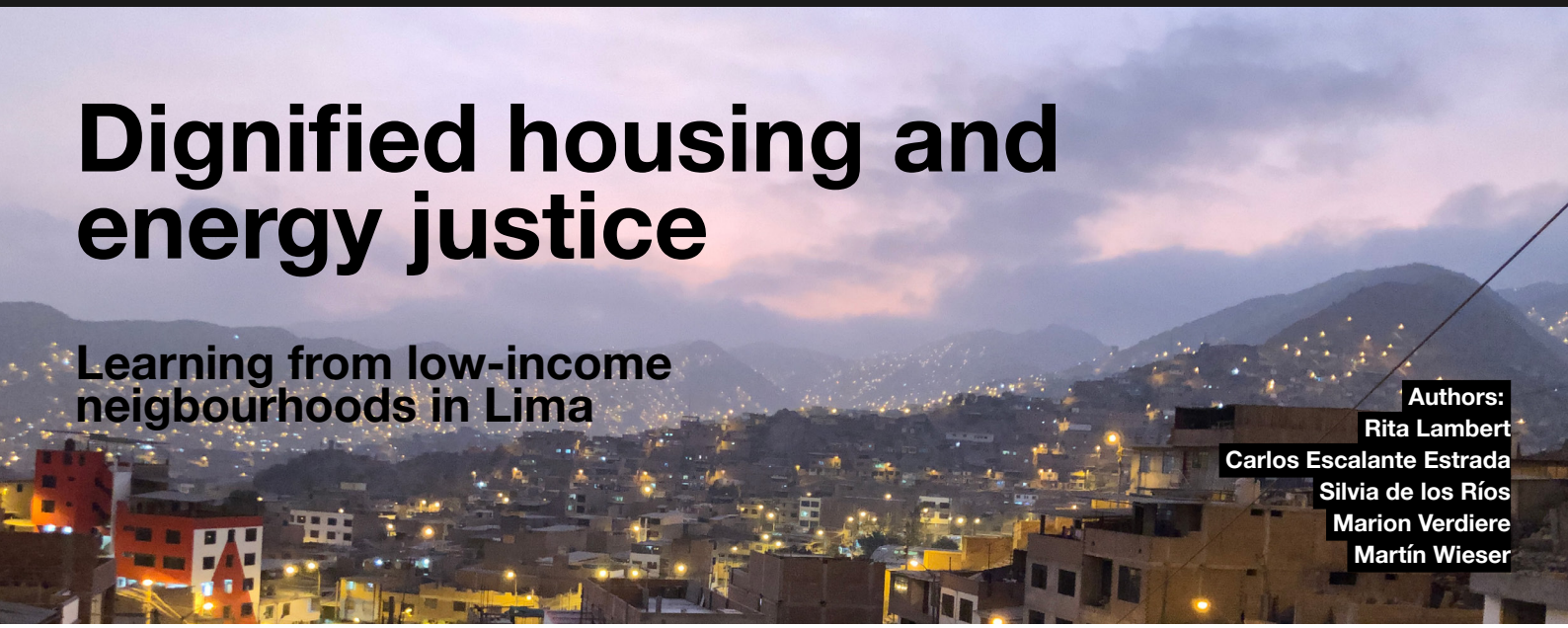

Dignified housing and energy justice

Learning from low-income neigbourhoods in Lima

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POLICY BRIEF

Introduction

Access to dignified housing and energy are essential to reduce poverty and improve well-being. Dignified housing is rooted in the belief that every person has the right to a decent and secure home where individuals and families can maintain a healthy quality of life. Globally, these concerns are expressed under two interrelated Sustainable Development Goals (SDG); namely SDG7- 'ensure access to affordable, safe, sustainable and modern energy for all'- and SDG11 - 'ensure sustainable cities and communities'. Despite these targets, access to energy and dignified housing is unequal in cities of the global South where rapid growth occurs through informal urbanisation. Low-income settlements in particular face challenging conditions as they are disproportionally affected by precarious housing, energy risks, inadequate and unreliable services, lack of affordability and access to financial services, tenure insecurity and exclusion from planning processes.

