Coordinating an Energy Transition in Africa: Challenges and Opportunities

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https://doi.org/10.53973/jopa.2023.58.3.1a6

Abstract

Goal #7 of Agenda 2063 envisions an Africa with "environmentally sustainable and climate resilient economies" and renewable energy is considered an important priority area for achieving this goal. While strides have been taken at varying levels and paces across the continent in the uptake of off-grid renewable solutions to the energy crisis in the region, there remain gaps in the energy system and industry. This paper examines the challenges to and opportunities for attaining a continent-wide energy transition in Africa. Drawing on a descriptive research design using mixed methods, the paper argues that coordination both within and between states is imperative for a successful energy transition in Africa. Within the state, the paper argues that active energy citizenship and participation reflects the level of coordination between the government and the citizens in the design and implementation of an energy transition. Between states, the paper argues that coordination in energy policies at a regional level is attainable if construed through the lens of developmental regionalism (Qobo, 2007).

Keywords: Renewable energy, Transition, Challenges, Opportunities, Africa.

Introduction

Goal #7 of Agenda 2063 envisions an Africa with "environmentally sustainable and climate resilient economies" as a catalyst for inclusive growth and sustainable development (African Union, 2023). Renewable energy is deemed as one of the priority areas for achieving this goal, yet sub-Saharan Africa (hereon, Africa) continues to grapple with the energy trilemma characterised by energy, insecurity, energy inequity and sustainability issues (World Energy Council, 2022). Irrespective of its persistence, Africa has taken great strides towards increasing the share of renewables in its energy mix to address the challenges of access and energy poverty. However, such strides have been impeded by the Covid-19 pandemic, Russia's invasion of Ukraine and the shock to the energy market and supply chain, and global geo-political challenges such as the resultant volatility in energy prices, all combine and pose a risk to

the region's energy security opportunities (International Energy Agency, 2022)

Overall, there has been an increase in the uptake of off-grid solutions to improve energy access yet there remain gaps in the energy system and industry. According to the 2022 Africa Energy Outlook report, the challenges underscoring the global energy market are reversing positive trends in improving access to modern energy with 4% more people living without electricity in 2021 in comparison to 2019. In addition, 600 million people (43% of the total population) lack access to electricity and about 970 million Africans lack access to clean cooking fuels. While liquefied petroleum gas (LPG) has been the leading off-grid solution, the hike in prices has made the commodity unaffordable for 30 million people, pushing many to revert to the traditional use of biomass for energy generation and undermining the prospects of achieving access to universal clean cooking fuels by the year 2030 (International Energy Agency, 2022)

Also, the failure of national utilities across Africa to cater for the energy needs of the citizenry has created opportunities for the exploration of new and cleaner energy sources. For example, Eskom's public debt challenges coupled with poor infrastructure maintenance has resulted in rolling blackouts (dubbed 'loadshedding') since 2007 (Eskom, 2012) in South Africa. The public utility's lapses have created an opportunity for the Renewable Energy Independent Power Producer Procurement Programme (REIPPPP) to generate and contribute electricity from renewable sources such as wind, biomass, small-scale hydropower and solar to the nation's electricity grid. In 2022, the president, Cyril Ramaphosa, announced that the IPP will double the procurement of the normal 2 600MW of renewable power per annum (GreenCape, 2023).

In Nigeria, the Power Holding Company of Nigeria, formerly the Nigerian Electricity Power Authority, has failed to meet the energy needs of the people. Access to reliable and affordable energy has been a challenge plaguing the Nigerian economy. As a result, many have turned to alternative solutions. While some use generators (which remains a growing and thriving industry and hence the politics of the electricity market), it exacerbates air and noise pollution given the poor spatial planning, and some, especially in rural areas, use combustible wastes, still others have looked to renewable sources such as solar and wind for energy.

