6

‘Candles are not bright enough’: inclusive urban energy transformations in spaces of urban inequality

Federico Caprotti, Jon Phillips, Saska Petrova, Stefan Bouzarovski, Stephen Essex, Jiska de Groot, Lucy Baker, Yachika Reddy and Peta Wolpe

Introduction: from voices to energy transformations

> The gangsters can rob us because there is no electricity and no one can see them coming. (SEA, 2016)
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> There is not sufficient light for our children to study at night – candles are not bright enough. (SEA, 2016)

These statements were made by people living in shacks in informal settlements in Cape Town, South Africa. These settlements are not serviced by the city authorities, with limited, unaffordable or in some cases no access to electricity or running water in each shack. A few shared toilets were provided, located a short distance away. Although the city authorities were seeking to rehouse some of these communities, the ever-present insecurity of potential relocation to new formal accommodation on the outskirts of the city, far from economic opportunities and serviced infrastructure (SEA, 2010), created a very precarious day-to-day existence.

Amid this context of marked and enduring socio-spatial and environmental-economic inequalities (explored more fully in the next section), there have been calls for a national transition away from carbon-intensive and inefficient energy practices. This call is due, in part, to the broader global policy-making context of concern about the impact of climate change, as well as worldwide development trends, such as those enshrined in the UN’s Sustainable Development Goals (SDGs), the New

Urban Agenda (Caprotti et al., 2017) and the 2030 Agenda for Sustainable Development. In part, there have been calls to reconfigure the national energy landscape in South Africa, including energy supply, energy mix and the legal and jurisdictional framework through which energy currently flows. This context leads us to argue that the move towards a new energy landscape cannot simply be described as a transition, but more accurately – in light of the need to involve multiple scales and actors, and to manage complex development outcomes – as a societal transformation.

However, while a low-carbon and energy-efficient transformation is crucial for the country, and many policies and strategies support a climate-friendly future, it is particularly important in the South African context to consider how such a transformation can be made inclusive. Many cities have developed climate and energy strategies, but many municipalities face significant financial, technical and socio-economic challenges in terms of mainstreaming climate responses into their planning and operations. The primary mandate of local government is to provide basic services for their citizens and, in particular, the poor. At the same time, the notion of a 'just' energy transition has been gaining increasing prominence in national climate and energy discourse in South Africa (Swilling et al., 2016), including as part of its nationally determined contribution on climate change (Government of South Africa, 2016). The concept of a 'just' transition points towards a sustainable future that places the needs of the poor and their communities as paramount to the attainment of such a future.

In light of these emerging and challenging agendas, this chapter first presents a brief overview of the electricity landscape in South Africa, followed by a discussion of the key issue of how to define and think about a just, fair and equitable energy transformation. The discussion then moves on to consider the theme of decentralisation in South Africa's energy landscape, before offering some concluding reflections, including a brief vision of how we might hope a just and energy-efficient city might look in South Africa in 2030. The chapter was co-written by scholars with multiple theoretical perspectives and backgrounds, and by practitioners at Sustainable Energy Africa (SEA), a Cape Town-based organisation centrally involved in promoting urban energy transformations that are both low carbon and equitable.

The quotes above encapsulate the experience of urbanisation in South Africa for many of the urban poor. South Africa was 66 per cent urbanised

in 2017, according to the World Bank (2018). This proportion is growing, as poor people move from rural areas to cities in search of employment and better opportunities. At least 10 per cent of South Africa's population (4.7 million people) reside in urban informal settlements, comprising more than 1.3 million households (Misselhorn, 2010). South Africa's nine largest cities alone are estimated to be home to 23 per cent of households deemed to be without adequate shelter. Nearly 50 per cent of South Africa's population are considered energy poor, on the basis that the poor spend more than 10 per cent of their household income on energy compared to 2–3 per cent for mid- to high-income households (DoE, 2012). Moreover, the poor spend a disproportionately high share of their income on transport relative to mid- and high-income households. Thus, inequality and poverty have become entrenched in South Africa, despite redistributive policies that include free basic electricity and a system of social grants.

