



# (Un)Just transition in power generation: neoliberal reforms and climate crisis in Sudan

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## ABSTRACT

Given the undisputable reality of climate change, this article explores Sudan's power generation and its approach to the current climate crisis, focusing on the perspective of a just energy transition. It highlights how the power sector's plans remain centralised, favouring urban consumerism, cost-driven energy sources, and inadequate social and environmental evaluations with limited community involvement. Furthermore, the absence of timely adaptation measures has left off-grid populations and those displaced by hydroelectric dams disproportionately vulnerable to worsening climate conditions, loss of traditional livelihoods, and conflicts over dwindling natural resources. This exacerbates instability and regional development disparities. The article advocates for a just energy transition in Sudan that not only reduces CO<sub>2</sub> emissions but also minimises adverse impacts on local ecosystems and livelihoods. It suggests a blend of distributed and utility-scale renewable energy sources alongside existing hydro-thermal capacity. It also calls for prioritising power supply to off-grid communities through socially driven financing mechanisms, countering the neoliberal push for privatisation and full-cost recovery.

## Transition (in)juste dans la production d'électricité : réformes néolibérales et crise climatique au Soudan

### RÉSUMÉ

À la lumière de la réalité incontestable du changement climatique, cet article explore la production d'électricité au Soudan et son lien avec la crise climatique actuelle, en se concentrant sur la perspective d'une transition énergétique juste. Il souligne que les plans du secteur de l'électricité restent centralisés, favorisant le consumérisme urbain, les sources d'énergie coûteuses et des évaluations sociales et environnementales insuffisantes, le tout avec une implication citoyenne limitée. En outre, l'absence de mesures d'adaptation opportunes a rendu les populations non connectées au réseau et celles déplacées par les barrages hydroélectriques disproportionnellement vulnérables à l'aggravation des conditions climatiques, à la perte de leurs moyens de subsistance traditionnels et aux conflits liés à

## KEYWORDS

Climate change; just energy transition; colonial legacies; liberalisation; social development

## MOTS-CLÉS

Changement climatique ; transition énergétique juste ; héritages coloniaux ; libéralisation ; développement social

## PALAVRAS-CHAVE

Alterações climáticas; Transição Energética Justa; legados coloniais; liberalização; desenvolvimento social

l'épuisement des ressources naturelles. Cette situation exacerbe ainsi l'instabilité et les disparités régionales en matière de développement. L'article plaide en faveur d'une transition énergétique juste au Soudan, qui permette non seulement de réduire les émissions de CO<sub>2</sub>, mais aussi de minimiser les effets néfastes sur les écosystèmes locaux et les moyens de subsistance. Il propose un mélange de sources d'énergie renouvelables distribuées à grande échelle, ainsi que des capacités hydrothermales existantes. En outre, il appelle à donner la priorité à l'approvisionnement en électricité des communautés non connectées au réseau par le biais de mécanismes de financement sur critères sociaux, en s'opposant à la poussée néolibérale favorisant la privatisation et le recouvrement intégral des coûts.

## Transição (in)justa na geração de energia: reformas neoliberais e crise climática no Sudão

### RESUMO

À luz da realidade indiscutível das alterações climáticas, este artigo explora a geração de energia do Sudão e a sua ligação à atual crise climática, focando-se na perspectiva de uma transição energética justa. Sublinha a forma como os planos do setor energético permanecem centralizados, favorecendo o consumismo urbano, as fontes de energia orientadas para os custos e avaliações sociais e ambientais insuficientes com um envolvimento limitado da comunidade. Além do mais, a ausência de medidas de adaptação atempadas deixou populações fora da rede e comunidades deslocadas por barragens hídricas desproporcionalmente vulneráveis ao agravamento das condições climáticas, assim como à perda de meios de subsistência tradicionais e a conflitos em torno da diminuição dos recursos naturais. Isto, por sua vez, agrava a instabilidade e as disparidades de desenvolvimento regional. O artigo defende uma transição energética justa no Sudão que não só reduza as emissões de CO<sub>2</sub>, mas também minimize os impactos adversos nos ecossistemas e meios de subsistência locais. Sugere uma combinação de fontes de energia renováveis distribuídas e à escala dos serviços públicos juntamente com a capacidade hidrotérmica existente. Além disso, apela à priorização do fornecimento de energia às comunidades fora da rede através de mecanismos de financiamento de cariz social, contrariando o impulso neoliberal para a privatização e a recuperação a custos totais.

## Introduction

Sudan is one of the countries in the world that is most vulnerable to climate change. Average temperatures across all seasons between 2000 and 2009 are estimated to have been between 0.8 to 1.6°C higher than those in the 1960s (UNEP 2020, 88). Changing rain patterns that reached the extremes of both droughts and floods were recorded in different parts of the country (*ibid.*). With more than 50% of primary energy coming from biomass (wood and charcoal) mostly used for cooking (Rabah et al. 2016), desertification is leaving vast areas and arable lands threatened. These combined climatic distortions have resulted in inconsistent agricultural production, on which the livelihoods of

more than two-thirds of the population depend (Republic of Sudan 2021), with consequences for food security.

