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Owning the just transition: comparing citizen participation in South African and German wind farms

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ABSTRACT

The global effort to reduce carbon emissions, driven by industrialised countries in the north is increasingly perceived as an unfair imposition by countries in the south. Wind turbine technology importantly contributes to the energy transition and its introduction has produced new players in energy systems, for instance through financial citizen participation in wind farms. The shape and degree of citizen participation is geographically variegated even within countries. Taking a multi-scalar perspective inspired by institutional theory, we explore the micro, meso and macro institutional and regulatory frameworks perceived as supportive or restrictive in the development of citizen participation in Germany and South Africa. Our findings highlight the importance of citizens' ability and will to create legal structures for inclusive collective action and their ability to access affordable investment capital through local banks and other financing arrangements. Under the right institutional conditions decentralised energy systems, such as small-scale wind farms, provide an opportunity for fostering emotive and economic ownership by citizens in the global north and south alike.

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Introduction

The global north and global south are increasingly at odds with one another regarding climate change and the just transition, the latter being about distributive, participatory and restitutive justice. While the global south is increasingly contributing to carbon emissions as these countries develop (Fuhr, 2021), popular discourse is blaming the global north as being the historical and major contributor to global warming, yet the sense is that the global south is disproportionately paying the price (for examples, see Adow, 2020; Bassey, 2018; Obeng-Odoom, 2021).

Assessments of energy transitions around the world in terms of their achievements for citizens are bleak (for examples, see Brunet et al., 2021; Golubchikov & O'Sullivan, 2020; Kanger & Sovacool, 2022; Sareen, 2021; Sovacool, 2021). For instance, Sovacool (2021) in his expert-guided review of 332 case studies from across the globe and across a

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variety of renewable and climate change mitigation technologies identifies four distinct processes of injustice: economic enclosure, for example, privatisation and land grabbing; political exclusion, often of local stakeholders; ecological encroachment and social entrenchment, for example, discrimination against indigenous populations and women, modern slavery and murder. Nevertheless, he asserts that energy policies and projects with more proactive efforts should enable a 'fairer, more equitable, and more just' global energy future (p. 2).

In fact, research on community renewable energy projects has shown that citizen participation can have a variety of positive outcomes. Ebers Broughel and Hample (2018) identify a few: financial returns (Salm et al., 2016), fostering local economic development as well as communal values such as self-determination, self-sufficiency and solidarity through the empowering process of local engagement, job creation and the prospect of making a positive environmental impact (Walker, 2008); as well as the motivation of more positive attitudes towards wind turbines (Musall & Kuik, 2011).

Within the literature and in practice definitions of 'community energy' vary (Walker et al., 2010). They can include direct and indirect participation (Holstenkamp & Degenhart, 2013) and ownership by citizens with more exclusive benefits for direct participants in the former and more widespread benefits for the community in the latter (Walker, 2008), but also municipal actors and public-private partnerships with utilities (Walker et al., 2010). Walker et al.'s research has shown that the term at times may be used by developers as a rhetorical device to gain communal support in situations where in fact community benefits stayed disappointingly limited in the perception of members of the community.

While some authors emphasise 'community energy' as a construct that involves actors that are local to a specific energy project (e.g. Heldeweg & Saintier, 2020), others use the term to describe direct citizen participation at national scale (e.g. Salm et al., 2016). Some define community energy in a more fine-grained manner. For instance, Wiersma and Devine-Wright (2014, p. 458) define the community energy sector as local voluntary groups and 'grassroots initiatives' distinct from local third sector professional organisations. Somewhat simpler, Walker (2008) coined the distinction between 'communities of locality' – constituted by local individuals and 'communities of interest' – constituted by geographically spread individuals with shared interests.

Furthermore, Walker and Devine-Wright (2008 in Musall & Kuik, 2011) distinguish between two dimensions along which projects can be assessed: (1) who benefits from the outcomes? And (2) who is involved in the development and running of projects? These questions refer to two key aspects of social justice that are at the core of the Just Transition debate: distributive justice and procedural justice. A third dimension that complements these is the one of restitutive justice: (3) How are those who are negatively impacted by energy projects compensated? (See for example Fathoni et al., 2021).

Renewable energy technology has facilitated community energy and the decentralisation of energy systems. While the more technical literature refers to decentralisation as increased deployment of autonomous energy systems that are not connected to the regional or national electricity grid and provide energy to local prosumers, the social science literature, including financial, political and social dimensions, also considers the greater potential for social justice of decentralised ownership and management of grid connected energy systems (Watson & Devine-Wright, 2011). Some go as far as linking it to 'energy democratisation' (Heldeweg & Saintier, 2020, pp. 2–3; Fathoni et al., 2021).

But citizen participation in energy projects is far from being an automatically accessible and inclusive process (as shown for instance by Martinez-Lugo's, 2020 study of Latinex communities in Tucson/Arizona and Fathoni et al.'s, 2021 study of community-based renewables projects from Suma Island in Eastern Indonesia). Instead, as Sovacool (2021, p. 13) writes: 'Low-carbon transitions and climate mitigation efforts can be viewed as power struggles and processes of exacerbating vulnerability. … Climate mitigation creates a fulcrum for elitism, discrimination and the consolidation of wealth'. This can also happen in the context of 'community energy'. Consequently, Fathoni et al. warn against 'romanticising the notion of "community" in community-based energy as inherently good' (p.2). Community and capitalism are 'joint at the hip' (Brodkin, 2005, p. 307 on Joseph's seminal 2002 book 'Against the Romance of Community') meaning that communities 'are produced by struggle and in relationship to a wider structure of capitalism … ' and 'the dynamic outcome of struggle among persisting differences and claims to ownership and power' (Brodkin, 2005, p. 306). In fact, citizen participation and community energy involve highly political processes in which opposing economic interests are at stake, come to the fore and need to be mediated. But participative local energy projects may be better equipped to lead to equitable outcomes than more centralised and exclusive projects.

This paper focusses on two kinds of community energy: (1) Cases of direct citizen participation in wind farms in three locations in Germany. These wind farms range from 2.8 MW to 300 MW capacity and are incorporated as closed-end funds. (2) One case of indirect citizen participation through a community trust's share ownership in a local wind farm of about 80 MW in South Africa. We also discuss, in the abstract, as to our knowledge real world examples of wind farms financed in this way do not exist as per yet, the potential of the traditional financing mechanism Stokvel as a form of local citizens' direct participation in South Africa.

Both decentralisation and community energy are often associated with relatively small-scale energy systems in opposition to centralised, utility-scale electricity generation (Fathoni et al., 2021). Some assume 10 MW installed capacity to be the threshold between decentralised small-scale and centralised utility-scale systems. For example, the German national grid authority reports facilities under 10 MW only at the aggregate level on its annual list of utilities feeding into the German grid (*Kraftwerksliste*). However, within the community energy literature MW capacity for energy projects cannot consistently be found. Descriptions of community energy projects such as district heating systems, PV and solar panel installations and heat pumps in community buildings for instance may be reported in terms of roof tops covered by panels, number of buildings connected to district heating or equipped with heat pumps, or in terms of cost savings at municipal level (e.g. Musall & Kuik, 2011; Walker et al., 2010). Wind farms are more consistently reported in terms of MW capacity per turbine, and within the reviewed literature cases included projects from 75 kW with one to 11.7 MW with nine turbines, hence a project that passed the 'utility scale' of 10 MW. This is however a phenomenon which will become more frequent in practice as the capacity of single turbines is ever increasing. Nevertheless, research on 'communities of locality' energy projects which pass the 10 MW threshold seems to be relatively rare.

In particular one of the cases presented here – the largest German wind farm which is in fact run and owned exclusively by local citizens - shows how scaling up of community energy can be successful. Our other German cases show smaller scale wind farms and

more limited citizen participation, and provide some insights into what could be obstacles to scaling up. Our South African case of community trust ownership and reflection on the financing mechanism Stokvel explore how scaling up and broader community benefits can be generated through indirect and potentially also direct forms of participation.

We chose these examples to show how different forms of citizen participation can develop from distinct local contexts and can support local democratisation of energy generation and financial and social benefits. This is in line with our endeavour to avoid the fallacy of universalising 'solutions' from industrialised, northern hemisphere countries, but to give highly contextual examples from both, the global North and South, a platform (also see Fathoni et al., 2021).