At the end of apartheid in 1994 only 36 per cent of the population had access to electricity. While the newly elected democratic government in South Africa implemented a national housing and electrification programme, as a result of which the domestic household connection rate has risen to 88 per cent (DoE, 2014), the national commitment to provide universal and affordable access to electricity has not yet been achieved. Approximately 3 million houses have been built and delivered to the poor since 1994. In an attempt to address the massive housing backlog (a legacy of the previous oppressive apartheid regime), the decision of the new government was to build as many houses as swiftly as possible in a cost-effective manner. As a consequence, while many houses were built, they lacked important thermal insulation: many even lacked ceilings (Naicker et al., 2017; SEA, 2017). These homes were predominantly located in the urban periphery, where land was cheap. In turn, this house-building programme resulted in resource-inefficient cities, with the poor being located on the margins of cities far from economic opportunities and social resources (Reddy and Wolpe, 2014). This population continues to be burdened with high transport costs to access economic and social opportunities, which further deepens the poverty cycle. This situation has served to perpetuate the spatial inequality of apartheid, characterised by the sprawl of low-density 'white' suburbs in contrast to the concentrations of high-density 'black' areas (Wolpe et al., 2012). It is in this context of pressing need and complex governance, legal and infrastructural

sticking points that a sustainable energy transformation is seen as a necessity.

Energy transformations and South African cities

Realising low-carbon urban energy transformations is dependent upon a range of factors and preconditions beyond the availability and implementation of new technology and innovations. The generation and supply of energy is essential to continued economic growth, while the associated emissions lie at the core of debates about climate change. The associated aspiration for the transformation to be inclusive and 'just' within society adds another layer of complexity and tension to the process. In South Africa, the historical legacy of apartheid, political governance structures and capacity, the form and structure of urban areas, rural-to-urban in-migration and societal attitudes have a fundamental influence on the path that a low-carbon energy transformation might take.

Historically, South Africa's industrial policy has been dominated by the availability of cheap electricity, which was generated using the country's cheap and plentiful coal reserves to power the expansion of the mining and minerals-beneficiation industry. As a result, the country's 'minerals-energy complex' became dominant in protecting the requirement for, and monopoly of, cheap power coupled with cheap labour (Fine and Rustomjee, 1997). These interests became institutionalised by the state with the 1922 establishment of the state-owned electricity utility Escom (now Eskom). Eskom is 'the fulcrum on which the input of coal and outputs of cheap electricity turned', with large mining houses providing coal at one end and receiving electricity for the extraction and refining of commodities at the other (Baker et al., 2015).

Despite attempts to reform Eskom in line with global trends in electricity liberalisation in the 1990s and 2000s, Eskom continues to own the centralised transmission grid and holds majority control over the country's generation capacity, overseeing approximately 60 per cent of electricity distribution, with municipalities responsible for the rest. In 2005, as part of the continued focus on cheap coal-fired electricity for industry, Eskom's capacity expansion programme included two coal-fired power stations, Medupi and Kusile, which at 4,800 MW each will be the largest on the continent. Renewable energy had a minimal role in this programme, consisting only of the 1,352 MW Ingula pumped storage programme and the 100 MW Sere wind farm now funded by the World Bank.

Following important legislative changes to allow for the procurement of privately generated power, the Renewable Energy Independent Producer Procurement Programme was introduced in 2011. By the end of 2018, 6,422 MW had been procured from ninety-two utility-scale independent power producers (IPPs) and 99 MW from twenty small-scale IPPs (1–5 MW) under five bidding rounds. However, the programme's initial success in its early years was undermined by severe delays between 2015 and 2018, in large part due to strong political and ideological resistance by Eskom. Notably, Eskom refused to sign outstanding power purchase agreements (PPAs) from Round 4, arguing that it would make a loss from having to purchase energy from IPPs. It wasn't until April 2018, following the inauguration of President Cyril Ramaphosa, that the outstanding PPAs were signed. It is apparent that the institutional strength and accompanying inertia signified by Eskom represents a considerable barrier to the emergence of a low-carbon energy transformation in South Africa. By 2019, the failure to control mounting debts at Eskom raised the prospect of imminent restructuring and a redistribution of responsibilities among the national institutions that govern energy. How this process is directed and controlled will be highly significant in opening up or closing down pathways of energy transformation.

