference Number ER/DDF20/2.

Finally, we conducted a targeted, narrative literature review concerning labour camps to triangulate findings, better position our study within the existing literature and to identify research gaps. We used multiple databases (e.g. ScienceDirect, Springer and Sage) and searched for studies from the past twenty years using the terms “labour camps” and “United Arab Emirates” and “energy”. We cite most of these documents throughout our study, indicating where they confirm our findings.

3.2. Conceptual approach

In addition to establishing our study using sound empirical data, we aimed to make conceptual advancements and connections by involving three related themes, namely energy and transport poverty, peripheralization and spatial justice. The use of these terms is based on previous research. More specifically, we engaged with multiple studies to construct the definition of energy poverty (Boardman 2010; Groth 2019; Upham, Sovacool, and Monyei 2022) and to explore transport

Table 1. Overview of community and household interviews by location, respondent number, salary (AED. 1 USD = 3.67281 AED), gender and general description (N = 51).

Labour camp Location	Respondent Number	Gender	Country of origin	Monthly income (USD)	Time Spent in the UAE
Danube – Mussafah Industrial Zone	DMIZ-01	Male	Uganda	\$ 245.06	Four months
Danube – Mussafah Industrial Zone	DMIZ-02	Male	Pakistan	\$ 599.04	Approximately ten years
Danube – Mussafah Industrial Zone	DMIZ-03	Male	India	\$ 299.52	Four years
Danube – Mussafah Industrial Zone	DMIZ-04	Male	India	\$ 245.06	Three months
Danube – Mussafah Industrial Zone	DMIZ-05	Male	India	\$ 299.52	Two years and eleven months
Danube – Mussafah Industrial Zone	DMIZ-06	Male	India	\$ 326.75	Three years
Danube – Mussafah Industrial Zone	DMIZ-07	Male	India	\$ 381.21	One year
Danube – Mussafah Industrial Zone	DMIZ-08	Male	India	\$ 299.52	Three years
Danube – Mussafah Industrial Zone	DMIZ-09	Male	India	\$ 353.98	Six years
Danube – Mussafah Industrial Zone	DMIZ-10	Male	Pakistan	\$ 326.75	Four months
Danube – Mussafah Industrial Zone	DMIZ-11	Male	India	\$ 326.75	Three years
Cubes Park – Mussafah Industrial Zone	CPMIZ-01	Male	Uganda	\$ 299.52	Ten months
Cubes Park – Mussafah Industrial Zone	CPMIZ-02	Male	India	\$ 490.12-544.58, depending on work schedule	Six years
Cubes Park – Mussafah Industrial Zone	CPMIZ-03	Male	India	\$ 435.67	Three years
Cubes Park – Mussafah Industrial Zone	CPMIZ-04	Male	India	\$ 299.52	Three years
Cubes Park – Mussafah Industrial Zone	CPMIZ-05	Male	India	\$ 272.29	Five years
Cubes Park – Mussafah Industrial Zone	CPMIZ-06	Male	Pakistan	\$ 272.29	Three years
Cubes Park – Mussafah Industrial Zone	CPMIZ-07	Male	India	\$ 272.29	Three years
Cubes Park – Mussafah Industrial Zone	CPMIZ-08	Male	Uganda	\$ 299.52	Two years and ten months
Cubes Park – Mussafah Industrial Zone	CPMIZ-09	Male	Uganda	\$ 245.06	One year and six months
Cubes Park – Mussafah Industrial Zone	CPMIZ-10	Male	Nepal	\$ 245.06	Two years
Cubes Park – Mussafah Industrial Zone	CPMIZ-11	Male	Nepal	NA	One month
Cubes Park – Mussafah Industrial Zone	CPMIZ-12	Male	Uganda	\$ 245.06	One year
China Camp- Mountain Gate Camp	CCMGC-01	Male	Bangladesh	\$ 299.52	Thirteen years
China Camp- Mountain Gate Camp	CCMGC-02	Male	Bangladesh	\$ 544.58	Sixteen years
China Camp- Mountain Gate Camp	CCMGC-03	Male	Nepal	\$ 408.44	Two years
China Camp- Mountain Gate Camp	CCMGC-04	Male	Bangladesh	\$ 340.36	Twenty-one years
China Camp- Mountain Gate Camp	CCMGC-05	Male	Bangladesh	\$ 340.36	Fourteen years
China Camp- Mountain Gate Camp	CCMGC-06	Male	Bangladesh	\$ 272.29	Twelve years

(Continued)

Table 1. Continued.

Labour camp Location	Respondent Number	Gender	Country of origin	Monthly income (USD)	Time Spent in the UAE
China Camp- Mountain Gate Camp	CCMGC-07	Male	India	\$ 353.98	Thirteen years
China Camp- Mountain Gate Camp	CCMGC-08	Male	Nepal	\$ 272.29	Twelve years
China Camp- Mountain Gate Camp	CCMGC-09	Male	Bangladesh	\$ 272.29	Ten years
China Camp- Mountain Gate Camp	CCMGC-10	Male	Bangladesh	\$ 272.29	Ten years
China Camp- Mountain Gate Camp	CCMGC-11	Male	Bangladesh	\$ 326.75	Twelve years
Mohammed Bin Zayed City SPML Staff accommodation-Female camp	MBZC-01	Female	Uganda	\$ 272.29	One year
Mohammed Bin Zayed City SPML Staff accommodation-Female camp	MBZC-02	Female	Bangladesh	\$ 272.29	Three years
Mohammed Bin Zayed City SPML Staff accommodation-Female camp	MBZC-03	Female	Nepal	\$ 245.06	One year and seven months
Mohammed Bin Zayed City SPML Staff accommodation-Female camp	MBZC-04	Female	Nepal	\$ 299.52	Seven months
Mohammed Bin Zayed City SPML Staff accommodation-Female camp	MBZC-05	Female	Philippines	\$ 408.44	Ten years
Mohammed Bin Zayed City SPML Staff accommodation-Female camp	MBZC-06	Female	Nepal	NA	One month
Al Raha Village	ARV-01	Male	Bangladesh	\$ 435.67	Twenty years
Al Raha Village	ARV-02	Male	Bangladesh	\$ 272.29	Fifteen years
Al Raha Village	ARV-03	Male	Bangladesh	\$ 326.75	Fourteen Years
Al Raha Village	ARV-04	Male	Bangladesh	\$ 340.36	Ten years
Al Raha Village	ARV-05	Male	India	\$ 272.29	Three years

*All interviews are anonymized to protect respondents (who constitute a vulnerable group) and fully adhere to institutional ethics requirements.

