

Strengthening equitable and sustainable municipal service delivery in informal settlements: lessons from a socio-technical energy innovation in PJS Settlement, Khayelitsha, Cape Town

Author and presenter: Thandeka Tshabalala – PhD Candidate, Centre for Sustainability Transitions, Stellenbosch University

Co-Author: Dr Nthabiseng Mohlakoana - Senior Researcher, Centre for Sustainability Transitions, Stellenbosch University

Co-Author: Dr Megan Davies - Researcher, Centre for Sustainability Transitions, Stellenbosch University

Abstract

South Africa urgently needs positive examples of how energy access and energy poverty initiatives can be implemented and sustained to upscale just energy interventions. To this end, we ask: what lessons have been learnt from socio-technical innovations focused on energy poverty alleviation, and how can they be applied to enhance equitable and sustainable municipal service delivery in informal settlements? In response, this paper investigates a case study of an energy poverty initiative in the City of Cape Town that is useful for grappling with South Africa's unfolding just energy transition, specifically within the context of urban informal settlements. The case study examines an off-grid (solar-powered) public lighting innovation in an informal settlement called PJS Settlement in Khayelitsha, Cape Town. The case study builds on how public lighting, an essential aspect of municipal service delivery in informal settlements, can potentially be enhanced through collaborative socio-technical innovations based on small-scale renewable energy technologies. Reliable public lighting is a core municipal service delivery function that not only enhances the safety of residents at night-time but also enables access to other essential community services that are typically located on the outskirts of the informal settlements, such as communal water points and toilets after dark (Ngwane, 2021a; Borofsky, 2022a). In addition, public lighting can also improve the enjoyment of the outdoors after sunset, improve feelings of safety and facilitate longer trading hours for informal traders (Gillard et al., n.d.). Based on an analysis of the case study, we share some emerging insights on how community engagement, partnerships and social ownership in socio-technical innovations can enhance the success of energy poverty alleviation initiatives and, in turn, support municipal service delivery in informal settlements in Cape Town.

1. INTRODUCTION

This paper focuses on urgent and pressing issues relating to energy access at a community level for urban informal settlements in South Africa. It problematises top-down decision-making processes and centralised energy infrastructure, such as grid-connected high mast lights, in addressing energy access challenges within urban informal settlements and explores how such technological interventions might miss vital opportunities to enhance energy justice outcomes at a community level. In contrast, the paper also presents an analysis of a decentralised solar public lighting socio-technical innovation to illuminate lessons of how renewable energy interventions might enhance municipal service delivery in urban informal settlements in South Africa. This is investigated within the wider context of municipal service delivery to marginalised households and communities in urban informal settlements and aims to demonstrate how renewable-energy based socio-technical innovations might help address these challenges, particularly concerning public lighting.

About 19%¹ of households in the City of Cape Town reside in urban informal dwellings, and roughly 60-55% of all informal dwellings are in informal settlements (City of Cape Town, 2021). Service delivery in these informal environments is challenging, amongst other things, due to a lack of governance at various service delivery levels, finances, and appropriate infrastructure to respond to community needs. One critical component of service delivery in informal settlements is public lighting, which is the focus of this paper within the broader context of municipal service delivery in informal settlements. Public lighting in informal settlements is necessary to provide safety for residents at night-time and improve access to essential community services such as communal water points and toilets; which are typically located on the outskirts of the informal settlements due to the lack of access routes caused by congestion of shacks in small land spaces (Tshabalala & Mxobo, 2014; Borofsky, 2022a). Public lighting, amongst other things, can also improve the vibrancy of the settlements and enjoyment of the outdoors after sunset and facilitate longer trading hours for informal traders (Gillard et al., n.d.; Smidt-Hart, 2019), thereby indirectly promoting economic growth and well-being of residents within municipalities.

