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Introduction

The energy transition is now a globally recognised priority, and it is clear to most countries that it requires a swift and determined response, which is becoming increasingly urgent in light of the destructive effects of climate change. Furthermore, recent geopolitical upheavals, a pandemic and the Russia-Ukraine war, to name but a few, have further accentuated the inherent vulnerabilities of the existing energy system, which is largely dependent on fossil fuels. In this context, the energy transition is no longer just an environmental choice but a structural necessity.[1] Over the last few years, there has been a growing awareness that the transition, as it has been set up, is not technically neutral but produces winners and losers. This has given rise to the idea of a Just Energy Transition, initially conceived in trade union circles as a form of job protection, which today extends to the concept of climate justice and global equity.[2] This analysis aims to highlight the gap between the perception of a just energy transition in the Global North and that in the Global South, particularly in sub-Saharan Africa. While the North aims to decarbonise its energy systems while preserving its economic competitiveness and social stability, adopting compensatory measures to support the most vulnerable regions, the Global South faces challenges such as access to energy, climate adaptation and economic development.[3] African scholars, therefore, introduce the concept of Energy Progression, arguing that the transition is a gradual and cumulative process, rather than a simple replacement of energy sources.[4] This view therefore rejects the one-size-fits-all approach and draws the international arena's attention to the right to development of sub-global countries, while also highlighting a regulatory tension with regard to environmental policies. This divergence is not abstract but becomes particularly evident when examining the role of fossil fuels in transition strategies. Among these, natural gas is at the centre of a heated debate in which, on the one hand, its role as a 'bridge fuel' within the transition process is supported, thanks to its relatively low environmental impact compared to other

[1] Hafner, Manfred, and Tagliapietra, Simone, eds. *The Geopolitics of the Global Energy Transition. Lecture Notes in Energy* 73. Cham: Springer, 2020. https://doi.org/10.1007/978-3-030-39066-2.
[2] David J. Doorey, *Just Transitions Law: Putting Labour Law to Work on Climate Change*, SSRN Scholarly Paper no. 2938590 (Social Science Research Network, 2017).
[3] Fronteddu, Sebastiano, and Sabato, Boris. "A Socially Just Transition through the European Green Deal." *European Trade Union Institute* (2020).
[4] Nalule, Victoria R. "Energy Progression: A Pathway for Africa's Energy Transition." In *Energy Transitions and the Future of the African Energy Sector: Law, Policy and Governance*, edited by Victoria R. Nalule, 120-135. Cham: Palgrave Macmillan, 2021.

fossil fuels and its ability to support the integration of renewable energies.[5] On the other hand, its nature as a polluting fossil fuel is emphasised and, by definition, therefore incompatible with a decarbonisation trajectory consistent with long-term climate goals. Especially in the sub-Saharan context, which is rich in resources yet characterised by one of the lowest electrification rates on the planet, natural gas can be useful and represent a complex opportunity: on the one hand, it can serve as a tool to support energy and industrial development, but on the other, its use risks reinforcing long-term dependencies on fossil fuels, preventing a just and sustainable transition.

I. Research Question

This thesis aims to investigate the extent to which natural gas can constitute a legitimate and pragmatic component of a just energy transition in Sub-Saharan Africa, and particularly in Nigeria, given structural energy poverty, institutional fragility, and global decarbonisation pressures.

Two interconnected issues are therefore investigated: on the one hand, whether a universal model of a just energy transition exists, and on the other hand, the possibility that natural gas represents a pragmatic and temporary component of such a transition in Nigeria. The decision to analyse Nigeria specifically is due to the fact that the country concentrates within itself the main challenges related to a just energy transition. Despite possessing some of the largest natural gas reserves in Africa, Nigeria simultaneously faces serious problems of energy poverty, institutional fragility, and persistent socio-economic inequalities. Furthermore, Nigeria perfectly embodies the phenomenon of the 'resource curse', whereby wealth derived from natural resources does not translate into sustainable economic development, but rather into inequality, corruption and political instability. These factors make Nigeria an ideal case study for examining whether and to what extent natural gas can be a pragmatic and temporary component of a just energy transition in a context characterised by energy poverty and institutional fragility.

[5] Luca Franza, Dick de Jong, and Coby van der Linde, "The Future of Gas: The Transition Fuel?" in *The Future of Natural Gas: Markets and Geopolitics*, ed. Silvia Colombo, Mohamed El Harrak, and Nicolò Sartori (Rome and Rabat: Istituto Affari Internazionali and OCP Policy Center, 2016), 25–39.

II. Methodology

Methodologically, the research adopts a mixed approach, combining qualitative-theoretical analysis with a quantitative econometric component. The qualitative part explores the political and institutional dynamics of Sub-Saharan Africa, with a particular focus on Nigeria, while the quantitative component provides empirical evidence on the relationship between natural gas and economic growth**,** helping to verify the theoretical hypotheses explored in the qualitative part. In this way, the thesis combines theory, institutions, and empirical evidence, providing a comprehensive view of the dynamics of the energy transition in the region with an analysis that integrates global theories with the local context and empirical data to answer the central research question.

Firstly, the qualitative part is developed in the first three chapters and analyses the evolution of the concept of just energy transition, before examining the literature on the resource curse theory to understand how Nigeria's wealth of natural resources does not always translate into sustainable development, but often fuels inequality and political instability. Subsequently, the case study of Nigeria is explored in depth with an analysis of its energy and environmental policies. A key aspect of this research also concerns the perception of natural gas as a political commodity. The qualitative analysis is based on academic sources**,** government reports and institutional documents describing how the government, gas companies and the local population interact in the context of natural resource management. This analysis relies on academic articles and books**,** government reports and institutional documents relating to Nigeria's energy policy.

Secondly, the econometric analysis found in Chapter Four is based directly on the work of Evans and O., which uses a linear regression to test the relationship between natural gas production and GDP growth in Nigeria. The regression includes control variables such as oil production**,** infrastructure investment and foreign investment flows**,** with the aim of isolating the effects of natural gas production on the country's economy. Moreover, there is a set of graphs describing economic trends, including both graphs created in Excel using official databases and graphs reproduced from data provided by existing academic sources. The maps also show the geographical distribution of resources

in different geographical areas. The econometric data comes from the World Bank**,** the IEA and Nigerian national statistics, covering the period from 1970 to 2023.[6]

Finally, it should be specified that due to the great diversity within sub-Saharan Africa, each country exhibits unique political, economic, and social characteristics. Therefore, the proposed solutions for a just energy transition, while valid in many contexts, must be adapted to local specificities. Each country has different needs and challenges, and consequently, the energy strategy must be flexible and responsive to the geographical, economic, and institutional conditions of each national context.

III. Literature Review

In contemporary discourse on climate policy and energy reforms, the term *just energy transition* describes a pathway to achieving a low-carbon economy while ensuring fair and equitable socio-economic impacts. As noted by *McCauley and Heffron*, the concept did not carry the same meaning when it was initially coined in the context of labour movements, where it was primarily focused on protecting workers' rights and securing employment during shifts away from fossil fuel industries.[7] Over time, however, the notion of a just transition has expanded to a broader focus, connecting decarbonisation with social distribution and justice. *Newell & Mulvaney* in their work 'The Political Economy of a Just Transition', argue that limiting the transition to compensatory measures does not address the deeper dimensions of distributive, procedural and recognitive justice inherent in energy systems. In this regard, the just transition is based on, but does not completely coincide with, the literature on energy justice. [8] Scholar Fronteddu and Sabato provide an analysis of the European approach to a just energy transition, emphasising that the main objective is to preserve economic competitiveness and social stability during the transition and proposing compensatory measures for the most vulnerable countries. The European Union is criticised for its approach, which is considered too sectoral and

[6] Evro O. Evans, Obiwale Fortune O., Mepaiyeda E. B., and Emeke Chukwu, "The Role of Natural Gas in Nigeria's Energy Transition and Economic Growth – An Econometric Approach," paper presented at the SPE Nigeria Annual International Conference and Exhibition, Lagos, Nigeria, 4–6 August 2025, https://doi.org/10.2118/228755-M

[7] Darren McCauley and Raphael Heffron, "Just Transition: Integrating Climate, Energy and Environmental Justice," *Energy Policy* 119 (2018): 1–7, https://doi.org/10.1016/j.enpol.2018.04.014.

[8] Newell, Peter, and Mulvaney, Dustin**.** "The Political Economy of the 'Just Transition.'" *The Geographical Journal* 179, no. 2 (2013): 132–140. https://doi.org/10.1111/geoj.12008.

territorial, neglecting the multiple dimensions of energy poverty, for its technical and top-down decisions without the involvement of local communities, and finally for the market mechanisms implemented, which focus on private investment and do not aim to reform existing economic systems.[9] Scholar Victoria Nalule, in contrast, presents the African perspective on just energy transition, suggesting the implementation of 'energy progression' that proceeds gradually and does not use a one-size-fits-all approach, in order to address the challenges of energy poverty by combining climate goals with socio-economic development.[10] The core concept expressed by Pastukhova and Westphal is that the global energy transition should be understood as a geopolitical process, as it reshapes international relations and political economies. The different regional trajectories of the transition are interconnected, with decisions made in one region affecting others, creating new inequalities. The main challenge of the transition is therefore the difficulty of creating global governance frameworks capable of managing these connections in a socially and politically sustainable manner.[11] Getting to the heart of the regional analysis, Philippe Copinschi describes the Historical Development of Hydrocarbon Economy in Sub-Saharan Africa, investigating the reasons why the oil industry has remained mainly under the control of foreign companies, with gas development being slower and determined by the interests of external actors. The scholar recounts the energy paradox that characterises the region and manifests itself in a great wealth of energy resources and dramatic energy poverty.[12] This picture is analysed through the resource curse theory, first articulated by Richard Auty, according to which countries rich in natural resources, particularly fossil fuels, fail to benefit from the economic wealth they generate, experiencing much more often economic

[9] Fronteddu, Sebastiano, and Sabato, Boris. "A Socially Just Transition through the European Green Deal." *European Trade Union Institute* (2020).https://www.etui.org/sites/default/files/2020-09/A%20socially%20just%20transition%20through%20the%20European%20Green%20Deal-2020-web.pdf.