There are opportunities to address the energy trilemma and enable an energy transition in Africa. However, the challenge of investing in infrastructure that supports old and new energy systems and of developing a cost-effective way to leverage Africa's abundant resources remains persistent. Thus, the main question this paper seeks to explore is: what are the challenges and opportunities for addressing the energy trilemma and attaining an energy transition (as enshrined in goal #7 of Agenda 2063) in Africa? It posits that the goal can only be achieved through effective coordination at two levels: within and between states.

Within the state, coordination between the citizenry and the government is needed. That is, there needs to be a widespread awareness and acceptance of the challenges of climate change necessitating an energy transition.

However, the design and implementation of energy transition policies must be cognisant of the socio-economic implications. Thus, active energy citizenship and participation becomes crucial and mutually reinforcing. We measure the extent of effective coordination between the government and the citizenry using perception data from Afrobarometer. The hypothesis is that the more aware citizens are of the challenges necessitating an energy transition, the more active/effective they become in the design and implementation of energy transition policies. Between states, coordination of national energy policies and strategies at a regional level are critical. While this study is situated within the broader literature on regional integration in Africa, it adopts Qobo's argument on "developmental regionalism" (Qobo, 2007:13). That is, regionalism in Africa must be geared toward achieving development outcomes as opposed to the "integration-focused" European Union model, where a premium is placed on infrastructure-related or project-based regional cooperation to manage regional public goods (Qobo, 2007). The paper adopts the Stag Hunt game theory to depict the challenges of coordination, especially in the face of uncertainty.

The article is structured as follows. The next section outlines the methodology used in this study, followed by a discussion on the challenges of coordination in an N-player initiative drawing on the Stag Hung game theory. Following this, a discussion on the state of energy, citizenship and participation in Africa is provided using descriptive statistics from Afrobarometer data. The paper ends with a discussion on the challenges and opportunities for coordination within and between states in Africa.

Methodology

The study adopted a descriptive research design drawing on a mixed methods approach. It begins by providing descriptive statistics using perception data from Afrobarometer Round 7 and 8 survey data. The data is used to discern the level of public awareness on climate change matters, as an indication of how active energy citizenship and participation is across Africa. The discussion on coordination between states draws on scholarly and empirical literature on regionalism in Africa. The study draws on reports, and scholarly literature in discussing the challenges and opportunities for a continent-wide energy transition in Africa.

Analysis

The Coordination Problem: Stag Hunt Game Theory

Game theory offers an interesting perspective in analysing strategic interaction in international affairs – conflict and cooperation. The theory is predicated on rationalist and positivist traditions; it enables the prediction of actor behaviour in a cooperation or conflict situation. The theory assumes that actors are both rational and strategic. Rationality entails the preference of some outcomes over others therefore behaving in ways that lead to the preferred outcomes. Actors are deemed strategic to the extent that their ability to achieve their preferred outcomes depends on how others respond to their actions. Thus, the need to consider the possible responses of other actors into account is crucial.

In the application of game theory to a social issue, it is important to understand who the actors are, what options or possible

actions are available to them, what outcomes emerge for each possible combination of actions the actors choose, and what their respective preferences are over the possible outcomes. The various types of games within the theory elucidate on specific challenges within cooperation and conflict. For instance, the Prisoners' Dilemma game theory is the most common and frequently used analytical tool. The game provides insight into the challenges of self-interest and collective gains. The Stag Hunt or Assurance game, Battle of the Sexes, and the chicken game (also known as the Hawk/Dove) address the challenges of coordinating strategies to achieve certain collective goals. We draw on the Stag Hunt or Assurance game for our analysis in this article.