The City of Cape Town provides public lighting through high mast lights in areas with limited access due to the high density of households in informal settlements. However, the case study of off-grid (solar-powered) public lighting at PJS found that the level of lighting from high mast light is insufficient because of the shadows they cast in the small pathways between the shacks (Borofsky, 2022b). Moreover, households outside the high mast light radius receive no public lighting (Borofsky, 2022a; City of Cape Town, 2022). Furthermore, due to the high level of vandalism and theft of municipal infrastructure, high mast lights are susceptible to vandalism, leaving residents in the dark for several days before the lights can be repaired (City of Cape Town, 2013, 2019; Smidt-Hart, 2019). In some instances, regular maintenance on high mast lights is limited because of the rapid growth of informal settlements where residents tend to build on land reserved to allow maintenance vehicles access to service points. The lack of illumination in informal settlements can create isolation within communities as well as unsafe and unattractive environments. This demonstrates that the prevailing, conventional approach to public lighting in informal settlements within the City of Cape Town requires reconsideration. Thus, socio-technical innovations like the one explored in the case study are well positioned to contribute to improved municipal service delivery.

This paper aims to contribute to the growing field of just transitions research, particularly from the vantage point of priorities of energy access and energy poverty alleviation within urban informal settlements. The rest of the paper is structured as follows; in section 1, the literature on just urban energy transitions, energy access and poverty, and energy justice are explored to position the case study exploration and situate emergent lessons and insights. Section 2 follows with an overview of the methodology, and after that, a discussion puts forward various emerging lessons necessary to consider as insights into the deployment of renewable energy initiatives in an informal settlement environment. These lessons are relevant for discussing South Africa's just energy transition because addressing energy access and poverty issues in the context of municipal service delivery for informal settlement residents is key in ensuring that the energy transition benefits are redistributed to marginalised communities/populations.

2. LITERATURE

This paper builds on a conceptual framework that links socio-technical energy transitions, community decision-making, energy poverty and participatory urban governance. The conceptual framework helps us understand the elements of governance and agency required by various stakeholders in implementing renewable energy initiatives in informal settings.

¹ 270 000 households living in informal dwellings and total number of households in Cape Town is 1.44 million. Approximate estimate based on 2020 mid-year population estimate using average household size as calculated from the 2016 community survey (Cape Town Human Settlements Strategy, 2021 pg. 17). Informal dwellings include backyarders and residents in informal settlements.

2.1 Just Urban Energy Transitions

One cannot look at the energy transition without understanding how technology interacts with the population in a given context. Thus, the socio-technical energy transitions acknowledge that the energy transition is about technological innovations, the users and how technology and innovations become embedded in society, community, or space (Sareen & Haarstad, 2018; Haque, Lemanski & de Groot, 2021).

Over 67% of South Africa's total population resides in cities (South African Cities Network, 2022). Thus, energy transitions have significant implications in cities, as high population growth and urbanisation is happening where energy access and poverty are prevalent today (Araújo, 2014). Likewise, urbanisation offers an important opportunity for energy transition interventions, as energy choices affect energy utilisation, and currently, high energy consumption occurs in cities.

To pursue a just energy transition, a collaboration of stakeholders such as government, civil society, and industry is vital in redistributing benefits to marginalised populations (Carley & Konisky, 2020). Thus, the energy transition should not simply be a matter of producing clean energy but also how much energy is produced, for whom, and to sustain what kind of life (Velicu & Barca, 2020). The just transition literature encourages a shared vision, inclusive planning and decision-making that involves all affected actors in a way tailored to local circumstances. Haque, Lemanski and de Groote (2021) argue that context matters and more attention is needed when investing in urban infrastructure because households and local communities are the bearers of the negative consequences of service delivery. Moreover, understanding the everyday life of households or communities helps explain patterns of everyday energy consumption and needs, which enable us to understand the issues that underpin the transitions in everyday life, thereby pointing to potential sites for facilitating just energy interventions (Köhler et al., 2019).