Germany is one of the global leaders in renewable energy generation and in the citizen-led energy transition. In the first quarter of 2023, 48.6% of all electricity fed into the grid came from renewable sources (Destatis, 2023). Wind contributed 32.2%; slightly more than coal. Citizen-financed renewable electricity generation plays an important role in Germany. In (2013), Trend:Research Institut and Leuphana Universität Lüneburg (a widely cited source), found that roughly 46% of renewables investments came from individuals and groups of individuals; of these 54% were individual investors, 26% private shareholders and 20% cooperatives.

In contrast, South Africa retains an appetite for coal. It has ample coal supply which historically allowed for cheap energy production as the country industrialised and diversified. Coal also remains a significant export. The energy sector is the greatest contributor to carbon dioxide emissions (95.2% in 2020) thanks to a continued reliance on coal (Government Gazette, 2022). In consequence, South Africa is the 14th largest emitter of greenhouse gasses in the world, the largest emitter in Africa, and has the highest carbon intensity in the G20. In terms of the Paris Agreement, South Africa has however made commendable commitments for a staged reduction of carbon emissions with the aim to achieve net-zero emissions by 2050 (Climate Promise South Africa, 2023). Nevertheless, South Africa continues to be dependent on coal in the face of electricity production constraints, and growing electricity demand as government tries to fulfil its promise of providing electricity for all (Brown, 2021). In contrast to Germany, South Africa seems to follow a top-down strategy in its renewables transition, with policy programmes favouring large investors (Baker et al., 2021) who provide for community empowerment to comply to the Renewable Energy Independent Power Producer Procurement Programme (REIPPPP) (Khan, 2022).

In this paper, we explore, as a potential solution to the perceived disconnect between global effort and local inclusion, examples of financial citizen participation in both countries. Crucial for a citizen-led energy transition is the access to adequate levels of finance. Experts agree that global financial capital is sufficient to close investment gaps in terms of climate mitigation and adaptation (IPCC, 2023) but warn that institutions are lacking for effectively directing finance towards these goals. The IPCC suggests that public finance is an important lever to encouraging the needed private investment. For instance, Yadav et al. (2019) cite low affordability as one of the many hurdles for the deployment of decentralised PV in India. Anantharajah and Setyowati (2022) show how international climate finance favours large-scale projects instead of small projects and developers in the Asia and Pacific region. In contrast, Hall et al. (2016) show how German local cooperative and savings banks foster localised ownership structures of energy generation infrastructure. Local banks working with local citizens, cooperatives

and closed-end funds in Germany and Stokvel in South Africa have a more limited geographic range and assess risk and returns within the local context, while international climate finance has a global playing field. This is why these instruments are worthwhile exploring for their potential to foster emotive and economic ownership of the energy transition.

Various studies have highlighted the importance of institutional features at local, regional and national scales (Brunet et al., 2021; Chien, 2022; Essletzbichler, 2012; Mühlemeier, 2019; Sovacool et al., 2019), in particular highlighting how local actors use institutional resources at different jurisdictional scales as levers for realising community energy projects (e.g. Hill & Connelly, 2018; Rösler, 2018; Sareen, 2021; Sareen & Haarstad, 2018; Sareen & Nordholm, 2021; Setyowati & Quist, 2022; Wieczorek et al., 2015). Multiscalar approaches more strictly follow the idea of the geographical extend of institutions and agency, distinguishing between the local, regional, national and global scale.

Sensitivity to institutions – laws, norms and values (North, 1981), helps identifying a comprehensive set of factors at different scales that support or hinder local actors' agency. National and subnational scale regulations define actors, attribute competences and govern participation and interaction (MacKenzie & Martínez Lucio, 2005). At local and interpersonal level, pre-existing relationships, social norms and values play an important role for the realisation of community energy projects, as illustrated by Rösler (2018). In summary, our analysis focusses on regulatory and institutional frameworks at local, regional, national and global scales that citizen wind farm investors found particularly enabling or hindering in realising their projects in Germany and South Africa and what lessons can be learnt.

Comparative case study methodology

The data for this paper comes from two research projects. The first wave of interviews in 2018 was conducted as part of a study on local community acceptance in the context of a South African wind farm that was partly owned by a large developer and partly owned by a local community trust. The second wave of interviews and focus groups in 2021–2022 was part of an international research project on the Just Transition. This time the same South African wind farm was included but participants comprised a broader set of experts. In addition, we included participants from two communities in Germany with citizen-initiated and co-owned wind farms, which were run as closed-end funds and from a third location where co-ownership had more difficulty to emerge. Due to the existing legal and institutional frameworks in each country, both structures, community trust in South Africa and closed-end fund in Germany are typical for citizen wind energy projects in the respective countries (see Kahla et al., 2017 on Germany).

We adopted a qualitative comparative case study method (Leedy & Ormrod, 2005) as this enabled in-depth understanding of each case – the case being the local citizen co-owned wind farm(s).

All three locations in Germany where we conducted interviews with wind farm neighbours, initiators and shareholders/partners were in rural areas close to the North Sea. The main local income sources were tourism and agriculture and interviewees associated local economic risks with the seasonality of activities in both sectors. Several interviewees were farmers and emphasised the economic difficulties caused by varying agricultural yields

and the trend towards industrialisation of the sector. Historically the farms were built on marshland that was dried by settlers about 300 years ago. Land parcels were traditionally small and ownership dispersed. Location A and B were in areas with unemployment rates just below the German average (Bundesagentur für Arbeit, 2024). Location C was in an area with an unemployment rate of 1% above the German average. But the villages with populations of 400–7.500 individuals were too small to access more location specific public statistics.

In location A, between the early 1990s and mid-2010s, six citizen wind farms were developed. Their formal merger in 2015 and the subsequent construction of additional turbines as well as repowering of the wind farm until the year 2022 resulted in an installed capacity of more than 300 MW with a total of 88 wind turbines. This is 30 times the threshold commonly associated with utility-scale energy systems (>10 MW rated power). Hence this case could provide insights into how small decentralised projects can scale up and gain the size of centralised utilities.[1]

In location B, between the early 2000s and 2021, four wind farms were built with capacities ranging from early ones of 2.8 MW to later ones of 19.2 MW (calculation based on interview data, 2021).

In location C, only one wind farm with four turbines and, after repowering, a total capacity of 30 MW was built near residential areas.

By the year 2021, when we collected our data, all of these wind farms included elements of citizen participation but to varying degrees, as will be shown further below, and all of them were conceived as one or several closed-end funds.

The South African wind farm was situated 120 kilometres from a large metropolitan city, in a relatively remote rural area with poor access roads and no other public transport. Agriculture and tourism were the primary economic sectors in the area. The communities near the wind farm (in a 50 km radius) were dichotomous and a depiction of the segregated history of the country:

Community 1 – *Farmers*: The wind turbines were situated on large productive dairy farms that received a commission payment for energy produced on their farms. The farms were normally family-run and privately owned. Although farmers had no direct ownership in the wind farms, they benefited financially from the commission payments as well as from improved access roads between the wind turbines both on their farms and between the farms where wind turbines are situated. The farming community can be categorised as middle to high income.

Community 2 – *Rural Community* was characterised by high unemployment, low education levels and life in poor housing conditions. Sporadic employment was available through fishing and seasonal work on the farms. Inaccessible roads made it difficult for people from these communities to find employment and limited access to public services.

Community 3 – *Rural Coastal Town* was a poor area of mostly 'shacks' and small government Reconstruction and Development Programme (RDP) houses. Poverty and unemployment were high.

Community 4 – *Coastal Resort Town* had of the most expensive real estate in South. Most homes were 'holiday-homes' – luxurious and opulent. It was situated next to Community 3.

Community 5 – *Rural Coastal Resort Town* was set alongside the coast. This area, while quite desolate, was popular with the wealthy. Most homes were also 'holiday-homes'.
Community 6 – *Farming Town* was the trade hub for the farming sector, with a middle-class residential area bordering a 'township' for a poorer community. These were historically white and black areas, and these demographics mostly remained even after 30 years of democracy.