Coordination problems emerge when two or more actors can reach a mutually desired outcome or avoid a mutually undesired outcome by combining their actions in a certain way but where more than one possible combination is possible. The presence of multiple ways to combine actions requires that actors coordinate on the same combination (McAdams, 2009). Coordination games have multiple equilibria and thus payoffs alone do not determine the behavioural outcome. In such cases, it is important to investigate other factors such as political dynamics, socio-cultural dynamics, and structural issues, for instance, to explain and/or predict behavioural outcomes. Coordination games often present a "distributional choice between conflicting preferences of different individuals, which must be made on the basis of some complex and contestable normative" theory (McAdams, 2009:212-213). In this paper, we construe the challenges of implementing a continent-wide energy transition in Africa (embodied in goal #7 of Agenda 2063) as a Stag Hunt or Assurance coordination problem.

In his seminal text titled *A Discourse on Inequality,* Rousseau (1984) illustrates the challenges of coordination using the story of two hunters who must choose between 'hunting stag' and 'hunting hare'. The chances of successfully hunting the hare are independent of what other hunters do; however, there is no chance of bagging the stag by oneself. The chances of successfully hunting a stag are dependent on the number of hunters who choose to cooperate and coordinate their hunting strategies for the big prize – the stag (Rousseau, 1984) (Skyrms, 2001). The payoff matrix below (Table 1) outlines the actions privy to each hunter. The combination of actions leads to possible outcomes or payoffs in each box.

The above is a simplified analysis of the challenges of N-player energy cooperation. There are two sets of actors – one hunter and other hunters (where the latter is viewed as a unitary actor, for illustrative purposes). Each actor has two options – to hunt the stag or the hare. The combination of actions between the two actors leads to outcomes/payoffs as shown above. The upper-left cell indicates that cooperation and coordination of strategies (pooling resources, hunting skills,

Table 1: Stag Hunt Payoff Matrix

One Hunter	Hunt Stag	Hunt Hare
Hunt Stag	3	1
	3	2
Hunt Hare	2	2
	1	2

Source: Authors

collective planning, and execution) leads to an optimal outcome where both parties successfully hunt the stag and go home with sizeable portions of meat (3, 3). The next best outcome is depicted in the lower-right cell where both hunters unilaterally defect from hunting the stag in pursuit of the hare. Both go home with a smaller portion of meat (2, 2). The worst outcome for each actor is depicted in the upper-right and lower-left boxes. The failure to coordinate strategies after a verbal (or signed) agreement undermines the prospects of collective gains (2, 1 and 1, 2).

Similarly, transitioning to cleaner sources of energy while addressing existing inequalities in access, availability, and affordability on a continental level requires all member states to, aside from agreeing to cooperate, choose the same combination of strategies – coordination (McAdams, 2009). Sustainable natural resource management and biodiversity conservation, sustainable consumption and production patterns, water security, climate resilience and natural disaster preparedness and prevention, and exploring renewable sources of energy require a sound political and economic environment – and the active participation of the citizenry in decision making processes and implementation. Thus, coordination between the government and the citizens is imperative.

Apart from mineral resources, agriculture is one of the economic mainstays of African economies. The impact of climate change, food and water security, and the region's gross domestic product (GDP) is forecast to decrease by an estimated 8.6% year after 2100 Vaissier, Stolp & Coetzer, 2021). In the same breath, Africa's energy demands are projected to triple by 2030. The current challenges underpinning electricity generation and consumption in the region include incessant blackouts, delipidated energy infrastructure, carbon-intensive sources of energy, and poor access. While a transition is imminent, the process would require Afrocentric energy policies that are cognisant of the unique dynamics and needs in Africa rather than the timelines of Western states otherwise construed as a "global agenda".

While there are several factors that influence whether governments can effectively choose and coordinate their energy policies to meet continental goals, we argue that a conducive political environment is a prerequisite for effective coordination within the state and between states (in a region). We assess public perception data on climate change and agency of the citizenry as a measure of energy citizenship and participation in Africa.

Within States: Energy Citizenship and Participation in Africa

How Aware Are Africans of Climate Change?

The role of citizens is important in the fight against climate change. Table 2 is a descriptive statistics analysis of the maximum, minimum, and mean values for climate change awareness across 39 countries between 2021 and 2023.