Source, authors.



Figure 1. Mix of residency types and living conditions: Panel A shows the corridor and inside of a room in Danube's labour camp. Panel B shows the inside of a room in Cubes Park labour camp. Panel C shows the outside of a building in China Camp labour camp and its patio. Panel D shows the entrance hall and the inside of the room of Mohammed Bin Zayed City labour camp. Panel E shows two sides from the outside of Al Raha Village labour camp (Ewers, Diop, and Le 2020). Source, authors.

D



E

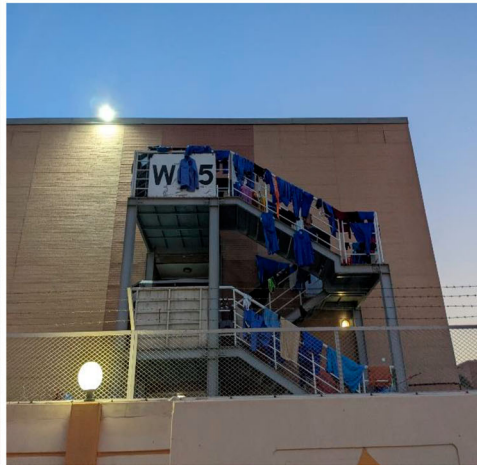


Figure 1. *Continued.*

poverty, we not only included studies on accessibility and affordability but also included themes related to inclusion and segregation (Lucas 2018; Mattioli, Lucas, and Marsden 2017; Mullen and Marsden 2016). Finally, regarding the themes of peripheralization and spatial justice, we explored key relevant literature (Blowers and Leroy 1994; Brock, Sovacool, and Hook 2021; Park and Sovacool 2018; Soja 2009; 2010) with consideration of how these research areas are linked to the marginalisation of vulnerable communities. Although in this research, we do not engage in the nuances around the definition of each of these concepts, we demonstrate their complexity with consideration of how

all of the topics are interlinked, and how each topic exacerbates the vulnerabilities of already vulnerable groups or individuals.

The first theme is *transport and energy poverty*, sometimes called mobility injustice or fuel poverty (Lowans et al. 2021; Martiskainen et al. 2021). Energy poverty broadly refers to the inability of householders to pay for adequate supplies of electricity or heat and energy services (Sovacool 2012). Energy poverty leads to inadequately heated homes, resulting in health issues such as but not limited to circulatory and respiratory diseases, premature heart attacks, and asthma in children (Sovacool and Furszyfer 2022; D. D. Furszyfer and Sovacool 2023). It also increases social isolation, mental health issues, and winter deaths among the elderly (Rudge and Gilchrist 2005). The concept of transport poverty aims to encapsulate the lack of mobility services needed to participate in society, resulting from inaccessible, unavailable or unaffordable transport (Lucas 2018; Mattioli, Lucas, and Marsden 2017; Mullen and Marsden 2016). The links between health and transport poverty are also negative and include social exclusion, increased vulnerability to pollution and increased illness rates (General Consumer Council of Northern Ireland 2001). As our research reveals, energy and transport poverty can occur simultaneously and reinforce each other, leading to a “double energy vulnerability” (Simcock et al. 2021).

Research exploring this double energy vulnerability has noted, for instance, that low-income households could reduce their energy and transport use considerably to avoid financial difficulties when fuel prices increase (Cong et al. 2022; Sovacool et al. 2023). Others have noted that an increase in fuel prices could have direct impacts on people’s wellbeing since inhabitants of vulnerable households may be unable to keep their homes at comfortable temperatures or unable to afford or access essential transport services, limiting their ability to meet fundamental needs, such as healthcare, education or employment (Martiskainen et al. 2021; Mattioli, Lucas, and Marsden 2017). Such dynamics have direct influence on people’s wellbeing, life opportunities, and ability to participate fully in society. The second theme deals with the concept of *peripheralisation*, which emerges from the social justice and environmental politics literature (Park and Sovacool 2018). Peripheralization describes the marginalisation of communities and how they often have environmental issues imposed on them (on occasions without their consent). Blowers and Leroy (Blowers and Leroy 1994) suggest that such a process reveals how patterns of environmental inequality, political power (or the lack thereof) and politics and democracy (or lack thereof) are linked. The same study notes that peripheralisation normally has five interconnecting drivers: (i) marginalised groups are economically excluded with little influence over their individual or collective employment; (ii) they are culturally marginalised with strong feelings of being isolated and powerless and are often ambivalent about their status; (iii) they disproportionately encounter significant environmental threats and impacts; (iv) they usually have limited political power over decisions made that influence their communities; and (v) they are geographically marginalised and frequently incentivised or forced to occupy peripheral or remote spaces in society (Blowers and Leroy 1994).

The last theme is *spatial justice*, which is relevant to our research since this field of literature indicates potential coping remedies and strategies for addressing injustice (Brock, Sovacool, and Hook 2021).

Soja’s notion of spatial justice, which is fitting for this work, calls on researchers to understand how social hierarchies can become rooted in spatial or geographic patterns that might result in “*unjust geographies*” (Soja 2010). Soja also notes several approaches to addressing spatial injustice. The first is reimagining the city not as a neutral place but as an active environment where a struggle over resources and, thus, over competing interests takes place. The second approach indicates changing geographies and acknowledging our intrinsic ability to influence, shape and direct future outcomes. The third deals with participatory democracy. In this approach, Soja calls for more inclusive and representative forms of decision-making that reflect the interests of local communities or marginalised groups. The last approach captures sustainability in cities. In our study, this would refer to marginalised groups and how they familiarise themselves with long-term holistic sustainability with improvements in community health and wellbeing.

Research exploring the implications of spatial justice underscores how geographical inequalities can negatively affect human health and life opportunities (Harvey 1996). Others elaborate on how controlling space can be employed to exclude vulnerable groups from decision making processes and provide even greater privilege to powerful groups, leading to further stigmatisation and denigration of vulnerable groups (Simmons and Walker 2004). As such, spatial inequalities exacerbate other distributive inequalities (Bouzarovski and Simcock 2017).

These key topics, transport and energy poverty, peripherisation and spatial justice, were taken as the underpinning framework for conducting each element of the research. Importantly, we need no look at these topics as isolated pieces of the study but rather as an integrated set of perspectives essential to uncovering the focus of our study, which is leveraging insights into the lived experience of the UAE's temporary migrants to uncover energy and transport policy solutions that additionally take into consideration spatial injustice.