[10] Nalule, Victoria R. "Energy Progression: A Pathway for Africa's Energy Transition." In *Energy Transitions and the Future of the African Energy Sector: Law, Policy and Governance*, edited by Victoria R. Nalule, 120-135. Cham: Palgrave Macmillan, 2021.

[11] Maria Pastukhova and Kirsten Westphal, "Governing the Global Energy Transformation," in *The Geopolitics of the Global Energy Transition*, ed. Manfred Hafner and Simone Tagliapietra (Springer, 2020), 337–360.

[12] Copinschi, Philippe. "Sub-Saharan Africa: A Future Global Gas Player?" In *The Future of Natural Gas*, edited by Luca Franza, Dick de Jong, and Coby van der Linde, 181-203. Rome: Istituto Affari Internazionali, 2016;
Copinschi, Philippe. "Energy and the Economy in Sub-Saharan Africa." In *The Palgrave Handbook of International Energy Economics*, edited by Manfred Hafner and Giacomo Luciani, 693–712. Cham: Springer, 2022. https://doi.org/10.1007/978-3-030-86884-0_34.

underdevelopment and marked political instability.[13] This phenomenon is linked to the so-called Dutch disease, in which the expansion of the oil sector leads to economic dependence, difficulties in differentiation and inequalities. Finally, Michael Ross theorises that these countries tend to have less democratic governments, greater corruption and increased internal conflicts due to the concentration of power and resources in the hands of a few.[14] Although this theory has found great approval in academic circles, it has also been criticised by various authors, including Paul Collier, who argues that the resource curse theory can be misleading because it does not consider how resources are managed. He argues that natural resources do not automatically cause the problems mentioned above, but have the effect of creating fiscal and political risks that depend on a country's institutional capacity. [15] Finally, Benjamin Smith and David Waldner highlight the empirical weaknesses of the theory, arguing that the effects of oil wealth vary according to region and historical period, and that there is no universal link between resource abundance and state failure, citing Latin American and Southeast Asian countries as positive examples.[16] Furthermore, Jeffrey Sachs and Andrew Warner criticise Auty's deterministic approach, recognising patterns similar to those described in the resource curse theory, but arguing that with appropriate macroeconomic policies, the negative impacts of resources can be mitigated.[17] With regard to the role of natural gas as a transition fuel, Franza, de Jong and van der Linde highlight its potential to reduce CO_2 emissions compared to coal and oil, while promoting its operational flexibility to balance renewable energy production. They also state that gas is perceived by international actors as an extremely politicised commodity and therefore involves risks that in turn limit investment in the sector.[18] In addition to this theory, the CIEP study shows that in a

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[13] Richard Auty, *Sustaining Development in Mineral Economies: The Resource Curse Thesis* (London: Routledge, 2002), https://doi.org/10.4324/9780203422595.

[14] Michael L. Ross, "The Political Economy of the Resource Curse," *World Politics* 51, no. (1999), https://doi.org/10.1017/S0043887100008200;
Michael L. Ross, "Does Oil Hinder Democracy?" *World Politics* 53, no. 3 (2001); Macartan Humphreys, Jeffrey D. Sachs, and Joseph E. Stiglitz, eds., *Escaping the Resource Curse* (New York: Columbia University Press, 2007);
Michael L. Ross, *The Oil Curse: How Petroleum Wealth Shapes the Development of Nations* (Princeton, NJ: Princeton University Press, 2012).

[15] Paul Collier, *The Bottom Billion: Why the Poorest Countries Are Failing and What Can Be Done About It* (Oxford: Oxford University Press, 2007).

[16] Benjamin Smith and David Waldner, *Rethinking the Resource Curse* (Cambridge: Cambridge University Press, 2021).

[17] Sachs, Jeffrey D., and Andrew M. Warner. "The Big Rush, Natural Resource Booms and Growth." *Journal of Development Economics* 59, no. 1 (1999): 43–76.

[18] Luca Franza, Dick de Jong, and Coby van der Linde, "The Future of Gas: The Transition Fuel?" in *The Future of Natural Gas: Markets and Geopolitics*, ed. Silvia Colombo, Mohamed El Harrak, and Nicolò Sartori (Rome and Rabat: Istituto Affari Internazionali and OCP Policy Center, 2016), 25–39.

hypothetical scenario where coal is completely eliminated from energy systems, the use of gas reserves is compatible with the remaining carbon budget to meet the climate targets set by the 2015 Paris Agreement. In particular, the use of gas could generate more electricity with lower CO_2 emissions than coal, thus extending energy production capacity while respecting climate limits.[19] According to Kulušić, et al., natural gas is considered a "second best" option in the energy transition, necessary to bridge the technological and economic gap, but subject to certain structural limitations. Gas can play a supporting role in energy production through renewable sources in systems that still suffer from a lack of storage solutions**.** However, its effectiveness depends on the ability to manage methane emissions throughout the entire supply chain and on the political context, which will be decisive in determining whether gas can truly be a sustainable solution or a limitation for a low-emission future. [20] The research conducted by Ouki, which examines the prospect of an African 'gas renaissance', includes the econometric analysis of Evans and O.. This study is based on the theory of endogenous growth, which sees natural resources as drivers of development if managed effectively. [21]

[19] CIEP (Clingendael International Energy Programme), *The Role of Natural Gas in the Global Energy Transition*, 2024.
[20] Kulušić, Ivor, Lucija Jukić, Ivan Smajla, and Daria Karasalihović Sedlar. "The Role of Natural Gas in the Socio-Technical Transition to a Carbon-Neutral Society and a Review of the European Union's Framework." *Sustainability* 16, no. 9 (2024): 3791. https://doi.org/10.3390/su16093791.
[21] Ouki, Mostefa. *Prospects for a Potential African Gas Renaissance en Route to a "Just Energy Transition*". OIES Paper NG 185. Oxford: Oxford Institute for Energy Studies, September 2023. https://hdl.handle.net/10419/280128.

Chapter 1 – A Just Energy Transition: Evolution and Diverging Approaches

1.1 The Necessity of an Energy Transition

This paragraph introduces the concept of energy transition, tracing its evolution from its earliest formulations to its subsequent development and differentiated meanings in different geographical contexts. As outlined in the introduction, the contemporary global order is undergoing a series of profound transformations, including the COVID-19 pandemic, the ongoing war between Russia and Ukraine, and the intensifying effects of climate change. These developments have highlighted the structural weaknesses of existing economic and energy systems and, as a result, they have contributed to reshaping global geopolitical dynamics. It is in this context that the energy transition has been increasingly understood not only as a response to climate change but also as a vital necessity shaped by the inherent structural fragilities of fossil fuel-based energy systems, including high levels of greenhouse gas emissions, irregular and limited resource availability, and rising economic, social, and environmental costs. Over-reliance on fossil fuels, apart from contributing to global warming, also leaves energy systems vulnerable to price volatility, supply concentration, and recurring crises. Disruptions to global supply chains following recent conflicts and crises have made energy security a priority for governments. In any case, resource depletion and the nature of climate change ultimately constitute the structural constraint that makes a profound adaptation of global energy systems inevitable.[22] Consolidated scientific assessments by the Intergovernmental Panel on Climate Change indicate that limiting the increase in global average temperature to well below 2°C above pre-industrial levels, while pursuing efforts to limit it to 1.5°C, is essential to avoid the most serious and potentially irreversible impacts of climate change.[23] These goals have been formalised in the 2015 Paris Agreement, the first international treaty on climate change, adopted by 195 Parties at the UN Climate Change Conference (COP21) in Paris in December 2015 and entered into force on 4 November 2016. This treaty represents a landmark in the multilateral climate change process

[22] Peter Newell and Dustin Mulvaney, "The Political Economy of the 'Just Transition,'" *The Geographical Journal* 179, no. 2 (2013): 135, https://doi.org/10.1111/geoj.12008.

[23] Intergovernmental Panel on Climate Change, *Global Warming of 1.5°C* (Geneva: IPCC, 2018); Intergovernmental Panel on Climate Change, *Climate Change 2023: Synthesis Report* (Geneva: IPCC, 2023).

because, for the first time, a binding agreement brings all nations together to combat climate change and adapt to its effects. In recent years, the formulation has been revised, stating that the need to limit global warming to 1.5°C by the end of this century, and to do so, greenhouse gas emissions must decline by 43% by 2030. Therefore, a structural transformation of energy systems is needed, as they remain the main source of anthropogenic emissions because of their continued reliance on fossil fuels. Politically, the initial concepts for an energy transition were based primarily on highly technical and economic reasoning. With a view to maintaining growth while reducing greenhouse gas emissions, the transition was initially conceived as a process of replacing fossil fuels. Social issues and the interest that these policies had in them remained relatively marginal.[24] Profitability has always been at the center of international debates on the issue, with everyone assuming that decarbonization could be achieved through gradual adjustments to existing economic and technological structures.[25] Over time, however, this narrow framing proved to be insufficient and social contestation and growing empirical evidence showcased how the decarbonisation policies that were being implemented were generating uneven social and territorial impacts. These effects were more visible especially in regions dependent on fossil fuel extraction and carbon-intensive industries, where the costs of transition were more concentrated and difficult to absorb. Indeed, the increase in energy prices, employment losses, and uneven regional impacts demonstrated that climate policies could also generate substantial social disruption if distributive consequences were not adequately addressed. All these dynamics challenged the assumption that the advantages of shifting to a decarbonised energy system would be inherently distributed evenly across global society, and it is within this context that the concept of a *just transition* started to gain prominence.

1.2 From the Energy Transition to a Just Transition

The term ‘just transition’ originated in the 1980s in North America, within the labour movements and environmental justice struggles, when trade unions developed it in response to new regulations aimed at preventing air and water pollution, which had led to the closure of highly polluting industries.[26] Their aim was to find a way to balance environmental protection with workers’ rights and economic security. The two scholars

[24] Newell and Mulvaney, “The Political Economy of the ‘Just Transition.’”
[25] Newell and Mulvaney, “The Political Economy of the ‘Just Transition.’”
[26] David J. Doorey, *Just Transitions Law: Putting Labour Law to Work on Climate Change*, SSRN Scholarly Paper no. 2938590 (Social Science Research Network, 2017).