TABLE 2: Descriptive Statistics: Awareness of Climate Change 2021-2023

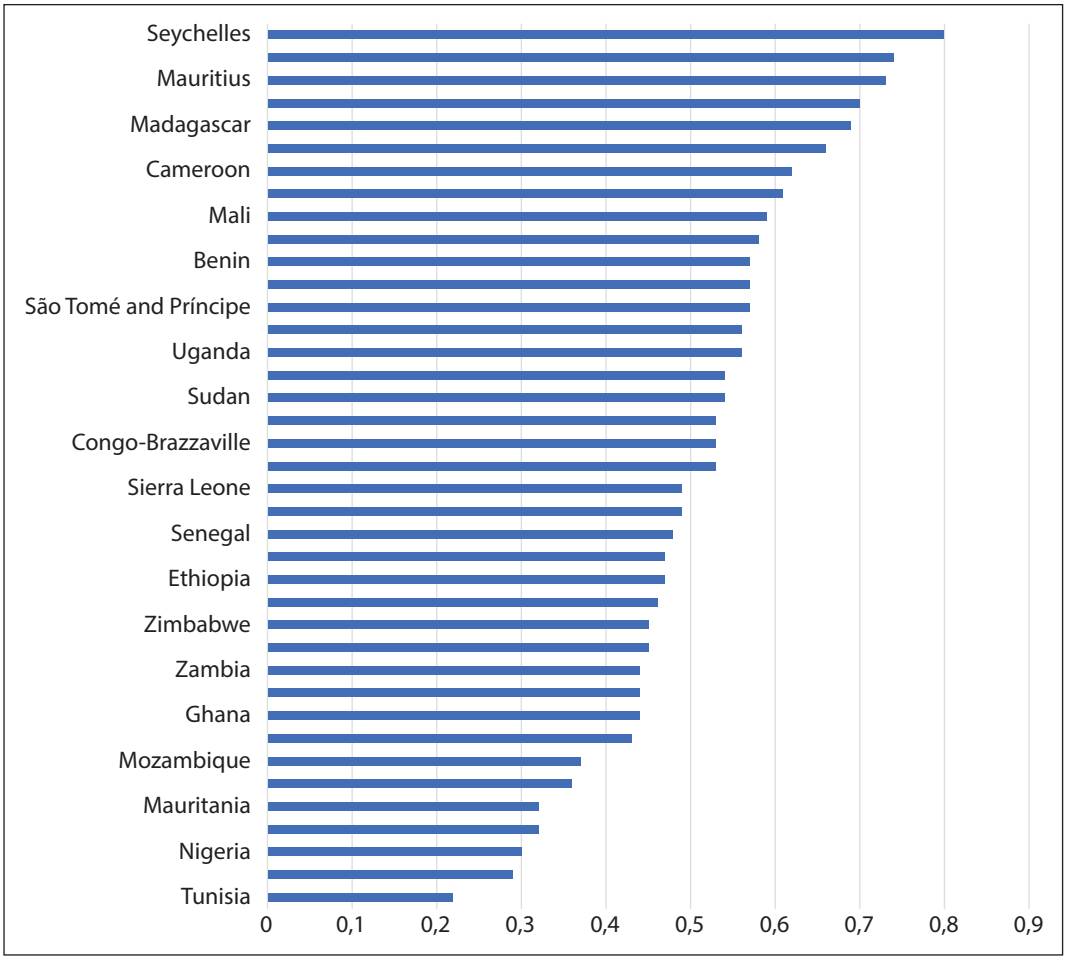
	Awareness
Maximum	0.80%
Minimum	0.22%
Mean	0.51%

Source: Authors

On average 51% of Africans say that they have heard of climate change. However, the minimum and maximum values indicate that there is great variation across the countries. The maximum value indicates that in one country (Seychelles), 80% of citizens are aware of climate change while only 22% are aware of climate change in Tunisia. Awareness of climate change is 8 points lower the round survey (58% – 2019/2021) and 7 points lower than the round 7 survey (57% – 2016/2018).