4. Results: energy, transport, and health from low-income migrants' lifestyle

This section presents our results organised in the dimensions of housing and energy needs, mobility and transport, and wellbeing and health. These align with our background sections 2.1, 2.2, and 2.3.

4.1. Housing and energy needs in labour camps

The term labour camp is not pejorative; instead, the concept is related to the sponsors' commitment to providing their employees with housing accommodation. For low-income migrants, this is normally in dormitory-style dwellings, which often shelter residents and provide them with electricity, water, communal kitchens and bathrooms (Amnesty International 2013). Regardless of having access to these services and facilities — often at no additional cost to workers— there are certain characteristics that put labour camp residents in a vulnerable position. These include health-related issues due to poor living conditions, lack of space, unreliable energy and water services and the camps' sanitary conditions. DMIZ-09 noted these elements explicitly when he stated:

We often have problems with the AC. Sometimes, we can spend days without having access to it, and in summer, believe me, you feel like dying when the AC is not working. Plus, the lift never works and the rooms and corridors are always dirty. We don't have CCTV cameras either, so anyone in the camp could access our rooms and steal from us. We have no ventilation here; imagine eight people breathing the same air for hours in a single room? That can't be healthy. I actually think that if they do not let us open the windows is not because they are afraid we are going to jump off, but because they do not want us to waste energy, so there is no fresh air coming into this room. What makes things worse is that the AC is connected to the toilets. I think that the lack of ventilation has affected my health severely. Also, the smells inside the rooms and corridors are terrible; they stay with you even if you are not in the camp. The smell always makes me feel bad, sick and nauseous. It is impossible to get used to the smells. Just imagine how bad and small our rooms are that we don't have a place where to dry our clothes and since we cannot open the windows, we need to let dry our clothes over the beds.

Our site visits also revealed that most participants admitted their living conditions of housing precariousness. Some striking examples of deprivation included eight people living in a single room, not being able to open their windows and noxious smells emerging from the lack of ventilation. Table 2 and Figure 2 illustrate these dynamics.

Having energy and water access contributes to maintaining decent living standards and mitigating poverty (Eakin et al. 2016; Sovacool and Furszyfer 2022; Furszyfer and Sovacool 2023). In all five labour camps we visited, none of the residents paid for these services (e.g. air conditioning, lighting and water) and had "unlimited" access to them. However, not paying for these services led to energy waste practices and conflict among residents regarding temperature settings (Furszyfer Del Rio 2022; Sovacool 2020). Table 3 summarises these practices, with residents mentioning that their roommates would leave the "AC on all day" or that different thermal preferences have "affected their health". Others said having an AC was a luxury in their countries of origin; therefore, they would leave it on "all the time."

Table 2. Labour camp residents' perceptions of housing insecurity and deprivation of amenities.

Respondent	Confirmatory statement
DMIZ-10	<i>I don't like living with six people in one room in a small space. Our living conditions are as if we do not belong here if we compare to the people living in the big buildings in the city. Another problem is the smell. It smells very bad, some rooms are worse than others, but the whole floor smells awful.</i>
DMIZ-11	<i>My room is the size of a studio, and six people are living there. Living with so many people in such a small room is not healthy, and you know it, man. This is a confined space. We need privacy; here, we don't have any, we need freedom, but here we don't have much. So, there are a lot of problems, there is no privacy, no freedom and no hygiene. Look around you, there are flies everywhere, we sleep with the flies in our rooms, and the flies wake us up.</i>
DMIZ-10	<i>If the AC is not working at night, you cannot breathe because it is too hot, it is like a nightmare, but you are awake. It is not healthy to sleep at 44 °C in a room with 12 people. We need the AC to survive.</i>
MBZC-01	<i>The quality of the AC is not good because sometimes it stops working for three days. When the AC is not working, oh my dear, you can die because you cannot breathe. Really, you can't breathe, we are not OK when the AC is off, because it gets too hot. You cannot sleep, and because we are eight in the room, you feel like dying. Another problem is that we cannot open the windows because the beds are blocking them.</i>
CCMGC-10	<i>We need more toilets, there are too many guys in this camp. Just in this building, I think there are more than 300 people, and we have 40 toilets, we all leave to work at the same time, so there are not enough toilets for everyone, that is the main problem. The water is a problem sometimes since it does not always come. When we return from our duty, and all are taking showers, there is not enough water for everyone.</i>
ARV-01	<i>The mattresses are also very bad. I do not know when was the last time we got new mattresses but everyone on this floor complains about them. Everyone hates them because we cannot sleep, and we are not allowed to change them. Food is another problem, we always have the same food, every day, the same food. That is not healthy. I buy food from the market, but I cannot bring it inside, and that is another problem.</i>

Source, authors.

Regarding the potential for energy waste as a result of abundant but unpriced access to energy, the cultural backgrounds of many labour camp inhabitants seems to serve as a barrier to further unnecessary exploitation of energy. In the words of our respondents:

DMIZ-01: We cannot overuse energy, because if there is a problem with the power supply, then the whole floor could have trouble with their ACs and you don't want that. You don't want to cause any trouble to the rest of the people on the floor.

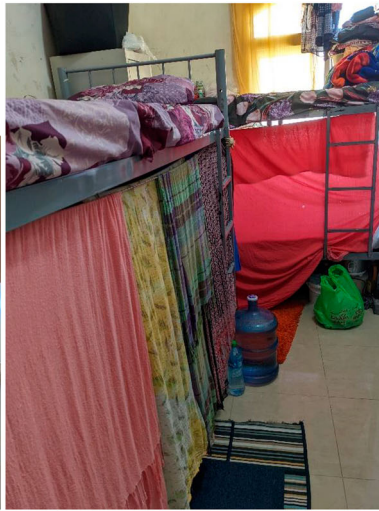
DMIZ-12: We don't like wasting energy, there is no reason for doing it. Other people in the camp waste energy because they feel that in this way, they can take revenge against the camp and our living conditions, but we don't. We turn everything off if no one is in the room.

Table 3. Labour camp residents' dynamics of energy waste and thermal comfort.

