

FIELDWORK REPORT MAPUTO

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Summary

This report describes the fieldwork in Maputo, Mozambique, one of the cities selected by the Mapping Urban Energy Landscapes - MUEL research project. Through institutional and household interviews, community workshop and documentary analyses the projects gathered data on the city's urban energy landscape.

Interviews with those who plan, manage, produce, distribute and coexist with energy infrastructure – the institutional interviews – provided information about the current state of energy planning, the state's perception of and vision of current and future energy provision as well as insights into the state of energy planning and a vision of future energy scenarios.

The focus of the fieldwork was on the community's experiences of energy. In particular, the participatory mapping workshop with the community provided rich and detailed information on the inhabitant's energy needs, perceptions of energy services and the current state of energy supply in of the Maputo's unplanned settlements in the “reed city”. The results of the workshop allow to distinguish three immediate priorities for energy access as described by local residents: 1) extending street lighting as far as possible as a public service to every corner of the community; 2) improving the safety of cooking without increasing household costs; and 3) facilitating the extension of information and communications networks, particularly gaining access to the internet.

Additionally, the workshops provided an insight into how energy services provision are intertwined with the local livelihoods; highlighted the spatial aspects of different energy uses; shed light on barriers to electrification, such as the construction material of the house; and, through the case of improved cookstoves provided by an international NGO, underlined the complex considerations that need to be taken into account while working towards improvements and solutions. Moreover, the workshops show the participants' understanding of communal and individual practices of energy use.

1 Introduction

This report details the fieldwork research activities that took place in the metropolitan area of Maputo, Mozambique July 2013 and July 2014. This report reproduces summaries of workshop results and institutional interviews previously published in:

- Castán Broto, V., Salazar, D., & Adams, K. (2014). Communities and urban energy landscapes in Maputo, Mozambique. *People, Place and Policy*, Vol. 8, No. 3, pp. 192–207.
- Castán-Broto, V., Stevens, L., & Salazar, D. (2015). Energy Access and Urban Poverty. Energy and everyday life in an informal settlement in Maputo, Mozambique, *Poor People's Energy Briefing*, Vol. 4.

As well as the draft paper:

- Castán-Broto, V., Energy Sovereignty and Development Planning: the case of Maputo, Mozambique (under review)

Maputo is the capital of Mozambique, a growing urban area whose history has been shaped by political turmoil and the reliance of the whole country on the city-port. The failure of the colonial government to actually govern the city, the Portuguese exodus in 1975 which included the dismembering of the systems for management of infrastructure in the city, the war from 1977 till 1990, and the cyclones that ravage the city sporadically are all factors that impact today's infrastructure landscape. Maputo is often thought of as 'two cities': one called 'the cement city,' the planned area with tarmac road and relatively reliable infrastructure services, and the informal settlements known as 'the reed city', named for the reed-build homes, standard in pre- independence times. Although today reed-build homes are rare, 'the reed city' is still subserviced; it is clogged by its deficient transport links and plagued by problems in the water and sanitation services, waste management, and to a lesser extent, the provision of energy (Castán Broto, Salazar, & Adams, 2014)

The fieldwork was led by Dr Vanesa Castán Broto with support of Domingos Augusto Maculule (Institutional Interviews), Felisbela Materula and Diana Salazar (Workshop organisation) and Kevin Adams (photography). Following the project's methodology a series of different research methods were deployed to gather data on energy landscapes.

Seven structured interviews with state and civil society stakeholders were conducted to gather qualitative data on the state of the energy system in Maputo, on the schemes by which urban

energy is governed, and on the perception of current challenges that will shape the future of energy. 16 interviews were conducted with people living in communities and playing different roles in the energy system: three of those interviews were informal; because of the interviewee's request. A workshop for participatory mapping of energy landscapes was conducted in a community space in Chamanculo C, a historic unplanned settlement in the centre of the city. Both small group and plenary discussions exposed local understandings of the relevance of different energy services in people's lives and how energy is understood in relation to energy needs and the local uses of energy. Altogether, 28 participants were interviewed in 23 interviews (See Table 1.1.)

Table 1.1. Characteristics of population reached through the interviews.

	Interviews	Participants
Group		
Institutional representatives	11	12
Local Businesses	8	9
Community members	4	7
Gender		
Female		9
Male		19
TOTAL	23	28

The analysis of documentary sources -such as energy maps, policy papers, official statistics, studies and newspapers- was directed to understanding the national, regional and local context in which urban energy landscapes are produced and facilitate the interviews sample.