In cities such as Lima, characterised by urban inequality, more than 70% of neighbourhoods are self-built or auto-constructed through the efforts and resources of inhabitants. In the absence of public investments and technical assistance, as well as housing and energy policies that support vulnerable groups, low-income communities have developed coping strategies to reduce their vulnerability and meet their everyday energy and housing needs. Understanding these strategies is imperative to inform effective policies and planning to reduce poverty and carve pathways towards sustainable and just futures.

Key messages:

- Policies, technologies and co-funding mechanisms that support the process of auto-construction along its various stages, at the same time as maintaining inhabitants' autonomy, is vital in the strive towards sustainable cities.

- Everyday energy risks that affect low-income settlements are invisibilised. Authorities and service providers should work together with communities to provide safe connection and maintenance to prevent energy risk inside as much as outside the homes.

- Besides dwelling, low-income neighbourhoods also support economic activities. Energy planning should adapt energy supply and tariffs to differentiated demands. Pro-poor mechanisms, regulations and subsidies, as well as the development of efficient and effective processes within and beyond the market are necessary to address the diversity of energy needs.

- Informal arrangements, hybrid solutions and decentralised networks are more flexible in meeting energy needs, maintaining independence and controlling costs. Moreover, energy sharing and solidarity-based practices, driven by women, are key for community resilience. Decentralised approaches that strengthen collective solutions, eliminate inequalities and empower women must be supported to build resilient energy systems.

- Critical linkages between vulnerability to energy poverty and the built environment are overlooked. The institutional silos from which energy and urban planning are conventionally approached need better connection to strengthen collective action, prevent risks, improve thermal comfort and avoid lock-in scenarios with carbon intensive futures.

UCL THE BARTLETT ENERGY INSTITUTE
dpu Development Planning Unit
CRDF CEPT RESEARCH AND DEVELOPMENT FOUNDATION
CEPT UNIVERSITY
PONTIFICIA UNIVERSIDAD CATÓLICA DEL PERÚ
cidap
sea Servicios Educativos El Agustino
FORO CIUDADES PARA LA VIDA
CENCA Instituto de Desarrollo Urbano
MHT MAHILA HOUSING SEWA TRUST Dignified Home, Dignified Work, Dignified Life

The GEMDev research project

GEMDev - Grounded Energy Modelling for Equitable Urban Development in the Global South - is a 3-year research project started in 2020 and funded by the Economic and Social Research Council (grant number ES/T007605/1). It was developed jointly between the Bartlett School of Environment, Energy & Resources, UCL (BSEER), the Bartlett Development Planning Unit, UCL (DPU), CEPT University, Foro Ciudades Para la Vida, Centro de Investigación, Documentación y Asesoría Poblacional (CIDAP), Instituto de Desarrollo Urbano (CENCA), Servicios Educativos El Agustino (SEA), Pontificia Universidad Católica del Perú (PUCP) and Mahila Housing Sewa Trust (MHT). GEMDev focuses on the nexus between energy and housing and aims to contribute to inclusive decision-making by developing tools for better energy planning particularly for off-grid and partially off-grid communities with limited or precarious access.

1. What is energy poverty?

Energy poverty is a state in which a household or individual cannot afford or access sufficient, reliable and safe energy services to support their basic needs and wellbeing. Energy poverty is dynamic as people can move in and out of it, depending on various internal and external factors, such as housing, infrastructure, as well as social, economic, cultural and political aspects. Likewise, it is important to consider the notion of energy vulnerability, which is the susceptibility of households to fall into energy poverty.