2.2 Energy Poverty and Access

The sub-Saharan Africa region lags the most in terms of access to electricity, accounting for three-quarters of people globally without electricity access (REN21, 2020). Compared to most countries in sub-Saharan Africa, South Africa has the highest electrification rate, yet about 40% of South Africans are energy-poor (Baker & Phillips, 2019). The lack of access to sustainable modern energy services and products is defined as energy poverty. Previous definitions of energy poverty in the global South focused on access to electricity, but it has since been broadened to include affordability and reliance on traditional fuels (Olawumi Israel-Akinbo, Snowball & Fraser, 2018). Access to modern energy is central to human development and is encapsulated in the SDGs (7,10, 11 and 13); this includes extending study hours for children, improving livelihood access, and improving air quality and information flows, contributing to three specific development outcomes: education, livelihoods, and health (Kumar, Höffken & Pols, 2021). Thus, the lack of access to energy is linked to the perpetuation of poverty and limits households' ability to meet the above-mentioned developmental goals (Mohlakoana & Wolpe, 2021).

Energy access to urban informal settlements in South Africa can be achieved through innovative approaches to delivering affordable, reliable, sustainable, and modern energy to the most impoverished (Kumar, Höffken & Pols, 2021). For example, distributed renewables for energy access play an increasingly significant role in delivering energy access in developing countries (REN21, 2020). Additionally, as part of the decarbonisation agenda, local communities are encouraged to implement and consume renewable energy from decentralised energy systems. Considering the literature on energy poverty and access, the following section will expand on the elements of justice required to

achieve equitable access to renewable energy for marginalised communities/ populations in the energy transition

2.3 Energy Justice: Community Decision-Making and Ownership

The energy justice literature is centred on the notion that all individuals should have access to affordable, safe and sustainable energy and be able to sustain a decent lifestyle, as well as participate in and lead energy decision-making processes, with the power to make a change (Carley & Konisky, 2020; Hillerbrand, Milchram & Schippl, 2021). This is important in addressing energy access and poverty alleviation in the energy transition. The energy justice literature features three main principles, namely 1) distributional justice, which means distributing benefits and burdens across populations; 2) procedural justice, which focuses on who is included in the decision-making processes and ensures that energy procedures are fair, equitable and inclusive of all who choose to participate; 3) recognition justice, which requires the understanding of historical and on-going inequalities and prescribing efforts to reconcile these inequalities; and 4) restorative justice, which advocates for using government or other interventions to either avoid distributional, recognitional or procedural injustices or correct them (Carley and Konisky, 2020). The just energy transitions signify recognition of these priorities alongside the decarbonisation agenda.

Energy initiatives that involve citizens from the onset have a higher success rate. They disrupt the top-down policy engagement, which has been noted as insufficient in engaging communities. At the core of defining energy, community is focusing on “shifting the benefits and governing powers to local communities” (Ambole et al., 2021: 2). Energy communities give communities more power in deciding and providing for their own energy needs, which further creates energy systems that are responsive and context-specific, like in PJS informal settlement. The literature on energy communities encourages more participative and democratic energy processes. Ambole et al. (2021), in their review of the energy communities literature in the global South, cite that the concept is most familiar in the global north due to its potential to shift energy systems to renewable energy sources. It is, however, less prevalent in the global South, with a few projects exhibiting conventional characteristics because local communities are often inadequately resourced to govern and manage their projects. Ambole et al. (2021) further mention that defining energy communities can be challenging, mainly because the definitions of community involvement in a project vary among the people involved. In most cases, the complexities of these energy challenges necessitate collaboration with other stakeholders outside of the settlement to leverage diverse expertise and resources.

3. METHODOLOGY

The paper focuses on a solar-powered public lighting case study implemented at the PJS informal settlement in Khayelitsha, Cape Town. It uses secondary research and trans-disciplinary methods, focusing on lessons learnt from the deployment of decentralised shack-mounted solar lights in PJS Informal Settlement to understand how the case study might surface how energy access and poverty initiatives can be implemented and sustained to upscale just energy interventions in informal settlements. The secondary information about the case study comes from information found on the SJC and City of Cape Town websites and a PhD thesis compiled by one of the students who partnered with the community to implement the project.