Newell and Mulvaney trace the emergence of the just transition discourse as an effort to connect environmental sustainability with employment concerns, arguing that climate initiatives should incorporate strategies to protect livelihoods and promote social justice as well. Therefore, originally, the idea of a just transition was basically only about providing support to those who might be negatively affected by environmental rules, but over time, academia refined and expanded this understanding, marking a shift from a purely labour-centred approach towards a more comprehensive conception of justice within energy systems. It is now clearer that the idea of energy transition cannot be separated from political issues. Changing energy structures inevitably raises questions of power, conflict, and redistribution in the territory that we wish to restructure. It is not simply technical tools that are being modified, but real socio-political structures that are constantly linked to and defined by different historical trajectories and the institutional choices of the policies put in place.It is not possible to ignore the fact that attempting to change these structures, in one direction or another, necessarily produces winners and losers. It is automatic to wonder who bears most of the costs of change and who benefits most from the emerging energy innovations. To date, the idea of a just transition has evolved into a normative and analytical framework that seeks to reconcile the climate mitigation goals with social equity. Newell and Mulvaney in their work *Political Economy of a 'just transition',* argue that limiting the transition to compensation measures fails to address the deeper distributive, procedural, and recognitional dimensions of justice embedded in energy systems. Instead of focusing solely on the final targets, they emphasise the process of the transition, which includes how decisions are taken, whose interests are prioritised, and how social and economic disruptions are handled.[27] The just transition, as far as it is concerned, is mainly based on the literature on energy justice, although it does not correspond entirely to it. Energy justice is a school of thought that seeks to address energy issues and the inequalities they raise from three main intersectional angles: the first is distributive justice, concerning the distribution of costs and benefits. The second is procedural justice, which covers everything related to participation, transparency, and decision-making processes. Finally, there is recognition justice, which emphasizes the need to recognize the diversity of social, economic, and cultural contexts.[28] Energy justice is not considered in this thesis as an autonomous

[27] Newell and Mulvaney, "The Political Economy of the 'Just Transition.'"
[28] Darren McCauley and Raphael Heffron, "Just Transition: Integrating Climate, Energy and Environmental Justice," *Energy Policy* 119 (2018): 1–7, https://doi.org/10.1016/j.enpol.2018.04.014.

theoretical framework, but rather as a tool and an analytical dimension that is part of a broader reflection on just energy transitions. This approach assumes that there is no single valid normative model and takes a more flexible approach to each situation and the way in which considerations of justice are applied in different socio-economic contexts. In summary, to develop a just transition, look beyond decarbonization results alone and question the political economy of the energy systems we seek to change. As highlighted by Newell and Mulvaney**,** there is a global structure of energy injustice that precedes and conditions the transition itself. Justice in decarbonisation therefore, represents only part of the challenge and the deeper issue consists in tackling the deep-rooted inequalities that are built into the global fossil fuel system. These disparities influence who has access to energy, the exposure to environmental harm, and participation in decision-making processes, and risk being reproduced, instead of being solved, through low-carbon transitions if left unaddressed.[29] By shifting the focus from just technical solutions to questions about power, governance, and fair sharing, the just transition framework offers a valuable perspective to see the energy transition as a lively and political journey. In this regard, the notion of just transition is closely linked to the notion of sustainable development. The latter, which is supported by global institutions like the United Nations, suggests the convergence of three interconnected and mutually reinforcing objectives that make up the three pillars of sustainability: social justice, economic development, and environmental preservation.[30] While states and stakeholders around the world commonly agree on the goal of sustainable development, the question of how to actually accomplish this goal, balancing the three pillars of sustainability and making them compatible, is far more contentious.[31] This perspective is essential for analysing how global, regional, and national pathways to decarbonisation may diverge, and why one, uniform model of transition is neither feasible nor desirable. The following paragraphs build on this conceptual foundation by examining how the just transition has been institutionalised within global governance frameworks, and how its interpretation varies across different regional and developmental contexts.

[29] Newell and Mulvaney, "The Political Economy of the 'Just Transition.'"
[30] United Nations, *Transforming Our World: The 2030 Agenda for Sustainable Development* (New York: United Nations, 2015).
[31] Sebastiano Sabato and Boris Fronteddu, *A Socially Just Transition through the European Green Deal?*, Working Paper no. 2020.08 (European Trade Union Institute, 2020).

1.3 The Global Institutionalisation of the Just Transition

As the concept of a just transition gained both analytical and normative importance, it became more and more integrated into international policy and global governance. This institutionalisation of the concept reflects a growing recognition that climate mitigation actions are also supposed to account for social and economic effects. However, as we will see in this chapter, important ambiguities and limitations are present when addressing justice issues on a global scale. In the 2019 book *Just Transitions: Social Justice in the Shift Towards a Low-Carbon World* written by Morena, Krause, and Stevis, it is explained that within the international climate regime, the origins of the idea of a just transition are rooted in the principle of common but differentiated responsibilities and respective capabilities (CBDR-RC), as outlined in the United Nations Framework Convention on Climate Change.[32] This principle was officially included in the UNFCCC in 1992, in Rio de Janeiro, at the United Nations Conference on Environment and Development (UNCED). This inclusion marked an important milestone, and here is what Article 3, paragraph 1, of the UNFCCC stipulates: 'The Parties should protect the climate system for the benefit of present and future generations of humankind, on the basis of equity and in accordance with their common but differentiated responsibilities and respective capabilities. Accordingly, the developed country Parties should take the lead in combating climate change and the adverse effects thereof'. Thus, this principle recognises that countries have contributed unevenly to climate change and have varying capacities to respond, thus justifying different pathways to decarbonisation. Later the 2015 Paris Agreement strengthened this approach by explicitly acknowledging the importance of considering 'the imperatives of a just transition of the workforce and the creation of decent work and quality jobs' in national climate strategies.[33] Although open-ended and relatively undefined, the inclusion of this concept in the agreement marked a crucial step in recognising the correlation between climate action and increasingly pressing social concerns, often linked to global employment.[34] In 2015, a more explicit attempt has been made by the International Labor Organization to better define this notion of a just transition and to put it into practice, with the *Guidelines for a Just Transition towards Environmentally Sustainable Economies and Societies for All. These guidelines* provided

[32] Edouard Morena, Dunja Krause, and Dimitris Stevis, *Just Transitions: Social Justice in the Shift Towards a Low-Carbon World*, 1st ed. (London: Pluto Press, 2019).
[33] United Nations Framework Convention on Climate Change, *Paris Agreement* (Paris: UNFCCC, 2015).
[34] Morena, Krause, and Stevis, *Just Transitions*.

a comprehensive policy reference for integrating environmental sustainability with social justice, labour rights, and inclusive growth. They underline the importance of encouraging social dialogue, implementing active labour market policies, focusing on skills development, and strengthening social protection systems to help manage the employment changes brought about by environmental transitions.[35] Hence, by framing the just transition as both a social and economic process, the ILO contributed to widen the concept and to go beyond compensation mechanisms, embedding it into a broader agenda of structural transformation. Gradually, the lexical field of just transition is permeating key institutions such as the Conference of the Parties (COP). Today more than ever, climate action has become inseparable from discussions on infrastructure development financing, adaptation, and damage and losses. Under increasing pressure from developing countries, the concepts of equity, inclusion, and social impact have taken on greater importance in the debates that have animated the various COPs in recent years.[36] In 2022, at COP 27, the UNFCCC established the Just Transition Work Program (JTWP). This initiative aims to motivate the various parties around the table to better communicate and implement their commitments to a just transition, in order to turn the generic commitment to a just transition into practical policy guidance.[37] However, due to the non-binding nature of the Work Programme and the absence of precise implementation mechanisms, this initiative has mainly served to highlight the gap between normative recognition and practical application at the international level. By COP30, the just transition had moved beyond the status of a guiding principle and became the object of discussions on a dedicated implementation mechanism. The adoption of the Just Transition mechanism, commonly referred to as the *Belém Action Mechanism*, marked a significant qualitative shift in the global governance of just transitions, by adopting a rights-based approach thus explicitly linking just transition pathways to human and labour rights, gender equality, and the protection of Indigenous Peoples and marginalised communities, while also recognising the need for enhanced financial and technical support.[38] In this sense, the UNFCCC confirmed the evolution of the just transition from a concept initially centred on workforce protection, to a broader

[35] International Labour Organization, *Guidelines for a Just Transition towards Environmentally Sustainable Economies and Societies for All* (Geneva: ILO, 2015).
[36] Morena, Krause, and Stevis, *Just Transitions*.
[37] United Nations Framework Convention on Climate Change, *United Nations Framework Convention on Climate Change*(UNFCCC, 2022).
[38] United Nations Framework Convention on Climate Change, *COP30 High-Level Ministerial Roundtable on Just Transition* (UNFCCC, 2025).

framework that addresses structural inequalities, development, and international cooperation. Although there is some shared understanding between institutional and academic discourses, the notion of a just transition continues to provoke considerable debates. The problem lies in the fact that different stakeholders can interpret it in various ways, promoting often conflicting agendas: while some highlight economic competitiveness and social stability in developed nations, others emphasise the importance of historical responsibility, addressing inequality, and the urgent need for climate action. These tensions are revealing underlying disagreements concerning the definition and realisation of justice in climate policy, especially when just transition frameworks are applied outside their original contexts in the Global North.[39] In light of these interpretations, more questions arise about the universality of prevailing just transition pathways. The models that were conceived in industrialised economies often assume a post-industrial base with high levels of energy access, institutional capacity and fiscal space; when the same models are applied to developing countries, these assumptions risk neglecting structural differences and reinforcing existing inequalities. In the following paragraphs, we will analyse these differences, especially highlighting how European and African viewpoints are shaped by their unique histories, social and economic systems, and development goals. Understanding these differences is essential for assessing the normative claims that are intrinsic in dominant just transition frameworks and evaluating their applicability beyond industrialised contexts.