2 Institutional Interviews

Through a purposive sampling nine individuals were contacted and interviewed, representing some of the most relevant actors in the national, regional and metropolitan-scale: the water and utility companies, a company distributing petroleum products, the local and national government representatives, an energy development fund, as well as local charcoal vendor, representing local business (Table 2.1).

Table 2.1 Institutional interviews: population sample characteristics.

Interviewee	Gender	Interviewee position	Institution type	Sector
1	M	Officer	Utility (Water)	Private
2	M	Charcoal vendor	Small business	Private
3	M	Officer	Utility (Electricity)	Government / Public company
4	M	Officer	Environment Department, Local government	Government
5	M	Officer	Energy development fund	Public company
6	M	Officer	Ministry of Energy	Government
7	M	Officer	Distributor of petroleum products	Public company

2.1 Institutional actors

While the extractive industries play a crucial role in transforming the landscape (e.g. Hidroelétrica de Cahora Bassa; the Brazilian multinational Vale), the role of distribution companies cannot be underestimated. Distribution companies link their expansion to issues of territorial control. For example, a representative of EDM explained that “we are ‘all terrain’: we arrive [to remote locations] before any other company”. A representative of Petromoc, Mozambique's state-owned distributor of petroleum, boasted about their ‘full coverage’, particularly in comparison with the multinational companies that have arrived to Mozambique following the liberalization of the fuel market.

2.2 Energy scenario

In terms of everyday practices of energy use, the dominance of charcoal in the bairros’ energy landscapes and the popularity of the pre-paid system reflect an inclination towards self-determination in relation to the specific business models to deliver energy. Charcoal is mostly produced in small quantities that circulate from the urban hinterland to the city and within the city. The charcoal network constitutes an alternative to centralised and obscure systems of distribution of electricity and petrol, over which local residents have little control. When it comes to charcoal, local business people control the whole chain. Similarly the prepaid system has given families certain autonomy in relation to the control of their own electricity

consumption.

Firewood is a less popular fuel: as a local community representative explains “there are a few communities that use firewood, but the reason is very simple: because the bushes are too distant from the city and transporting firewood is more difficult than transporting charcoal”. Transport costs reduce the price difference that generally makes firewood cheaper.

A local charcoal producer described charcoal production as a subsistence activity: “...charcoal here can save a life. When somebody does not have any money, does not have anything, they can come here and cut one, two, three [trees] and already you have a bag of charcoal, you have something to eat at home.” Thus, unlike export-oriented industries, charcoal offers a safety net in the most extreme situations, while also provided a flexible alternative that producers can engage with when no other livelihood means are available

The prepaid system, has been recognised as a great advancement by the communities in many bairros in Maputo. Institutions are so satisfied with the system that EDM is now planning to integrate advanced technologies to facilitate payment through ATMs and mobile phones. Yet, there has never been an in depth discussion of the structural conditions that have made the prepaid system successful, from chronic deficiencies in infrastructure to the conditions that prevents communities to keep up with subscription payments.

A different issue relates to the dynamics of extension and improvement of the electricity system. Given the lack of resources and dependence on electricity exports, the incremental expansion of infrastructure is a necessity. A key aspect here is prioritisation. How do EDM and financing institutions prioritise the building and repairing of transformation posts to support and maintain electrification? An institutional representative explains: “In Maputo, for example, in Zimpeto, there are places that need the installation of a new transformation posts but the cost and limited number of consumers do not justify this intervention”. Determining such minimum number of consumers is a complicated process which privileges formal arrangements and those communities which are able to navigate the institutional setting. This construction of ‘the consumer’ pays no attention to the actual conditions of living. In practice, it does not seem that the principle of counting consumers is the main guiding principle for network improvements. In addition to the designation of VIP areas, improvements in the electricity network and public lighting are apparent alongside the newly built avenue Julius Nyerere, that exhibits large newly built mansions, luxury hotels, and public schools. In neighbourhoods like Chamaculo C, where relocation is out of the question, communities

struggle to maintain transformation posts, particularly those located in flood-prone areas, and public lighting is confined to the main avenues because of the difficulties to installation posed by narrow streets.