A further constraint on the emergence of a low-carbon energy transformation in South Africa is the way in which electricity is distributed. Municipalities are responsible for just over 40 per cent of electricity distribution in South Africa and supply about two-thirds of the country's customers, buying electricity in bulk from Eskom at wholesale prices, which they then mark up and sell on to the end user. Municipal distributors are dominated by the country's eight large metropolitan distributors, who reap significant profits from their on-selling of electricity, which they use to cross-subsidise electricity for the poor and municipal rates for services such as waste collection and roads (Baker et al., 2015).

This arrangement originated from the end of apartheid in 1994, when municipalities were given a role as 'developmental local government'. The vision of the ruling party, the African National Congress (ANC), was to rebuild the country's economy while bridging the gap between the rich and poor (Mohlakoana, 2014). Electricity was central to this vision because it was perceived as a convenient, modern networked infrastructure with the potential to create business opportunities as well as reduce the negative health effects of indoor air pollution from traditional energy sources. Local government was perceived as being the closest to the people and

so was considered to be best placed to implement subsidised rights-based service access. After some political 'horse-trading' in establishing the post-apartheid state, municipalities secured an electricity distribution function (Palmer et al., 2017: 30–3). According to the National Treasury (2016, cited in Palmer et al., 2017: 200), surpluses on electricity distribution are typically about 5–10 per cent of the budgets of the large metropolitan distributors. At the end of 2018, municipalities were not yet permitted to procure their own electricity, with the exception of generation for own consumption in their own buildings or on their estate.

To achieve universal access to modern energy services in South Africa, two key pro-poor measures were introduced. First, the state's Free Basic Electricity Tariff of 50 KWh per month was introduced in 2003. The scheme is partly funded by the Local Government Equitable Share Grant from the National Treasury and, in the case of shortfalls, partly by surpluses generated by the municipalities' sale of electricity (including for Eskom service areas within urban centres, who refuse to provide these pro-poor subsidies). Second, the distribution of electricity to low-income households by municipalities is also subsidised through an 'Inclining Block Tariff System', whereby charges increase with consumption. This system means that users with higher consumption rates are charged at a higher rate and in turn facilitate cross-subsidisation for low-income consumers who are charged at the lower rates. The higher charges for high consumption are also intended to promote energy conservation. Although the adequacy of these schemes is heavily criticised, they are only made possible by cross-subsidisation from the resale of Eskom electricity generation.

Therefore, any challenge to this funding model, such as reduced consumption because of higher electricity prices, energy efficiency initiatives or distributed renewable energy generation by private residential customers (small-scale embedded generation), increases the financial vulnerability of municipalities and their ability to deliver pro-poor programmes. Paradoxically perhaps, the promotion of some policies to reduce energy demand threaten the potential of municipalities to fund redistributive policies and remain as viable concerns. This situation places municipalities in an awkward role as drivers of low-carbon energy transformations, irrespective of their variable capacity to delivery low-carbon initiatives (Baker and Phillips, 2019). Thus, reform at the municipal level, as well as the enablement of spaces of innovation and practice around sustainability (Barnes et al., 2018), appears to be an essential prerequisite for energy transformation.

Another important barrier to the implementation of a low-carbon energy transformation is the structure of most South African cities. As mentioned above, the spatial structure of cities was inherited from the apartheid era. Many South Africans were displaced during apartheid based on the racial composition defined for every residential area by the Group Areas Act of 1950 (Field, 2001). This legislation resulted in racially segregated neighbourhoods, designated as 'White, Black, Indian and Coloured' (Crankshaw et al., 2000; Lemanski, 2009; Turok, 2014). Apart from the White areas, neighbourhoods were usually located at the urban periphery in so-called 'townships' or, for rural areas, 'homelands'. These settlements were characterised by little or no service provision by municipalities, were generally outside areas with economic opportunities and were poorly connected by public transport (Knox et al., 2017). While electrification has extended access to modern energy services, some areas remain unconnected or inhabitants do not have the ability to pay for the electricity supplied. In these cases, illegal connections and/or the continued use of traditional fuels thwart universal energy access, let alone a managed low-carbon energy transformation.

The expansion of informal settlements at the edge of most South African cities represents an additional significant challenge. In Cape Town, over 39 per cent of the population growth between 2001 and 2011 comprised new arrivals from outside the Western Cape (City of Cape Town, 2014). The provision of public services for such migrants on private land is problematic because of property ownership and because the land has usually not been zoned for such uses in terms of the city's spatial planning framework. The unpredictability of in-migration flows and locations for informal settlements makes forward planning almost impossible. Nevertheless, informal settlements have become a permanent feature of South African cities, which points to the need to integrate energy planning with spatial planning to achieve any low-carbon energy transformation.