The South African windfarm comprised 32 turbines over 28 hectares of land, with a generating capacity of just less than 80 MW. The wind farms' corporate social investment and its trust's community interventions revolved around Communities 2, 3 and 6.

In terms of MW and ownership wind farms in South Africa tend to be more centralised than those in Germany (Baker et al., 2021). In Germany the NIMBY (not in my backyard) phenomenon poses one challenge to larger wind farms, however, as this article and others have argued, the legal and financial possibility for small investors to build and access subsidies for wind farms is another reason for the smaller size and more decentral character of wind farms in Germany. The example of German location A is exceptional but a case from which valuable lessons for scaling up in the German context can be learnt, in contrast to the cases in location B and in particular in location C.

On the other hand, the still significant influence of large utilities and the centralised character of power systems in the South African renewables sector can be explained by the institutional framework on the one hand, and generally low income in rural areas where wind farms are built. Our South African example explores how decentral citizen participation in more deprived areas can be facilitated through the financial mechanisms of community trusts and our reflection on Stokvels shows how this traditional financing mechanism could help the emergence of more decentralised ownership that directly benefits the local population and could also be a tool for furthering local acceptance and upscaling wind farm development.

Overall our examples from two very different country and socio-economic contexts show how locally available institutions and financial mechanisms can be suitable for tailoring an economically and politically fairer and inclusive energy transition that fits the context. It also shows that in both contexts local economic elites' political opportunity and will to drive fair and inclusive projects is also crucial.

Our research strategy was two-fold combining (1) analysis of publicly available documents, statistics and academic literature to establish the legal and institutional framework of the energy transition and citizen participation in each location and (2) qualitative interviews and focus groups to learn about the experience of members of the communities involved in energy projects and experts with external views on citizen participation in local wind energy projects. With our research participants we explored their perception of the local wind farm(s), historical development of each including factors had been helpful or hindering, and – in the second wave only – factors that, in their opinion, contributed to a just energy transition.

We selected participants based on purposeful sampling (Leedy & Ormrod, 2005), where we contacted individuals based on the criteria of their personal lived experiences with wind farms. Participation in the research was voluntary and all data was anonymised. Participants were informed on the nature of the research, and they were required to sign a consent form, prior to the interview. Participants came from communities affected by the

Table 1. Interviews (Int) and focus groups (FG).

Germany 2021/2022		South Africa 2018		South Africa 2022	
Two experts on citizen participation	FG	Manager 1	Int	Training provider 1	Int
One anti-wind turbine activist and one industry expert	FG	Manager 2	Int	Training provider 2	Int
Two partners	FG	Community Engagement Officer	Int	Training facilitator	Int
Two employees at the wind farm management company	FG	4 members of surrounding communities	Int	Maintenance worker	Int
Partner	Int	Local government councillor	Int	Wind farm manager	Int
Manager/partner	Int	CSI beneficiary	Int	Small wind turbine manufacturer	Int
Partner	Int	Farmer	Int	Renewable energy business owner	Int
Anti-wind turbine activist	Int	SME owner	Int	German International Trade Chamber	Int
				Environmental activist	Int
				Labour activist 1	Int
				Labour activist 2	Int
				Industry Association	Int

respective wind farms; leadership and employees of wind farms; civil society activists such as environmentalists; organised labour; and local experts with knowledge of the just transition and renewable energy. We conducted semi-structured in-depth interviews and focus groups (Lee, 1999). These sessions were in-person or virtual and lasted approximately 60–90 minutes. Table 1 lists our interviews and focus groups. We discussed our preliminary findings with stakeholders and academics in two round tables in South Africa with a total of 17 participants in addition to the researchers.

Although sample size varied between the countries and local cases, per country we perceived a convergence and repetition of observations across participants on research dimensions relevant for this paper, indicating data saturation. This is in line with Hennink and Kaiser's (2022) observation that sample sizes between five and 24 interviews with a mean of 12–13 interviews lead to data saturation. All interviews and all German language focus groups were transcribed, while insights gained during round tables in South Africa were documented in hand-notes only.

Data from both waves were first analysed inductively through reading, note taking and team discussions to identify overarching themes. Second, taking a deductive approach, we reviewed transcripts and notes systematically for the dimensions relevant for this paper: the role of financial institutions (e.g. national and local banks), legal incorporation of the case (e.g. closed-end fund, community trust), local, regional, national level context, e.g. subsidies, grants planning procedures, spatial planning, energy law, local relationships; enablers and barriers; positive and negative outcomes of the projects in terms of perceived fairness and justice from the viewpoint of participants.

Citizen-led energy transition in Germany

Citizens' financial participation in renewable energy infrastructure is considerable in Germany. The association of German energy cooperatives' latest survey found that Germany has 877 energy cooperatives, with 220,000 individual members. Average investments amount to 5.200 Euros and total at 3.4 billion Euros funding 8 TWh for wind and solar electricity generation (DGRV, 2023). These numbers exclude citizen participation

through other legal constructs, meaning citizens' contribution is of an even larger scale than these numbers suggest. Citizens can contribute in various ways. Holstenkamp and Degenhart (2013) distinguish between direct and indirect financial participation. Direct participation involves capital investment from citizens – in Germany this can take place through shares in cooperatives, closed-end funds, and limited liability companies and renewable energy bonds/mezzanine financing; indirect participation means citizens benefit indirectly from an energy project's revenues when these are used for improving local authority services, lowering energy prices or other communal projects e.g. by a citizens' trust. In terms of direct participation, Holstenkamp and Degenhard further distinguish between active and passive participation, indicating that shares in cooperatives, closed-end funds and limited liability companies convey much stronger co-decision-making rights to shareholders and entrepreneurial responsibility than bonds/mezzanine financing (see also Yildiz, 2014). Table 2 summarises the different

Table 2. Legal constructs for citizen investment.

	Energy cooperatives	Closed-end funds	Limited liability companies, stock corporations, companies under private law	Debt/mezzanine financing
Participants	Local members	Citizens are limited partners; general partners are often corporate actors (limited liability companies); can be locals and non-locals	Locals and non-locals	Savers can be non-locals
Aim	Decentralise energy infrastructure, influence local energy policy	Decentralise energy infrastructure	Invest in renewables with potentially high risk and returns	Invest in renewable energy to save conditions and guaranteed returns/profit participation
Entrepreneurial decision-making	Equal voting rights independent of share size	None for limited partners; complete for general partner	Co-decision-making	none
Management	Elected board of management and board of directors	General partner	Investors are co-managers	none
Equity vs debt	Equity finance from members, debt capital mainly from cooperative banks and subsidised loans	Equity finance	Equity finance	Dept finance
Accessibility/ costs	Share prices tend to be small; high legal hurdles at inception; high time investment in co-management	Share price depends on number of partners; high legal hurdles at inception but can be managed through professional general manager	Share price depends on number of partners, high time investment in co-management	Depends on capital requirements
Risk	Personal liability limited to the capital invested	None of the partners has full liability; fiscal advantage as initial losses can be offset against other forms of income	Full liability for partners	Revenues can vary within a margin

Note: Based on Yildiz (2014).

types of direct financial citizen participation according to participants, aims, decision-making, management, equity vs debt finance, accessibility/cost and risk.

Mignon and Rüdinger (2016) propose that the existence of accessible and customisable legal forms of incorporation is an important precondition for collective energy projects, for instance, for accessing the required funding (Mignon & Rüdinger, 2016; Rösler, 2018). In our case studies, the local wind farms had been conceived as closed-end funds (Firmeneintrag Creditreform, 2023). In fact, this legal construct allowed local developers to raise funds while customising rights and duties, which varied across the cases.

In location A, the first wind turbines were constructed at the end of the 1980s. All belonged to local farms as required by law at the time. Because more locals and non-locals started planning wind turbines in the area, the municipality decreed that only locals were allowed to invest. To raise funds and as a motor for local economic development in an area that mostly relied on farming and had little industry, in 1993 the first local citizen wind farm was conceived with 18 partners. All households were offered shares and shares were distributed equally across partners to maximise distributive justice and avoid conflicts. This also meant that every partner had one equal vote. Local individuals who had already built turbines on their farms took charge of project development and management. The same lease conditions were established for all landowners.