Respondent	Confirmatory statement
CPMIZ-08	<i>If I were paying for it directly from my pocket, I wouldn't use so much energy. Maybe we are using it this much because it is free.</i>
CPMIZ-11	<i>Sometimes, it is cool enough, we don't need the AC on, but we still leave it on all day, all night and all day. Sometimes, because the AC is on all day, the room gets too cold, my throat hurts, and I feel sick. We don't need the room that cold, but they [roommates] still turn it on.</i>
CPDMIZ-05	<i>The AC in our room is always on at 24°C. It is different to where I am from because, in India, only the rich people would have ACs. I only had a fan, so coming here and using the AC is good; we use it all the time.</i>
CCMGC-03	<i>Sometimes I don't think we need to have it on [the AC]. I am from the mountains in Nepal, and there can get very cold. So, when it is cold in the room, I am fine, but people put the AC to 24-25°C because they feel cold. But I don't think we need it on. They could use one extra blanket instead of turning the AC on.</i>
DMIZ-07	<i>The problem is that in my room, some people like the temperature at 22°C, and at 22°C, I feel cold. I don't think we need the AC during wintertime. We could save energy by not turning it on.</i>
MBZC-05	<i>Sometimes I feel my roommates are wasting energy and they simply don't care. When I tell my roommates to switch the AC off, they look at me like "who are you". The same is with water, they leave the tap running, and they do not care about conserving the water. They just waste it all the time. It is really sad. Sometimes the AC affects my health because, in my room, we are from different countries, and we got used to different body temperatures. When the AC is on all night, I cannot breathe well, my throat is very dry the next day, and I feel as if I was sick. I don't feel very well. So, I sometimes feel cold, but not my roommates, so they will put the AC at full power, and what can I do? I am from the Philippines, I dislike using the AC, I like warmer places more than cold ones.</i>

Source, authors.

A



B



C



Figure 2. housing precariousness in labour camps. Panel A shows beds blocking windows and the use of beds as a place to dry clothes. Panel B shows a double room occupied by ten individuals. Panel C shows an overcrowded room due to the lack of physical space for storage. Source, authors.

CPMIZ-08: Maybe because in my home [Uganda] we didn't use the AC; instead, we left the windows open. In Africa, we can live without AC; here, I found it funny, everywhere you go, there are ACs on all the time and working at full power.

CCMGC-01: In Bangladesh we only use a fan, and we were fine using a fan only. Now we have the AC full power all day. When I arrived in the UAE, I only knew fans, it was a different way. It took me like two months until the AC became normal to me.

MBZC-01: People from different countries leave the AC on all the time, and I don't like that, I feel that we are wasting energy. We are wasting something that we are not using. We don't pay for the AC, but that is no reason to waste energy.

These views considered, we note that some labour camp residents suggested that wasting energy (and water) resources can serve as a form of revenge for inappropriate treatment. Therefore, although one might assume that waste of resources would not be an issue for cultural reasons, it is an issues that merits monitoring and consideration in policy contexts.

4.2. The transport and mobility patterns of labour camp residents

Transport and mobility poverty can reflect inequality in access to busses, personal vehicles, taxis and metro. Research indicates that inadequate access to transport is a potential aspect that could trigger social exclusion (Currie et al. 2010; Lucas 2006). For our case study, mobility constraints particularly affect labour camp residents living on the city's outskirts because they have fewer economic resources and alternatives to move from one place to another. Moreover, Abbas reports that transport occupies the third position in UAE residents' expenditure, just after housing and food (Abbas 2017). However, for people living on the city's outskirts, expenditure on transport could increase and thus represent the household's biggest expenditure, accounting, in some cases, for over 25% of their income (UN-HABITAT 2017; D. D. Furszyfer and Sovacool 2023).

Perhaps unsurprising, none of our participants owned a car, and about 85% (39 participants) commented that their only accessible option for mobility was taking the bus. This is a good example of the degree to which labour camp residents fall well outside of the cultural norms present among the more affluent segments of Abu Dhabi society. What we found further striking from our results is that none of our participants could walk to their workplace. Table 4 illustrates these experiences, with some participants commenting that paying for a taxi to the city centre will "represent more than 10%" of their "monthly salary", while others commented that the city is designed for having personal vehicles and not for pedestrians.

It is worth mentioning that residents of labour camps do not pay for the transport services to get them to their workplaces. Although the overwhelming majority (about 90%) saw this as a benefit, others commented that this service was their only option to get to work and asked for other mobility options. Figure 3 shows the busses used to transport works. Participants elaborated on the issues of only having access to transport provided by their employer:

DMIZ-09: We don't have any options here. We are completely dependent on the company's transport to get to our work. You cannot walk either because there is nothing to protect you from the sun; there are no trees or walking areas.

DMIZ-10: We should have more options for public transport. I work in Khalifa Port and there is no way to get there but only using the company bus. If I miss the company's transport, then I'm in trouble because I either pay for a taxi that will cost me a big part of my salary or I miss duty day.

Table 4. Labour camp residents' walking patterns and expenses on transport.

Respondent	Confirmatory statement
DMIZ-09	<i>Some areas have a lot of zebra lanes close to each other. But we don't have any in this area. You need to walk a lot to have a chance to cross the street. The city is built to have a car; if you don't have a car, then you need to use the bus or taxis. But taxis are too expensive, and buses can't get you everywhere.</i>
CPMIZ-06	<i>A taxi will charge me 120 Dirhams to go to the city centre and return me to the camp. That is a big part of my monthly salary, more than 10% of it in one trip only.</i>
DMIZ-03	<i>It is impossible to go walking, it is too far and sometimes it gets too hot and there are no spaces to protect you from the sunshine. You'd die before getting to your workplace.</i>
CPMIZ-08	<i>I think that the cost of transport is only fair for those that have money. The problem is that taxis get you to the exact point and buses don't. With the bus, you need to walk, and in summer that is very tough, it is almost impossible. I think that this city is built for cars to be a necessity. The city is built for that. It is hard to walk, there are no cycling lanes and the busses won't take you everywhere.</i>
DMIZ-01	<i>Since I don't have a car and taxis are very expensive if I need to walk 2 kilometres when it is too hot, I feel bad. I feel tired and thirsty. You need to plan your day in the mornings or after 6 pm to do things that require you to walk.</i>

Source: authors.

A



B



Figure 3. Panel A shows the buses used by companies to translate workers. Panel B shows the lack of mobility services in China Camp. Source, authors.

4.3. Health, wellbeing and quality of life

Housing, energy (gas and electricity), transport, and mobility patterns not only affect labour camp residents' lifestyles but also often induce negative impacts on health, wellbeing, and perceived quality of life (Sovacool and Furszyfer 2022). Table 5 illustrates a broad spectrum of issues raised in our interviews. For instance, participants reported how their health deteriorated because of the cold temperatures inside rooms and the extreme weather conditions that labour camp residents are forced to work in. Meanwhile, most of the health-related issues regarding mobility services were related to commuting time.