Distributed generation is, theoretically at least, well suited to the sprawling and informal nature of much of South Africa's urbanisation. Renewable energy technologies have the potential to generate electrical power for households which are often located in informal settlements or rural areas. Indeed, international donor-funded schemes for the generation of renewable energy in informal areas have had some (small-scale) impact. There are, nevertheless, considerable limitations to the decentralised use of renewables on a larger scale. Buildings in informal settlements, often no more than shacks, do not necessarily have the required space or are

not capable of bearing the weight of a solar panel of sufficient size to generate a worthwhile amount of electricity. Solar home systems, for example, consist of a compact solar panel which can be installed on the roof, but small systems are only sufficient to power a light, television and heater for a few hours per day. Larger panels can also be mounted on poles, but these are subject to the risks of theft and wind damage. However, the infrastructural development required for energy access to 'temporary' informal settlements on undeclared land is not legally permitted, because ultimately informal settlements can be cleared by the municipality.

The transformation of urban form is being attempted in some South African cities to facilitate a low-carbon transformation through applying the principles of the compact city, densification and transit-oriented development. The reconstruction and remodelling of townships and informal settlements creates opportunities for energy efficiency. In Cape Town, the city's 2012 Spatial Development Framework and its 2013 Integrated Transport Plan have provided a coordinated approach to densification along the main transport corridors. For example, the densification of the Voortrekker Road Corridor – from a residential density of fifteen to twenty dwelling units per hectare at present to seventy-five dwelling units per hectare by 2034 – might achieve a 50 per cent reduction in energy and carbon emissions compared with the continued sprawling scenario (SEA, 2014). However, high-density housing options are not desirable within South African society as they are typically associated with public housing and the hostels provided for black South Africans during apartheid. Freestanding houses with their 'own' plot represent both a traditional and contemporary cultural living aspiration, which people had been denied during the apartheid era (Mbatha and Mchunu, 2016). The 'one house, one plot' approach of government housing schemes is at odds with the development objectives of accessibility and compact cities (Rode et al., 2014), increases the cost of energy provision and infrastructure, and can contribute to energy vulnerability in these areas of mobility (Knox et al., 2017). At the same time, private development applications have been received for new satellite towns, such as WesCape in Cape Town, which offer a utopian, but inequitable, alternative for those who can afford the exclusive nature of these new urban forms (Cirolia, 2014). These new models of urban form present a challenge to entrenched societal attitudes, aspirations and expectations.

While the contextual discussion above has outlined some of the key ways in which South Africa's energy and urban landscapes interact in

inequitable ways, there have been calls to make certain that any societal transformation is just and equitable, and to ensure positive outcomes for the poor and socio-economically marginalised. The next section turns to examine what a 'just' transformation may mean in this context, and highlights some of the main complexities and issues involved in thinking about, and planning for, a 'just' transformation.

Conceptual considerations

In recent years, 'just transition' has emerged as one of the key conceptual framings with which to capture the relationship between energy sector reconfigurations and social justice. Originally a term used to discuss the job losses associated with the movement away from fossil fuels (McCauley and Heffron, 2018), there has recently been an effort to employ it as a wider explanatory approach to unravel the systemic mechanisms via which social inequalities are reproduced (or transformed) as a result of sustainable development objectives. A key departure point for just transition debates has been the burgeoning body of energy justice scholarship, with its multi-faceted treatment of issues of affordability, access, security and reliability of supply, and the integration of democratic and representative processes, as well as its emphasis on the recognition of vulnerable populations (Goddard and Farrelly, 2018). Some of these tenets are also contained in the 'transitions management' approach which argues that socio-technical change and innovation in the energy sector can be steered and governed by acknowledging the roles of relevant actors in system transformations, and by paying attention to the pathways of knowledge and learning implicated in these processes (Avelino and Grin, 2017; Frantzeskaki et al., 2012; Markard et al., 2012).