1.4 The European Approach to the Just Transition

At the global level, the European Union has positioned itself as one of the most proactive regional actors in integrating social considerations into climate and energy policy. The EU's approach reflects its long-standing leadership ambitions in climate governance and its specific socio-economic and political context, which is characterised by relatively high levels of energy access, mature welfare systems, and a strong regulatory capacity. This explains why the just transition within the European framework has been articulated primarily as a policy response to manage the distributive and social consequences of decarbonisation in an advanced industrial economy. The central policy for the EU's approach is the European Green Deal (EGD), launched in 2019 as a comprehensive strategy to achieve climate neutrality by 2050. The European Green Deal should serve as

[39] Newell and Mulvaney, "The Political Economy of the 'Just Transition.'"

'[...] a new growth strategy that aims to transform the EU into a fair and prosperous society, with a modern, resource-efficient and competitive economy where there are no net emissions of greenhouse gases (GHG) in 2050 and where economic growth is decoupled from resource use'.[40] In terms of structure, the Commission Communication on the EGD is organised around eight macro-areas for action, considered as 'interlinked and mutually reinforcing', which are: increasing the EU's climate ambition for 2030 and 2050; supplying clean, affordable and secure energy; mobilising industry for a clean and circular economy; building and renovating in an energy and resource efficient way; accelerating the shift to sustainable and smart mobility; from 'Farm to Fork': designing a fair, healthy and environmentally-friendly food system; preserving and restoring ecosystems and biodiversity; A zero pollution ambition for a toxic-free environment. At the same time, the Commission stresses the importance of achieving a 'socially just' ecological transition, 'of ensuring that the cost of the transition is not borne by the most vulnerable populations', as a precondition for a successful transition towards a zero-emission economy. In this context, the European Pillar of Social Rights (EPSR) is presented as the reference framework to ensure that '[...] no one is left behind'.[41] The EPSR includes 20 principles and rights organised around three chapters, which are: equal opportunities and access to the labour market; fair working conditions; and social protection and inclusion. In addition to the areas mentioned above, the stated intention is to mainstream sustainability into all EU policies, with explicit references to the EU budget, macro-economic and fiscal policies, taxation, research and innovation, education and training, trade policies and EU external policies. It is important to underline that the EGD is meant to be a growth strategy, in which the objective of promoting a sustained growth pattern remains crucial, and economic growth is not considered incompatible with the achievement of high levels of environmental protection and social progress. The objective of the EGD is indeed double: firstly, to guide the transition towards an economy (and a society) characterised by 'zero net emissions' of greenhouse gases and the decoupling of economic growth from resource use. Secondly, it is '[...] to protect, conserve and enhance the EU's natural capital, and protect the health and well-being of citizens from environment-related risks and impacts'.[42] In the Green Deal, it is thus explicitly recognised that the transition to a low-carbon economy requires important

[40] European Commission, *The European Green Deal* (Brussels: European Commission, 2019).
[41] European Commission, *The European Green Deal*.
[42] European Commission, *The European Green Deal*.

economic and social adjustments, particularly of just transition, which is mobilised to ensure political feasibility and social acceptance of ambitious climate targets, framing social protection and territorial cohesion as necessary complements to environmental action. 'The EU's interpretation of just transition emerges here as closely linked to the objective of maintaining economic competitiveness and social stability while pursuing decarbonisation'.[43] This approach has been operationalised through a set of specific policy tools, most notably the Just Transition Mechanism (JTM). The JTM is designed to support regions most affected by the transition, especially those that depend heavily on coal, lignite, and industries with a high carbon footprint. It is structured around three key pillars: the Just Transition Fund, which provides grants to support economic diversification, worker reskilling, and environmental rehabilitation; the InvestEU scheme, which encourages private investments in areas undergoing transition; and a public sector loan facility, created to fund infrastructure projects that may not be commercially viable but are deemed socially necessary. As Sabato and Fronteddu mention, the EU's Just Transition Mechanism mainly aims to compensate for the social and regional challenges of decarbonisation, rather than fundamentally reshaping the existing economic systems. A frequent critique concerns the sectoral and territorial focus of EU just transition instruments, which are accused of prioritising coal-dependent regions while paying comparatively less attention to other forms of vulnerability, such as energy poverty, precarious employment, or inequalities linked to income and housing. Sabato and Fronteddu highlight that focusing on investment-led solutions and market-based mechanisms can be not efficient enough. They point out that the way decisions are made often feels very technical and top-down, leaving little room for local communities and workers affected by these decisions to truly participate beyond just formal consultations. This makes us think about whether all aspects of justice, especially procedural and recognition dimensions, are being fully considered. In addition, the scholars underline that, as the EU's approach to the just transition is shaped by its internal political economy and social contract, it is difficult to transfer it beyond the European context.[44] The EU's position on the issue of just transition is mainly redistributive, without considering any real restructuring of its current system. This is mainly due to its highly

[43] Sabato and Fronteddu, *A Socially Just Transition through the European Green Deal, 25.*
[44] S. Sabato and M. Mandelli, "Towards an EU Framework for a Just Transition: Welfare Policies and Politics for the Socio-Ecological Transition," *European Political Science* 23 (2024): 14–26, https://doi.org/10.1057/s41304-023-00458-1.

administrative nature and the availability of fiscal resources it can use to finance its measures and institutions. These risks present the European model as a normative benchmark, implicitly assuming that similar paths can be replicated elsewhere. But such an assumption overlooks the structural differences that characterize other regions, particularly the South, in terms of development, institutional capacity, and access to energy.[45] These limitations reveal a broader tension in the European approach. If on the one hand, it has helped shape the global dialogue on just transition by integrating social issues into binding climate policies, on the other hand, its interpretation often aligns with a sector-specific and compensatory view of justice, which may limit its applicability where the main challenge is expanding energy access and economic growth rather than addressing the social costs of decarbonisation.[46] This European approach highlights the difficulties but also the necessities of implementing a just transition. The following section focuses on African perspectives on a just transition, highlighting its unique characteristics, specific challenges, priorities, and potentially unique solutions, distinct from the European approach.

1.5 African Perspectives and the Energy Progression

African perspectives on the just energy transition differ crucially from European ones in both emphasis and scope. As emphasised by the African Climate Foundation in *African Perspectives of a Just Transition to Low Carbon Economies*, the principal idea is that a just transition in African contexts must be assessed primarily by its capacity to expand energy access, reduce energy poverty, and support inclusive economic development, rather than focusing only on its contribution to emissions reductions. Indeed, in regions where large segments of the population remain excluded from modern energy services, the justice dimension of the transition cannot be reduced to compensation mechanisms for displaced workers.[47] Certainly, African interpretations cannot be monolithic, since energy challenges and policy priorities differ significantly across countries, shaped by resource availability, levels of industrial development, urbanisation trends, and institutional capacity. However, multiple common structural constraints are evident across the region; notably, factors such as high informality, rapid population growth, and limited fiscal space constrain decarbonization options. The economic and social

[45] Sabato and Fronteddu, *A Socially Just Transition through the European Green Deal? 17.*
[46] Sabato and Mandelli, "Towards an EU Framework," 18.
[47] African Climate Foundation, *African Perspectives of a Just Transition to Low Carbon Economies* (African Climate Foundation, 2022).

disparities driving these differing viewpoints are further highlighted in the *Climate Inequality Report* 2025[48], in which the studies demonstrate that countries in the Global South, including those in Sub-Saharan Africa, have contributed minimally to cumulative greenhouse gas emissions while bearing a disproportionate share of climate-related vulnerabilities. At the same time, they also face significant constraints and delays in mobilizing national resources for climate mitigation and adaptation. This imbalance questions the consistency of universal decarbonisation expectations and strengthens arguments for differentiated responsibilities and tailored transition strategies. From an African perspective, justice in the energy transition cannot be conceived and implemented without taking into account issues of timing, sequencing, and affordability. For many African policymakers and academics, it is important not to rush into rapid decarbonization at all costs without first studying and adopting more gradual and adaptable strategies that link climate goals to region-specific development needs. As a consequence, these perspectives put the stress on enabling factors such as access to finance, technology transfer, and policy independence, instead of strict adherence to external timelines or specific technology mandates. In this debate, Victoria R. Nalule's theories represent an important contribution to the African approach to energy transitions. The scholar questions the dominant use of the term "energy transition" in global political discourse, arguing that it often implies a rapid, linear, and universally applicable shift from fossil fuels to renewable energy sources. This framework, she argues, generally reflects the historical development and institutional strengths of industrialized economies but fails to take into account the socio-economic challenges faced by many African countries.[49] In response, Nalule defends the concept of *energy progression*, which reconceptualises energy change as a gradual and cumulative process rather than merely a substitution of one energy source for another. If we look at the history of the industrialised countries, energy systems have rarely evolved through sudden replacements; instead, new sources have typically been layered onto existing ones over extended periods of time. Industrialised economies themselves followed a prolonged, sequential path, first moving from traditional biomass to coal, then to oil and gas, before progressively integrating low-carbon technologies. In this regard, expecting African countries to compress or even

[48] Lucas Chancel, Thomas Piketty, Emmanuel Saez, and Gabriel Zucman, *Climate Inequality Report 2025* (World Inequality Lab, 2025).
[49] Victoria R. Nalule, "How to Respond to Energy Transitions in Africa: Introducing the Energy Progression Dialogue," in *Energy Transitions and the Future of the African Energy Sector: Law, Policy and Governance*, ed. Gavin Wood and Keith Baker (Palgrave Macmillan, 2021).

bypass these stages reflects, according to Nalule, a selective reading of history and risks entrenching implicit double standards within global climate governance.[50] Nalule does not frame energy progression as a rejection of climate mitigation objectives, nor does she deny the urgency of expanding renewable energy deployment across the African continent. On the contrary, it has been noted that Africa is the most vulnerable continent to climate change impacts, as it is expected to severely disrupt water and food systems, public health and agricultural livelihoods, not to mention causing enhanced droughts, sea level rise, and changes in the incidence and prevalence of vector-borne disease.[51] In particular, she criticizes the idea that the transition must primarily involve reducing emissions without really paying attention to the development of the affected area, local institutional capacities, or the social consequences that would result from these changes. In this way, the idea of justice cannot be reduced to figures quantifying emission levels, as it is also a question of ensuring that energy systems remain accessible to as many people as possible and that they promote economic and structural development.[52] The scholar affirms that what is required is an improvement to the energy system, and not a radical change. Within this framework, fossil fuels, and natural gas in particular, may continue to play a conditional and context-specific role, an issue that will be explored in greater depth in Chapter Four.