2. What are everyday energy risks?

Everyday energy risk is the probability or threat of damage, injury or loss caused during the access and use of energy for daily functions such as cooking, working, heating and cooling. For example, inside dwellings, leaks from gas cylinders used for cooking can cause injury and loss; also poor-quality wiring can generate risk of burns, electrocution and fires. In public spaces, poor connections of public electricity cables, faulty or mismanagement of energy infrastructure can also lead to fires.

3. What is thermal comfort?

Thermal comfort describes the state of a person's satisfaction with the surrounding thermal environment. It refers to the ranges temperature, humidity, and airflow conditions that make an individual feel comfortable and at ease. Spaces that are cold and humid in winter, or too hot in summer, can create stress and exacerbate heath conditions; in extreme cases they can endanger occupants' lives.

4. Methodology and context

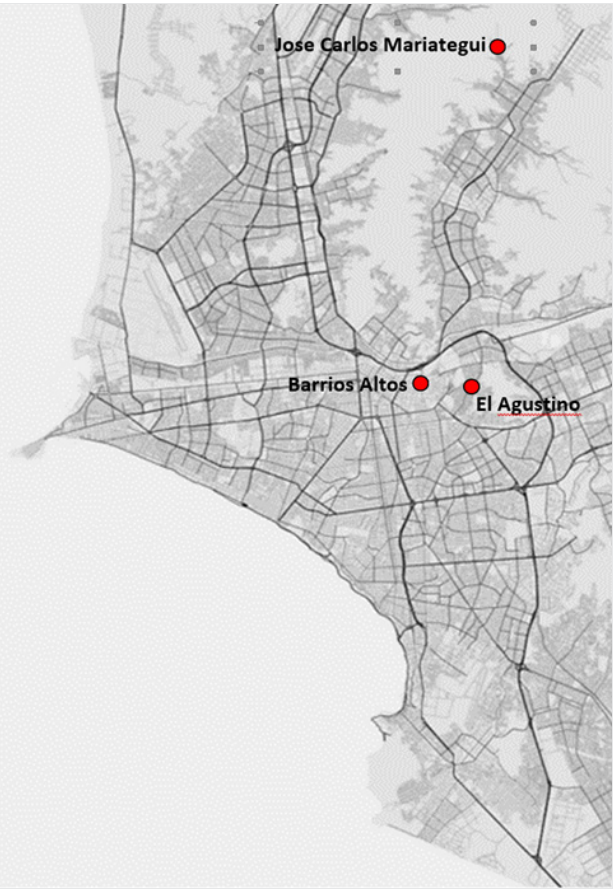
Data collection was carried out between June and September 2021, at the height of the COVID-19 pandemic. The research team worked remotely with the support of partnering non-governmental institutions based in Lima – CENCA, CIDAP and SEA – which have long-standing relationships of trust with residents in the selected low-income settlements.

To understand inhabitants' energy practices and how these intersect with housing, the team analysed energy access and use, how it relates to the energy risks to which inhabitants are exposed, as well as thermal comfort in the home. The data collection for individual and household level data was carried out through a total of 45 household surveys with an equal number of men and women, as well as 15 oral histories. In addition, 3 focus groups in each settlement, were conducted to capture communal energy challenges and practices. These were also documented through participatory visual methods.

In parallel, data loggers measuring temperature and humidity were installed in each of the 45 participants' homes over a full year from March 2022, to cover the different seasons. These devices recorded the thermal performance of the buildings and were accompanied by surveys to assess occupants' thermal, light and comfort levels. A weather station (Figure 1) was also installed in the settlements to facilitate comparison and analysis of the exterior and interior conditions of homes. The data were analysed using both quantitative and qualitative techniques. The data loggers' readings were plotted in a graph to understand the changes in temperature and humidity over the year, and they were also cross referenced with the thermal comfort surveys responses.