These interview statements corroborate startling health issues presented in labour camps emerging from unsanitary conditions, lack of medical treatment availability, ventilation, and

Table 5. Labour camp residents' perceptions of declining health and quality of life.

Respondent	Confirmatory statement
DMIZ-02	<i>Mostly inside the house I have headaches, even migraines because it is too hot. Some people just fall from dehydration because they are not drinking water. I've seen so many cases of this. People just faint and people in the camps panic when they see someone fainting. People coming from their duties in the camp in summer pass out like flies.</i>
DMIZ-09	<i>People living in the camp are not physically fit. They have breathing problems, inhalation problems, they cannot breathe well and they cannot sleep because of their health problems and if they cannot sleep, others cannot sleep. Many people in my room have coughing and breathing problems; they are sick all the time and I think it is because there is no ventilation. Another problem is that here in the rooms we are at 22°C, and then we go out to the streets and we are at 45°C, our immunity systems get affected because of that, the changes in temperature so extreme are not good. Maybe, that is why everyone in the camp is sick.</i>
DMIZ-05	<i>Transport has affected my health. I spend 4 h on the bus and that is a lot of time. Because of that, I'm having back pains all the time.</i>
DMIZ-10	<i>I have a coughing problem because it is too cold. I don't like the AC to the lowest temperature. I am always coughing because of that. Spending so much time in transport has also affected my health, I have back pains and I feel tired all the time. Since I moved to this room, I have a skin problem: look at my arm and my leg, I have a skin problem because of the hygiene and because I live with too many people and there is no fresh air.</i>
CPMIZ-12	<i>In my country, I didn't have AC. So I never got used to it until I arrived here. I sleep on the upper bed next to the AC, and sometimes I feel it is difficult to breathe at night, which is a problem for me. I'm not good with the AC, I never had AC before, so sometimes when it is on all night, I struggle to breathe.</i>
CCMGC-05	<i>My mental health has been affected because our lives are always the same. Sometimes I feel like we are in prison, I feel caged with not many options of things to do. I think that by being here, we are only surviving and passing the time. That is what we are doing here, surviving.</i>

overcrowding of rooms (McQue 2020; Webster 2017). In fact, The Arab Health Congress stated that “these living conditions create ideal incubators for communicable diseases to spread” (Carroll 2014). Access to reliable basic services and time spent on transport also account for shocking issues affecting people’s health. For instance, multiple studies indicate the deleterious health impacts of poor ventilation and indoor air quality on human health (Seppänen and Fisk 2004; World Health Organization 2009, 2021), and how these are specifically harmful to vulnerable groups such as the elderly, pregnant women and children.(Furszyfer et al. 2020; Lamichhane et al. 2021; Pan et al. 2022) Other studies have investigated the negative health impacts of how time spent on transport affects the passengers’ health (Boniface et al. 2015; Tranter 2010). Our study, therefore, helps corroborate previous studies reporting how vulnerable groups are more prone to experience health problems, long-term illness or disabilities (Ekbrand and Halleröd 2018; Parry et al. 2007; Ridley et al. 2020) due to energy and transport poverty and also how labour camp residents may not be aware of how poor their health outcomes are compared to other groups.

5. Discussion: poverty and vulnerability, marginalisation and spatial justice in the UAE’s labour camps

Our research shows that temporary migrants living in labour camps are subject to a “double energy vulnerability” since they are incapable of securing, socially and materially, energy and transport services to satisfy their basic needs independently of primary employer-employee dynamics. Our research also shows that institutional support for temporary migrants in the form of social safety nets is not as developed to avoid the exacerbation of peripheralisation. In tandem with this, the historical lack of policies to integrate temporary migrants into the wider society, along with the UAE’s socioeconomic disparities, could suggest that structural discrimination and the lack of disposable income and property rights could prevent vulnerable groups from accessing low-carbon technologies and the benefits emanating from them. In this dimension, research has suggested that energy, as a social justice issue, can create disproportionate harm to low-income and vulnerable populations; thus, there exists a need to recognise and address these inequities (Jenkins et al. 2016; Keady et al. 2021). In the UAE, this could stem from unequal income distribution, ethnic discrimination and a perpetual lack of homeownership among the migrant groups residing in the

country. The unequal benefits of energy and the transition to a low-carbon future could have their roots in low levels of knowledge and lack of engagement from society and the government to prioritise the needs of vulnerable groups. If the energy needs of temporary migrants remain neglected, this could detrimentally impact their health and social wellbeing and limit their ability to benefit from, participate in, and even access low-carbon technologies as the UAE moves ahead with its sustainability agenda.

Regarding transport, like Linovski and colleagues (Linovski, Baker, and Manaugh 2018), we noticed that issues around justice and mobility are not only related to different levels of availability and affordability —although affordability is clearly an issue— but also to how institutions and policies respond to prioritising the most vulnerable groups in terms of accessibility. In other words, transport justice not only deals with increasing accessibility to available modes of transport in the city but also deals with how specific modes of mobility exclude marginalised and vulnerable groups when they do not have means of access (Lubitow, Abelson, and Carpenter 2020). The inequalities regarding transport among temporary migrants in the UAE are identified as poor mobility affordability and access, peripheralisation and spatial injustices and segregation, and pervasive patterns of immobility based on differential power and resources. The situation of temporary migrants in the UAE, therefore, corroborates previous transportation studies that link vulnerable and minority groups with decreasing accessibility and lower transit service levels (Churchill 2020; Karner and Niemeier 2013; Wells and Thill 2012), wellbeing deterioration (Churchill and Smyth 2019) and discrimination that may perpetuate economic and social disadvantage due to lack of opportunities (Churchill, Okai, and Posso 2016).

Our research also underscores how the UAE, despite being a developed country rich in energy resources, poverty persists across subsets of the overall national population. This finding aligns with other studies showing that social and economic conditions can significantly vary across sub-national locations, alternatively called microregions (Bradley et al. 2022; Furszyfer et al. 2023). Under these circumstances, the UAE could mitigate energy and transport poverty by delivering policy actions tailored to specific subnational contexts, explicitly considering marginalised and vulnerable communities such as temporary migrants.

In sum, our study has revealed that the key energy and transport poverty issues lead to degraded wellbeing and quality of life for labour camp residents. Specifically, they are lacking in control or influence over domestic energy choices, unaffordable transport, and unavailable transport. Our research, however, also suggests that these patterns are shaped by three themes — peripheralisation, spatial justice and extreme poverty. The next sections explore these key themes in further detail.