Between 1996 and 2015, five more citizen wind farms were built and each time shares were offered to all local residents aged 18 and over. The most recent included 320 partners, which represent 95% of the community's adults. In 2015, all six wind farms merged into one closed end fund to overcome conflict over land. In consequence, additional turbines could be built between the pre-existing wind farms. The merged wind farm was managed by a private local energy office. For the merger individual shares were re-evaluated by an external auditing company to ensure a perception of procedural justice. As some individuals had invested in more wind farms than others, the resulting share sizes were different at this point. At the time of writing the wind farm had 88 wind turbines. Its management company employed 35 people locally and had diversified and internationalised its operations.

Initially the wind farms in location A could be characterised as examples of decentralised energy generation as their size was small. Subsequent repowering and their merger led to a utility-scale wind farm. However, ownership remains decentralised, with 95% of the local adults being shareholders of the wind farm.

In location B, the first wind farm with 7 turbines was built in 2000 by 16 partners with support from a private planning office located within the region. The planning office received two turbines instead of a fee. Two closed-end funds, one for the 16 investors, one for the private planning office, were created to accommodate this arrangement. After selling its wind farm to its employees, the planning office continued running the wind farms as a subcontractor.

A few years later a second wind farm with 7 turbines was built. This time 28 local citizens (every locally registered individual of 18 years had been offered shares) bought shares in one citizen wind turbine, while six turbines were shared between the initiators and landlord farmers and one turbine given to the private planning office; three closed-end funds were created to allow for the creation of separate legal entities. In addition, an infrastructure company was created which bundled responsibility for rights of way and grid infrastructure, and distributed revenues, running costs and risks of turbine failure

from the total seven wind turbines which stood in locations with slightly different wind conditions across all owners. Local directors were installed at the closed-end funds to ensure business tax was paid to the local authority, although the management company in charge of the day-to-day running was based in the wider region. Although local developers were transparent about the opportunity for local citizens to invest, ownership purposefully remained more concentrated among those who initiated the project, with only a relatively small part of shares made available to other locals.

In 2013 and in 2021, two wind farms were conceived by the municipality with help of a local planning office and this time 100% of the shares were offered to local citizens. The first one had 6 turbines and was owned by 200 local partners. The second had 210 local partners. These last two wind farms are more likely to contribute to more energy democracy than the two former ones by the fact that both had around 200 shareholders among the 400 local villagers.

In location C, wind farms and citizen participation only emerged late after a long struggle by residents against local turbines. As in locations A and B, local farmers from location C had started building individual turbines on their farmland from the 1980s. In the 1990s when these farmers planned to build larger wind farms near residential areas with the help of external, 'Bavarian' investors – the designated land east and west of the village could accommodate up to 180 turbines – these plans were met with fierce local opposition. Eventually, only four turbines (after repowering their joint capacity was 30 MW) were built on one side of the village, and some local citizens accepted shares in the wind farms as a form of compensation. From the 2010s there was talk about a citizen wind farm, and as a result in 2020, 20% of the shares of the repowered windfarm were made available for purchase by citizens from the two village next to the wind farm. In fact, interviewees in this location felt that local wind farm development lacked transparency and inclusivity and neared coercion and corruption. For instance, one interviewee described the process and how she was financially and emotionally impacted by the local wind farm like this:

> I read in the [local] newspaper, between the many adverts and official announcements, that there is a change in local land usage. (…) that (…) a massive wind farm was planned (…) at the borders of the local authority. (…) And we [she and one other person] were the only ones [at the hearing] who opposed. No-one [else] had any idea. (…)
>
> The [person] who wanted to oppose together with me [this was when the wind farm was to be repowered], then abandoned [me], because he had been paid very good money (…). [The wind farm investors] bought his house [paying] very well. (…) Also, the local farmers received very good compensation. (…) And to me, they obviously did not come anymore, because they knew that I wanted to continue living here. (…)
>
> [Since the wind farm was built,] my land is worthless. (…) I am at the other end of the energy transition (…), because [it is about economic] power. I feel like a loser and permanently impotent and helpless.

Interviewees in this location perceived that mostly affluent individuals could access large earnings through relatively large shares in wind farms. One of them had recently, but reluctantly invested into the local citizen wind farm. But she was doubtful whether her share would yield much return due to the high number of shareholders and gradual phase out of subsidies. She had nevertheless invested to gain insights into the

management of the wind farm and was then frustrated to learn that what looked from the outside like one large wind farm consisted of several separate legal entities of which the citizen wind farm was only one small part; her share hence did not give her any voting rights over the development of what looked from the outside like one big infrastructure project. She felt that neither distributive nor procedural justice were fulfilled in this case.

While wind farms in location A, B and C where all incorporated as closed-end funds, they varied in the way they included citizens. In location A all turbines installed were part of a citizen wind farm, meaning 100% of their shares were available for purchase by local citizens. In contrast in locations B and C private developers although including a small number of citizen turbines used complicated legal constructs to separate the citizen turbines from the initiators/developers' turbines and kept the larger part of the development for themselves.

Grashof et al. (2015) and Olbrich and Fünfgeld (2023) found a strong regional variety as to preferences regarding specific types of financial participation depending on political, economic and social context. Models of direct financial participation would be preferred in affluent regions while in areas with low household incomes citizens seemed to prefer indirect participation through communal benefits (Olbrich & Fünfgeld, 2023). In fact, in the regions where we conducted our case studies, citizen co-ownership of wind farms through closed-end funds seemed to be the norm. A rural region dominated by farming meant that many individuals had equity in the form of land and farms. For instance, initiators of wind farms reported how in the early years their farms and homes stood as security for the capital raised to fund the wind turbines.

Also, prior experience with specific participation models increased preference for them (Olbrich & Fünfgeld, 2023). Case in point is that farmers who had built turbines on their land also initiated the citizen wind farms.

Direct participation models require not only capital investment but time and effort to run an energy project; and legal and administrative hurdles, according to Olbrich and Fünfgeld, also dissuade potential initiators. Here the evaluation of costs and benefits plays a key role and Olbrich and Fünfgeld found that smaller projects – with a smaller number of investors – seem more suitable for direct participation, as yields per investor tend to be higher. This observation was supported by the intricate ways in which local initiators/developers in locations B and C ensured at the same time local acceptance and large personal revenues by including one or less than one citizen wind turbine in their own much bigger wind farm project.

In location A, the political will to create a more balanced distribution of shares across the local population was greater and was described as one of the factors that allowed the wind farm to achieve its exceptional size (88 turbines for 320 partners):

> Because the old hands said: "We include everyone every time [when new wind turbines are built]." They could have said instead: "We are already in business, let's do this on our own." Then they could have earned significantly more money, but the local mood would certainly have changed, because those who had not participated would still have to hear and see the wind turbines. (…) But everyone could participate and that was motivating and created a positive mood.

In this location, the windfarm was a strong motor for regional economic development which resulted in the creation of jobs for people from the wider region. The local

management office, which oversees the wind farm and subsequently also expanded into international projects alone has 35 FTE locally.

The fact that later wind turbines in locations B (the two last wind farms) and C (as part of the repowering of the existing wind farm) allowed for wider citizen participation than earlier local projects may be related to several factors: (1) local acceptance of further expansion and repowering of wind farms requires the turbines to benefit everyone in the community. (2) Citizens have become more interested in wind turbine investments as they see these as a save possibility to gain additional income. (3) Citizens may feel that this is at least some form of compensation given the environmental impact of turbines they would be subject to anyways in a political environment that has become more prone to prioritise climate action and hence renewable energy technology. (4) Municipalities become increasingly involved into local wind farm projects.

Our cases show that the financial participation of local citizens in wind farms, even if all are conceived as closed-end funds, can come about in many different ways and may include citizens to highly variable degrees may explain Olbrich and Fünfgeld's (2023) findings that project planners, although offering financial participation, have mixed experience regarding its benefits for increasing local acceptance.