Figure 1: Checking the results from weather station installed in José Carlos Mariátegui. Photo: Marion Verdiere

5. Case study settlements



Map 1: Case study settlements - Barrios Altos, El Agustino and José Carlos Mariátegui. Source: authors

Three settlements in Lima – Barrios Altos (Figure 2), El Agustino (Figure 3) and José Carlos Mariátegui (Figure 4)– were selected for the research for two reasons: first, because of the GEMDev project team's strong links and networks in the settlements; second, because they were representative of the dominant housing processes through which the urban poor access housing in Lima. Barrios Altos, which was established in the 1500s, and El Agustino, which was established in the 1950s, are in the centre of Lima, whilst José Carlos Mariátegui, a much younger settlement established in the late 1990s, is located in the periphery of the metropolitan area (see Map 1). Since the three settlements are at different stages of development and located in different parts of the city, with diverse topography, they provide a means to understand a range of energy and housing conditions. Older settlements, such as Barrios Altos and El Agustino, have consolidated housing and energy infrastructures when compared with those of more recently established settlements, such as José Carlos Mariátegui.

While Barrios Altos exemplifies the process of subdivision of what used to be large purpose-built family villas of the elite in the now overcrowded and dilapidated historic centre, El Agustino and José Carlos Mariátegui have consolidated through auto-construction on the city's steep slopes.

Since these last two settlements have emerged through a similar process of incremental urbanism, but with a 40-year gap between them, taken together, they shed light on the trajectory of the auto-construction process and how energy practices, risks and thermal comfort in the homes evolve. Moreover, the fact that both are located on steep slopes allows a better understanding of the housing and energy conditions in which 2.8 million inhabitants or 30 per cent of the current urban population live. Focusing on urbanization on steep slopes, and the challenges inhabitants face, is of paramount importance because it characterizes the way the city continues to grow.

With regards to housing conditions and energy access, José Carlos Mariátegui, inhabitants build their own homes using very light materials, such as corrugated sheets and timber panels, which do not adequately insulate them from summer heat nor from the cold and humid conditions in winter. Since these settlements are considered informal, municipal processes to connect households to electricity and water can take up to several years. While waiting, many residents enter into agreements with neighbours lower down the slopes who have electricity and water to 'borrow' the service via cabling they themselves install. In addition, some households also share electricity meters and split the bill equally. With time, some residents manage to get their individual meters.

El Agustino's houses were initially made of wood panels and corrugated sheeting, and gradually upgraded to cement and mortar and extended to as many as four or five storeys. Over time, the consolidation of the settlement has led to overcrowding and loss of open space that in turn negatively affected ventilation, light and humidity in dwellings. Investments in energy infrastructure, such as electrical