As roughly 75% of the world's emissions originate from energy sources, which are predominantly utilised for power generation (Ritchie, Roser, and Rosado 2020), this article examines power generation in Sudan and its approach to tackling the ongoing climate crisis, taking into account the principles of a just energy transition (Akuno et al. 2022, 28). The just energy framework highlights that transitioning from a fossil-fuel-based economy also entails moving away from historical colonial and neoliberal power dynamics that have had a disproportionate impact on people in the global South. Instead, it is attentive to the social implications for labour, local communities and vulnerable members, including women and various minorities. Drawing on our earlier research paper (Basheir and Salah 2022), this article offers a more comprehensive analysis and exploration of ideas and themes in relation to Sudan's power generation landscape.

The article demonstrates how existing and future frameworks for electricity generation fail to consider a just energy transition approach. In addition to existing low electrification rates and prioritisation of grid-connected urban centres, the ongoing crisis of electricity blackouts is pushing the sector towards greater inequity and using more of the same climate-threatening energy sources, polluting thermal plants and ecologically disruptive hydroelectric dams, altering natural water cycles and agricultural patterns.

The effects of climate change are becoming increasingly visible in different parts of Sudan. Off-grid populations, as well as victims of hydroelectric dam displacements, have been disproportionately exposed to worsening climate conditions due to disruptions of their traditional means of livelihood, and in the total absence of timely and effective adaptation mechanisms. Climate change has also had an unmistakable impact on fuelling conflicts in different regions of the country, increasing instability and inter-regional development gaps (Suliman 2006, 125). This is why a just energy transition was positioned as a central demand of the 2018 revolution, when Omar Al-Bashir was overthrown. However, the succeeding technocratic government has aligned with the security forces and the residue of the old regime to enforce neoliberal reforms and reject these popular policies, often through violent means.

Here we advocate for a just energy transition in Sudan, which involves shifting power generation strategies to focus on supplying energy to off-grid communities through socially driven finance mechanisms. In this context, the preferred energy sources for the transition should not only be low in CO<sub>2</sub> emissions but also have minimal negative impacts on local ecosystems and livelihoods.

We start by contextualising power generation in colonial history, with its centralised logic that prioritised expansion along the Nile River with large agricultural projects, hydroelectric dams and the resulting development disparity. We then focus on the current trends in power supply and demand, and the criteria guiding the energy sector towards perverse forms of development.

## **The historical context**

The modern nation state in Sudan is the product of a highly centralised colonial legacy whose features are evident in the energy sector today. The colonial era focused on specific priorities, the most important being securing the resources of the Nile for Egypt under

the British-Egyptian period of colonial rule, and expanding the production of cheap raw materials in Sudan, particularly cotton, for export (Salah 2019). This contributed to the creation of a central development pattern based on large projects. Post-colonial national governments continued to pursue similar policies based on the deep link between energy development and the political goals of the system. Regimes consistently favoured large inefficient projects in energy production, especially thermal and water projects. These were often associated with a high environmental cost paid through the dismantling of communities and their traditional livelihoods, in favour of classes in other areas. When large projects are designed around political wins, they seldom pay attention to the environmental consequences of these projects, which often negate their economic feasibility.

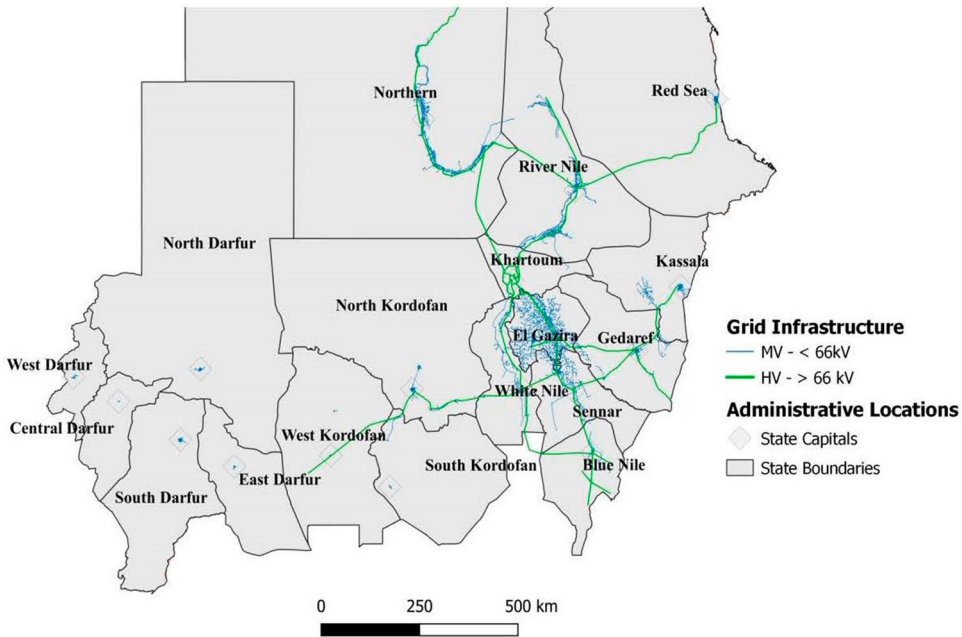
### ***Colonialism and developmental inequality***

The prevailing inequality has its roots in Sudan's history. Spaulding (2010, 266) observes that Turko-Egyptian rule between 1821 and 1885 witnessed the expansion and hegemony of merchants southwards, in parallel to the slave trade coming from the south and accompanied by trade in raw materials (gold, ivory, animal skins etc.). These dynamics created a conflicted social development, with the introduction of capitalist relations reflected through an 'Arabicisation' project led by the merchant class which had begun to emerge even before Turko-Egyptian rule in the Sinaar kingdom (1504–1821). This created an enduring symbiotic relationship between the dominant class of merchants and their claimed Arabic culture which continued under British-Egyptian colonisation (1899–1955) and which set the terms for Sudan's independence.