Distribution company representative explained the spatial differentiation of different lines and who uses them: “There is a difference, because there are lines... that are for the VIPs: this is the case of the line that supplies the Central Hospital, the one that supplies the Quartel General and the one that supplies the presidential area”. This represents a deliberate designation of certain areas as being more deserving than others, so that the utility creates hotspots prioritising the needs of those who have a secure supply.

3 Workshops

Chamanculo C is a historic neighbourhood located near the centre of the city. This is the part of the city which is popularly known as ‘the reed city’, with unplanned settlement and infrastructure deficiencies, especially in water and sanitation and unpaved roads. Chamanculo C has 25,318 inhabitants, distributed in 74 *quarteirões*; it has 5,630 buildings of which 5,231 are for housing (AVSI, 2013 in Castán-Broto, Stevens, & Salazar, 2015).

A workshop for participatory mapping of energy landscapes was conducted in a community space in Chamanculo C in July 2014. Participatory mapping is a type of community mapping that emphasises the co-production of knowledge between researchers and research participants through the use of a combination of dialogue and the production of visual artefacts (Corbett, 2009 in Castán Broto et al., 2014).

3.1 Methodology

25 participants from across the neighbourhood, were recruited for the exercise, selected through the community structure to represent diverse *quarteirões* (a subdivision of 50 to 100 houses). Participants represented a broad range of ages (from 18 to >80) including both men and women. Local neighbourhood leaders also attended.

The workshop took the whole day and ended with a party as a means to acknowledge everybody’s participation and time.

The workshop consisted of three parts:

- During the first part, participants were provided with photographs of energy- related artefacts to discuss their relevance to the neighbourhood. When they found one with particular significance, they were invited to discuss it with the group, naming the object and explaining where it comes from and where it goes. Participants found it difficult to engage with this activity, perhaps because it was at the beginning of the workshop, but it helped to focus the conversation around energy services and prompt thinking about diverse energy relationships in their community.
- During the second part, participants discussed energy services (cooking, lighting, cooling, communications), drawing relationships on paper and using multiple media materials such as stickers and modelling clay.
- During the third part, participants guided the facilitators in a walk across the neighbourhood to describe key artefacts in their energy landscape.

Both small group and plenary discussions exposed local understandings of the relevance of different energy services in people's lives and how energy is understood in relation to energy needs and the local uses of energy. The different structure of the activities allowed participants to mix themselves in terms of age group and gender. Also the use of different elements such as photos, maps and various resources during the group discussion facilitated a wider contribution; nevertheless, it was noticeable that young people, the Chefes of *quarteirões* (community leaders) and a female participant who was a teacher had active participation while elderly people remained quieter. Both voice and images of all the group presentations and discussions were recorded and later transcribed for analysis. Direct observations and participants' diaries were used to capture impressions and information. The materials assembled were analysed to examine 1) how energy is relevant in people's lives and 2) how it is understood in relation to different expectations about energy needs and uses of energy.

3.2 Perspectives on energy supply on a national scale

The participatory workshop in Chamanculo C revealed that, above all, participants had a great sense of pride in the improvements made to the electricity network. They greatly valued the control they felt over payments through the Credelec system. They were also proud of the Cahora Bassa dam in the north of Mozambique, one of the largest hydropower facilities in Africa. This dam operates by virtue of a reciprocal arrangement between EDM and the South African energy company Eskom, whereby Cahora Bassa provides energy to Johannesburg and

Eskom provides cheaper electricity to the south of Mozambique. Participants spoke of Cahora Bassa as something they would like to learn about and attached great significance to it, as the dam is an important symbol of the modernization of the country. People did talk about the problems of intermittent access to electricity, which was partly due to problems with supply, and partly due to the variability of incomes meaning people were not always able to buy credits.

There was little mention, in comparison, about the discovery of the large offshore reserves of natural gas in the north of Mozambique which are likely to transform Mozambique into one of the largest exporters of natural gas. Although the discovery is likely to transform the national energy system, there are no guarantees that the current government and energy providers will have the appropriate regulatory frameworks and distribution systems to actually provide gas to impoverished households (Mahumane and Mulder, 2015 in Castán-Broto et al., 2015).