Researchers agree that the German regulatory and institutional framework has been particularly supportive of the emergence of a citizen-led energy transition. For instance, the federal governments' feed-in tariffs first established by the Renewable Energy Act (EEG) of 1990 and, existing until 2017, reduced investment risks along the lifecycle of renewable energy infrastructure (Curtin et al., 2018; Dóci & Gotchev, 2016). The feed-in system (FiS) guaranteed electricity generators a fixed payment for every kWh produced by eligible technologies over a period of 20 years. This rate was degressive to incentivise technological innovation for new installations. Payments also depended on technology, size, and geographic location. Except for photovoltaic technology there was no limit to annual installation. Second, grid operators were obliged to connect renewable energy systems to their grid and prioritize buying the electricity produced from renewables over other electricity sources. Thus, the EEG reduced output price, demand, contract, volume and balancing risks for producers of renewable electricity (Dóci & Gotchev, 2016). This significant elimination and reduction of risks meant that banks could offer loans to renewables investors at very low rates.

Our wind farm initiators/developer participants confirmed the positive evaluation of the early EEGs; in particular conditions around and from the 2000s onwards were seen as very favourable to wind farm expansion and, thanks to acquired experience and generous subsidies, capital for wind farms could be easily raised from local banks.

This shows that other institutional factors, not only the FiS, were important (Curtin et al., 2017). Various authors have highlighted the role of Green or State Investment Banks (Geddes et al., 2018; Hall et al., 2014; 2016; Mazzucato & Penna, 2015; Owen et al., 2018; Zhang, 2020). Early on, the German State Investment Bank KfW made available funds for soft loans for onshore renewables investment which could and still can exclusively be accessed through local banks (Hall et al., 2016; KfW, 2023) and these were important enablers for citizen investments into renewables (Hall et al., 2014, 2018). Initial soft loan programmes such as 100/250MW wind and 1000 and later 100.000 Roofs programmes and subsequent soft loans reduced initial investment risks for community actors (Dóci & Gotchev, 2016), who otherwise would have had difficulties to raise these

funds, being traditionally more risk averse and often lacking investment and renewables expertise (Mignon & Rüdinger, 2016). Acting within small regions local cooperative and savings banks could build on pre-existing relationships with citizen and community investors and local knowledge when assessing viability of loans (Zhang, 2020 based on Brunner et al., 2004). Moreover, local savings banks and cooperative banks include in their statutes social and environmental goals, and local value creation; and, over time, they have acquired renewables investment expertise (Hall et al., 2016).

For their first wind farm in the early 2000s, the 16 investors in location B had to make a personal contribution of 50k Euros each to raise 1 million Euros each in capital. In the citizen wind farms built in 2013 and 2021, with around 200–210 partners, shares were more accessible with one share per individual available for 5000 Euros each. In location A, with a longer history in wind farming, shares in the early 2000s cost between 3000 and 5000 DM and later 3000–5000 Euros, and some local banks would provide loans to fund citizens' shares. Revenues from wind energy allowed paying back capital loans relatively quickly. Participants in location B gave the example of a partner raising 45k Euros capital without a deposit and being able to repay within three to four years using wind farm revenues. In location C citizen wind farm shares were 2000 Euros but this was felt as still too much given the average local wages.

One federal scale provision that was not mentioned by our research participants and is rarely referred to in the literature, but which may also have been favourable for the wind farm pioneers in our cases is that until the late 1990s, citizen investors benefitted from important tax advantages, as they 'could aggressively write off depreciation against all forms of income, including wage income' (Bolinger 2001 in Curtin et al., 2018).

Several studies of community energy have suggested that in addition to localised banking and matching forms of incorporation, Germany's federal structure has been decisive (Dóci & Gotchev, 2016; Schmid et al., 2020). Within Germany's federal state with its subsidiary principle, municipalities and regions have important legislative powers and some funds to support specific policy goals such as renewables deployment. For instance, municipalities can provide seed corn funding for community energy projects (Dóci & Gotchev, 2016; Rösler, 2018) or a favourable political environment facilitating citizens' collective efforts to set up their renewable energy project (Beermann & Tews, 2017; Dóci & Gotchev, 2016). For instance, in locations A and B, the municipality provided one key foundation to citizen wind farms by limiting planning and investments to locally registered individuals.

Pre-existing local business relations have been shown to have enhanced trust and willingness to invest in renewables infrastructure by individuals (Strupeit & Palm, 2016) and access to capital from banks (Zhang, 2020). Case in point seems to be that early investors who later also initiated citizen wind farms were already running farming and other businesses.

At the micro-level, the supportive but also hindering role of interpersonal and social relations between initiators of renewables projects and within local communities has been highlighted (Rösler, 2018). Our interviewees reported that local support of citizen wind farms was facilitated by the small size of both communities A and B, which was under 500 adult individuals, by family ties with individuals who already had invested in wind farms, and the possibility to spread information over new developments door-to-door. One partner in location A explained: 'We discuss contentious issues openly and

controversially, but to the outside we present ourselves with one voice'. Partners in locations A and B suggested that external planners would have had more difficulty gaining local acceptance due to the fact of being outsiders. It was also suggested that external developers would unlikely pay a fair lease to landlords and contribute to local economic development, as one partner reflected: 'It is often a rip off … .' The opposition in location C against early wind farms which were to be funded by 'Bavarian' investors is another case in point.

Although, as presented above, other institutional factors are relevant for the emergence of a citizen-led energy transition, the replacement of the feed-in system by a quota-based auction system through the EEG of 2014 and applied since 2017 created a more difficult environment for citizen energy in Germany (Beermann & Tews, 2017). In fact, it has led to the reduction of citizen-led projects and some of our participants were quite vocal about the change.

Although cooperatives have been seen as the most powerful structure through which citizens can get engaged and influence local energy policy (Yildiz, 2014, p. 61), in location A the citizen wind farm, a closed-end fund, developed powers at various geographical scales due to the efforts of its local management company. By reaching the exceptional size of 88 turbines with above 300 MW installed capacity, it is at the time of writing the largest citizen wind farm worldwide and the largest German onshore wind farm. Its managing company gained significant influence even beyond the local scale, where it provides about three dozen skilled jobs. The company took over the operation of the local electricity grid, developed plans for local hydropower generation and collaborates with renowned research institutes in the enhancement of wind turbines to reduce their environmental impact. The managing company developed positive relations with local and regional environmental organisations by investing into local conservation projects. Furthermore, it lobbies the federal government for more favourable policies for citizen wind farms and a decentralised energy system within an industry network, which it contributed establishing, and by funding a legal think tank, taking political initiative as, for instance, recommended by Beermann and Tews (2017). Beyond the national scale it runs wind farms in Europe and a charitable wind turbine in Africa.

This kind of expansion may have been thanks to several factors such as favourable subsidies combined with local individuals' entrepreneurial skills and ambitions, local banks' support and local partners' financial contributions and acceptance of wind farm expansion, as well as partners' decision to invest a certain percentage of the wind farm's revenues into future business development. One weakness of closed-end funds, which is the limited power it gives partners in the day-to-day management of the operation, may also be a strength as the delegation to a general partner or management company allows for professionalisation (Ensenzberger et al., 2003) and more ambitious development of wind farms and related activities. One key feature of the successful expansion and local value creation of location A's activities seems to be (1) strong local embeddedness by including 95% of the local adults as partners for raising funds and generating high levels of local acceptance for wind turbines and wind farm expansion and (2) that revenues were not just absorbed by the partners but parts of the revenues were successfully reinvested by them into new and expanding businesses.

Policy-led energy transition in South Africa

The financing and ownership by citizens in wind farms in South Africa differs considerably from the one in Germany. Financing and ownership are facilitated mostly by policy interventions introduced by the REIPP Programme, black economic empowerment policy and legislation, and corporate social investment projects of the wind farms themselves. Table 3 presents these options and describes the participants, structure, and beneficiaries of such interventions; the objectives, the level of engagement and decision making by community members; how they are managed and financed and the accessibility to finance; and who bears the risks and costs of such financing and ownership. In addition to the different structures for citizen investment and community benefits, financing from financial institutions, private investments and other methods of financing make up the balance of the ownership structure of investment finance and ownership of the wind farms.