Sudan has continued to experience severe developmental disparity and a northern monopoly of power connected to the cultural diversity present since the colonial era. This diversity separated northern Sudan from its southern regions, including some areas in Darfur, Kordofan and Blue Nile<sup>1</sup> which were demarcated under the Closed Districts Ordinance, first introduced in 1922. This isolated large areas and diverse population groups from the socio-economic development of the rest of the country until 1946. By 1955 war had erupted between northern and southern Sudan, prior to the declaration of independence in 1956.

Colonial policies continued, and conflict took on an explicitly religious character following the first military coup in 1958 (Bola 2001). Successive governments in Sudan have been predominantly characterised by military rule, implementing developmental policies that favoured the central and predominantly Arabicised areas known locally as the 'Hamdi triangle', comprising Dunqulah, al-Abyad and Sennar, fostering the cultural and religious exclusion of the rest of the country. The energy sector, being a vital central service, played a political role in perpetuating the military's control and its influence over various regions in Sudan (see Figure 1, where the national grid leaves western and southern regions in the dark).

The most significant of these power projects are the hydroelectrical dams, a colonial legacy that continues to have a significant impact on Sudan's energy sector. The history of dam construction is linked to British-Egyptian colonialism, evident from the studies of the second cataract of the Nile dating back to 1897, even before colonisers entered Khartoum. This highlights the colonial motive of controlling the Nile's waters. Detailed



**Figure 1.** Electricity grid networks in Sudan (2019). Source: World Bank (2019).

strategies for dam construction were developed in 1904, prioritising the storage of water for agricultural expansion in Egypt and more opportunities for agricultural expansion in Sudan to provide low-cost agricultural products to the coloniser (Salah 2023; Garstin 1904).

After independence, the purpose of constructing dams changed from preserving water for Egypt's benefit to solely focusing on energy production. This shift started to take shape after a World Bank report of 1983 which explored the potential for hydroelectrical development, adopted by the regime of Omar Al Bashir (1989–2019). Future studies and projects were subsequently directed towards the exclusive goal of energy production.

In Sudan's past, multiple political and economic centres had been associated with historical kingdoms and sultanates, such as Sennar, El Fasher and Abbasia. Now a political centralisation took place, centred on Khartoum. This was in part due to agricultural expansion in the central regions and the Blue Nile strip, from about 70,000 feddans before colonialism to more than 4 million feddans by the end of the colonial period. Dam projects have played a decisive role in agricultural expansion and this major political transformation (Salah 2023).

### **Post-colonial central government policies**

Projects proposed under national governments, specifically those related to dams under Al-Bashir's rule, followed the colonial vision. Following independence in 1956, the first military rule under Ibrahim Abboud (1958–1964) continued the policy of agricultural expansion, morphing into agricultural capitalism focusing on the export of raw materials and the expansion of mechanised agriculture at the expense of small farmers (Ali 1994,

121–158; Taha 2016). The Nimeiri government of 1969 to 1985 initially emphasised a developmental project in the energy sector as part of its 10-year plan. However, after signing the Addis Ababa Agreement in 1972, which briefly halted the war in southern Sudan, the state treasury shifted its spending towards political loyalty (De Waal 2019, 89–93). Political instability increased, and the government focused on reconciling traditional forces through the National Reconciliation Agreement of 1977. In 1978, the government entered into an agreement with the International Monetary Fund (IMF) (Ali 1991, 33–40). A transformation in the energy sector became evident only when integrated development projects shifted their focus from water storage to energy production in 1983.

The masses revolted and overthrew Nimeiri in 1985, but the same traditional forces that were allied with Nimeiri then assumed power under the leadership of Sadiq al-Mahdi. Economic policy now depended on the export of livestock from western Sudan and agriculture from the east. This came at the expense of creating violent local conflicts, with growing environmental challenges threatening the western parts of the country and the Sahel region in general. Most notable of these challenges was the great drought in the mid 1980s (Suliman 2004) that contributed to the intensification of conflict over land and resources in the Darfur region (Suliman 2006, 361–365).

More recently, during the early years of Al-Bashir's rule (1989–2019), isolationism and economic blockades limited the possibilities to expand services. However, in the early 2000s, the discovery of oil and a political settlement with major movements and parties led to an economic surplus that benefited several sectors, including energy. Yet, political challenges arose during the post-settlement transitional phase, as the government prioritised maintaining Al-Bashir's rule and the Islamic political system, which had an impact on energy-related policies and their political role.