3.3 Energy Services in the settlement

The qualitative research was complemented by quantitative survey of energy access following the TEA methodology, the results of which are available Open Access¹. Interpreting the results of the TEA survey and the participatory mapping exercise together, we can distinguish three immediate priorities for energy access as described by local residents: 1) extending street lighting as far as possible as a public service to every corner of the community; 2) improving the safety of cooking without increasing household costs; and 3) facilitating the extension of information and communications networks, particularly gaining access to the internet. This highlights that although the majority of residents failed to meet the minimum standard for space heating (due to short periods of cold) they prioritized street lighting and communications.

¹ To read more about the TEA survey and methodology: <http://policy.practicalaction.org/policy-themes/energy/total-energy-access>

Measuring definitions: <http://policy.practicalaction.org/policy-themes/energy/total-energy-access/measurements-and-definitions>

Questionnaire: https://energypedia.info/images/2/2c/TEA_ESI_questionnaire.pdf

3.3.1 Electricity

People welcomed the huge improvements in electricity supply, although intermittency and affordability remained issues. There is less interest in fuel substitution, perhaps because there is not yet a vision among local residents and government authorities about how cleaner fuels such as LPG could improve the lives of those in Chamanculo C. However, in the light of the new discoveries of natural gas in Mozambique, we believe that it is important to explore alternatives for the substitution of household fuels together with the potential implications for the numerous people whose livelihoods depend on charcoal.

Residents explained that connecting the household to the electricity network depends on the structure of the house and whether it is suitable for connection (e.g. reed houses would not be considered suitable). As house quality has improved, people have accessed electricity. Yet, for the few people still living in reed homes, connecting to the network may not be possible. Housing improvements have gone hand in hand with access to the network. In some cases, for example, electricity posts were built together with the houses.

Particular insights from the workshop revealed how much people valued electricity for improving communication and lighting. Attention is turning more to intermittency of supply and people's ability to afford credits, so that they can access these services more continuously. It reminds us that having an electricity connection does not guarantee a continuous level of service.

3.3.2 Lighting

Electricity plays a key role in community life and public spaces. This is not just because it is linked with commercial activities, but also because lighting plays a key role in building up a safe and welcoming neighbourhood. Participants explained how the extension and upgrading of public lighting in the last few years had benefited the community directly, through the improvement of the safety conditions in shared spaces.

In Chamanculo C most roads are extremely narrow and lighting is very poor. Residents explained that without public lighting, many errands were suspended or involved elaborate detours using wider streets. For those who only have access to public sanitation facilities in the neighbourhood, public lighting is essential. Public lighting, though, is confined to the few main roads that are connected by narrow and unpaved paths. Participants noted the

importance of alternative means of lighting along those paths, including the moon as a source of lighting. In this way, lighting is related to spatial aspects: the distribution of the houses in the neighbourhood, the presence of appropriate roads, and people's ability to bridge distances through walking.

Lighting also relates to the electrification of the household. Here is where lighting becomes more closely related to yearly patterns of energy use, and the way the length of the day bears influence in electricity consumption. Participants noted a considerable seasonal difference, with a higher energy bill in the winter, when days are shorter. The categorical depiction of seasonal differences highlights the way the implementation of a pre-paid system for the provision of electricity, and the fact that lighting is the main service obtained from electricity, enable local residents to understand and control their own demand of light, to the point that they share a common view about consuming more electricity during winter. The pre-paid system has also changed perceptions that illegal connections were encroaching in the collective infrastructure and residents argue that illegal connections to the electricity network have almost disappeared in the neighbourhood. This perception matches the cartographic evidence gathered by AVSI for a participatory local plan in 2012 (AVSI, 2012 in Castán Broto et al., 2014).

3.3.3 Cooking and Water Heating

Residents agreed about charcoal being the main fuel for cooking. They explained that people may use other fuels for different reasons, depending on whether they can afford them, or linking those fuels with particular occasions and uses (such as the use of firewood in parties).

The discussion focused on when energy for cooking was needed, in relation to different life patterns. Participants emphasised that there were fixed routines of cooking and heating water, which followed the number of meals per day. They explained that they eat three times per day, always at set times. There is co-ordination between large meals and heating water for which they may use a range of technologies from an electric heater to solar water heaters.