One of the authors gathered further information via her embedded researcher position as she is also an employee of the City of Cape Town’s Sustainable Energy Markets department. Thus, she is embedded in an institution involved in making policy changes around energy poverty and energy access, whilst the other two authors are experts in energy poverty and transitions research, allowing the authors opportunities to learn from each other, reflect and be part of practical resolutions for real-world issues (Fazey et al., 2018).

The solar-powered public lighting pilot case study builds on a campaign launched in 2016 by the Social Justice Coalition (SJC) called "effective public lighting" to improve public lighting in low-income areas (Social Justice Coalition, n.d.). The campaign emphasised the need for public lighting to improve safety in previously black townships. As part of their PhD studies, two students approached SJC to collaborate and link them with an informal settlement for a pilot project to showcase that alternative decentralised small-scale renewable energy infrastructure could offer better service quality than high mast lights (Borofsky, 2022a). The students' first interaction with PJS informal settlement was in February 2018. Community engagement and ownership were crucial elements for the success of the case study. It is evident in the case study analysis that the PJS community leaders played a vital role in the engagement process and were key enablers in implementing the aforementioned just energy intervention. They ensured collaboration within the community, mobilising community members to participate in the project and selecting local youth members to take part in economic opportunities that arose from installing the solar lights and community surveys (Borofsky, 2022b).

4. CONTEXT

4.1 South Africa's Energy Transition and Informal Settlements

South Africa's energy transition allows us to address social equity issues in low-income communities, such as lack of access to energy and energy poverty, which are prominent in the current energy system. Since local governments are closest to local communities, they must be concerned about solving energy poverty and access because of its interlinkage with other socio-economic issues such as poverty, wellbeing, livelihoods, health and access to basic services. Thus, addressing energy access challenges is essential in addressing inequality and poverty in our cities. More importantly, South Africa's energy transition allows us to reflect on local governments' existing governance structures, infrastructure and financial models for service delivery. These are useful to understand when seeking to alleviate energy poverty or implementing just energy interventions. The energy transition helps us reflect on whether these are suitable for allowing for a just energy transition or need to change (Parliamentary Liaison Office, 2018). South Africa's energy transition is linked to various urban energy issues mentioned above; thus, as the just transition discourse grows, there needs to be a stronger focus on the urban dimension and, particularly, urban informal settlements.

4.2 Life in Informal Settlements

"Life in informal settlement is not easy; there are many challenges. Nonetheless, we have seen that those who live there have no choice but to rise up to the challenge and take action to make life"
Ngwane, 2021b: 134).

Informal settlements in South Africa are highly contested spaces. In most cases, there is a struggle in pursuit of urban inclusion, caused mainly by inequalities between residents of the same city and the endeavour for basic services such as water and sanitation to be extended to the poor. Yiftachel (2009b:89) uses the concept of 'gray spaces' to describe informality by saying that it tends to lie in between "legality/approval/safety" full membership and the "darkness of eviction/ destruction/ death". In this sense, informal settlements are distinguishable from legal, planned settlements and tend to exist partially outside city plans. The implication for poor households is that finding a place to live and work in the city is a struggle, with legally registered and serviced land rarely available or affordable. Thus, members of poor households resort to spaces in informal settlements to meet immediate shelter needs. In most cases, the existence of such informal settlements is condemned and seen as chaotic and dangerous by many, including the prevailing notions of urban planning (Haque, Lemanski & de Groot, 2021). These unplanned urban zones and informal settlements mould a new form of urban segregation,

lacking certainty and basic services for the inhabitants to fully realise their urban inclusion (Yiftachel, 2009).