By the early 2000s, Al-Bashir's government was attempting to turn energy production and distribution into a massive political project, expanding residential supply networks in the Hamdi triangle to gain support from its residents. The Merowe dam was proposed as a solution to guide Sudan towards development and progress. Al-Bashir referred to it in his inauguration speech as 'the project of the century', symbolising the end of poverty and the grand launch of the Greater Sudan state. It was presented not only as a major development project, but also a distraction from the International Criminal Court's 2009 memorandum which accused the president of crimes against humanity. However, the fog of developmental discourse soon cleared in the face of the reality of increasing electricity cuts and the rising costs of electricity.

Favouring pro-government companies in construction and marketing led to increased corruption, nepotism and lack of oversight, causing construction costs to rise. Consequently, Sudan faced a massive debt of around US\$3 billion allocated for the dam's construction. Electricity production capacity significantly decreased, from the initially claimed 1250 MW to less than 600 MW at the time of its opening (Hashem 2016).

Lack of transparency significantly increased the environmental cost of constructing the dam. The government entrusted the engineering work to Lahmeyer International, a German company convicted in corruption cases related to water projects in southern Africa's Lesotho Highlands (Probe International 2006). Consequently, the World Bank stopped working with Lahmeyer for seven years. However, Lahmeyer found opportunities to continue its operations, including in Sudan, where funding sources with little

regard for transparency were available. Lahmeyer continued to serve as an engineering consultant for other dam projects and even expanded its work.

### **Power supply today: what are the criteria?**

In Sudan, only around 32% of the population have access to electricity supplied by two interconnected national grids (World Bank 2019, 22), with grid-connected areas experiencing frequent supply interruptions. The current capacity of 3.5 gigawatts is equally divided between hydropower and thermal generation (steam using fossil fuels). Grid access is concentrated in urban areas and completely excludes the five federal states of Darfur and the South Kordofan region (see Figure 1). These are the same sites where conflicts erupt – a situation largely shaped by historical developmental inequality.

Demand has grown considerably over the past 10 years, at an average of 12% per year (World Bank 2019, 16), mainly due to increased consumption per capita and to a lesser extent rapid demographic growth, offsetting marginal increases in supply.<sup>2</sup> In addition to a huge gap in financial resources in the sector, governance has played a key role in undermining the sector's performance. High rates of urban electricity consumption put pressure on the sector to increase the available capacity. The criteria for deciding on these additional capacities, and the sector governance at large, disregard the interests of local communities, justice or sustainability.

Several policy frameworks have been formulated to respond to the pressing environmental risks facing the country. Most notable is the Environment Protection Act 2001, which consolidates different environmental laws covering biodiversity protection, pollution control, public environmental awareness and environmental and social impact assessments (updated by the transitional government in 2020: UNEP 2020). The government also committed to the Intended Nationally Determined Contributions (INDCs) during COP21 in 2015, which were updated in 2021 (Republic of Sudan 2021). Despite the existence of these frameworks, their implementation faces constraints, lacks standardisation, and exhibits inconsistencies.

### **Liberal reforms**

Governance of electricity supply has undergone major shifts since the 1990s, with privatisation and 'unbundling' systematically prescribed for most countries around the world with issues of 'inefficiencies' (Kessides 2004, 131). Normally, unbundling aims to separate the historically vertically integrated state monopoly over the three main components of electricity supply: production (generation facilities), transmission from production sites to consumption sites, and distribution to end consumers (*ibid.*).

The unbundling of the National Electricity Corporation (NEC) was fully implemented in Sudan in 2010, with the formation of five new companies according to their technical functions; for example, thermal generation, hydro generation, and transmission. These companies are all managed by the Sudanese Electricity Holding Company (SEHC) and they are all under the Ministry of Energy and Mining (World Bank 2019, 13). The expected increase in management efficiency associated with unbundling did not materialise, with the lack of financial autonomy of these different companies and their

overlapping mandates cited in justification (*ibid.*). However, the soundness of unbundling as a universal reform measure is what should be questioned.

Opening the sector for private investors is one of the key justifications given for unbundling, as it allows greater segmentation that accommodates a heterogeneity of actors and opens the door for competition (Graham and Marvin 2001, 141). But the NEC unbundling was carried out in such a way that a detailed framework for how to engage with private investors was not in place, and only a generic legal framework about their participation exists (World Bank 2019, 13). In addition, the low (subsidised) electricity tariff was deemed unattractive to investors.

The lifting of subsidies on electricity tariffs was therefore the other major recommendation for sector reform. Between January 2021 and January 2022, electricity tariffs were adjusted three times at exponential rates. For instance, the lifeline (the cheapest and most subsidised quota) was reduced from 200 to 100 kWh and its price increased from SDG 0.15 to SDG 5 (3000%) (Anadolu Agency 2021). The commercial and agricultural tariffs have increased by 13,000% and 5000%, respectively (Open Sudan 2022).

In addition to electricity tariffs, liberalisation reforms were also introduced for the currency, wheat and fuel (World Bank 2021). After the December 2018 revolution that led to the overthrow of Al Bashir's government, urgent solutions were needed to address the economic challenges faced by the country. The economic downturn caused by the loss of oil revenues in 2011, and 30 years of corruption and clientelism under an authoritarian regime, had emptied the public coffers. This, coupled with long-standing debt arrears surpassing US\$50 billion (IMF 2021), put the post-revolution transitional government under pressure to follow the liberalisation measures prescribed by international organisations and development agencies as a condition for financial aid. Although this financial aid was later suspended, following a military coup in October 2021 the coup leaders expedited the implementation of further liberalisation measures to compensate for the lack of foreign aid.