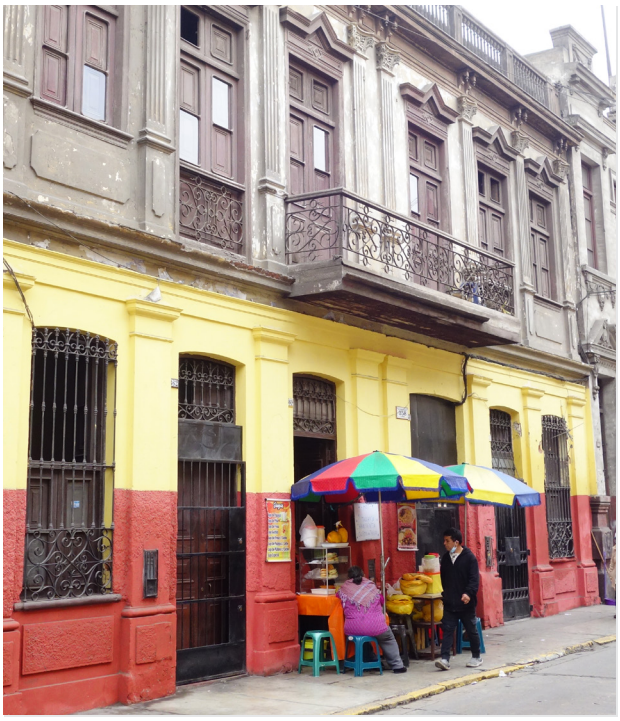


Figure 2: Barrios Altos. Photo: Rita Lambert

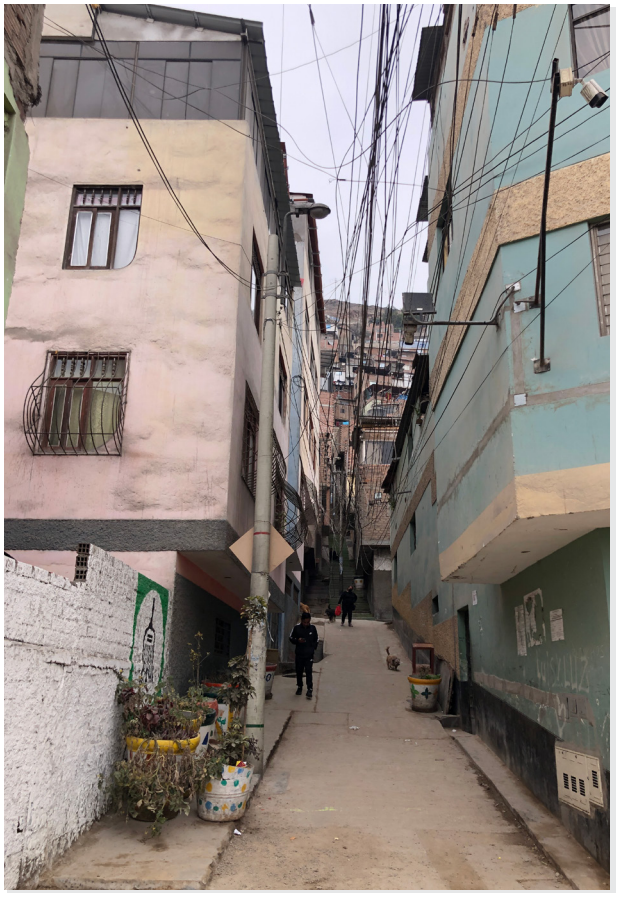


Figure 3: El Agustino. Photo: GEMDev

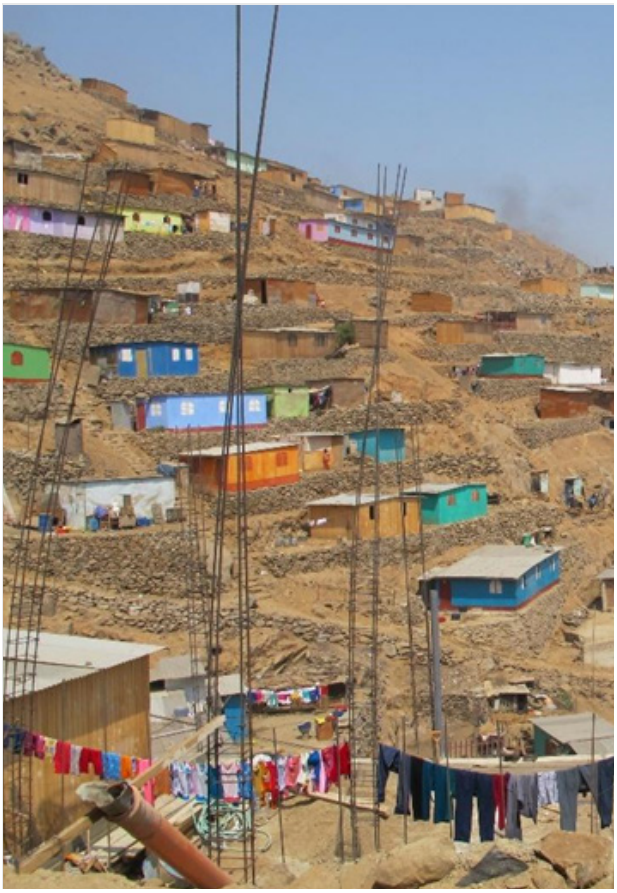


Figure 4: José Carlos Mariátegui. Photo: Rita Lambert

connections, internal wiring, sockets and lights, have been made incrementally by inhabitants themselves. Although community organizations work to improve infrastructure, it takes many years to get service connections, and some people continue to rely on clandestine electricity connections. For cooking, gas is used, but before it was widely available, residents relied on wood and kerosene.