5.1. Marginalisation and discrimination

Although discrimination is forbidden in the UAE, and a significant portion of its inhabitants are non-nationals, the UAE still face issues related to perceived discrimination. For instance, Stratford reported that The Ministry of Labour had received complaints about racial discrimination in the workplace (Stratford 2009). He also notes that such cases are difficult to prove, and low-income migrants often do not complain at the risk of losing their jobs. Discrimination also becomes manifested in terms of nationality. For instance, The National newspaper reported discrimination practices in job recruitment advertising regardless of breaching federal anti-discrimination legislation (Singh 2020). The National also notes that Emirati authorities provided new recruitment packages of fixed salaries for domestic workers; however, these salaries are adjusted by nationality.

Given this dynamic, labour camp residents frequently experience perpetual political, social, economic and spatial marginalisation. Table 6 presents the specific challenges lived by our respondents' interactions that often made them feel "judged". Some participants even mentioned that they feel "abandoned" and that they "have no one to listen to" their "problems".

5.2. Spatial injustice

Spatial justice includes the right to define one's space without discrimination emerging from hegemonic preconceptions (Johansen, Fisker, and Thuesen 2021) and spatial injustices result in "biases imposed on certain populations because of their geographical location" (Soja 2009). Moreover, research indicates that geographic disparities exacerbate the occurrence of domestic transport and energy deprivation and in consequence, spatial injustice is fundamentally produced through and intertwined with geographical inequities and flows that are enrooted in the cultural, infrastructural and economic aspects of society (Bouzarovski and Simcock 2017; Furszyfer Del Rio et al. 2023). In a way, our study suggests that spatial justice is crucial to guarantee equitable access to resources and opportunities for all resident and minimising this principle can contribute to and exacerbate poverty. Feelings of spatial exclusion were brought by several participants, but perhaps the most illustrative examples were those from from the following participants:

DMIZ-03: We could live nearer to the city centre, we don't have much time to go visit the city and to make friends. I think it is because of where we live. We have the shops very close and the hospital too, but we don't have anything close to socialising and meeting new people. Here, in this camp, we only have this highway. The problem is our location, the highway is the only thing that we can see.

ARV-02: We live far away from everything, as if they hid us from society. It is like if they put us away, then, we don't exist. We live here because people from the city do not want to see us.

CCMGC-02: There's nowhere to walk around here, we are surrounded by camps, that is why here it is called China Camp. We are thousands of people, maybe millions living in this area and far from everything. Look around you, there is the desert and the closest thing next to us is the slaughterhouse. I think there is a prison close to the area. But nothing else, we walk in the camp because we have nowhere else to walk.

Literature indicates that such perceived spatial exclusion and segregation issues could make individuals feel excluded from society and isolate themselves from the city and its activities (Ozkazanc

Table 6. Patterns of discrimination and intolerance among labour camp residents.

Respondent	Confirmatory statement
CMGCC-05	<i>There is no one to listen to our problems, if something happens here, no one will help us, so where else should we go? Who's here to help us with our problems? No one. They just want us to work but they do not care about our health; they do not even care if we die. The main problem is that we have no one answering or acting in our favour, we are abandoned. People want to speak about these issues but they do not dare to do it. There are other issues about language, not everyone can communicate, so there you have another form of discrimination. People want to say we have problems and communicate these problems to the outside.</i>
ARV-02	<i>I don't think I'll ever belong to this society or have my own house here. I've been working here for more than 15 years and I have only lived in labour camps. 15 years working here and I do not have a home or a car. That is why I know that I'll never belong to the society.</i>
DMIZ-09	<i>I think we are discriminated against because look at us, look at how we live. The problem is that here in the UAE, no one knows that we exist and how we live, and if they do, they do not care. They just know that we are here to do the worse jobs because they know we will do them to feed our families. But this is discrimination, the way we live and the way they treat us is discrimination.</i>
DMIZ-11	<i>I don't think this is fine, you live in the UK, right? Do you think they will allow this to happen in the UK, because I have lived in other camps, this is not the only one, there are many camps like this in all the Gulf Countries. I have family living in Europe and they told me this is not fine, that I should live somewhere else, but this is my only option for sending money to my parents.</i>
ARV-04	<i>In the mall, sometimes, if we are together [people from the camp], security staff will kick us out, they don't like us. Sometimes, in public, we are not allowed to enter some streets. We are only allowed to enter there if we are working cleaning the mall or the streets but not on our free days. What is the difference? I don't get it.</i>
CPMIZ-08	<i>When I came here, the Asians didn't get used to us. I felt they were not very comfortable around black people, but at least now they don't care anymore. I didn't take it as bad because I understood that when you are new to someone or you see something for the first time, of course, it is funny or scary.</i>
CCMGC-02	<i>I came 16 years ago and things were different and I suffered discrimination. For me, it was very difficult to meet people, but I grew up. I know I was discriminated, but I didn't care, because I came here to get a salary, that was my main objective, getting money for my family, so I didn't care about discrimination. I learnt that when you have money and a roof over your head you can manage everything.</i>

2021). Dupont attributes segregation patterns to certain economic and socio-cultural aspects (Véronique Dupont 2004), while Xian and colleagues (Xian, Qi, and Yip 2022), provide a remedy and note that access to mobility services can enhance social relations and alleviate residential segregation. Our own research found that spatial segregation due to lack of access to mobility services in tandem with restrictions imposed at labour camps, led to feelings of monotony and boredom, as the following respondents elaborated:

DMIZ-11 Our life in the camp is a mechanical life, we go to work, eat and sleep. It is like a robot's life. We can't do anything that is active or that is good for us because we have nothing near us. In our free days, we don't do much because it takes us one hour to get to the city and one hour to return home and it costs a lot of money. We don't have a place to be, so we sit in our beds. Our lives are not healthy, and every day is the same. We don't have a place to walk either, across the street is the highway and around us are parking lots, we are robots, we are living the mechanical life.

CMGCC-03: I would like to have more things to do around here. There is nothing to do. Yes, we have the camp and we have the basketball court, but nothing else. Life can sometimes be boring here.

In terms of design, over 90% of participants complained about the size of rooms and many noted that lack of personal privacy has led to mental health effects and the erosion of trust in others (Dimond, Fiesler, and Bruckman 2011; Perryman and Appleton 2016). In our research, perceptions about the lack of privacy were brought by our participants when mentioned:

CMGCC-03: I would like to have more privacy. There is no privacy in this place. I would like to have more freedom too. More freedom to do more things. I think I will only have more freedom when I have more money. We don't have much freedom either because if you speak you could get arrested. People are here for their bread and butter only, no one can do anything, we are restricted in everything we do.