The most advanced attempt at the continental level to articulate an African vision of energy transition is *The Energy Transition Strategy and Action Plan* (ETSAP).[53] Developed by the African Union's African Energy Commission, ETSAP serves as a guiding framework to accompany African countries towards 'a sustainable, low-emission energy future by 2063'. The central element of the ETSAP is its political anchoring in the African Common Position on Energy Access and Just Transition, which was warmly endorsed in 2022 by the leaders of the African Union. This shared stance clearly emphasizes that Africa's energy transition cannot be conceived as a mere decarbonisation trajectory, but must be primarily geared towards: ensuring universal access to energy, boosting economic growth, supporting structural change, and tackling climate change in

[50] Victoria R. Nalule, *Energy Transitions and the Future of the African Energy Sector: Law, Policy and Governance* (Cham: Palgrave Macmillan, 2020).
[51] Geoffrey Wood et al., The Palgrave Handbook of Managing Fossil Fuels and Energy Transitions, (Palgrave Macmillan, 2019).
[52] Nalule, "How to Respond to Energy Transitions in Africa."
[53] African Union and African Energy Commission, *Energy Transition Strategy and Action Plan (ETSAP): Towards a Sustainable, Low-Emission Energy Future by 2063* (African Union, 2025).

ways that align with development priorities.[54] In this sense, ETSAP is perfectly in line with the logic of energy progression, but also consistent with the Paris Agreement without subordinating African needs to external objectives or imposed timelines. The ETSAP is structured around six strategic pillars, around which Member States should develop their national policies: the first pillar is universal energy access, which places access to energy as a fundamental condition of justice, as energy is understood as an enabler of health, education, employment and social inclusion. The second pillar is energy security and reliability, according to which energy security is understood not only in geopolitical terms, but also as the protection of vulnerable populations from external shocks, price volatility and supply disruptions. It recognises that energy instability has regressive social effects and disproportionately affects low-income households and rural communities. The third pillar, sustainable and inclusive economic growth, clearly refers to the distributive justice dimension, according to which the transition must create jobs, local added value and widespread economic opportunities, avoiding extractive or enclave-oriented dynamics. The fourth pillar, climate change mitigation and adaptation, addresses both issues together, recognising that adaptation is an immediate priority for many African countries. The fifth pillar, regional integration and energy markets, makes it clear that regional cooperation is seen as a tool for reducing structural inequalities between countries and regions, and that integrated energy markets, interconnections and shared planning serve to improve accessibility and reduce costs, with direct social benefits. Finally, the sixth pillar is institutional capacity, governance and finance, which recognises that a just transition requires strong, inclusive and capable institutions, thus alluding to the capacity of states to protect vulnerable groups and direct investment towards social as well as environmental objectives (AU–AFREC, 2025).[55] Taken together, these pillars show how the African approach to just transition differs from the dominant models developed in the global North. While the latter tend to view justice as an ex-post compensation mechanism for the social effects of decarbonisation, ETSAP assumes that access, security and economic inclusion must be preconditions for the transition. Furthermore, another distinctive feature of African approaches to just energy transition is the centrality of gender equality, which is not considered a secondary social issue, but a structural dimension of both vulnerability and resilience. Another important difference with the European viewpoint is that within African policy debates, There is an increasing

[54] African Union and African Energy Commission, *ETSAP*.
[55] African Union and African Energy Commission, *ETSAP*.

recognition that energy systems are not gender-neutral, and that issues like climate change and energy poverty are closely linked to longstanding gender roles regarding work, access to resources, and decision-making authority. The African Union's African Energy Commission, women often primarily responsible for subsistence farming, water collection, cooking, and domestic energy. Limited access to modern energy services then impacts their health, the time they have, their income opportunities, and their educational chances. Because of this, achieving justice in the energy transition really depends on addressing these gender inequalities. When energy access and resilience improve, it directly supports women's social and economic empowerment. You can see this approach clearly in African-led regulatory frameworks and regional governance efforts, which tend to include gender considerations more openly than many just transition models in the Global North.[56] For example, in West Africa, the Economic Community of West African States (ECOWAS) was among the first African regional organisations to adopt a directive requiring gender assessments in energy projects, signalling an awareness that climate and energy policies can reproduce or challenge existing social hierarchies.

To conclude, we analysed how African perspectives on the just energy transition, together with the concept of energy progression, call into question the idea that a single, universally applicable transition model can adequately capture the diversity of development pathways. African leaders are calling for a definition of justice that includes climate change mitigation and the unfinished development agenda. They emphasize that high levels of energy access and institutional capacity cannot be taken as an implicit starting point for everyone. The redefinition of the African energy system cannot be thought of as an exception or a variant of a single normative transition system, but must be interpreted on its own terms.

This conceptual framing provides a coherent foundation for analysing the complex trade-offs that characterise energy transitions in Sub-Saharan Africa and, as the following chapters will demonstrate, in the Nigerian context in particular.

1.6 The Global Energy Transition as a Governance Challenge

The earlier sections have demonstrated that strategies for a just energy transition vary between regions, influenced by their unique historical backgrounds, development goals,

[56] African Union and African Energy Commission, *ETSAP*.

and institutional strengths. Nevertheless, these strategies are interconnected. As highlighted in *The Geopolitics of the Global Energy Transition*, 'the energy transition is not merely a shift from one energy source to another, but a set of overlapping transformations that are already reshaping international relations, markets, and domestic political economies'.[57] The transition is best understood as a deeply interdependent process in which regional pathways mutually condition one another.

In the book, Pastukhova and Westphal point out that the energy transition is still a very geopolitical process. Rather than losing political influence, it is transforming how global power is experienced, centered around new infrastructures, technologies, and supply chains[58]. Although oil and gas may become less dominant, new rivalries are arising over access to technology, standards, intellectual property, and critical raw materials. These changes could disrupt the existing balance, particularly in regions linked to global supply chains, which often face unequal access to financing, technology, and decision-making. In any case, the global energy system is likely to remain hybrid for a number of years to come, with fossil fuels and renewable energy sources coexisting in national and regional energy grids. As a result, any transition is interconnected, and geopolitics will always be influenced by legacy energy systems, stranded assets, and the distribution of the costs and benefits of this transition.[59] This demonstrates that the energy transition is networked and that every policy decision matters. For this reason, the divergent approaches to a just transition in Europe and Africa should not be seen as competing or canceling each other out, but rather as interdependent. European strategies are dependent on external resources, markets, and technologies. African needs are shaped by financial flows, regulations, and global standards. Thus, a just transition is less about regional policies and more about governance embedded in global interdependence. The research in this chapter agrees that the biggest challenge of the global energy transition isn't the lack of targets or narratives, but the difficulty in creating governance frameworks that manage these interconnections in ways that are socially and politically sustainable. If issues like distributional effects, energy poverty, and unequal risks aren't addressed

[57] Manfred Hafner and Simone Tagliapietra, eds., *The Geopolitics of the Global Energy Transition* (Springer, 2020).
[58] Maria Pastukhova and Kirsten Westphal, "Governing the Global Energy Transformation," in *The Geopolitics of the Global Energy Transition*, ed. Manfred Hafner and Simone Tagliapietra (Springer, 2020), 337–360.
[59] Maria Pastukhova and Kirsten Westphal, "Governing the Global Energy Transformation," in *The Geopolitics of the Global Energy Transition*, ed. Manfred Hafner and Simone Tagliapietra (Springer, 2020), 337–360.

explicitly, efforts to decarbonise may inadvertently deepen existing inequalities. Framed in this way, the just transition appears not as an add-on to technical change, but as a condition for its durability. This analytical perspective provides the bridge to the chapters that follow, which examine how these interdependencies materialise in Sub-Saharan Africa and, more specifically, in the Nigerian context.

Chapter 2 – Sub-Saharan Africa Energy Landscape

2.1 Historical Development of Hydrocarbon Economy in SSA

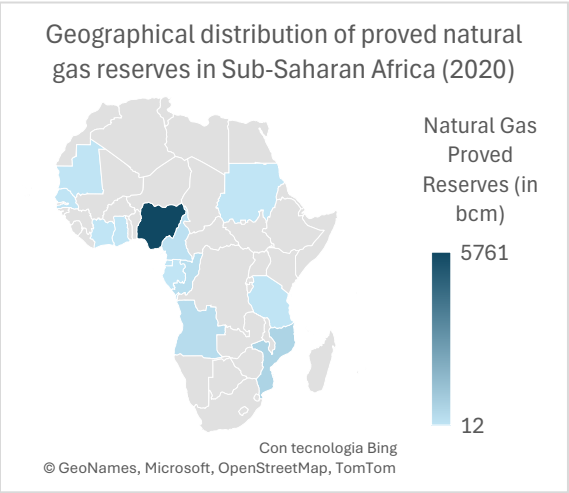
Despite its wealth of natural resources, especially energy, Sub-Saharan Africa only recently appeared on the oil and gas map compared to other hydrocarbon-rich regions like North and Latin America, the Middle East, and North Africa. In "Energy and the Economy in Sub-Saharan Africa," Philippe Copinschi outlines the evolution of the hydrocarbon industry in West Africa, beginning with the start of the oil production in the 1960s, following discoveries in the Gulf of Guinea, with Angola in 1955, Nigeria and Gabon in 1956, and Congo-Brazzaville and Cameroon in the early 1970s. The region's oil output expanded significantly in the 1970s after the Nigerian Civil War (1967–1970) ended. The boom was driven by significant price increases following the 1973 and 1979 oil shocks and a wave of nationalisations within OPEC. These shocks raised global oil prices, creating new opportunities for exploration and production, particularly in Sub-Saharan Africa. Governments eager to attract foreign investment offered favourable fiscal regimes to international oil companies, which, having been expelled from OPEC countries, saw Africa as an attractive diversification option. Indeed, reflecting on the weakness of the State in Africa, none of the oil-producing countries in Sub-Saharan Africa ever nationalised their oil industry. Although OPEC used to encourage its members to nationalise their oil industry to further their economic independence, Nigeria (which became a member of the OPEC in 1971) holds approximately 60% of Nigeria's gas reserves, but it has left operational control of many activities to foreign companies.[60] This explains why Sub-Saharan Africa was one of the oil and gas regions that benefited the most from the nationalisations in OPEC countries in the 1970s. The region experienced a second oil boom in the 1990s with a series of huge discoveries made offshore. As a result, Sub-Saharan oil production increased from around 400,000 barrels per day (bpd) in the late 1960s to 2.5 million bpd (Mbpd) in the mid-1970s, mainly driven by Nigeria. It continued to grow, reaching 4 Mbpd by the late 1990s and 5 Mbpd in 2019. Today, Sub-Saharan Africa is home to over a dozen oil producers, with Nigeria and Angola still standing out as significant contributors. Sub-Saharan Africa produces about 5 Mbpd of oil in total. While this doesn't seem to account for roughly 5% of worldwide oil