Households in Chamanculo C tend to consist of several separate rooms around a patio, each used for diverse functions at different times of the day. The house architecture allows for cooking to take place outside the independent rooms where people sleep and take shelter. The cookstove(s) constitutes a central point in the house, where the rhythms of cooking intersect

with the needs for hot water. Having multiple stoves is crucial for daily cooking and cleaning activities. Alongside the cooking stoves, a larger stove is used to heat large quantities of water with residual heat. Hot water is needed for a multitude of uses, such as personal hygiene and washing clothes. Having a place to boil water may also have important health benefits when the water supply is unreliable and of dubious quality. However these arrangements mean that multiple uses co-exist spatially, and residents associate this with the high frequency of accidents around the cookstove.

Residents choose to cook outside partly because they have the space to do so on their patios, but also as a strategy to avoid indoor air pollution. If possible, through cleaner fuels or stoves, interviewees said they would prefer to cook indoors. This would free up their outdoor space for other uses, and could reduce accidents. However, any solution would also need to work with the variety of pot sizes, multiple pots being used at once, and the use of stoves for heating water: although the introduction of charcoal-based improved cookstoves seems to offer an immediate and effective solution to improve the safety of local residents while reducing the pollution caused by cooking practice, there are specific design and economic considerations which could improve the integration of improved cookstoves within the local economy, leading to higher rates of uptake and usage.

The Fundação AVSI, an international NGO with a range of successful community- led programmes in Chamanculo C, is one of the local organizations delivering a pioneering programme for the replacement of approximately 5,000 traditional cookstoves with improved cookstoves. (Castán-Broto et al., 2015). Users explain how the new cookstoves allow for cooking indoors (because they produced less pollution), are safer for children, and use much less charcoal than the traditional model made of iron and recycled metals. Because of their portability, the cookstoves have the potential to help women adapt to different circumstances. However, the new cookstoves do not meet the full range of cooking needs because the model chosen is of a very small size not necessarily suited for cooking large amounts. Moreover, cooking tends to use a few stoves simultaneously, as different components of a meal may require separate cooking pots. Improved cookstoves may also not meet the needs of people whose livelihoods depend on cooking in the street.

3.3.4 Space Heating and Cooling

The key feature of energy that was found to most closely relate to the spatial aspects of the neighbourhood was thermal comfort and food preservation. Here, the house was presented as the unit to describe different practices of heating and cooling space. Heating was not thought of as an issue of great concern because of the relatively benign climate in Maputo which, according to participants, is never too cold. Cooling needs awakened more debate. Although most participants argued that they simply opened the window when it was too hot, participants had a vibrant debate about the use of fans and air conditioning units as well as electric heaters. This concluded with realization that nobody in the community actually owned such appliances, and therefore they did not know how to use them.

3.3.5 Communication

Communications were treated entirely differently from other uses in two ways: first, different rhythms and forms of energy use were discussed in relation to the actual ‘demands’ of the appliances and the way they were integrated into people's everyday lives; second, thinking of energy as a means for communication prompted questions about what energy actually is and its significance in their own lives.

With regards to communication, appliances impose their rhythm on the life practices in Chamanculo C. Some participants highlighted the alarm clock, the appliance that marks the start of the day. The mobile phone, as generally agreed, was used thorough the day. The radio was very significant too, particularly because, as participants explained, it had historically brought communities together at the times of the news, although there was some speculation about whether this continues to be as important as it was in the past, with the prevalence of television and the internet increasing. With regards to the television one participant explained that:

“The use has increased because the more we know it, the more we use it every day. We have children and we watch it almost every night, to watch the soap and we do that with the whole family. Most households watch TV at night.”

Participants also talked about their use of internet, particularly in internet cafes, and the fact that patterns of internet use were closely linked to individual preferences. So, while

participants established social patterns in relation to the use of TVs and radios, or the practices of cooking and lighting, they situated technologies such as internet and mobile phones as individual-based technologies, for which social patterns could not be identified.

The theme of communications not only raised questions about the variety of rhythms in energy use and whether different appliances were embedded in everyday life or not, but also, it fostered a vivid discussion about what was energy and what was not energy, particularly in relation to the observation that, according to participants, communication relied on people themselves talking or writing to each other. This was followed by a discussion about the extent to which human energy, food and other actions were also part of the energy system. Such views reveal how when departing from the perspective of experience, energy questions raise issues which are not necessarily subsumed in a merely utilitarian understanding of what energy is and why it matters.