To paint a broad picture of how informal settlements are seen by their residents, Ngwane (2021a) indicates that, in most cases, informal settlements are named after historical events, the culture of the place, and the politics with which the residents identify. Whilst other names may describe the conditions in informal settlements, others indicate a vision of hope, for instance, Khayelitsha, which means "new home" (Ngxiza, 2012; Ngwane, 2021a).

The broader Khayelitsha, located 30 km from the Cape Town Central Business District, is dominated by informal settlements and low-cost housing (Tshabalala, 2020). Like many South African townships, it is characterised by underdevelopment and challenges such as poverty, unemployment and inadequate infrastructure (Ngxiza, 2012). The deliberate spatial segregation, resulting from apartheid planning, architecture and racial development strategy, created vast distances between Khayelitsha and areas of socio-economic opportunity (Knox, de Groot & Mohlakoana, 2018). Considering the context of many low-income areas in South Africa, just urban transitions, energy poverty and access, and energy justice are relevant and helpful for the SA context. The case study in PJS showcases how the challenges can be met through renewable energy initiatives.

4.3 Case Study: Wall Mounted Solar-Powered Public Lights PJS Informal Settlement

PJS informal settlement is in Khayelitsha, site B. PJS informal settlement is approximately 30 years old and is home to nearly 2,300 people (Borofsky, 2022a). Two PhD students implemented the pilot at PJS. The students had various meetings with the City of Cape Town department officials and councillors. They partnered with two local NGOs (SJC and VPPU) and a Cape Town-based lighting engineer who supplied and maintained the solar lights after installation.

Borofsky (2022a) selected the pilot site with the help of a local NGO, Social Justice Coalition (SJC), which provided a list of three informal settlements around Cape Town where they had contact with the leadership and that were not included in governmental plans for upgrading in the immediate future. After further investigation, PJS was considered a good site for the pilot because the size was manageable size to implement a pilot; the settlement was dense with dark pathways, and the community leaders were willing to work with the research team. The informal settlement has two high-mast lights on the perimeter of the settlement that is intended to provide light to neighbouring areas within a radius of about 100 meters of each light. It has been electrified with formal grid electricity.

The pilot consisted of four parts, a) household enumeration, b) mapping of the pathways in the settlement, c) installing motion sensors to analyse pedestrian activity in various pathways in the early morning and evening hours, and d) installation of solar-powered wall-mounted lights.

In March 2019, a household census was conducted in the informal settlement. Upon consultation with various stakeholders, including VPUU, an enumeration data collection tool was developed for household survey data collection carried out by field teams in the informal settlement. 763 household heads were surveyed, and 793 structures were counted - the remaining buildings were either empty, no one could be found at the time of the survey, or the building was only for non-residential purposes (e.g., church, childcare, etc.).

The researcher collaborated with residents on mapping the informal settlement, provided her architectural opinion about installation materials, and developed the sensor installation and data

collection plans. To introduce the sensors to the residents, the researcher held community meetings to describe the purpose and function of the sensors and address concerns. 122 PIR motion sensors were installed on paths to measure pedestrian frequency in September 2019. All the sensor data was collected with three local data collectors and a research assistant. In total, 78 sensors functioned for the entire study period.