Since then, the cost of living has skyrocketed, and inflation has increased from around 50% in 2019 to more than 200% by the end of 2022 (Trading Economics 2023). Information campaigns during the lifting of the subsidies emphasised that the upper classes were the main beneficiaries of state subsidies due to their higher consumption rates. However, the liberalisation measures have disproportionately impacted the working class, marginalised communities, and the agriculture and industry sectors (Greco 2023, 3).

Pushing private investment in the electricity sector poses a long-term risk of diverting electrification efforts from their intended social development goals. The commodification of basic services like electricity could lead to a delay in achieving universal electrification, especially for off-grid populations in Sudan who often lack the financial means. While access to finance remains a significant obstacle in reaching the 80% electrification targets by 2030, previous experiences have shown that relying on the private sector has not been the most efficient approach for socially driven electrification endeavours. Trotter and Abdullah's research highlights that publicly led initiatives are better suited to balance social development with cost recovery (Trotter and Abdullah 2018, 145). They achieve this by implementing context-sensitive finance mechanisms for end users, such as the 35-year loans provided by the Korean government for connecting rural users to the national grid (*ibid.*, 141).

Furthermore, the participation of the private sector, driven by its profit-oriented nature, does not prioritise other important aspects of social development, such as



transferring technical and industrial knowledge and infrastructure to local communities (*ibid.*, 145). This can lead to a continued reliance on value chains controlled by developed and emerging markets for both soft and hard project inputs, perpetuating dependency and vulnerability to external markets. Encouraging private developers to invest in new developments also means the prioritisation of short-term financial costs over the long-term impacts on the environment and its inhabitants.

### **Least-cost planning**

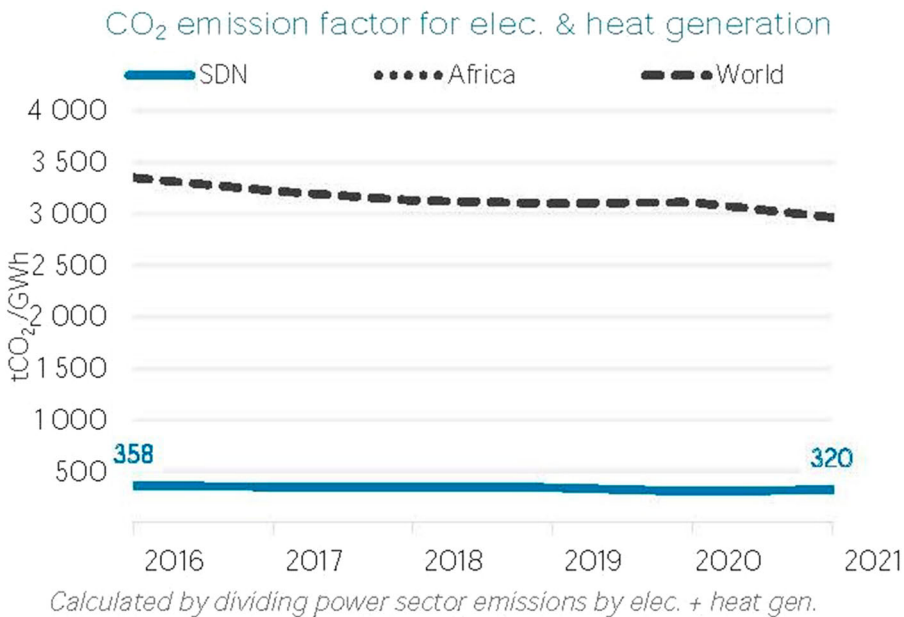
Currently, efforts in the energy sector are mainly directed to respond to the rising annual energy demands, rather than examining its drivers and rationale (class formation and inequality). The lack of a holistic vision to guide planning is resulting in development patterns that have been proven unsustainable long ago. In Sudan, more than 60% of the population are still off-grid, and consumption rates among the supplied population are almost six times the average for sub-Saharan Africa (308 kWh per month) (World Bank 2020, 4).

One consequence of the oil boom years (1999–2011) was the emergence of a middle-class lifestyle. Greater Khartoum, concentrating around 20% of the country's population (approximately nine million people: Ille and Steel 2021, 3), consumes more than 60% of the country's electricity in key industries, services and commerce (Ministry of Water Resources and Electricity 2012, 29). Overall, 60% of the supply is consumed by the residential sector (World Bank 2019). In a Dubai-like mode of development, traditional architecture with cool earth-based materials and open spaces has given way to concrete jungles of poorly ventilated tiny apartments. Buildings are now fully reliant on energy-intensive air conditioning, reflected in the demand profile, where demand in summer is double that in winter (*ibid.*). This is a direct consequence of the lack in rigorous laws and institutions regulating buildings, and the manufacture and importation of electrical appliances, particularly air conditioning units.

These large annual consumption rates have worsened the national supply gap, with the energy sector under constant pressure to provide more electrical capacity. More than 1200 MW of thermal plants have been installed between 2003 and 2016 to respond to increasing demand (STPGC n.d.). The fast and relatively cheap development of thermal plants has overshadowed their reliance on fossil fuels – in this case, oil and coal. The loss of local sources of oil, following the independence of South Sudan, along with their hard currency revenues, meant largely relying on imported fuel in a highly fluctuating exchange rate market.