3.3.6 Energy and livelihoods

Energy plays an important role in sustaining local livelihoods. Additional fieldwork observations showed that there are a variety of livelihoods associated with energy, both directly and indirectly. For example, charcoal is present in the street landscapes: on the street you can see women selling small amounts of charcoal, suitable for a family meal. The work of street vendors is to organize piles of charcoal, each pile corresponding to the amount of fuel needed per day in an, approximately, 5-person household. Many combine this activity with cooking and selling food, which also depends on using charcoal. Large-scale trading of fuels also provides livelihood opportunities. Big depots store large sacks which are sold to smaller sellers or directly to families who have both capital and storage space. Unlike street selling, the depots are all run by men, who manage the premises, take care of the facilities, and transport charcoal in wheelbarrows to households and workplaces. The residents described in detail the flows of charcoal from distant regions where it is produced (Matutuine, Xikwala Kwala) and the way it is distributed within the community, with the provision centralised in large markets of charcoal and low scale distributors that sell small amounts of charcoal in local markets and neighbourhoods. Participants spoke of charcoal both in relation to its insertion in the local economy and the way it links them to the spaces where charcoal is produced.

The introduction of the prepaid electricity system has supported the development of small businesses that sell the electricity credits directly to households and, thus, have an additional source of income. Electricity also supports small businesses locally. Beauty parlours, restaurants, and shops, for example, depend on electricity to support a range of appliances (from blow driers to fridges) as well as resources to promote their business, such as music and external lighting. Many residents also commented on their dependence on mobile phones to find jobs or to respond rapidly to new or temporary employment opportunities.

Another factor highlighted by local residents was the importance of iron works – especially those making cookstoves – in providing local livelihoods, both for those who make the cookstoves and those who sell them in local markets. The nearby market of Xipaminine, for example, has a whole section dedicated to selling cookstoves. However, the improved cookstoves being promoted by AVSI are subsidized and imported from the US, which may damage local cookstove markets. Nevertheless, the project provides temporary employment for the young professionals who distribute the cookstoves. A more sustainable approach could entail the design of locally tailored models of cookstoves, built with local resources, tailored to local patterns of energy use, and providing an additional opportunity for local businesses.

3.4 Summary of the workshop: Energy landscape

Figure 1 presents the results of the collective effort by participants to describe the energy landscape in Chamanculo C. The diagram is a composite of digital representations of four working groups in which participants discussed lighting, cooking and heating water, cooling and heating space, and communications. This diagram is intended to present part of the data produced in the workshop, rather than as an analytic representation of the discussions. The researchers have added to the original diagrams two notes in the corners that indicate whether the discussion focused more on the spatial elements in relation to energy or the artefacts that were involved in their use.