In Barrios Altos, residents are generally long-standing tenants. A quarter of the houses are built with adobe walls and prone to humidity. Although over the years residents have managed to get individual meters, clandestine electricity connections are still present. In the absence of public and private investment to upgrade and maintain infrastructure, inhabitants live with energy-related risks such as fires caused by short circuits and electrocutions from faulty or exposed cabling which have affected residents and claimed many historic buildings.

6. Towards dignified housing and energy justice

Considering the energy practices, needs and aspirations of Lima's inhabitants, the following strategic action pathways can support access to dignified housing and affordable, adequate and safe energy services:

6.1 Supporting the auto-construction process along its various stages

Although families improve their condition over time, the subdivision of housing and consolidation of habitat does not guarantee neighbourhoods and housing that enhance wellbeing. Over time, these processes can lead to inadequate levels of thermal comfort and health impacts. Moreover, energy and structural risks may change over the years, but they are not fully eliminated.

Analysing the trajectory of auto-constructed settlements such as José Carlos Mariátegui or El Agustino, it is evident that although thermal comfort improves with the upgrading of construction materials, the way neighbourhoods consolidate has negative impacts on ventilation and natural lighting inside dwellings. Practical and economic solutions to improve health and thermal comfort at the initial stages of the auto-construction process are imperative. The research demonstrates that the initial stages of development with poor insulated homes, coincide with young households with small children that are at greater risk of respiratory diseases. As governments subsidies dedicated to housing currently exist (but they are designed predominantly for the middle income), these could be re-designed for low-income families. For the initial stages of auto-construction, investing primarily in roofing materials that avoid overheating in summer and heat loss in winter, while being lightweight solutions that are earthquake safe can substantially improve thermal comfort.

Supporting housing and public space improvements throughout the different stages of consolidation with pro-poor policies, technologies and co-funding mechanisms can enhance inhabitants' health and the overall resilience of the city. These policies should be based on deep knowledge of informal processes for the social production of housing and habitat. Moreover, state actors, academia and NGOs could do more to provide training and technical assistance adapted to inhabitants' reality that recognise their material and cultural conditions, at the same time as supporting their autonomy.

6.2 Preventing energy risks both inside and outside the home

Energy poverty and vulnerability are related to energy risks that affect inhabitants on a daily basis. Residents of the three settlements face a variety of hazards in accessing and using energy that relate to different energy sources, such as electricity, gas and firewood.

With regards to electricity, hazards outside the dwellings include exposed and poorly maintained power distribution cables in public areas. Inside the homes, poor quality wiring, lack of maintenance of electrical appliances, and precarious connections to electricity all lead to the risk of electrocution and fires. For those households that have been connected to the grid, ENEL (the service provider) is responsible for fitting an individual household meter. However, for many households, electrical installations are carried out with limited technical support, which means that inhabitants are prone to energy-related risks. The interface between the outside and inside of dwelling requires particular attention.

The access to gas in the form of Liquefied Petroleum Gas (LPG) tanks also presents risks especially in hillside areas such as José Carlos Mariátegui and El Agustino with inadequate roads and staircases. Many inhabitants have highlighted the risks of falls and physical injuries that occur while carrying gas cylinders up the steep stairs. Moreover, gas leaks due to faulty valves and even explosions of cylinders have also been reported.

As a result of increased costs of electricity and gas, many resort to using wood-based products as a complementary cooking fuel, both at the individual and collective level. Although wood is primarily burned outside the home, smoke from cooking can pose significant health concerns. Participants also noted that fire and embers presented risks of burns for children and adults and increased the potential for structures to catch fire.