The Afrobarometer data indicates that awareness of climate change is higher in small island countries such as Seychelles (80%), Mauritius (73%), and Cabo Verde (66%) (Figure 1). Awareness is the second highest in Malawi (74%), Gabon (70%) and Madagascar (69%). However, awareness is the lowest in

Figure 1: Awareness of Climate Change



Source: Authors

Tunisia (22%), followed by Botswana (29%) and Nigeria (30%). The diverging trends suggest that climate change is prioritised and/or approached differently across the region.

Out of the 10 countries that are most vulnerable to climate change, 7 are in Africa: Mozambique (1st), Malawi (3rd), Ghana and Madagascar (joint 8th position) (AfDB, Climate Change in Africa, 2019). It is therefore surprising that while awareness is high in Malawi and Madagascar (69%) awareness in Ghana (44%) and Mozambique (37%) is below the regional average of 51% . This suggests that in these countries there is a gap between national polices and public awareness – in essence climate change policies are not reaching the ground level. This may also be due to the inadequate or efficient transfer of knowledge.

As noted above, the awareness of climate change is lower than in previous rounds. It is near impossible for fewer citizens to know less of climate change than in previous rounds. In Ghana, the awareness of climate change was initially asked in 2017 (round 7) and again in 2023 (round 9). In 2017, about 51% of Ghanaians said that they have heard of climate change, but this dropped to 46% in 2023. Similarly in 2018, 52% of Mozambicans say that they have heard of climate change, and in 2022, 34% say that they have heard of climate change – this is an 18-point decline. In Botswana, there is a 20-point decline in awareness (from 49% in 2017 to 29% in 2022). In South Africa, there is no difference in awareness as in both 2018 and 2023, 42% of South Africans say that they have heard of climate change.

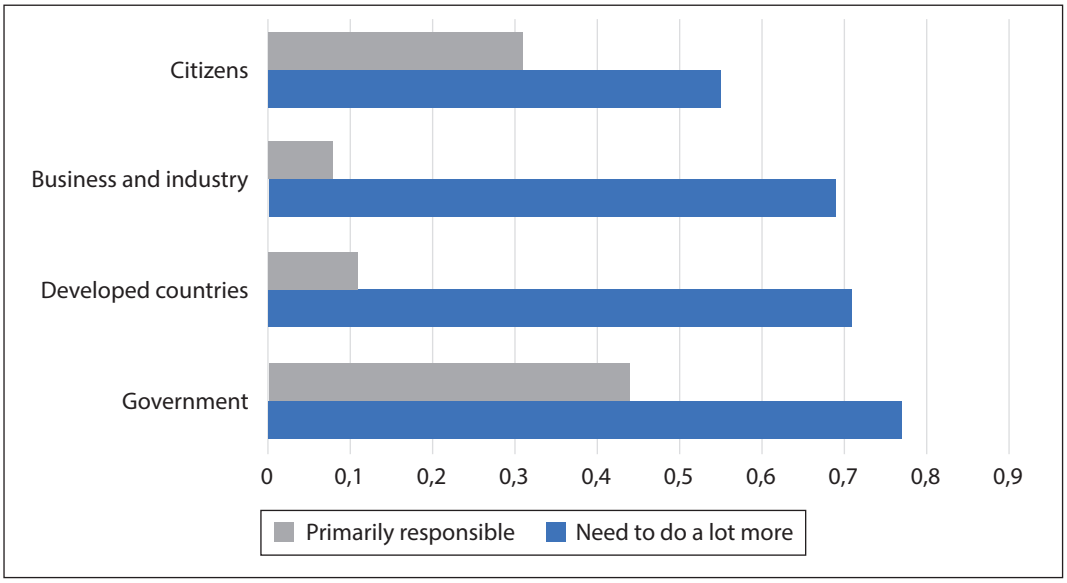
This observation is suggestive of under-explored explanatory factors that limit awareness. Two possible explanations are a language barrier and the centralisation of knowledge. Research conducted by the BBC World Service in 2009 finds that although most Ghanaians are aware of elements of climate change such as prolonged droughts, rising temperatures, and increasing variability in seasonal rainfall, this is seldomly associated with global climate change (Neville & Mohammed, 2010). This is in line with only 46% of Ghanaians who say that they have heard of climate change and 26% of citizens who associate it with negative changes. Only 46% of Ghanaians say that they can play a role in limiting climate change. In the same report, it was also established that climate change is poorly understood in Twi and Dagaare – about 85% of the population speak Twi (UPENN, 2014). In essence, the "everyday" language associated with climate change is not adequately translated and therefore not fully understood by most Ghanaians (Neville & Mohammed 2010).