The expansion of thermal production does not take into consideration the negative impact of fossil fuels, which cause a significant increase in the emission of climate-changing gases. These equalled about 5 million tonnes of carbon dioxide in 2020 (IRENA 2023, 3). As Figure 2 shows, emissions linked to power generation in Sudan remain relatively low when compared to the continent, or the world average. The thermal plants mainly use oil-based fuels like crude oil, light diesel oil, heavy fuel oil and heavy cooked gas oil (World Bank 2019, 19). These fuels are obtained both from domestic production and imports, with the proportion of imported fuels steadily increasing due to the ongoing depletion of local reserves.

Though experiencing significant delays, the 2018–2023 plan serves as the road map for energy development and gives thermal generation a central role (World Bank 2019). The



**Figure 2.** Emissions per generated electricity and heat (tCo2 per energy unit). Source: IRENA 2023.

World Bank, in its diagnostic report for the power sector published just a few months into the transitional period in 2019, laying out the sector status and its reform plans, recommends an additional capacity of 8000 MW (World Bank 2019, 40). Fifty percent of this is to come from thermal generation, 25% from hydroelectric dams and 20% from wind and solar energy (*ibid.*). The report is notable for its unidimensional criteria for new capacity planning that takes a minimum cost approach (the least-cost plan). Such an approach only considers the financial costs of projects, regardless of the consequent social or environmental costs.

Twenty-five percent of the planned thermal capacity is to come from coal, even as the rest of the world shifts away from this polluting fuel. Nonetheless, the nation is rich in renewable energy resources, boasting the potential for more than 2000 MW for photovoltaic solar, among the world's highest (Ministry of Water Resources, Irrigation and Electricity 2019, 28). Significant sources of wind power, biomass, and biofuels are available, with geothermal reserves (drawing on heat in the earth's crust) being present to a lesser degree (*ibid.*).

Sudan's INDCs ambitiously commit to additional capacities of renewable energies, in particular solar and wind: this has only marginally materialised. Of the 1000 MW solar energy committed to in 2015 (Republic of Sudan 2015), only an estimated 5 MW has seen the light and another 5 MW is planned to be commissioned, with major delays (Suna 2020). The 2021 INDCs commit to a total reduction of 12.4 Mt CO<sub>2</sub>e of greenhouse gas emissions related to the energy sector (Republic of Sudan 2021, 5). However, the framework emphasises that all committed mitigation and adaptation measures are dependent on the receipt of financial and technical international support (*ibid.*). The financial support needed is estimated at US\$8.24 billion over the next 10 years for both mitigation and adaptation measures (*ibid.*, 25).

Delaying the shift to renewable energy due to financial concerns is myopic given rising operational costs, import market volatility, and the risk which fossil fuels pose to energy security amid the looming climate crisis. Funding for renewable projects can be sourced from both local and international channels. Successful financing of small-scale solar initiatives has been achieved through local resources like microfinance for standalone solar home systems (Ahmed *n.d.*) and public funds for the two solar projects in the Darfur region. Valuable insights can also be gained from rapidly growing renewable markets that utilise innovative finance mechanisms like cross-subsidies between remote productive applications (e.g. telecom towers or mining) and nearby low-income residential communities (Sustainable Energy for All 2021, 30).

Moreover, for utility-scale projects with their higher capital costs, Sudan can solicit the available funding programmes dedicated to electrification in sub-Saharan Africa or for climate change initiatives, from which the country has marginally benefited compared to neighbouring countries: programmes such as the USA's Power Africa, the UNFCCC Green Climate Fund and Least Developed Countries Fund or the African Union's Africa Renewable Energy Initiative. Although these funding schemes have shown their tendency to strengthen neocolonial dynamics by fostering greater technical and financial reliance on imperial powers, publicly led and democratically managed developments have the potential to negotiate more favourable social and environmental conditions, thus expediting the just energy transition.

## **Power generation as political power**

### **Hydroelectric dams**

In a period of climate crisis, hydroelectric dams have the immense benefit of not relying on fossil fuels. However, they also have many negative aspects. The construction of the Merowe dam, the biggest hydro plant in the country, went hand in hand with environmental violations. A report on the environmental situation in Sudan, issued after the protracted armed conflict between 1983 and 2005, made it clear that the government did not adhere to its own legal standards in approving studies of environmental impact (UNEP 2007). When studies were presented to Sudan's competent authorities, they were thus not approved, and pressure was brought on the Gulf financiers to stop the flow of funding. The government's response was strong: it announced a ministerial change, with the minister and all departments involved with approving environmental impact reports removed. Around a week after the appointment of new departments, these reports were approved. Admittedly, this demonstrates the extent to which the Merowe dam, at the time, was of extreme importance. Verhoeven (2015) and Abd Elkreem (2018) confirmed that the Dam Implementation Unit (DIU) for Merowe dam was controlling 40% of the total budget in Sudan between 2006 and 2008.