Everyday energy risks are made invisible, yet they impact inhabitants' health, well-being as well as assets. Identifying and understanding these risks with local communities, government institutions and energy companies is crucial in order to address them. In addition, energy companies and state actors should work together with communities to provide safe connection and maintenance to prevent energy risk inside as much as outside the homes.

6.3 Adapting energy to differentiated demand

Low-income neighbourhoods are heterogeneous as residential dwellings can also include commercial and economic activities. Three of every fifteen interviewees allocated a dedicated or shared space to livelihood activity. In light that the electricity consumption is higher in these multi-use dwellings, energy planning should take this reality into account, and energy supply and tariffs adapted to differentiated demands. Acknowledging limited market competition exists (since the production and distribution of energy is in the hands of a small number of players) as well as issues of collusion and lack of controls for energy cost, further research is required to develop more efficient and effective processes within and beyond the market which include renewable energies, distributed generation, ESCOs, micro-grids, amongst others.

6.4 Strengthening decentralised and collective solutions that empower women

The ideals of modern centralised systems dominate infrastructure development and investment decisions. These are predominantly based on technical solutions with a focus on efficiency. However, inhabitants of low-income settlements rely on informal arrangements, hybrid solutions and decentralised networks that are generally outside the formal energy supply system. These are generally more flexible in meeting energy needs, maintaining independence and controlling costs.

In light of the slow development process of settlements, and the fact that formal electricity connection can take many years to arrive, inhabitants rely on fuel stacking (i.e. the use of multiple fuels and technologies simultaneously) and sharing energy as a strategy to reduce energy poverty. Energy sharing and solidarity-based practices driven by women have been particularly key for community energy resilience. Women take the leadership in addressing challenges related to energy poverty, as they are also disproportionately affected. For example, participants in the three settlements highlighted how they share LPG cylinders for cooking and organise to buy LPG in bulk to reduce transport costs. Many women discussed the sharing of

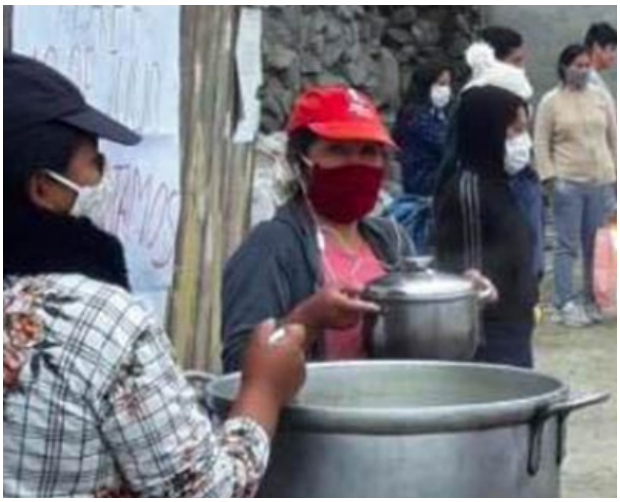


Figure 5: Ollas comunes in José Carlos Mariátegui. Photo: CENCA

home appliances, such as blenders and fridges, given that very few households can afford them alone. During the COVID-19 pandemic, women groups opened community kitchens (also known as ollas comunes in Spanish) to combat food and energy insecurity (Figure 5). They also established schools in local community centres as Peru's Ministry of Education mandated that all classes should be delivered online. As many households faced challenges in accessing reliable electricity, lacked individual internet connections and could not afford to pay for internet data to access remote classes, the collectivised teaching in communal spaces meant that the burdens and costs were shared and thus more affordable.

Given the importance of collective sharing strategies, it is important to identify the individualising perspectives that structure and support dominant energy policies and understand how these can increase vulnerability. Devising policies that fundamentally strive to strengthen collective life as part of physical infrastructure delivery remains imperative. Alongside this shift in policy focus, it is necessary to give greater recognition to local-level actors, such as communities and municipalities, and to find a better balance between different levels of governance.