[60] Philippe Copinschi, "Energy and the Economy in Sub-Saharan Africa," in *The Palgrave Handbook of International Energy Economics*, ed. Manfred Hafner and Giacomo Luciani (Cham: Springer Nature Switzerland, 2022), 694.

production and about 3.5% of the total. The significance of the continent goes beyond what is immediately apparent: due to its consistent openness to foreign investors and is considered a key area for hydrocarbons exploration and deepwater offshore oil activity by the oil and gas industry. Beyond its contribution to global energy, it represents 25% to 33% of the activities of major international energy companies.[61] The historical role played by natural gas is ultimately quite minimal, particularly because it is international private actors who manage its development rather than national policies. The lack of a clear plan for exploiting the region's oil reserves by any of the countries in the region has allowed foreign players to take over the market and develop their own autonomous infrastructure, production and exploration systems. This means that the development of this industry depends directly on the interests of external players who, until now, did not see the need to invest in gas. Historically, exploration has rarely focused on gas, and associated gas (inevitably extracted at the same time as crude oil) was even considered most often as waste, or at best as a cumbersome by-product. As a result, it was usually released directly into the atmosphere or flared. And despite the known environmental and health risks, a small portion was used to maintain reservoir pressure. The high costs of transporting gas from production sites to major consumption centers in Europe, North America, and Asia, combined with the small size of national markets, had always ruled out the possibility of an economically viable gas project. For example, Nigeria's scattered oil fields require an extensive network of expensive pipelines to collect and compress associated gas before it can be processed, quickly leading to cost overruns. Nevertheless, it was Nigeria that kicked off gas production by opening its first LNG plant in the late 1999, after which the sector gradually developed. The initiative was followed by Equatorial Guinea (2007), Angola (2013), and Cameroon (2018), all of which built and opened new facilities, opening up sub-Saharan Africa to the global gas market. [62]

[61] Copinschi, “Energy and the Economy in Sub-Saharan Africa,”, 695.
[62] Copinschi, “Energy and the Economy in Sub-Saharan Africa,” 697.

Figure 2.1 Geographical distribution of proved natural gas reserves in SSA, 2023. Natural Gas Production in SSA (in bcm), 2020. *(Source: Enerdata, 2020).*



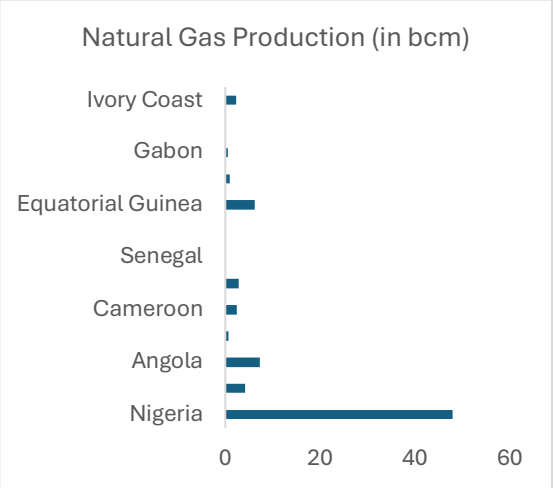
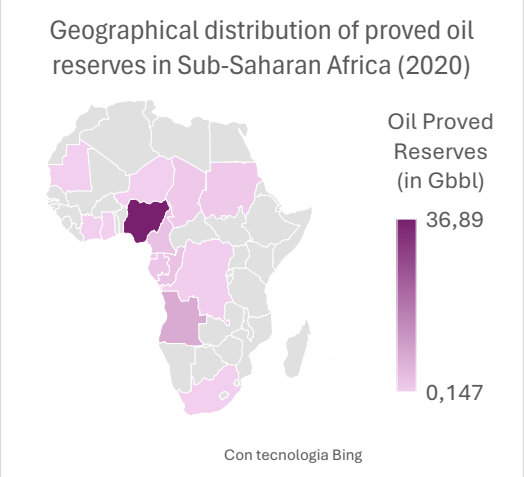
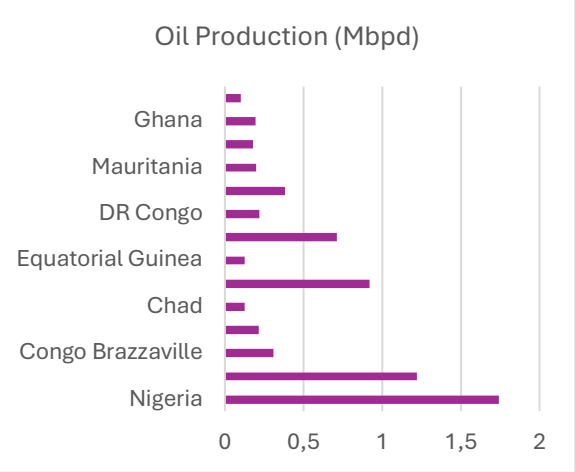


Figure 2.2 Geographical distribution of proved oil reserves in SSA, 2020. Oil Production in SSA (in Mbpd), 2020. *(Source: Enerdata, 2020).*





2.2 The Energy Paradox

"Sub-Saharan Africa is rich in energy resources but very poor in energy supply." So began the Africa Energy Outlook published by the International Energy Agency (IEA) in 2014, underlying the fact that "making reliable and affordable energy widely available is critical to the development of the region". Eight years later, in the 2022 edition of the Africa Energy Outlook, this remains globally unchanged: while Sub-Saharan Africa is home to around 15% of the world's population, the region only accounts for 4.3% of the

global energy demand and less than 1.75% of the world's electricity consumption.[63] This situation is often referred to as the energy paradox. The combination of vast natural resources and permissive tax regimes has long attracted major international oil and gas companies, making it a key destination for the global energy industry. And yet, the majority of the local population still lacks access to modern energy services, particularly electricity. This factor significantly limits economic opportunities and social development in the region. Sub-Saharan Africa has the second lowest electrification rate in the world (after South Africa). Despite global progress in this area over the past decade, recent data shows that the region is experiencing a significant slowdown. According to the Energy Outlook for Africa 2022, Africa is home to 75% of the world's population without access to electricity, with 600 million people lacking access to electricity (590 million of whom live in sub-Saharan Africa), effectively negating the progress made between 2015 and 2019. Based on the relationship between electricity access on one hand and GDP per capita, population growth (given that most Sub-Saharan African countries haven't achieved their demographic transition yet), and urbanisation rate on the other, the IEA projects that about 565 million people in the region will still be without electricity in 2030, indicating that SSA will remain the region with the highest energy poverty in the world. The average electricity consumption per capita in SSA (excluding South Africa) is 170 kilowatt hours (kWh), compared to 2100 kWh in emerging Asian economies, 2855 kWh on average globally, 5100 kWh in Europe, and more than 10,000 kWh in the United States. For comparison, electricity consumption in Africa as a whole is approximately 600 kWh per capita, further underscoring the structural gap between Sub-Saharan Africa and other regions of the world.[64]

[63] Philippe Copinschi, "Sub-Saharan Africa: A Future Global Gas Player?" in *The Future of Natural Gas*, ed. Luca Franza, Dick de Jong, and Coby van der Linde (Rome: Istituto Affari Internazionali, 2016), 186.
[64] Copinschi, "Energy and the Economy in Sub-Saharan Africa," 703.

Figure 2.3 Share of the Population with Access to Electricity, 2023. *(Source: Our World in Data, World Bank)*