The lack of attention to the environmental and social costs of building dams is also illustrated by the disregard of increasing evaporation rates. For the Merowe dam and other artificial lakes in Sudan, the total amount of evaporated water was more than 11 billion cubic metres, equivalent to 60% of Sudan's total share from the River Nile (Salah 2023). Such an increase affected the production levels of staple crops and orchards in the areas north of the Merowe dam and other areas in Sudan. This loss of livelihoods also contributed to the displacement of tens of thousands of affected people (*ibid.*).

Most drastically, the government forced the local communities to migrate to other areas without consulting them and proceeded to divide ethnicised population groups (according to DIU statistics [Dafallah 2016], these were around 67% Manasir, 26% Amri, and 7% Hamadab). Forced migration began with the Hamadab group through promises of rewards; they were then followed by the Amri group. When the Manasir and other groups refused to leave and demanded a local option (housing around the lake), the director of the DIU stated that he would 'get them out of their holes like rats' and closed the dam gates, flooding about 70% of their areas, affecting more than 150,000 people (Sudanese Online 2008) and submerging their land and possessions overnight. However, these groups still live around the lake in defiance of the government, which has cut off all services. They continue to protest these violations by presenting demands and conducting processions and sit-ins, but successive central governments have not offered any alternative local resettlement plans.

The groups that agreed to resettle have also been subject to government interventions, the most prominent of which is linking small farmers through loans (and subsequent indebtedness) to a system of central projects for grain and fertilisers. Small farmers must now rely entirely on centralised and inadequate irrigation systems. This further increases the economic significance of their displacement, as a radical transformation from independent societies with ownership over the land, to indebted agricultural producers on much less fertile lands (Zeitoun et al. 2019).

The Merowe dam has contributed directly or indirectly to major environmental transformations in the areas above and below the dam. Temperature, humidity and seepage rates, as well as the times and volumes of rain, have changed. The construction of the dam has also decreased the sediment rate in the water downstream, contributing to a reduction in the productivity of palm trees as well as falling production and productivity rates overall in the northern states of Sudan (Salah 2018, 88–90). Those affected by the construction were forced to increase their use of chemical fertilisers and pesticides due to agricultural pests and the continuous failure of the farming season, but to no avail. The lack of state support in the form of agricultural planning and supplying agricultural inputs, mainly energy, has had a heavy impact on those dependent on individual farming and cooperative agricultural projects. Despite studies which suggested that large agricultural projects were feasible, successive governments refused to facilitate these by constructing secondary canals.

Despite this disastrous history, the next few years saw more dams built: the Roseires dam in Blue Nile state and the Upper Atbara and Setit dams. In the latter case fertile lands were allocated to foreign investment companies and pastoralists were forced to migrate due to the flooding of their traditional grazing lands. When they moved with their more than three million cows to more southern areas, this created serious conflicts with existing inhabitants.

The memory of the affected areas has been erased by numbering the villages and cities. The forced integration of different ethnic communities with different means of livelihood created a state of continuous and increasing internal conflicts that coincided with the declining economy. In addition, the areas closest to those dams, such as the locality of El Buhaira, the al-Azaza area near the Roseires reservoir, and most of the villages on the banks of the Atbara River, have neither electricity nor regular access to water. Compensatory housing was poorly built, and constructed with shallow latrines which filled up easily in these rainy areas, creating unliveable homes. This provided a fertile environment for the spread of diseases such as cholera and malaria, as well as mental and reproductive

health issues known to be associated with the construction of dams in the absence of basic health services. Many small farmers left the affected rural areas, turning to precarious labour around cities and in the mining sector.

The economic, social and environmental cost of hydro-power projects show that the energy returns are low in comparison to the exorbitant costs. These are projects that exacerbate developmental inequality as they lead to large sections of the population losing their traditional means of livelihood without significant benefits. Hydro-power projects therefore contribute to creating spaces of sacrifice for the benefit of ‘development’ and capitalist accumulation in other spaces, reproducing developmental disparity, deepening historical inequality, and further increasing conflict.

However, resistance to such projects has intensified in the past decades from communities located within areas where the government plans to construct large dams for energy production. The most famous of these are Dal, Kajbar and Al-Sharik, whose lake area is estimated at around 1000 km<sup>2</sup>, in addition to the 3000km<sup>2</sup> of already established dam lakes (Salah 2023). These areas fiercely resisted the construction (Figure 3) despite the government’s brutal response, with arrests and extra-judicial killings. This resistance has largely succeeded in transforming public opinion towards the dams and also towards the regime. Ultimately, the cumulative effect of this resistance led the transitional government of 2019 to 2021 to announce the cancellation of the dams.

One of the most important obstacles in the energy sector is financial, political and administrative corruption, which has led, for example in the Merowe dam experience, to a significant increase in the cost of building dams. Some estimate that the final cost of the dam has doubled from what was planned at the beginning of the project. The lack of transparency and public participation makes estimating the financial,



**Figure 3.** Anti Dal and Kajbar dams protest following the declaration of funding from Saudi Arabia. Abri, Northern State 2015. Source: Provided by the Anti Dal dam committee.

environmental and social costs of corruption very difficult. The case of the Al-Fula thermal station in the western region of Sudan is instructive.

### ***Al-Fula power plant***

The thermal station in Al-Fula began to be considered in 2012, with a projected generating volume of 500 MW and a cost of about US\$680 million (Suna 2019). Its aim was to provide energy to Kordofan and Darfur. While about half of the total area of Sudan (46%), these regions have access to only 2% of the energy of the national grid (World Bank 2019). They are also one of the main sources of livestock, agricultural products and mineral exports, and the only oil-exporting area (but one which is facing a crisis of infrastructure in the main production sites).