At the same time as strengthening policies that guarantee the implementation and financing of decentralised and community-based projects, the elimination of inequality within the community scale is crucial. Moreover, given the vital role that women and their grassroots organisations play in community actions and energy resilience a gendered approach is necessary to devise policies and actions that empower women and redress structural injustices against them.

6.5 Planning material and spatial changes that link housing and energy

Environmental conditions within the home, including access to natural light, ventilation and thermal comfort, are related to the building fabric and the configuration of internal and external space.

Contrasting a young settlement such as José Carlos Mariátegui, with a more mature version such as El Agustino 40 years ahead, densification, without planning or control, has meant the loss of open space and the development of closely built houses that are four to five storeys high. At the neighbourhood scale, the pattern of development has resulted in narrow passageways and steep staircases in El Agustino. Consequently, the windows of many homes look out onto walls, resulting in dark, humid and poorly ventilated spaces. Those who can afford it use electric fans in summer and electric heaters in winter, investing a larger proportion of their incomes on electricity. The majority, however, make do with such conditions. Injustices are thus reproduced over time, with the urban poor made further vulnerable to energy poverty and thermal stress. In addition to impacting the environmental conditions inside the home, the loss of communal and outdoor space has consequences for people's capacity to cope with energy poverty as they are less able to collectivise their energy needs.

Although communities need to pay particular attention to safeguarding such spaces, policymakers and planners could also do more for their protection. Working effectively with communities, providing technical assistance and guiding the way settlements grow and consolidate could help prevent lock-in scenarios that depend on energy intensive practices.

In addition, it is essential to rethink the way housing is built, since conventional techniques of concrete, steel and brick are expensive solutions with high environmental impact. Recognising residents' incremental housing processes, there is a need to investigate and propose alternative systems that allow multi-storey consolidation built to withstand earthquakes, that are economical, ecological and deliver thermal comfort. For communal spaces, the need for shade in summer and control of drizzle and wind in winter should be key design considerations. The inclusion of appropriate vegetation, for example, often implies a slight increase in the budget for such interventions, but it represents a substantial impact in achieving more pleasant and comfortable spaces in the long term.

This research highlights the critical linkages between vulnerability to energy poverty and the built environment.

Energy policy and urban planning are typically dissociated in Peru, and more needs to be done to implicitly link them in ways that strengthen collective action, prevent risks, improve thermal comfort and ensure that families are not condemned to increasing their energy use to guarantee comfort in their homes. The institutional silos from which energy and urban planning are conventionally approached need urgent rethinking to deliver sustainable cities.

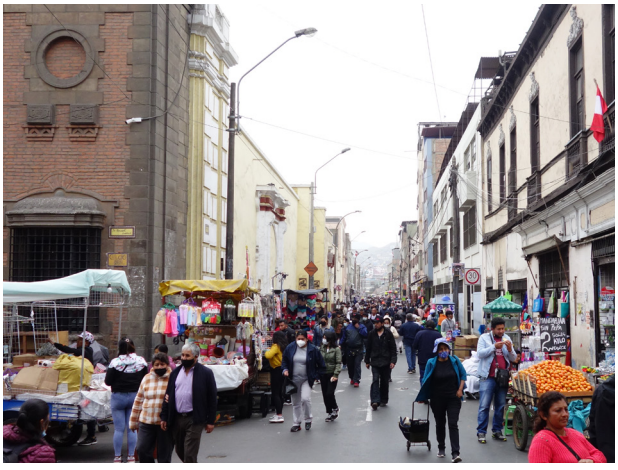


Figure 6: Public space in Barrios Altos. Photo: GEMDev

For more information, please visit the GEMDev project website www.gemdev.net, or reach out to Rita Lambert (rita.lambert@ucl.ac.uk), Martin Wieser (mwieser@pucp.edu.pe), Carlos Escalante (ceescalantee@gmail.com), and Silvia de los Ríos (delosrios.silvia@gmail.com).

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