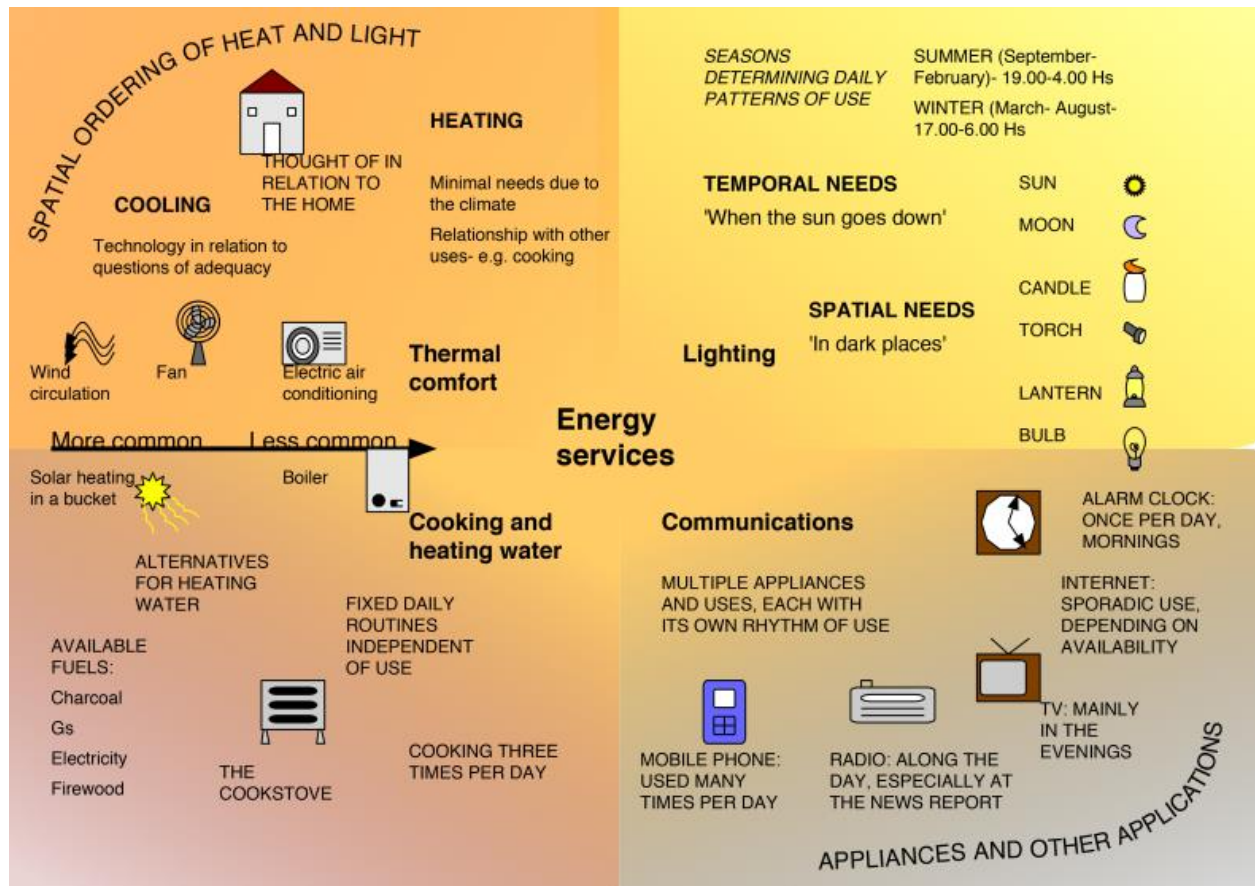


Figure 1 Energy Landscape in Chamanculo C - Summary of workshop results

4 Transect Walk

The final section of the workshop linked space, energy and views of the neighbourhood through two walks across Chamanculo C to observe and interact with different elements that they considered part of the energy system; the walks were followed by the collective mapping of the features observed and a discussion. Both walks were significant not just because of what participants highlighted but also because of what they ignored. As they were instructed to think about community and energy they avoided households (although they showed them when prompted) focusing instead on collective artefacts. When thinking about energy uses and their dynamics, participants in the workshop emphasised the home as the central unit for energy consumption, either implicitly or explicitly, and related the energy system to the home and home-based artefacts. However, when they were walking around the neighbourhood participants highlighted their awareness of infrastructure in shared spaces and how it becomes visible in their everyday lives.

For example, participants pointed at public lighting, transmission towers, and electricity connecting points. In both walks participants highlighted every electricity transmission station in the neighbourhood as part of the collective energy infrastructure. This is infrastructure that bears little relevance to their everyday life in any other way than as an object that facilitates energy connections and as a source of concern when there is an electricity fault. The idea that energy infrastructure is invisible to people as they go about their daily life is pervasive in energy research, but our research shows that citizens are well aware of the location of every transmission station in their neighbourhood.

In relation to the markets of energy, residents mapped key institutional dependences such as the nearest office of the energy company Electricidade de Moçambique and the markets of gas and charcoal. The linkages between charcoal and livelihoods were continuously emphasised, with stories about residents getting rich because “they sold a lot of charcoal and bought a big house.” What was rarely emphasised, however, even when prompted, were the shops to buy credit for electricity within the pre-paid system (Credelec). This is now bought in local shops alongside other goods and it is perceived as separate from the overall energy system, as if the capital flows were separated from those of electricity and the energy uses that they facilitate.

Like household artefacts, such infrastructure artefacts are also embedded in complex social and institutional relationships. The walk, for example, constituted an opportunity to talk about issues with individuals which were not raised in the collective discussion. One resident explained his concerns about people who lived in some houses temporarily, as ‘tenants’ may have different energy habits, for example, using more plastic and waste as fuel. The walk also showed how infrastructure is embedded in physical relations, for example, being integrated in the actual construction of houses. Overall, the analysis above points towards the complex social, spatial and material relations that structure the different uses of energy in Chamanculo C and contributes to an energy landscape which reflects community rhythms and artefacts.