Transition management and energy justice have, however, been criticised for failing to incorporate the power dynamics and political processes associated with socio-technical shifts. Starting from the need to overcome these lacunae, Goddard and Farrelly (2018) have developed the just transitions debate in the direction of articulating the 'political sensitivity of the energy justice field' and overcoming the traditional 'jobs v. environment' dilemma. A case study of Queensland's effort to move towards renewable systems of energy production identifies structural challenges such as the lack of bipartisan support in governing transitions, the absence of clear management approaches guided by long-term visions, as well as the reluctance of unions and communities to engage with wider narratives

of change. The embodiment of principles of energy justice in addressing these barriers, argue Goddard and Farrelly (2018), can provide 'democratic legitimacy' to efforts to bring about accelerated change in the energy sector, and turn adversarial actors into advocates.

McCauley and Heffron (2018) define 'just transitions' as a way of moving towards post-carbon scenarios in ways that are both fair and equitable. Moving the debate beyond traditional concerns around jobs and resources, they develop an explicit focus on inequality-inducing dynamics throughout the energy chain. In this line of thinking, a three-pronged approach towards justice (focusing on its distributional, procedural and restorative aspects) allows for understanding how individuals and communities are affected by shifts in how energy is consumed and transported, where energy infrastructure is cited, and the kinds of compensation mechanisms that can help ameliorate and restore the 'harms' resulting from energy-related shifts. In this approach, they position the just transition concept 'beyond its original strategic purpose' so as to unite 'climate, energy and environmental justice scholarships' (McCaulay and Hefron, 2018: 5) through a global ethic of care.

Affecting an 'energy transition with due attention to social justice in an unequal world' (Jasanoff, 2018: 11) is a central concern in a recent exploration of the ethical conundrums associated with imaginations and enactments of energy futures. Jasanoff argues in favour of a proactive and reflective environmental policy to create a more robust base of knowledge and technologies for transformative action. This response is predicated upon an 'inclusive politics' of technological transformation, attentive to 'issues of local capacity, whether in the form of social institutions, technical know-how or more material supports' (Jasanoff, 2018: 12). This calls for the development of new 'technologies of humility' (Jasanoff, 2018: 14) in science and policy, recognising the importance of communal practices and norms, the influence of history and culture, normative concerns to energy policy deliberations, and the design of new participatory strategies.

A further point highlighted by several scholars (Jaglin and Verdeil, 2017; Rutherford and Coutard, 2014) is that infrastructural formations are capable of driving processes of exclusion and marginalisation, often as a result of liberalisation and privatisation policies. In this context, Bouzarovski et al. (2017: 37) highlight how 'transitions create displacements that are reflected within multiple spatial scales, temporal horizons and thematic areas of activity'. The corollary is that any resultant vulnerabilities need to be considered as phenomena that are distributed throughout the

'energy chain' (Chapman, 1989) as opposed to being concentrated in particular aspects of production or consumption. Furthermore, it becomes necessary to 're-think the conceptual assumptions that inform sustainability transitions frameworks, by considering the material and infrastructural characteristics of place and space as contingencies that deserve customised conceptual attention' (Bouzarovski et al., 2017: 37). The next section tackles these questions by attempting to ground debates around just energy transitions in the specific context of the South African urban and energy landscapes.

Technological decentralisation in South Africa: (some) people's power?

In academic and policy debates, visions of inclusive or 'just' energy transitions often invoke principles of technological and political decentralisation (Bulkeley et al., 2013). If technological transformation is to become more attuned to local capacities – as Jasanoff (2018) suggests – then some form of decentralisation would seem to be necessary and desirable for a just energy transformation. Technological decentralisation can imply reorganisation of the highly centralised infrastructure by which energy is produced, distributed and consumed, while calls for political decentralisation typically seek to ensure a meaningful voice for citizens or local institutions in decision-making. For many urban policymakers and practitioners, the 'trilemma' of energy security, equity and environmental sustainability (Heffron et al., 2015) demands a greater role for local governments that are hampered by restrictive national policies and centralised infrastructures that limit the scope for responsive energy policy. In many ways, South Africa's metropolitan municipalities fit the popular narrative of cities driving climate change action and energy innovation 'from below' (Moloney and Horne, 2015). However, where residents, businesses and municipalities have embraced renewable energy, questions of justice arise between low-carbon and equitable energy transformations that require explicit attention to the politics of producing and resolving the injustices of energy transformation (cf. Goddard and Farrelly, 2018).To explore the complexities of what an inclusive energy transformation looks like, it is instructive to consider the relationship between technological and political decentralisation.