Who is Responsible for Fighting Climate Change?

When asked who can play a role in limiting climate change, 44% of Africans say that the government can play a role (Figure 2 on the next page). This is followed by 31% who say that citizens are responsible. Rich or developed countries and business and industries are identified as the least responsible – 11% and 8%, respectively. This is intriguing considering that the leading statement in climate change is that rich and developed countries are primarily responsible for global emissions.

As noted, second to government, Africans say that ordinary citizens can play a role in limiting climate change. This is indicative of a sense of agency among Africans. In countries

FIGURE 2: The Role of Stakeholders



Source: Authors

such as Botswana, Burkina Faso, Eswatini, Tanzania and Zambia, the perception that ordinary citizens can play a role in limiting climate change is higher than the perceived role of the other stakeholders – including the government. Interestingly, the awareness of climate change in all these countries is below 50%. In contrast, in Malawi and Mauritius, where awareness is over 7%, the perceived role of government is the highest. Nonetheless, only 8% of Africans say that Business and Industry can play a role in limiting climate change. This suggests that corporates have not presented themselves as a key stakeholder in mitigating climate change. Additionally, this coincides with the critique that business is not doing enough to tackle climate change. Thus, for corporates, the task is to make themselves more visible to local communities and the countries they operate in.

Respondents who have heard of climate change were asked if each stakeholder is doing enough to limit climate change. On average, Africans have high expectation for the government to do more. This call is the highest among Gambians, amaSwati and Tunisians (89% respectively). Interestingly, even though citizens disagree about whether rich or developed nations can play a role in limiting climate change, 71% of Africans say that these need to do more to limit climate change.

Between States: Challenges and Opportunities for a Coordinated Regional Energy Transition

A continent-wide energy transition requires a "whole-of-systems" approach to which coordination (and governance) are intrinsic. It offers an opportunity to explore and exploit renewable energy resources in

Africa to address the triple challenges of access/equity, security, and environmental sustainability (energy trilemma) at supranational level. This argument is furthered by Wu *et al.* (2015), who acknowledge that although Africa has an abundance of renewable energy sources such as wind and solar, these resources are geographically differentiated in distribution. Thus, addressing the trilemma effectively will require regional collaboration and grid interconnection.

Although, regional initiatives seeking to capitalise on the renewable energy potential of the region exist, there are challenges that continue to undermine their effectiveness. Such initiatives include the Africa Clean Energy Corridor (ACEC) and the West Africa Clean Energy Corridor (WACEC). The former is a regional initiative that seeks to secure the accelerated development of the renewable energy potential and cross-border trade of clean energy within the Eastern Africa Power Pool (EAPP) and Southern African Power Pool (SAPP). In partnership with the International Renewable Energy Agency (IRENA), the initiative was expanded to West Africa to aid in addressing the imbalance between the demand and supply of power, high generation cost, energy equity and security issues (African Union, n.d.)