Reflecting on our South African case study, the wind farm had a community trust component, but it far exceeded the norm, with 26% being owned by the community. This ownership was debt-financed by the Industrial Development Corporation (IDC), the South African development institution. In addition, it appeared that the community trust had employed a social development specialist and that the company made a considerable effort to engage with communities and that communities ultimately determined the spending of the income of the community trust. Even so, there were shortcomings, and the trust was still managed by the wind farm company and not by the community – in actual fact, it was found that most community members were not even aware of the existence of the trust.

An extension to the benefits accruing from the trust were other ways community members benefited. Wind farms may allocate a percentage of their revenue or profits to the community in the form of corporate social investment, and in the South African case study, the company adopted a profit-sharing approach. So not only did the community benefit from the dividends from the company through trust ownership, but also received a profit share in the form of community project investments. These funds were invested in an array of projects that were decided upon following an extensive consultative process with a wide range of community and other stakeholders.

Wind farms, normally situated in rural areas can also have a positive impact on local enterprise development through procurement practices that favour local businesses. In actual fact, this was a priority for this wind farm who wished to enable a sustainable community through enterprise development and actively sought out opportunities to support existing SMEs. The projects embarked upon had a direct benefit on the coordinators of the projects and contributed to social upliftment, and in this particular case, better service delivery where the local government was struggling to meet its service delivery mandate.

During the interviews, participants voiced suggestions on how the current model of trust ownership could be improved to allow for greater citizen participation and improved benefits for the local communities. One argument raised against the trust ownership model was based on the concern that individuals did not benefit directly from the trust. In an interview with the senior manager of the wind farm in charge of social development for the community, the manager suggested that for the trust model to allow for

Table 3. Structures for citizen investment and community benefits.

Participants	Trust Community members within a geographical radius of the wind farm	Corporate Social Investment Predominantly community members	Black economic Empowerment Individuals from previously disadvantaged backgrounds	Enterprise Development Existing or new community SME owners	Community projects Community members near wind farm
Structure	Trust ownership of a share of the wind farm company	Wind farm revenues for the benefit of the community	A share of the wind farm is either given or favourably financed	Preferential procurement and awarding projects to SMEs	Funding of community projects
Beneficiaries	Community members mainly through the trusts' investment in community projects	Community members through the wind farms' investment in community projects	Individuals selected who may or may not be from local community members	SMEs awarded contracts	Community managers' employed and the wider community who benefit from projects
Aim	Socio-economic development of communities in proximity to the wind farm	Socio-economic development of communities in proximity of the wind farm	Restorative justice and the reduction of inequality	Facilitate sustainable socio-economic development for communities	Provision of infrastructure and social support for the poor
Decision making by community members or beneficiaries	Trustees of the trust. This may or may not include community members	None unless there has been engagement with the community	Subject to ownership percentage and decision-making authority	The management of the wind farm or the trustees of the trust	The management of the wind farm or the trustees of the trust
Management	Trustees	Wind farm management	Wind farm management	Wind farm management and SME owners	Wind farm management and project managers
Equity vs debt	Commercial banks or development finance institutions	N/A	Equity or debt	Wind farm financing of the SME, or equity or debt financing	Wind farm or trust finance
Accessibility	Dependent on the REIPPP bid process	Subject to the wind farm managements' discretion	High barrier with limited number of beneficiaries	High barrier and subject to the wind farm managements' discretion	Dependent on the level of decision-making influence of the community
Risk	Low risk for the community members as there would be limited personal liability	None	High risk in terms of potential financial loss and personal liability	High risk as SMEs may be dependent on the wind farm	High risk as these projects are subject to the financing by the wind farm
Costs	Depends on the level of ownership and form of financing. Can be high	None	Depends on the ownership percentage and method of financing	Depends on financing provided by the wind farm and personal investment or debt	Depends of the nature of the project

economic emancipation, the dividends should go directly to individuals in the community once the capital amount was paid – a proviso was that this concept would not be viable when communities are large, resulting in the dividends being too widely diluted.

An interesting ownership alternative was put forward by the same manager, namely that of a Stokvel. Stokvels have been part of the informal financial system of South Africa for decades. They are rotational savings schemes, each with their own rules determined by members of the Stokvel. Stokvels are not unique to South Africa, for instance, they are known as Chama in East Africa; Cudinas in Mexico; and Tanomoshiko in Japan (NASASA, 2023). An illustrative example of a small Stokvel is as follows: Twelve members of a rural village agree to form a Stokvel, each contributing ZAR100 per month. Each member in turn is allocated a month when they are the recipient of that month's collection, and on that month, they would receive the other members' total contribution of ZAR1100. This would often be used for a home appliance or some form of a luxury, save for funeral arrangements, or be used as an investment club to invest in stocks or taking part in business ventures (NASASA, 2023). The wind farm manager explained the benefits of such a stokvel approach:

> Some of the people in the stokvel are not even working, but from the social grant that they are getting, they are able to deposit a R50 or R75 on a continuous basis. So, can we imagine that my R75 which has, together with others has made this R2 million. Now all of a sudden it has an opportunity to grow even further. So those are the type of things when you're talking about 'just transition' and the new future of the sector we were talking about, economic participation. (Wind farm Manager, 2022).

Stokvels have evolved and become more formalised over time, achieving scale and some becoming quite large, and most of the larger banks in South Africa now provide Stokvel investment products. The National Stokvel Association of South Africa (NASASA) estimate that 11 million South Africans are part of a Stokvel with about 810,000 active stokvels collecting R50 billion annually (approximately US$2.5 billion) (Dermineur & Kolanisi, 2023). While Investment Stokvels have been used as venture capital for SMEs who may struggle to obtain capital and credit from financial institutions (Phatlane, 2021), the lack of extant literature on Stokvels' investment in large-scale capital projects suggests that Stokvels have not been leveraged for this objective as yet, although this may be feasible and a consideration for future policy direction.

Hindering and supporting factors

On the micro and meso level, the REIPPP is a policy tool to manage the move towards renewables in such a manner as to contribute towards socio-economic development. Investors are therefore not only selected on the financial content of the bid, but also on potential societal impact. The 'economic development scorecard' of the REIPPP requires that communities in proximity to the renewable energy project receive at least between 2.5% and 5% of shareholding in the wind farm (Khan, 2022). Our case study wind farm had been successful in its REIPPP bid and a significant reason for this had been the commitment to introduce a community trust and allocating a proportion of profits to the local community.

Institutional investors, mostly South African based, held 74% of ownership of the wind farm. The trust, with community members being the beneficiary of the trust, owned the

balance of 26%. Community members would not have the financial resources to purchase this shareholding, nor would they be able to raise any finance from commercial banks to do so – most members are poor and unemployed. For the project to be feasible, it was essential that the ownership portion of the trust was purchased to provide needed capital for the project. The trust ownership component was therefore financed by the IDC. The repayment of the loan and interest would be from the dividends from the wind farm, and repayment was expected to be complete within 9 years of the approximately 20-year lifespan of the wind farm. This arrangement facilitated finance for the surrounding communities to own a portion of the wind farm and benefit from the profits of the wind farm.

Engagement with local government was also key to the successful implementation of community projects. The local municipality in which the wind farm was situated had experienced severe service delivery failures due to poor management and some degree of corruption. While the wind farm's management was clear that it was not a substitute for local government's responsibilities for service delivery, they tried to complement the local municipality's, as well as provincial and national governments' efforts of service delivery in order to improve the lives of communities.

One of the barriers to citizen participation was the sheer scale of the needs of the communities. The wind farm CEO described the difficulty of knowing how to best spend resources accruing for the trust and communities – poverty was beyond physical, but mental poverty. This meant a fundamental reconsideration of the wind farm's effort in the communities, and for them to refrain from a more patronising approach of imposing what they considered communities needed simply because they were poor, towards an engaged approach that focussed on a sustainable outcome.

There was a common concern amongst participants that much of the ownership of wind farms would ultimately be in the hands of institutional investors and wealthy individuals, and that this would perpetuate the existing inequalities in the country:

> Those able to participate are [economically] active but are more likely to perpetuate existing power dynamics that make our society unjust, and with that I can't help but think that we need to open that up for more diverse actors to participate in that economic opportunities (a consultant and academic specialising in renewable energy education and training).