In recent years, the centralised infrastructure and governance of electricity has become threatened by so-called 'disruptive technologies'. In the

case of South Africa, the term 'embedded generation' generally refers to rooftop or ground-mounted solar panels that connect directly to the distribution grid. It may involve a shopping mall reducing its electricity bills by installing solar panels, or a household motivated by power outages to install solar power as a backup for an unreliable grid supply. The technologies and processes involved in decentralisation are often celebrated as disruptive innovations, notwithstanding prominent failures (Caprotti, 2017; Knuth, 2018). In South Africa, this kind of technological disruption could indeed be cause for celebration: a bottom-up, demand-driven, consumer push for decentralised renewable energy that challenges the monopoly of Eskom, the vertically integrated electricity utility that is heavily invested in coal power and has proved resistant to renewable energy policies and procurement (Baker and Phillips, 2019). Where it is explicitly sanctioned by municipal governments, embedded generation might also provide a case of local government making in-roads against national government inertia.

Yet, as explored by Baker and Phillips (2019), embedded generation has the potential to entrench racial and socio-economic inequalities in South Africa. As introduced above, distributed solar power reduces the electricity revenue that municipalities collect from high-income consumers, revenues which are used to cross-subsidise energy for the poor and fund public services. During the transition from apartheid to democracy, South Africa underwent a significant process of political decentralisation, in which local governments were given the constitutional responsibility for delivering basic services such as water and electricity. However, changes to the financing of municipal service provision saw the reduction of revenue transfers from national to local government and the adoption of principles of full cost-recovery in the financing of basic services (Wolpe and Reddy, 2016: 19). While the generation of electricity and the planning of energy policy remained highly centralised, municipalities became more reliant on revenues from the sale of electricity to fund their budgets. As such, rooftop solar panel installations by commercial and industrial consumers and to a lesser extent, wealthy residents, may threaten the very financial survival of local government.

Embedded generation provides a characteristic example of trade-offs between low-carbon and equitable energy transformation. Since embedded generation threatens municipal revenue, it has provoked a concerted institutional response to technological change. For the managers

of electricity in South Africa's largest cities, it requires nothing short of reformulating the 'business model' of municipal government to ensure that they are able to survive and thrive through a coming transformation. In the case of South Africa, the relationship between technological and political decentralisation raises a series of important questions for an inclusive energy transformation. These include how 'the generation of renewable energy by and for the wealthy does not take place at the cost of service provision for the poor' (Baker and Phillips, 2019: 179) and how public institutions should operate policy levers and manage incentives. It also reiterates the importance of analytical principles, such as the myopia of studying (energy) poverty in isolation from (energy) abundance.

Yet this framing of technological decentralisation provides a partial picture of an urban energy transformation, framed by the view from municipal finance. A brief example demonstrates the silences that are generated from this inevitably partial view. When expanding upon the details of a policy document during an interview in 2018, a representative of local government explained the democratisation of energy in terms of citizens co-owning assets and scaling up community involvement in energy generation. It is a vision of energy transformation with significant social and political changes, but in which democratisation is conflated with liberalisation and market participation:

> Democratisation is linked to *customer centricity*. For example, a customer should have the *liberty* to generate their own electricity for their own use, in the way that they want, and they should have the ability *to sell* whatever they are not using to the grid. So it's mainly about opening up the market. Everyone has a role to play. There is no use in keeping people imprisoned by legislation, and stifling *innovation*. So when we focus on democratisation we are focusing on *opening up the entire market*. (Interview with representative of local government, 2018: emphasis added)

In contrast, some activists locate the potential for democratic control of energy squarely at the local scale by arguing for participatory democracy and community management of energy infrastructure, which arguably promotes a similarly liberal (if not individualised) vision of an inclusive energy transformation and those responsible for realising it. Alongside analysis of who wins and who loses from technological changes such as embedded generation, considering who defines the vision of what inclusive

energy looks like (including the relationships between infrastructural and political decentralisation, or between state and citizen) has profound implications for how plural energy futures unfold, or do not.