CMGCC-05: Privacy? There is no privacy if you live with ten people in one room. If I talk to my family, they can listen; there is no privacy. I would like to have more privacy. That would make things much better around here.

In the UAE context, specifically Abu Dhabi, spatial justice considerations should take into consideration spatial planning and zoning. As noted, however, in our discussion about transportation governance in Abu Dhabi, alignment of multiple entities, sometimes with conflicting priorities and interests, is needed. Hence, spatial justice will need to be elevated to a priority of the Emirate's leadership to ensure that coordinated action is taken. That is, no isolated actions will enable change for this somewhat intricate issue.

5.3. Capturing the experiences of extreme energy and transport poverty of labour camp residents

As discussed at the beginning of section 5, labour camp residents are prone to experience a "double energy vulnerability". For instance, many participants mentioned that transport could represent their greatest expenditure, spending over 30% of their monthly income on this service during one trip only. Moreover, due to the labour camp conditions, none of our participants had the option of choosing their thermal preferences; instead, they were subject to their roommates' preferences or the camp rules. Their low-income and living conditions (see Figure 4) sometimes pushed migrants to decide whether to send money to their families, eat or use transportation services. such cases are well illustrated by two respondents, who elaborated:

CCMGC-05: Many people are earning 1,000 Dirhams per month, other people even less. We buy food and buy expenses and send money to our families. If I pay 50 Dirhams for a taxi is not good for me or my family, we all lose if we use taxis or spend money on transport. The problem is that we cannot go outside the camp, because if we go out, we need to spend more money and we cannot afford that. We cannot afford to go outside, even 50 Dirhams is a high cost for us, so we cannot spend it on unnecessary things. Many times, we need to decide whether we eat good food or send money to our families.

MBZC-01: They should increase our salary, that is the problem. Because I came here only to get the money, that is the only reason why I am here. Without money, I can't do many things, for example, I have kids and I am widow,



Figure 4. Labour camp residents classifying themselves as in extreme energy and transport poverty. Source, authors.

they are educated but I have to pay school fees and is not easy. So if I take a taxi and spend 80 dirhams, that will affect my and my children's activities for the rest of the month. I think a good way to be more included in society would be with better salaries.

As previously discussed, labour camp residents have extremely limited access to energy and transport services and often experience discrimination, spatial exclusion and residential segregation. However, our interviewees also commented about their coping strategies, including solidarity among residents and how, despite the troubling lives inside labour camps, the UAE provides them with better opportunities than their countries of origin. [Table 7](#) depicts the residents' experiences and their coping strategies.

6. Conclusion and policy implications

As explored in the previous sections, the lack of agency and options for transport and energy services negatively impacts the wellbeing and health of labour camp residents. In the energy dimension, the impacts are more evident regarding thermal comfort, leading to energy waste and conflicts among residents. Thermal conditions, therefore, could be improved by, first and foremost,

ensuring that all labour camp developers and operators maintain the camp building according to UAE regulations. This will require further efforts by the UAE to monitor the performance of camp operations. Also important is accommodating residents based on their thermal preferences rather than nationality or the workforce they belong to. In this way, residents would not only enhance their social and physical wellbeing but also achieve energy savings.

In addition, to reduce costs and attend to the residents' needs, labour camp developers must consider building rooms with improved ventilation and implement energy-efficient measures such as installing glazing that regulates cooling and heating temperatures and improving the wall's insulation. Another alternative could include providing single fans to regulate temperatures individually. These measures directly align with the UAE Cabinet's national plan to introduce new sustainability standards for buildings (Aguinaldo 2022) and again, are consistent with camps being operated according to high standards set forth by the UAE government. Prioritising the energy efficient and sustainable operation of labour camp buildings supports the UAE's net-zero 2050 agenda (Government of the UAE 2022c) while further demonstrating a commitment to all aspects of sustainability, particularly the social dimension.

In terms of transport, policy frameworks in Abu Dhabi, and the broader UAE, must be cognizant of particular spatial attributes of labour camps, such as remoteness and temporal ones, such as variable (yet cyclically consistent) transport demand patterns. From an operational perspective, ensuring sufficient availability of vehicles at appropriate times not only contributes to equitable access but also provides economic drivers for private sector operators to explore this market. Further, the suitability of such transport modes might be lessened if, based on known demand patterns, public transport options become feasible to implement as the public transport network develops. In tandem with this policy, improving pedestrians' safety and paths by constructing new routes and corridors could reduce dependence on taxis and private vehicles.

Moreover, we suggest that the government must enhance its efforts in terms of infrastructure and promote affordability programmes to mitigate transport poverty in the outskirts of the city where most of the labour camps are located. In other words, a key recommendation emerging from our research consists of improving services and transport infrastructure, particularly for the communities that live in the peripheral areas of Abu Dhabi. Such efforts could leverage an understanding of predictable and known demand patterns from labour camps to bootstrap "thin" routes in the existing public transport network. For instance, optimising bus routes and funnelling local demand to co-utilize these routes could simultaneously increase bus frequencies and augment the catchment area of service offerings. These factors considered, policies to address transport poverty in the UAE

Table 7. Coping experiences of labour camp residents.

Respondent	Confirmatory statement
DMIZ-01	<i>There is a sort of no discrimination rule inside the labour camps, there are rules against discrimination here, so I have not felt discriminated.</i>
CMGCC-03	<i>The UAE society is good. There are differences but that makes it even better. I feel at home here. Here I have my family.</i>
DMIZ-02	<i>The UEA is a better country than where I am from, I spent 25 years in my country and never got a job there. I came here and I got a job. I came here wanting to develop myself, and here I am doing it.</i>
DMIZ-04	<i>Here everyone is nice, in my room there are Pakistanis, Indians, Nepalis, Bangladeshi and everyone is getting along well. Back in India, I would say that Pakistanis are terrorists, but I realized they are not, they are humans like me, so I think that is good.</i>
DMIZ-06	<i>This labour camp is better than home. Here, I have options: I have a washing machine, a bathroom, water, a cooking kitchen and AC. Everything is better here than home. I wouldn't improve anything because this is better than what I had in India.</i>
CPMIZ-01:	<i>Everything is better than my life in Uganda. Here, I feel safer, I have an AC, we have a bathroom and unlimited water and lights. Back home, I only had a fan. I think there is a lot of rich people in this country that don't look us in the eyes. But most of the people that I've met are like me, I've met all of them in the camp. Here, inside the camp, we are all the same</i>
CPMIZ-08	<i>I am from Africa and the energy here works better than in my home in Uganda. They provide it for free, so I don't have any problems with my energy in the camp. We also have ACs and water, which is also very good. The energy, water and lights work better than where I grew up.</i>

must reflect the fact that labour camp workers are unlikely to find a suitable social environment at destinations frequented by the more affluent segments of UAE society. In an effort to positively overcome the perceived discrimination noted in the paper, policies should be set forth that ensure transportation is affordable and accessible to locations that provide labour camp workers with the best social environment. When such locations are unavailable, they should be developed and ideally reached using soft mobility options, such as walking and possibly electric scooters and bicycles. The UAE Emirate of Sharjah, for instance, has already taken steps in this direction (Amir 2022).