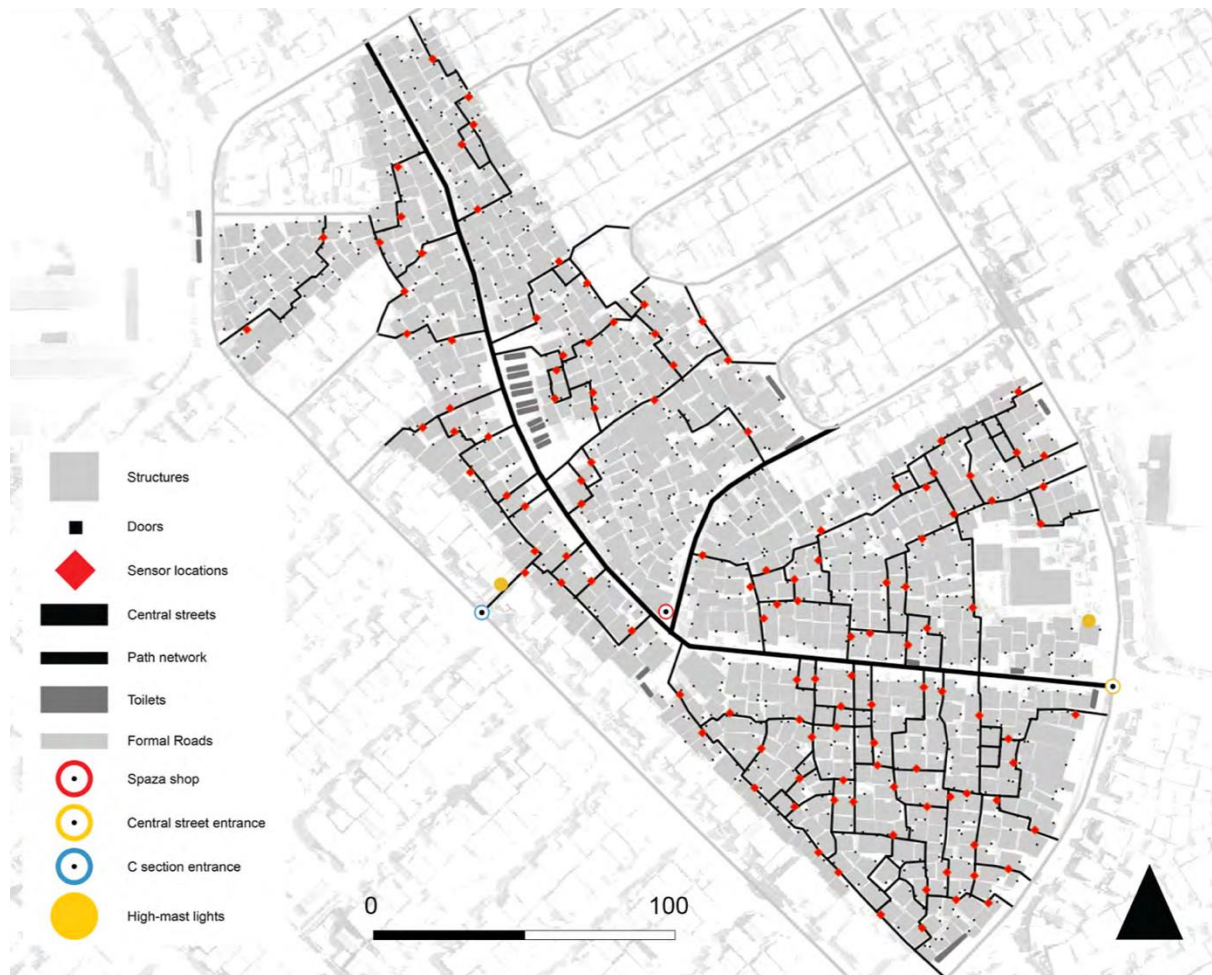


Figure 1. Path network map of the informal settlement

Map taken from (Borofsky, 2022a: 32) structures and path network mapped by authors in collaboration with two local leaders; High-mast lights: City of Cape Town Public Lighting, Open Data Portal, 2019; Base Map: Aerial Photo, City of Cape Town Open Data Portal, Feb 2018.

In September 2020, a community field team installed 281 solar-powered wall-mounted lights above or near the front door of dwellings on the selected treatment path segments and compounds such that the light beams into the public space (path or shared compound). Before installing the light, a field worker provided the household with a pamphlet containing information about the light and its purpose and then asked the homeowner for consent to install it.