While communities were consulted by the wind farm through an intensive community engagement process to determine trust and profit spending, no community member at the time of the interviews was a trustee of the trust. The reason given for this was the practical and contentious issue of selecting members of the community. As the communities were heterogenous in nature (four different communities were identified), selecting individuals may cause friction and resentment within and between the communities, although management were cognisant of the need to elect community members as trustees in the future.

Another barrier was that while electricity may be produced on the doorstep of communities, many homes were not electrified.

On a regional level, in order to improve socio economic outcomes, the South Africa wind farm has partnered with other wind farms in the region, all of which have some form of community investment due to the REIPPP bid process. As the Department of Energy had not specified geographic responsibility for the wind farms, there was a risk

of overlapping of activities, or the neglect of certain communities. This forum of wind farms was able to discuss such issues and share their experiences, thus enhancing the collective contribution the wind farms had for communities.

While the immediate communities had been given an opportunity for citizen participation, certain indigenous people had been excluded, specifically the Khoisan people.

> We believe that the Khoisan are not … consulted and they have been excluded most of the time. And because they were removed off the land, pre-1930, you know they have absolutely no access to the land of actually where they come from.

On a national level, government policy and the REIPPP programme provides a requirement for socio-economic development that ensures that wind farm operators commit to the communities in which they operate. The government has provided some institutional support for the programme and one of the successes of the programme lies in the Independent Power Producers (IPP) Office which was established and financed by the Department of Mineral Resources and Energy, National Treasury and the Development Bank of South Africa. The wind farm CFO described the positive contribution the IPP Office was having both in terms of ensuring compliance by IPPs and assistance the office provided to the wind farm in terms of communication, facilitation of finance, and general support. Another contributor to citizen ownership was the unique approach for financing the purchase of a shareholding in wind farms in favour of a trust for the benefit of the communities by the government's IDC.

Another enabler was the wind farm's proactive approach of working with government in terms of various development programmes as well as working with multiple governmental departments. The wind farm worked with the Department of Education on certain educational projects, or with the Department of Agriculture and Agrarian Reform on smaller community garden interventions. The CFO spoke of sometimes 'connecting the dots' by simply connecting people and organisations for the benefit of individuals and their community.

The effectiveness of policy was unfortunately constrained. A common theme emerged from the interviews in the second phase of the South African research, namely that policy and politics was a major stumbling block to the roll-out of renewable energy: 'So politics, not forward oriented politics I think is the major obstacle, because if you look on energy politics in this country, they are always following the market, rather than leading it, innovatively leading it' (Representative of a German trade organisation); 'I don't know with the minister we've got at the moment there will be a just transition because he doesn't believe in it' (Community activist). While the South African Department of Energy is the custodian of the REIPPP programme, the Department has been exceptionally slow at releasing opportunities for renewable energy projects. This has resulted not only in a slow move towards renewables, but a missed opportunity for rural development and poverty alleviation in communities which could have benefitted from wind farm projects.

The antithesis of the global north and south has been described earlier, yet it is important to note that there has been significant contribution by some countries in the global north to South Africa's renewable ambitions. Germany has been an enabler for the South African wind farm sector and local communities themselves. In an interview with a representative of a German trade organisation, the level of support that Germany was providing to South Africa became apparent in terms of government to government support;

private company to private company support; and global support programmes. Germany has provided skills development support in the form of vocational training for the promotion of the green economy, and has been an active supporter of the South African Renewable Energy Technology Centre (SARETEC). The German manufacturers of wind turbines are themselves investing in developing the renewable energy sector, especially with regards training to ensure skills needed for management and maintenance of the wind farms are available in South Africa.

It is difficult to determine the impact that the introduction of the European Union's Carbon Border Adjustment Programme will have on citizen ownership of wind farms. Two outcomes are envisaged: One would be the roll-out of renewable projects may be faster with resultant citizen ownership. The other is based on the concern that the urgent necessity to move towards renewables may compromise the current extended bid process that allows for careful consideration of community engagement and facilitates citizen ownership. This could result in the relaxation of community engagement and ownership requirements in order to speed up the process.

Discussion and conclusion

Sovacool (2021, p. 13) suggests that 'while inequality and exclusion are extrinsic to a given technology, they are intrinsic to the current regime of low-carbon energy'. Hence, he calls for more specific recommendations from the research community to policy makers and stakeholders.

Our findings indicate that the spread of ownership across citizens local to energy systems in Germany and South Africa can be an important factor supporting the speeding and scaling up of the energy transition. The opportunity to be empowered through either direct or indirect ownership in wind farms and a share in the revenue is not just a positive side effect but a key component of local acceptance and local economic development. Our cases show that how direct and indirect participation are shaped and implemented is crucial. Direct and indirect ownership schemes need to include the explicit aim to provide for distributive, participatory and restitutive justice meaning that ideally revenues are compensatory, e.g. for used farmland, and equal, e.g. all shares in a wind farm are equally accessible to all local individuals.

In the German case studies financial benefits, decision-making power but also entrepreneurial risks were direct for citizen co-owners within the incorporation of closed-end funds, but access to ownership for local citizens varied by location. And in our interpretation, this impacted the facility of project development as well as potential for upscaling local wind farms. In the South African case, ownership was less direct with the communities being the beneficiaries in a trust established on their behalf as well as benefitting from social investment initiatives by wind farm companies. This had the caveat that some citizens were not aware of their community owning shares and hence not being aware of the cause of public benefits derived from the trust's financial participation in the wind farm.

Financing for ownership was quite traditional in the German case, and occurred through private investment and bank financing within a generous subsidy environment for wind energy, while in South Africa, policy and state institutions informed the mode of financing. Citizen ownership in the South African case study was facilitated by a

government development agency who financed the trust ownership, but wind farms may finance citizen ownership themselves through some form of black economic empowerment initiative, such as the South African Stokvel.

Research on Germany has shown that direct forms of co-ownership are favoured in more affluent regions (Olbrich & Fünfgeld, 2023), although also in less affluent regions, local banks may make investment in renewables more accessible for people on lower incomes by providing subsidised loans However, populations' preference for indirect participation may also be due to local economic elites often not having distributive, restitutive and participatory justice 'for all' local citizens in mind when developing renewable energy projects. Similarly, in South Africa, existing institutional and private finance for wind farms will primarily be accessible to the wealthy. Given high income inequality in South Africa a different approach may be necessary to ensure that poorer communities close to wind farms can participate and benefit from some form of ownership. Through the REIPPP, the South African government could directly influence ownership composition, while simultaneously providing financing from development institutions to communities that would otherwise not have access. Also, in Germany, the new EEG (2021/2023) proposes financial community benefits in new wind farms (Eichenauer & Gailing, 2023; Olbrich & Fünfgeld, 2023). As South Africa slowly moves towards renewable energy and just transition policy evolves, various alternative approaches to citizen ownership may occur. For instance, community members could directly participate through shareholding financed by wind farms or other means, or through Stokvel investments resulting in community members' direct ownership.

Could Stokvel play a functional equivalent to local banking and local cooperatives/closed-end funds in Germany?

Stokvels could provide debt financing for investment in wind farms or invest in wind farms themselves. So yes, they could serve the role of traditional banking institutions. There would be a difference between a Stokvel and a cooperative or closed-end fund. A cooperative would run the business themselves; in a closed-end fund partners/shareholders would play a limited governing role over the business, with the principal entrepreneurial responsibility delegated to the general partner. If we consider the South African context and the community members who would contribute to such a Stokvel, they may lack the knowledge and expertise to run or govern a wind farm. But it would make sense to hold a share in a wind farm, and earn dividends which could then be distributed amongst the Stokvel members. The running of the wind farm would be in the hands of its managing office – similar to the general partner of a closed-end fund, but revenues or parts thereof would accrue directly to the individuals in the Stokvel.

Would a Stokvel be 'better' than a community trust?

For the individual members of the Stokvel, it would be. For the wider community, perhaps not. Not all of the community members would necessarily be members of the Stokvel, so direct ownership may exacerbate inequality. Similarly, participants in Germany noted that local and regional inequality between wind farm partners/shareholders and not participating individuals was visible. In addition, the trust model mandates the trustees to

use revenues for the upliftment of the community, and in the South African case study, resulted in significant community empowerment through improved service delivery and access to education and socio-economic opportunities. It is unlikely that this would be the outcome of the Stokvel where intuitively, revenue would be for the individuals' benefit and would probably be used for improving their families' living standards. However, some trickle down or multiplier effect may exist as suggested by participants in the German location A, who noted how the wind farm's revenue had uplifted economic development of the entire region.