From an overall energy and transport perspective, our study makes the following recommendations:

- (1) increase monitoring of labour camp developers and operators to ensure compliance with UAE regulations for safe, clean and efficient operations,
- (2) prioritise labour camp buildings in the implementation of UAE building sustainability standards and related net-zero aspirations,
- (3) ensure that labour camps are part of urban planning such that workers have access to destinations that are essential to cultural and social wellbeing,
- (4) implement safe soft mobility options so that access to such destinations can be achieved without requiring a personal vehicle or another expensive form of transportation (e.g. taxi).

Implementing these recommendations could help alleviate the energy and transport poverty issues we uncovered during this study and lead to fairer and more equitable transport and energy services.

Regarding the social dimension of sustainability, privacy arose as a primary concern for labour camp residents. Although there are social and environmental benefits that can be derived from communal living (Moran, Pallot, and Piacentini 2013), it is clear that activities that are often private (e.g. sleeping, showering, dressing and using the toilet) are restricted in labour camps. In fact, our research notes that there are no defined private spaces within labour camps. Because of this lack of privacy, participants often felt disempowered and oppressed and, for a few, lack of privacy even hampered their expression of emotion. The sustainable design of labour camps should consider not just energy matters, but also detached spaces where residents can communicate with their families privately, without others listening to their conversations, and in areas where they do not feel surveyed. Perhaps more importantly, developers should consider reducing the number of people per room; which may increase the chances of individuals finding time to be on their own while also increasing happiness and tolerance within the labour camps environment.

In conclusion, our study shows that labour camp residents, who are perhaps the most vulnerable segment of Abu Dhabi society, face energy and transport poverty challenges that are rooted in peripheralisation and spatial injustice. Further, although anti-hate crime and discrimination laws exist in the UAE, over 50% of our interviewees mentioned discrimination as very salient in their lives, with participants often noting how their living circumstances were different from migrants from European countries or UAE nationals. Although labour camp residents in the United Arab Emirates, and the broader Gulf region for that matter, are generally aware of the challenging conditions they will face when employed in the Gulf, their need for financial resources, which are often unavailable in their home countries, means that the benefits of employment frequently outweigh the challenges faced. It is important to note, however, that forms of manual labour employment undertaken, and the associated living conditions, are heterogeneous and this can result in higher degrees of poverty, marginalisation, and discrimination for some workers. Consequently, the acceptance of workers to their condition is a balance between two factors: first, an acceptance of an expected way of life to attain perceived benefits that are not accessible in home country; and second, in some cases, a fear of retribution for speaking out against unfair or discriminatory practices. This complex interplay of factors shapes the experiences and decision-making processes of labour camp residents in the region.

Regarding the nexus of energy and transport poverty, peripheralisation and spatial injustice, participants could spend more than 10% of their income on a single trip taxiing to Abu Dhabi's city centre, and all of our participants agreed that their income was insufficient to afford a private vehicle. In other cases, our study indicated that participants had no option to satisfy their energy needs; instead, their preferences were fixed by the camp rules or agreed upon by a "democratic" approach mediated by roommates. Thus, despite impacting similar demographic groups, the energy poverty experienced by labour camp residents differs from that the type of poverty that they were potentially exposed to in their countries of origin. That is, energy poverty in labour camps is not necessarily an issue of affordability but rather one stemming from a lack of agency. In turn, a substantial number of interviewees felt that their health had been compromised and they could not achieve personal comfort. Our research also revealed how the inadequate and unsanitary housing conditions of labour camps often led to negatively affecting both the mental and physical wellbeing of labour camp residents.

Regardless of their massive contributions to the country's economy, low-income migrant and temporary workers still experience marginalisation and spatial injustice, with few policies in place to remedy the situation. The spatial injustices experienced by labour camp residents are most visible in exclusionary zonings, institutionalised residential segregation and social control of space use. Consequently, they are often exposed to unequal treatment and have limited abilities to engage in Abu Dhabi's broader environment. This unequal urban distribution not only positions labour camps' residents to experience transport and energy poverty but also exposes them to other social and environmental hazards and economic disinvestment (Shi et al. 2016). Uniquely, the same idiosyncratic factors behind their potential peripheralisation are also strong levers for policy action. Tailored policymaking can be enacted to ensure these target communities are being reached, while positive spillover effects are also possible, such as in the example of optimised public transport networks.

Ethics statement

Our study received formal university ethics approval. We have blinded this statement for peer review reasons.

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Informed consent

Participants received an information sheet that outlined how their data would be utilised and we thoroughly explained the nature of their participation. In case the participants did not know how

to read, the letter was explained in plain English by the researcher or a camp member. Once the information sheet was explained, we asked participants to sign a consent form.

Data availability statement

Due to the ethical concerns of sharing qualitative data gathered from respondents from vulnerable groups, the interview transcripts cannot be made available.

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Appendix I

1. Introductory question, please can you tell me a bit about your background, where you work, why you live here
2. Tell me about your "lived experiences" of energy, about your consumption of energy services and monthly energy costs
 - a. What do you consume?
 - b. What energy systems do you own?

- c. What is the quality of service like? Has reliability ever been an issue?
 - d. Have you ever felt the need to “waste” or “overuse” energy?
3. Tell me about your “lived experiences” of transport and mobility needs, and monthly transport costs
 - a. Do you own a car?
 - b. How far do you travel (km) per month?
 - c. Do you ever go without transport/walk?
 - d. Have you ever felt the need to “waste” or “overuse” transport options?
4. Does your access to energy or transport, or lack of it, cause any health problems?
5. Have you ever witnessed an act of discrimination or deprivation, due to lack of access to energy, or lack of access to transport?
6. How can we include vulnerable groups more in planning and policymaking?
7. How can policy-makers/government improve your energy or transport security or community wellbeing?