Furthermore, the benefits of regional collaboration and coordination of energy policies and strategies to promote an energy transition and increased access are documented in a joint report by the International Renewable Energy Agency and Berkeley Lab titled "Renewable Energy Zones for the Africa Clean Energy Corridor" (Wu, Deshmukh, Ndhlukula, Radojicic & Reilly, 2015). Their findings show the following:

Shared benefits: The geographical distribution of renewable energy resources is dispersed in Africa. Thus, regional collaboration and grid interconnection will enable (neighbouring) countries to benefit from their respective strengths. For instance, the report posits that countries with poor cost-effective wind zones, such as Angola, Burundi, the Democratic Republic of Congo (DRC) and Rwanda, can benefit from the high-quality wind resources of neighbouring Tanzania, Namibia, and Zambia. Also, countries like Rwanda and Swaziland can explore the prospects of importing solar PV electricity from Tanzania and South Africa (Wu, Deshmukh, Ndhlukula, Radojicic & Reilly, 2015).

Economies of scale: Coordination necessitates the pooling of resources together for infrastructure development. The financial burden of the energy transition can be shared between collaborating states, which, in turn, reduces the cost of energy to the end-user. The Inga dam hydropower project hosted by the DRC and supported by the World Bank was aimed at pooling regional energy resources to the benefit of the Southern Africa region and beyond. However, the politics of infrastructure development has since hindered the progress and completion of the project.

Policy harmonisation and standardisation: Policy integration and harmonisation at the regional level is crucial for deeper integration, especially in Africa (Schiff & Winters, 2003).

Risk sharing and mitigation: Large-scale infrastructure is often associated with a sunk cost. The risk associated with such projects varies, thus, coordination at a regional level can prove useful in attracting

foreign investments for the project. Examples of such projects include the prospective Grand Inga dam initiative. According to the 2022 Africa Energy Outlook, there has been a decline in energy investments in Africa owing to less spending on export-oriented oil and gas projects and the risk of climate change, between 2015-2019 (International Energy Agency, 2022).

Despite these opportunities, the pursuit of national interests and the varying levels of development (infrastructural and financial are of importance here) undermine the prospects of a coordinated continental energy transition. The challenges of an energy transition are reflected in the challenges of attaining regional integration in Africa. It begs the question as posed by Jiboku (2015:23) "how do we reconcile the neo-functionalist ideals of supra-nationalism with contending issues of sovereignty and nationalism enunciated in neo-realism?" and "how will the gap between supra-nationalism and state sovereignty be bridged in Africa?" We argue that transcending this dichotomy necessitates an adoption of Qobo's (2007) concept of developmental regionalism. The discursive context within which "integration" is used symbolises a loss of power, agency, and autonomy over decision-making processes and outcomes. Conversely, an infrastructure-related or project-based regionalism symbolises "partnerships" where the loss of autonomy is symbiotic and controlled can lead to more successful outcomes. Further research is necessary to explore the discourse and practice of developmental regionalism in Africa (and the implications for energy transition).

Conclusion

An energy transition characterised by an increase in the share of renewables in the region's energy mix can improve energy access by extending electricity grids to underserved areas, thereby improving living standards and supporting social development. It can address energy security problems where an increase in the supply of electricity, for instance, as per market principles, reduces the cost of the product to the end-user. Affordability and reliability can substantially improve when multiple sources of energy are pooled together to complement existing sources and generating capacity. Through economies of scale, the cost of developing and maintaining energy infrastructure can be shared by various actors, fostering a sense of mutual benefit and common purpose.

Despite these opportunities, the effective coordination needed to achieve goal #7 of Agenda 2063 continues to be undermined by poor energy citizenship and participation across the continent, energy nationalism and the failure to actively commit to the pursuit of regional/continental initiatives. The benefits of coordination within and between states in Africa can potentially circumvent other imminent challenges like investment and finance for infrastructure development, job creation, and economic development, with a spill over into political stability through energy diplomacy.

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