Discussion and conclusion: identifying and moving towards inclusive energy transformations

We want to offer, here, concluding reflections on what an inclusive energy transformation might look like. Based on our discussion above, the following tackles this topic through three interrelated angles. First, we offer some thoughts on a conceptual and theoretical approach to just energy transformations. Following that, we offer a brief snapshot of what this may mean in reality for the South African city. Finally, we discuss what the just and energy-efficient city may actually mean in terms of the transformations needed in South Africa.

Theoretical perspectives

How might we approach (from a theoretical standpoint) the normative question of building a socially inclusive energy transformation? First, the literature on the subject emphasises the importance of including all relevant actors in decision-making processes through appropriate dynamics of recognition and consultation. As argued by Bouzarovski (2014), this process brings to the fore the kinds of populations that are recognised as worthy of support, and the procedures through which households and communities can access assistance. Of no less importance in this context is the mobilisation of planning frameworks so as to ensure that some of the broader injustices around energy restructuring processes can be dealt with in a systematic and comprehensive manner, alongside fiscal policies to support the low-carbon transformation. This more equitable approach can entail measures such as supporting neighbourhoods, cities and regions to address energy injustices via the development of affordable and locally sourced low-carbon energy, ensuring the pooling of household resources via various informal or formal networks so as to reduce individual energy needs, formulating regulatory processes and practices that can support fuel/supplier switching and facilitate energy efficiency investment and the implementing of information campaigns and area-based policies (while building the capacity of community organisations and local authorities) in order to address retrofits in 'hard-to-treat' properties. Nonetheless, it is important to remain conscious of the very real practical obstacles and

hurdles encountered (in both less affluent and affluent countries) in attempting to stimulate this kind of transformation.

Second, the distributional aspects of energy use are central to any to efforts to move towards a low-carbon future. As argued by Bouzarovski (2014), the broad consensus in the literature is that taxes on carbon (and energy) are generally regressive – as are, in principle, all fiscal instruments of this type targeting consumption. The fact that lower-income households have greater energy expenditure burdens than those with higher incomes means that a carbon tax is expected to have a negative impact on the distribution of income (despite the issue above, with energy burdens being lower among the poorest households). Overall, however, the distributional impacts of carbon levies are highly dependent on issues such as household size, location and the nature of consumption, rather than income (Dresner and Ekins, 2006; Gough, 2013). Depending on the method used, a carbon tax may be shown to have almost no regressive impacts at all (Tiezzi, 2005).

Third, it is important to think beyond conventional approaches of transitions and justice, because they may suffer from the limitations of transition and justice framings themselves (Bridge et al., 2013; Newell and Mulvaney, 2013; Velicu and Kaika, 2017). As a partial alternative, energy precarity thinking (Petrova, 2018a) offers novel insights into the political and spatial dynamics upon which vulnerabilities are predicated and performed. It is also evident that the nexus of justice and energy transitions needs to incorporate inequalities arising throughout the pathways involved in delivering a variety of socio-technical services to households (Petrova, 2018b; Walker and Cass, 2007). This perspective necessarily extends the field of inquiry beyond traditional north–south divides, and on to a wider variety of energy use and production modalities, as well as enlarging the area of inquiry to include themes such as geopolitics (Caprotti, 2015), gender (Pearl-Martinez and Stephens, 2016), intergenerational aspects of transition, and other important issues.

Fourth, it is key to interrogate critically the ways in which concepts of justice and equity are used in advocating specific transformational trajectories. This analysis is key in the context of South Africa, where societal transformation has been an enduring reality: the complex and shifting post-apartheid socio-political landscape is an example of transformation in process. For example, Farmbry (2014: 528) points out how a key transformational moment was the development and application of the South African constitution from 1994: this was 'a transformative

constitution, with a goal of building the nation as one with opposing norms than its predecessor and with a set of articulated goals around how a new South Africa might be better than the old'. Ensuring a transformation towards a 'just' energy landscape therefore means not simply establishing technical and political aims and (at times vague) recourse to simplistic notions of justice and fairness, but engagement with the realities of how specific visions of justice can be reified (Farmbry, 2014) throughout civil society in South Africa.

2030 snapshot: a just and energy-efficient city?

Conceptualising energy transformations is a foundational requirement for identifying transformational pathways and for elaborating political and economic strategies. Nonetheless, we have found that it is also key to think about the grounded, material question of what the characteristics of such a transformation may actually look like.