Due to the density of this informal settlement, standard pole-mounted streetlights were not a viable option. The advantage of using wall-mounted lights is a) they can be installed low enough that the illumination reaches the ground; b) they provide lighting in public spaces while also lighting the private area in front of each home; c) household members can easily keep an eye on the lights to help ensure that they are safe from theft and vandalism. d) In addition, the advantage of a solar-powered light is

that it is not vulnerable to grid reliability problems, such as planned power outages, which are common due to load shedding. The light is a 10-watt outdoor solar light equipped with a larger battery to ensure it stays illuminated during all dark hours (except in extreme weather conditions) and fitted with resilient hardware to weather, vandalism, and theft. The light automatically turns on at sunset and off at sunrise. A 15-watt solar panel powers it with a fixed arm to secure the orientation angle and make theft more difficult. In addition, a laser-printed logo and the text, "Property of PJS informal settlement. Not for Resale", printed on the front glass. The logo also signals that the community owns and monitors the light.

These particular solar lights cost approximately US \$26, including shipping from China to South Africa. In addition, a hybrid maintenance model was tested by hiring a local community maintenance team managed by Cape Town-based lighting engineer to monitor and repair the lights.

5. DISCUSSION

5.1 The Success of Renewable Energy Based Socio-Technical Innovations

The PJS informal settlement case study showcases how energy systems (solar-powered lights) fulfil societal functions in a particular space (informal settlement) whilst simultaneously addressing equity concerns around energy poverty and access in the energy transition (Köhler et al., 2019; Newell, 2021). Conventional high mast lights do not solve issues relating to how citizens, particularly those in informal settlements, experience public lighting infrastructure. Thus, the success of the decentralised renewable energy-based socio-technical innovation in the case study was more effective for various reasons; a) that it offers a great example of how innovations such as wall-mounted solar PV lights such as those installed at the PJS informal settlement improve lighting quality in informal settlements b) it showcases the need to embrace new technologies and community involvement for municipalities to meet the needs of communities in informal urban communities c) it is an example of how renewable – energy based socio-technical innovations might support more successful, effective, impactful approaches to public lighting in other urban informal settlements and thus positively impact a critical component of municipal service delivery.

5.2 Participatory Urban Governance, Actors and Agency

Although local government in South Africa is mandated through the Municipal Systems Act of 2000 to carry out meaningful community participation, the engagement is limited and constrained in most cases (Haque, Lemanski & de Groot, 2021). Borofsky (2022a) mentions that the pilot project's success relied on the first engagement with the community leadership structure, whose members took her around and spoke about the challenges they faced in the settlement. The community leaders were critical in coordinating the pilot implementation and engaging with the rest of the community about the project. Their role also included selecting sub-groups of unemployed youth in the community to conduct the household survey, which served as the study's baseline and end line. Amongst the youth, a team was responsible for measuring the quality of light levels and mapping it throughout the settlement. Some were responsible for the installation and maintenance of the solar lights.

Haque, Lemanski and de Groot (2021) mention that informal settlements have a more comprehensive range of internal structures that operate outside state structures. Communities form committees independently of the state to represent the community's interest as a whole. Ngwane (2021a: 38) calls these stakeholders "people's committees" or "amakomiti" in isiZulu. Most have locally elected or nominated leaders who serve as intermediaries between residents and local government. Their roles typically include mobilising residents in infrastructure access and mediating internal disputes. Community leaders in informal settlements perform fluid roles, shifting between community activism, coordination, local administration and sometimes political representation (Haque, Lemanski & de Groot, 2021). Although there are some instances where committees have self-interest, in most cases, the

people's committees are said to be answerable to the community and expected to cater for the needs of everyone equally and fairly, even when resolving disputes between residents (Ngwane, 2021a). In PJS informal settlement, for example, the subcommittee's involvement in the pilot project revolved around the specific conditions and challenges they and their community face. Moreover, the residents' ability to actively organise to participate in committees through nomination or elections shows their agency in improving the conditions in which they reside.

As emphasised in the literature on energy communities (Ambole et al., 2021), community involvement is a significant part of service delivery. By involving the community in decision-making, the process empowers them to be in charge of their agency and change. An insight from the case study is that the involvement of low-income communities in projects such as PJS public lighting alternatives can change the face of governance. Community buying into a project and taking part in the ownership of the project can positively influence how communities prevent vandalism and protect valuable infrastructure.