What other institutional reforms may be necessary to further support a citizen-ownership?

In South Africa the REIPPP has been relatively successful in terms of supporting citizen co-ownership through the bid process thanks to the requirement of a socio-economic and community development strategy, which has resulted in the incorporation of trusts in the ownership mix of new wind farms. The IDP and other development finance institutions have facilitated finance for these community trusts to purchase shares in wind farms. These institutions, as well as international development finance, have significant capacity to contribute to South Africa's investment in renewables, and if structured through appropriate policy, such finance could promote trusts and other forms of community ownership. The propensity of citizen participation and the resultant socio-economic benefits are severely constrained by the lack of implementation by government of renewable energy and just transition policy – resulting in the slow investment in wind farms. In the

The German regulatory framework aims to protect local environment and people through a variety of regulations in the domain of planning law, including protecting historical sights, signalling, noise levels, protected species, distance to residential areas. Developers are expected to make provisions to respond to environmental concerns in their planning applications and often these regulations have been used by wind farm opponents to halt or reduce projects.

However, standard guidelines on how externalised economic costs to citizens can be internalised by wind farm projects have so far not existed across the country. One step forward is the recent change to the EEG to including stipulations on community benefits. But the question remains if these are generous enough for creating the perception of distributional, participative and restitutive justice among wind farm neighbours.

Regarding models of direct participation in Germany, institutional provisions could be made to ensure more equality within wind farm projects that are conceived as local closed-end funds. The wind farm in location A is one example of what policymakers could aim to support in terms of more equitable direct participation: standardised ground rents for landlords and equal share sizes in local energy generation systems for all local citizens of age 18 and above, as well as the installation of a qualified general partner who oversees the economic and technical steering of the windfarm. This may be more appealing to those who favour direct participation and the privatisation of energy systems. Indirect forms of participation such as community trusts or funds returning to a municipal shareholder who earmarks revenues for specific citizen benefits may be more attractive to those who trust and wish for a stronger role of the democratically accountable public sector. Successful examples of this have been explored in the literature (for example Musall & Kuik, 2011;

Walker, 2008; Walker et al., 2010; Wiersma & Devine-Wright, 2014). Hence stronger regulatory support for either direct or indirect participatory mechanisms is also a question of political preference not just a function of socio-economic context.

Does citizens' financial participation in the energy transition lead to more equality in society?

In Germany the energy transition has so far been characterised by a strong financial and organisational participation of citizens while South Africa's transition policies favour large developers albeit demanding a social investment strategy from them. In our German case studies, equality outcomes within communities depended much on how closed-end funds were set up, and the academic literature on citizens' financial participation in energy projects also calls for nuances. For instance, various studies have shown that the typical community renewables energy investor is older, male, has a relatively high income, high educational level and high electricity usage (cited in Ebers Broughel & Hample, 2018; Fischer et al., 2021). Within a small community, depending on the model chosen, everyone may reap benefits but benefits would depend on the opportunity and ability to invest and relative share sizes, hence the important role of local financial institutions but also of the political will of project initiators/developers. Between communities there is likelihood of increased inequality if benefits and burdens from renewables expansion aren't accessible and redistributed across.

The citizen participation criteria included in policy provisions for the South African energy transition does contribute towards more equality in South Africa. While not enriching individuals directly, communities surrounding the wind farm benefit for the dividends accruing to the community trust and social investment initiatives of the wind farm. It complements the efforts of local government who, in this particular case study, provide poor service delivery. The sustainability focus of the interventions of the wind farms, especially in enterprise development, are aimed to ensure the benefits are long-term. The nature of wind farms requires investments to be placed where there is high wind velocity, often near the coastline, and in rural area. These are areas that have traditionally not benefited for the mining boom and industrialisation in South Africa, and tend to be poorer. The South African wind farm was situated in the Province of the Eastern Cape, the poorest province in the country. Therefore, these wind farms can provide some relief to geographical inequalities experienced in the country, benefitting rural, undeveloped and marginalised communities.

An evaluation of how EEG's suggestion of financial community benefits in new wind farms will impact the local and regional economic balance in Germany goes beyond the scope of this article and it might still be too early to say, although some *Länder* have already stipulated similar provisions at regional level which could serve as starting points for further research.[2]

Can the ownership and financing lessons from Germany and South Africa be applied to other contexts?

There are some valuable insights from the South African wind farm's approach to financing and ownership for communities, investors and policy-makers. From a policy

perspective, South Africa's emphasis on the bid process weighting towards regional socio-economic development resulted in investors being more mindful and compliant to community engagement and upliftment in their projects, as evidenced by ownership by the community trust and corporate social investment projects. This policy approach could be replicated elsewhere where there is a need for rural development, a need to address inequality between sections of the population, or as in this case, where local government lacks the capacity to provide effective service delivery. The application of development finance to facilitate community ownership, whether direct or through community trusts, was another lesson that could be applied elsewhere.

Secondly, while Stokvels were not utilised to finance the wind farm in this research, they are an option in South Africa as it moves towards a renewable future. Stokvels are not peculiar to South Africa, nor are they unique to the Global South, with evidence of similar arrangements found in countries such as Japan. The financing by Stokvels of wind farms and other renewable energy projects in which the community resides, could facilitate access to finance for wind farm operators while having direct benefits for communities who live in proximity to such projects.

The German cases as well as the South African case show that the political will towards providing distributive, participative and restitutive justice needs to be part of the energy transition in order to lead to economically and socially sustainable outcomes on the ground. South Africa and more recently Germany have created provisions within national level legislation for community benefits from wind farm projects. The variation in terms of outcomes and experiences across the German locations we studied highlighted the importance of local political and economic elites' will to drive a distributive, participative and restitutive energy transition, and this could apply everywhere were citizen-led energy transitions are an option under the existing regulatory frameworks, meaning citizens are legally allowed to own parts of the energy system.

Our case selection across Germany and South Africa is in so far too limited to assess what is better for a just transition, direct or indirect participation, as we looked at direct participation in Germany and indirect participation in South Africa, but not at both forms of participation across both countries. Also, our hunch is that even within these countries, at the micro-level, the one or the other form of participation may be better suited depending on local citizens' preferences and that their contribution to the just transition depends on the concrete level of local citizen participation they propose.

Regarding the institutional and regulatory context and its connection to a citizen-led energy transition, lessons from the German cases have also been drawn by others (for example Baker et al., 2021). Our review of the literature and our own research have shown that a citizen-led energy transition requires a multitude of levers: local financing mechanisms, appropriate ways of incorporating citizens' collective efforts, a certain level of local governance as through the German subsidiary principle that leaves significant political and financial powers to regions and to some degree to municipalities, favourable tax regimes, generous subsidy mechanisms, and an environment that allows for organisational and educational support and networks for citizen wind farm initiators/developers and investors. This combination of factors does not exist everywhere and hence a citizen-led energy transition at the scale seen in Germany may be difficult to replicate in other countries. But our German and South African cases have shown, that

different places have their own local institutions that may be adapted to the purpose of an energy transition that is just in terms of distribution, participation and restitution.

Notes

1. We thank both our anonymous reviewers for pointing this out.
2. For instance, since 2016 the German *Land* Mecklenburg-Vorpommern has a law (BüBemBeteilG M—V) that makes financial benefits for local authorities and local citizens compulsory; since 2019 the German *Land* Brandenburg has a law (BbgWindAbjG) that stipulates an annual lump sum for neighbouring local authorities (Eichenauer & Gailing, 2023). At federal level, the EEG of 2017 allows for *Länder* to make their own laws on benefits from local wind farm projects for local authorities and citizens; and the EEGs of 2021 and 2023 included additional stipulations for *voluntary* citizen participation. Some *Länder* as well as energy experts support federal level regulations that make financial participation of local communities and citizens compulsory with the aim of increasing local economic benefits and acceptance of wind turbines.

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