The determination of where the project would be located was based on the presence of large quantities of lost gas in oil production sites, which could be used in energy production at very low cost. Executing companies were contracted and a large percentage of the project budget was handed over. All the required machines and turbines were imported, but after that progress on the project stopped. In the pause, it is alleged that the project enabled one of the importing companies to sell the machines as scrap to cover the rest of its expenses, and this led to the state losing US\$360 million, which the government could not justify before Parliament.

Talks about the project were reopened multiple times, and an accompanying project was signed in 2018 (Darfur 24 2018), again in 2019 (Suna 2019) and at the end of 2022 (Sudan Khabar 2022). Yet each time a new company was contracted and funding provided, work then stopped. Conflicting decisions between official authorities and failure to raise the full funding contributed to the government ending the project.

### ***Funding policies***

Loan-based financing is one of the major problems facing energy production projects, especially dams. Countries could mobilise their own resources by taking advantage of financing through progressive taxation, the creation of public shareholder companies, and the provision of opportunities for the affected population to contribute to projects and solutions, guaranteeing broad participation and benefit. Instead, these projects are founded on loans, which not only have an impact on national sovereignty in relation to strategic projects, but also increase the weight of accumulated debt.

Projects such as the Merowe dam, the heightening of the Roseires reservoir, and the Upper Atbara and Setit dams, present a clear picture of these loan-based dynamics. In return for loans, Chinese companies obtained construction contracts and Saudi Arabia acquired more than one million acres (404,700 hectares) for a period of 99 years. Saudi Arabia's land acquisition is equal to the total area of the new Upper Atbara project, which is located on fertile lands that Saudi Arabia is considering exploiting as part of a project to provide food security (Sudan's Transparency Initiative 2017).

### **Conclusion**

Despite Sudan's proactive engagement through official commitments to climate change mitigation and adaptation, concrete actions remain limited and erratic. Little has so far

been done to address the vulnerability of communities displaced by large power projects, mainly hydroelectric dams, throughout the modern history of Sudan. These communities have not only lost their ancestral lands and memories but also their traditional means of livelihood, and are exposed to highly unstable new environments. In the context of climate change the only clear benefit of dams is their non-reliance on fossil fuels.

New power projects show little deviation from the business-as-usual approach, with heavy dependency on foreign capital investment. They continue to follow a highly centralised mindset, with inadequate social and environmental assessments and minimal input from affected communities. Despite Sudan's ambitious INDCs, future frameworks appear contradictory and poorly drafted, straying from the commitment to increase renewable energy capacity, mostly for financial concerns. The poor financial outlook of public sector companies and the urgent need for ample funding to address the power crisis have expedited the adoption of a least-cost energy mix criterion.

Such cost-oriented planning will be pushed to its limits with the gradual shift towards sector liberalisation through the accelerated lifting of public subsidies and the push towards private-sector involvement. This can exacerbate poverty and make adaptation efforts even harder for vulnerable communities. The least-cost criterion is also delaying efforts towards a just energy transition by incentivising the further development of fossil-fuel-based generation facilities, which currently have a lower cost per energy unit than renewables. Fossil fuels are still staples of electricity production.

Several axes of action could be gradually targeted in the path towards a just energy transition. First, national frameworks could be informed by local needs and voices, rather than being dictated by development agencies with their typical neoliberal reforms, favourable to corporates and tech giants. A context-sensitive just transition would take into account the poverty faced by a significant percentage of the population. In such a context, liberalising electricity tariffs to attract private investors might not be a realistic approach for expanding capacity. The focus within a just transition framework should be on providing electricity access to off-grid populations in rural and pastoralist regions, rather than encouraging the consumerist lifestyle of the urban middle class, that has been fuelling the climate crisis globally.

Integrating a just energy transition framework in power generation could work in conjunction with the current energy mix by complementing the available capacity with new energy sources that leverage the substantial renewable resources available in the country through both distributed and utility-scale generation. This approach enhances energy security by mitigating the impact of external market fluctuations for thermal plants and seasonal variations for hydro plants. It also sets the stage for a gradual shift away from polluting fossil-fuel-based generation and ecologically disruptive hydroelectric dams.

The existing INDCs, with their ambitious renewable commitments, offer a strong starting point. While linking INDC commitments to the receipt of financial and technical support from the international community seems like generous reparation, their implementation requires the outline of a more detailed framework. Sudan's INDCs also are a good example of how the pursuit of international aid by corrupt and kleptocratic regimes is translated into elaborate commitments without making any real effort towards their materialisation. Authoritarian and aid-seeking local governments can misuse such finance opportunities, given the lack of accountability in a mostly non-

democratic environment. Only democracy, as an instrument of accountability from below, can ensure the enforcement of such commitments. This makes the current struggle of the Sudanese people not only a fight for democracy at home, but also a fight for popular leverage over a crisis that we face as a planet.

## Note

1. South Sudan seceded and declared independence in 2011.
2. This article was written before the April 2023 war in Sudan.

## Disclosure statement

No potential conflict of interest was reported by the authors.

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