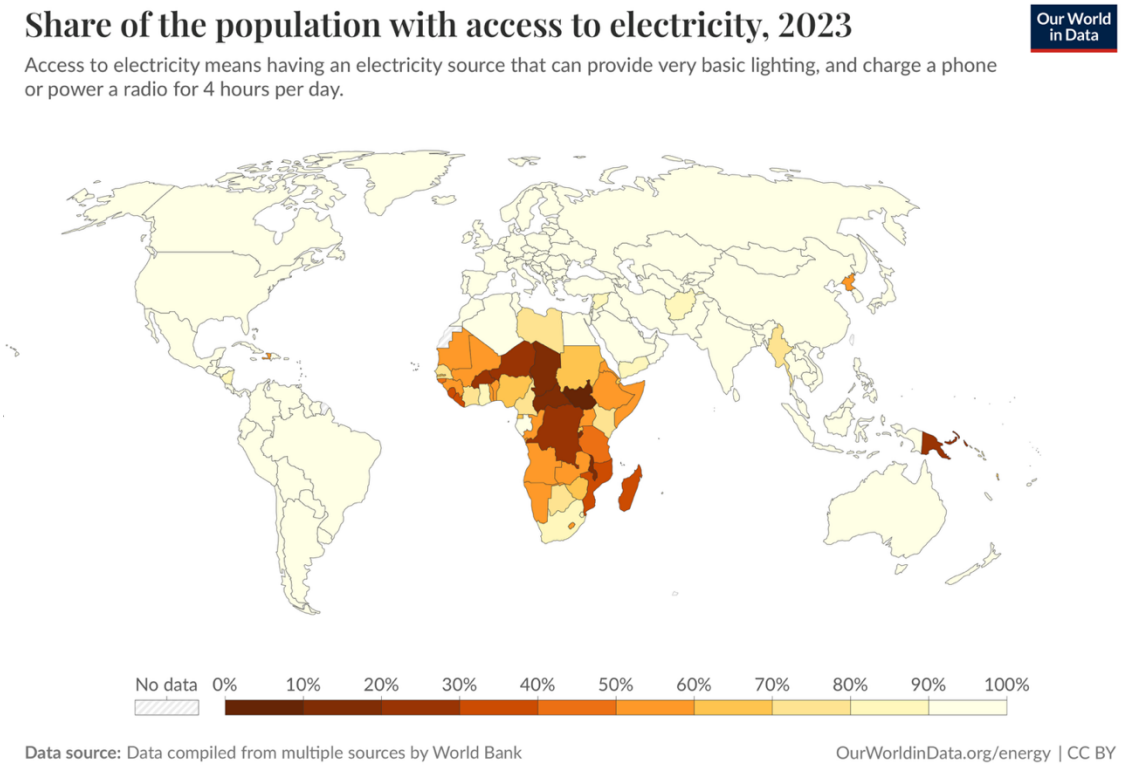
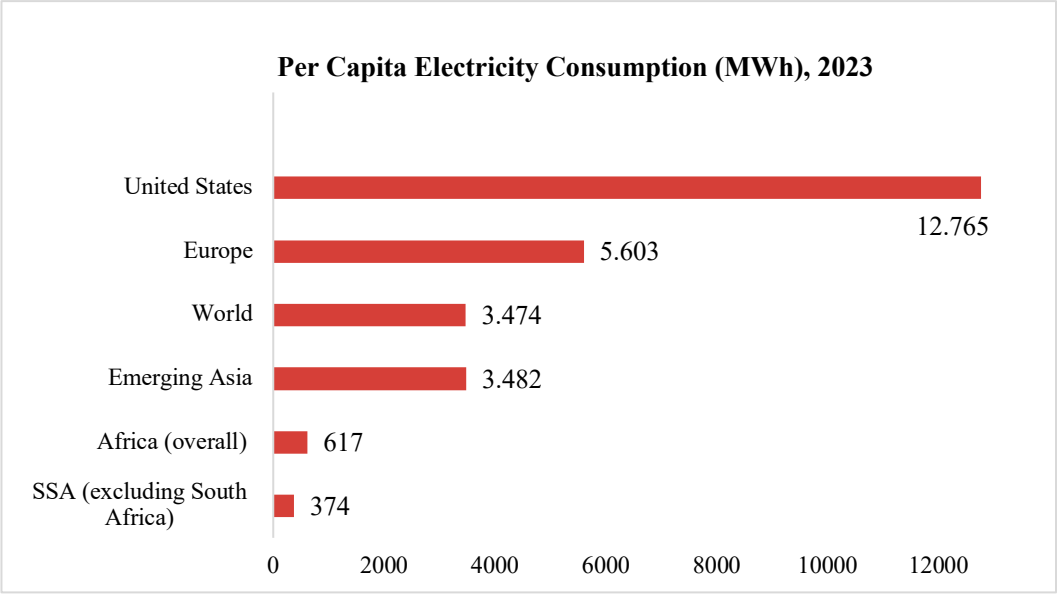


Figure 2.4 Per Capita Electricity Consumption (MWh), 2023. *(Source:International Energy Agency)*



"These disparities are evident not only across countries in the region but also within individual states, where structural weaknesses in the power sector further exacerbate these inequalities, resulting in a widening of the gap between urban and rural areas. In 2030, it is expected that about 85% of the population without access to electricity will be located in rural areas, where populations are spread over large distances and are usually not connected to a grid. On the other hand, in urban areas the electricity grid is often inefficient, as outages and load shedding are frequent in most countries. The load shedding is the deliberate and temporary shutdown of electricity in specific areas to prevent the grid from collapsing when demand exceeds available supply, a practice that ultimately leads businesses and households to rely on back-up generators running on diesel or gasoline at costs that are four times the price of grid power. In other words, not only is SSA not producing enough electricity, but the production costs are generally much higher than the global average. As a result, modern energy services remain unaffordable for the poor segments of the population, as the costs of energy services are generally higher than anywhere else, and so are the up-front costs of connection. Investment patterns indeed tend to reinforce these imbalances: most financing in power generation in Sub-Saharan Africa is geared not towards the basic energy needs of the poor, but towards industrialisation and the rising demands of existing consumers".[65] Approximately half of Sub-Saharan Africa's current electricity consumption is used for industrial activities, mostly mining and refining. A further expression of the energy paradox is that, despite the severity of the energy deficit, Africa holds considerable untapped renewable energy potential. Hydropower, solar and wind resources are abundant across the continent, yet their development remains remarkably limited. The Congo River alone could generate up to 40,000 MW, if there were funds to implement the appropriate technologies but only 1,424 MW are currently installed at Inga II. In the same way, installed solar capacity across Africa remains at around 10 GW and wind power at around 6.4 GW, while geothermal development barely reaches 1 GW despite an estimated potential of 14,000 MW.[66] These figures reflect a paradigm shift that also characterises sub-Saharan Africa: a vast renewable energy resource that is largely underutilised. This mismatch between potential and actual deployment continues to hinder the region's ability to diversify its energy mix, reduce costs, and expand access. Beyond issues of electricity access, a further and distinct concern relates to the lack of clean, modern cooking and heating energy,

[65] Copinschi, "Energy and the Economy in Sub-Saharan Africa," 705.
[66] Copinschi, "Energy and the Economy in Sub-Saharan Africa," 693.

which affects an even larger share of the population and has profound implications for health, the environment and food security. Nowadays, traditional biomass continues to dominate the primary energy mix, accounting for 65% of total energy use in the region (if South Africa is excluded, it increases to almost three-quarters), leaving its share in the overall Sub-Saharan African energy mix nearly unchanged over the last 25 years. According to the IEA, nearly four in five people of the population in Sub-Saharan Africa use biomass energy (often used in inefficient and unhealthy forms), compared with 52% in the developing world as a whole.[67] To conclude, several factors have contributed to the energy paradox and the associated weaknesses in energy systems, reflecting deeper structural constraints, such as the persistent mismatch between Africa's energy resources and their actual utilisation, high infrastructure costs, inadequate financing, outdated technologies, and restrictive regulatory frameworks. Collectively, these patterns are among the principal reasons why poverty remains so difficult to overcome in the region, creating an obstacle to the continent's economic development, social progress and environmental sustainability.[68]

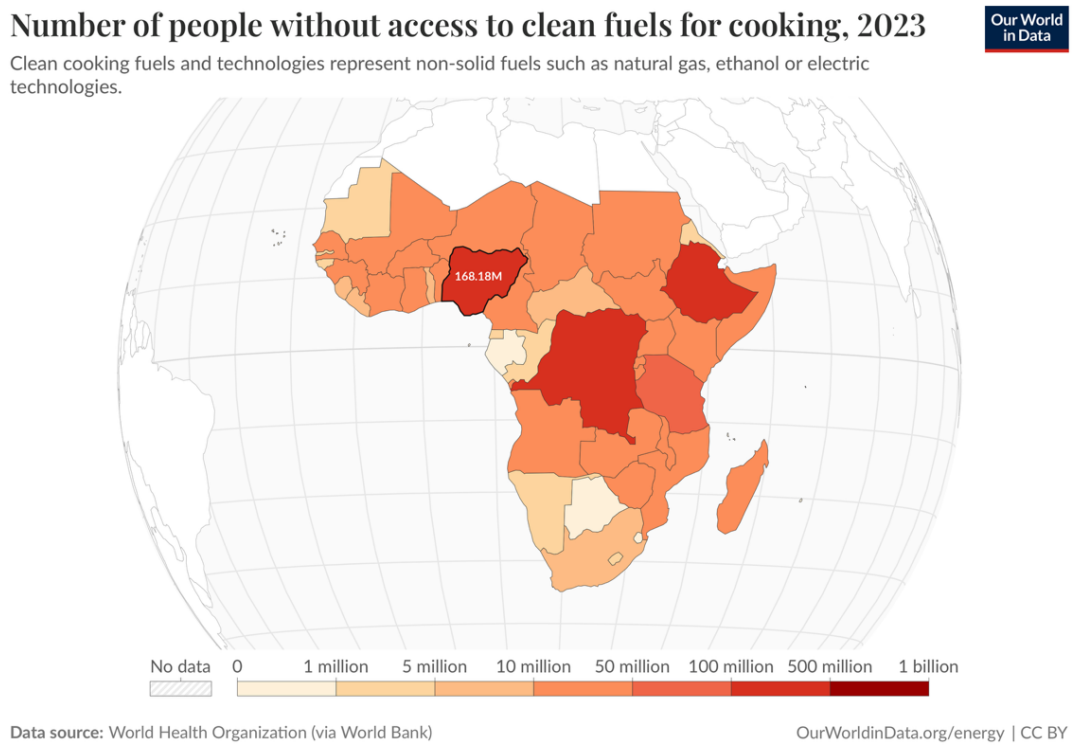
2.3 Lack of Energy Access and Poverty Trap

The lack of access to energy is a problem that has long been neglected, and only recently recognised as a priority by the international community and many African governments. In 2000, none of the eight UN Millennium Development Goals (MDGs) specifically addressed this concern, although the United Nations has always acknowledged that access to sustainable energy is essential for eradicating poverty. Ultimately, in the 2015 Sustainable Development Goals (SDGs), SDG7 explicitly aims to ensure universal access to affordable, reliable, and modern energy services by 2030, while also significantly increasing the share of renewable energy within the global energy mix. Sustainable energy is one of the 17 Global Goals constituting the 2030 Agenda for Sustainable Development. It suggests that an integrated approach is crucial for making progress across these goals and includes additional objectives, such as doubling the global rate of improvement in energy efficiency; enhancing international cooperation to facilitate access to research and technology; and promoting investment in energy infrastructure in

[67] International Energy Agency, International Renewable Energy Agency, United Nations Statistics Division, World Bank, and World Health Organization, *Tracking SDG 7: The Energy Progress Report 2019* (Washington, DC: World Bank, 2019).
[68] Copinschi, "Energy and the Economy in Sub-Saharan Africa," 693.

least-developed countries. As emphasised in the UN's *High-Level Dialogue on Energy* report [69], *'energy is an enabler of all other SDGs'*. Indeed, modern energy services support the provision of basic needs **(**lighting, heating, access to clean water, transport, cooking, etc), while promoting productive sectors such as manufacturing, commerce, agriculture, and industry. On the contrary, limited access to reliable, affordable energy services significantly hinders socio-economic progress. The poorest populations often bear the highest costs for poor-quality energy in terms of money, time, and health. Without modern energy access, enterprise development is constrained, and competitiveness is weakened, limiting producers' ability to reach regional and global markets.[70] Expanding access to electricity and clean cooking energy has therefore been recognised as a crucial driver of inclusive economic growth and poverty eradication.