Looking ahead to 2030, what would we imagine an inclusive energy transformation to manifest as, in the South African context? We offer this brief snapshot, which is not meant to be exhaustive:

- Everyone will have access to a reliable, affordable and safe supply of electricity.
- Everyone will have access to an energy-efficient, reliable and affordable public transport system.
- People will live in thermally efficient homes close to the job opportunities and social resources that cities have to offer.
- People will be actively engaged in decision-making around important social developments in the communities in which they live.
- There will be true, affordable, universal basic service coverage for all urban dwellers.

We recognise that these points represent one articulation of an ideal destination for transformational pathways. We also recognise that they raise more questions than can be answered here. For example, when considering the need for public transport, it is key to define 'public' transport in a 2030 South African city as compared to understandings of public transport systems in the country today. Questions about whose visions are included in transformational plans and pathways, and whose are crowded out or silenced, also need to be answered – and nowhere more so than in a country still grappling with a shifting post-apartheid landscape.

Nonetheless, we list these points as markers, or broad performance aims, of transformational strategies. The reality may be one of underperformance, but without a transformational ambition, any desire for social, technical and political change is likely to be vague and short-lived.

Challenges to inclusive energy transformations

Before the above snapshot can be achieved, several key challenges need to be addressed. These are summarised below, and may be usefully thought of as pointing towards the establishment of a broad 'roadmap' that is essential for thinking about transformational trajectories and realms of possibility and practicality.

Firstly, cities, as well as the different spheres of government, will need to work cohesively and in unison. Multi-level governance, strong leadership, cooperation and innovation will need to be at the core of this endeavour. The 1996 Constitution of South Africa stated very clearly that the three spheres of government (national, provincial and local government), while having their own independent mandates, should work together in cooperation and align their functions. This cooperation has not happened (for many reasons), as is clearly demonstrated when examining case studies within cities. There are overlaps in mandates, and regulations do not always make desired transformations possible.

Secondly, an inclusive energy transformation requires a radical change in current practices and thinking if the intended levels of transformation by 2030 (as imagined above) are to be reached. South Africa would need to consider a new picture and new ways of understanding and approaching development. To some extent, a change towards sustainable energy is happening. However, to achieve the desired scale of change, it is clear that this needs to be undertaken in a manner that addresses poverty, unemployment and inequality: the triple challenges facing South Africa. Many of the systems currently in place (such as procurement processes, regulations, vested interests and institutional support) have tended to resist the level of change needed. Planning and investment decisions made today will shape South African communities, and the economy, well into the next several decades.

Some municipalities have already been able to work towards transformations from the bottom up, signifying pioneering change from the local level, with national government taking heed and direction from the local level to develop support in this regard. For example, the city of Johannesburg

implemented a small electricity levy that helped to finance the installation of over 80,000 solar water heaters for low-income houses, thus providing these houses with affordable access to hot water. Some cities have embarked on widespread electrification of informal settlements using the maypole method of electrification, which has been very successful.[1] The city of Cape Town, in considering the best way to achieve its climate objectives and address poverty, has developed a system that attempts to align its various departments. While many officials trying to tackle climate change as well as service delivery claim that there is need for greater political support and decision-making, the examples of implementation taking place are already leveraging influence in this arena.

In conclusion, while challenges to an inclusive energy transformation persist, there is clear evidence of good work happening within cities, and communities themselves are increasingly demanding that their voice be heard. Much still needs to change at different scales of governance, including, for example, in how mandates and regulations are interpreted and perceived, how finances flow to the local sphere, how investment can be enhanced, how decisions are made and how information is made available. Engaging with communities and learning by doing are key to successful transformations in South Africa. This collaborative approach will pave the way for coordinated urban development and good urban governance, and ultimately to an inclusive and equitable energy future. This is the outcome that the communities want: candle-lit dinners for a special occasion, safe lighting for all their energy needs and, above all, better-quality lives.

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Note

1 The 'maypole' method of connecting an informal house to electricity is amongst the most cost-efficient technology choices, as service connections to households are simple and effective. Maypoles provide enough elevation to connect up to twenty-seven households, as they can accommodate up to three pole boxes with nine connection points each, but one or two nine-way boxes are usually adequate (Gaunt et al., 2012).

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