Borofsky (2022a), in her study, demonstrates how community members can be involved in the decision-making process through the installation of solar-powered lights. Rauschmayer et al. (2018) mention that in pursuit of good governance, people must have a political voice, effective representation, and agency to act socially and politically, using their knowledge, capabilities and power. Furthermore, enhancing participatory governance requires the representation of people typically outside the political sphere to be valued, politically engaged and able to challenge the injustices they face effectively. In projects such as PJS, collective action, which is the involvement of a group of people carrying out everyday voluntary action to pursue shared interests, has a high potential to contribute to the agency and well-being of the community (Rauschmayer et al., 2018). The energy justice element, mainly procedural justice, was enhanced as the solar-powered public lighting socio-technical innovation gave rise to power dynamics due to the community's ability to participate fully in the project. This sort of participation is fundamentally different from participation in the implementation of conventional centralised high mast lighting energy systems, where the municipality and engineers may hold power. Therefore, implementing decentralised energy systems and enhancing governance systems that allow communities to have greater participation and decision-making roles is fundamental in achieving a just energy transition (Damgaard, McCauley & Long, 2017).

Collective decision-making can lead to socio-technical solutions that more closely respond to the needs and priorities of community members. The socio-technical intervention in this informal settlement was successful because of the involvement of intermediaries such as the students, NGOs and engineers who worked closely with community members for various tasks. Including the voices of the affected people ensures that the community's infrastructure needs and aspirations are taken into consideration and that communities can act on the information provided to them if it is free from politicised pressures and actors (Haque, Lemanski & de Groot, 2021).

The Case of PJS informal settlement suggests that community projects (renewable energy solutions) can be socially owned, not in the sense of ownership of the infrastructure, but in terms of creating community ownership through meaningful engagements and partnerships within or outside the community and drawing in the local municipalities to avoid failure or sustainability of the project. In South Africa's community-owned renewable projects, the characteristics of community ownership and benefits of such projects differ from the global north. Community ownership in the global north typically includes sharing profits and upfront investments. In South Africa, community ownership may refer to creating a sense of ownership that empowers the community to participate fully in the project (Renewable Energy Agency, 2020). Thus, enabling new community governance structures to implement renewable energy projects may not only lead to a sense of ownership but also enhance the success of energy poverty alleviation initiatives and, in turn, support municipal service delivery in informal settlements.

6. CONCLUSION

Renewable energy systems enable us to reflect on whether the current governance, infrastructure, and financial models allow for a just energy transition. Furthermore, the energy just transitions offer alternative energy technologies that address climate change issues and serve as a platform for addressing equity issues. The case study of the PJS informal settlement's solar-powered street light showcases that, similarly to other policies and interventions that deal with informality, local governments need to have people (intended beneficiaries) at the centre when designing energy policies and interventions.

This paper outlined that for South Africa to have a just energy transition, community governance is the key to the success of projects addressing community energy access. Widening access to public infrastructure requires investment in physical infrastructure and an effective governance process for low-income urban dwellers. Local governments are critical in delivering local Just Transitions. Together with various stakeholders, they hold essential local knowledge, have relationships with communities, and are essential in delivering services to their residents. Thus, local governments need to facilitate the involvement of communities in policy-making processes to ensure that their voices are heard. Local governments should strengthen their relationships with communities and enhance local knowledge through democratic and inclusive consultations to fully understand all citizens' needs. This improves the local government's capacity to deploy energy infrastructure that responds to community needs, lowers costs, and ensures citizens play an active role in implementing a just transition. The case study has revealed how good governance can enhance citizens' access to infrastructure, especially where the infrastructure is explicitly targeted to meet their needs. The case study has further revealed that focusing on urban environments of the energy transition is crucial and that the transition's justice element is especially relevant in urban informal settlements.

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