Figure 2.5 Number of people without access to clean fuels for cooking, 2023. *(Source: Our World in Data, World Bank)*



[69] United Nations, *High-Level Dialogue on Energy: Concept Note, Technical Working Group 1* (New York: United Nations, 2021), https://www.un.org/sites/un2.un.org/files/2021/03/hld_on_energy_-_concept_note_twg_1.pdf.
[70] Copinschi, "Energy and the Economy," 696.

The consequences for populations of unequal access to energy are numerous and profound. Families in the region continue to depend on local biomass, such as firewood and charcoal, for cooking, for example. Women and children who could have spent time studying or training for productive activities leading to paid employment are most often assigned to laborious and time-consuming tasks such as harvesting charcoal. Understanding and responding to local challenges, such as freeing up time to open up new opportunities, is a concrete way to improve the quality of life and social status of a population. Moreover, in many cases climate change and deforestation are compounding the problem of finding suitable biomass for fuel. For the population, the health implications are the most urgent: it has been estimated that household air pollution from traditional cooking practices is responsible for approximately 600,000 premature deaths annually in Africa. The economic consequences of inadequate energy access are equally severe. The energy-sector bottlenecks and power shortages impacting many Sub-Saharan countries are quite common and can last for hours or even days, making it a persistent challenge for many communities.[71] According to the World Bank's Enterprise Surveys, Sub-Saharan African firms experience an average of about two months of power outages per year, compared with a global average of two weeks, resulting in substantial economic losses. For example, a 2023 study on South Africa reveals that power outages and load shedding have been costing the country between 1 to 1.3 percent of its GDP each year from 2007 to 2022. It's quite eye-opening to consider that the economy might be 17 percent larger today if these power issues hadn't occurred. The environmental impact is equally worrying, primarily in terms of deforestation, but there is also the problem of soil degradation affecting many areas on the outskirts of large cities. The high and constant demand for charcoal also weighs heavily on local forests and woodlands. And it is extremely difficult to ensure food security in the absence of modern energy sources. Without stable and constant electricity, there is no cold storage, but this also compromises irrigation systems and the processing of raw materials. Already low agricultural productivity suffers heavy post-harvest losses due to this lack of modern energy, forcing rural communities to stagnate in cycles of survival. We can easily understand that the lack of reliable and affordable power is one of the biggest constraints when investing on the continent, undermining job creation and social development. These interconnected factors create a challenging cycle of poverty: when incomes are low, it's harder to access

[71] Copinschi, "Energy and the Economy," 704.

modern energy services, and without such services, productivity, health, and education often remain limited, trapping families in poverty across generations. Making meaningful progress on almost all Sustainable Development Goals in Sub-Saharan Africa really depends on improving energy access significantly. That's why SDG7 is seen as a fundamental pillar for sustainable development everywhere continent.[72]

2.4 A Region Plagued by the Resource Curse

Sub-Saharan Africa is home to some of the continent's most valuable oil and gas reserves, which for decades have attracted sustained interest and investment from major international energy firms. Despite this wealth, the anticipated development has not materialized, and the extraction of such valuable resources has not translated into widespread prosperity or increased national wealth. The flow of foreign investment into the African oil and gas sector that has been generated over the last three decades, and that is still expected in the future is, in theory, usually presented as a great opportunity for the economic development of poorer countries. Especially since foreign aid to Africa from industrialised countries has been falling and gradually being replaced by an emphasis on trade as a means for African countries to escape poverty, the promise that oil and gas will improve the living standards of Africans repeatedly echoes throughout the continent, raising popular expectations.[73] This narrative continues to resonate today in countries such as Mozambique, Senegal, and Mauritania, just as it did in earlier decades in Nigeria, Angola, and Congo-Brazzaville: many citizens hope that petroleum wealth will finally break the cycle of poverty that afflicts their nations. The bitter reality is that oil and gas have failed to deliver on many promises. Supposed to create jobs, expand access to healthcare, food, and education, and support agriculture and housing, most countries in the region have ultimately experienced significant development failures. The petrodollar has so far failed to bring stable economic growth to these countries or reduce their poverty rates. Like many oil exporters in other developing regions (excluding Arab monarchies), long-established African producers such as Nigeria, Angola, Congo-Brazzaville, and Gabon have largely failed to transform their oil wealth into widespread socio-economic development, struggling to plan for a future beyond oil.[74] This pattern reflects what the

[72] Copinschi, "Energy and the Economy," 705.
[73] Copinschi, "Energy and the Economy," 698.
[74] Copinschi, "Energy and the Economy in Sub-Saharan Africa," 699.

literature describes as the resource curse, or the paradox of plenty, a concept first articulated by Richard Auty in *Sustaining Development in Mineral Economies: The Resource Curse Thesis* in 1993[75]. According to this theory, countries with abundant natural resources often fail to make the most of these natural riches. On the contrary, their economic performance is often ultimately worse than that of countries with far fewer resources. The sudden discovery of abundant natural resources can, in many cases, exacerbate pre-existing structural problems and generally has negative effects on local economies.[76] One of the main challenges for these countries is their limited ability to diversify their economies. A major challenge for these countries is their limited capacity to diversify their economies. During the 1970s, as the petroleum sector expanded, many Sub-Saharan African producers faced what is known as Dutch Disease. The name origins from the event that happened in the Netherlands in the 1970s, after the discovery of important natural gas deposits in the North Sea. Initially, oil development appears to be beneficial, since it can lead to rapid increases in per capita income. However, Auty explains how this often results in high inequalities in revenue distribution. These successes are often questioned because of the proliferation of rent-seeking activities. The exceptionally high profit margins in the oil and gas sector lead people to ignore other sources of revenue from hydrocarbons. As a consequence, even healthy pre-existing economic activities can be quickly disrupted and displaced by increasing reliance on petrodollars. We have to understand that whhen a government has sufficient funds, it is easier to import food or consumer goods instead of producing them locally. In a similar way, acquiring technological know-how tends to be simpler than developing it domestically. This is a partial explanation of how the financial benefits of petroleum can become a disadvantage, hindering the development of other productive industries. When oil windfalls raise the real exchange rate of a country's currency, most other exports become less competitive.[77] According to Ross, this process operates through two well-established channels associated with Dutch Disease. First, the spending effect occurs when rising oil revenues boost domestic demand, leading to higher prices for non-tradable goods. Because of this, domestically made goods become more expensive compared to

[75] Richard Auty, *Sustaining Development in Mineral Economies: The Resource Curse Thesis* (London: Routledge, 2002), https://doi.org/10.4324/9780203422595.
[76] Michael L. Ross, "The Political Economy of the Resource Curse," *World Politics* 51, no. 2 (1999), https://doi.org/10.1017/S0043887100008200.
[77] Richard Auty, *Sustaining Development in Mineral Economies: The Resource Curse Thesis* (London: Routledge, 2002), https://doi.org/10.4324/9780203422595.

imports, which can make national industries less competitive. Second, the resource pull effect occurs when labor and capital are drawn into the booming extractive sector, where wages and returns tend to be higher. This shift of resources increases production costs in other sectors, making it harder for them to compete internationally. Over time, this has led to the decline of agricultural and manufacturing sectors, which has increased dependence on oil and deepened structural vulnerabilities.[78] Meanwhile, the oil sector cannot compensate for the shortfall in other sectors. Since oil is a highly capital-intensive industry, it depends mainly on investment in equipment and technology, which means it offers limited jobs and fewer connections with the overall economy. As oil takes on greater importance in the country's economic activity and becomes an essential source of export revenue, governments become increasingly dependent on it. As the main source of public finance revenue and foreign exchange reserves, whoever controls access to oil revenues ultimately controls the state. In such contexts, oil becomes a central pillar of political influence and economic power. This configuration often results in a small group of individuals monopolizing control, from production to distribution. This situation can lead to what is known as "elite capture" where political leaders exploit control of oil revenues to strengthen their patronage networks, reward loyal supporters, and consolidate their power. A harmful cycle of dependency is built between those who hold political office and have the power to grant access to lucrative opportunities in the oil industry, and those who, having benefited from these opportunities, can provide the financial support necessary to maintain the regime that placed them at the head of these institutions. This does not occur to the same extent in more diffuse wealth-generating activities based on, say, fertile soil or fisheries, where the barriers to entry are far lower, the actors more numerous and the benefits more dispersed. This dependence on oil revenues negatively affects the capacity of states and their ability to govern. There is a vicious circle in which the more governments spend, the more they need oil revenues.[79] As a consequence, oil dependence is today overwhelming: in Nigeria (about 200 million inhabitants), petrodollars account for more than 50% of federal government revenue and more than 80% of export earnings, although it only accounts for 10% of GDP.[80] Like Nigeria,

[78] Michael L. Ross, "Does Oil Hinder Democracy?" *World Politics* 53, no. 3 (2001); Macartan Humphreys, Jeffrey D. Sachs, and Joseph E. Stiglitz, eds., *Escaping the Resource Curse* (New York: Columbia University Press, 2007).
[79] Copinschi, "Energy and the Economy in Sub-Saharan Africa,", 695.
[80] Organization of the Petroleum Exporting Countries, *Annual Statistical Bulletin 2024* (Vienna: OPEC, 2024), https://www.opec.org/assets/assetdb/asb-2024.pdf.

Angola's oil dependence is remarkable: oil and gas account for about 95% of goods exports, about 60-65% of fiscal revenues, and roughly 30% of its GDP.[81] Unlike Norway or, more recently, Dubai, both of which built robust institutions capable of managing hydrocarbon revenues, most African oil producers entered the petroleum era with fragile bureaucracies. While these governance weaknesses primarily affect state capacity and institutional performance, their implications extend well beyond administrative effectiveness. Many studies suggest that countries rich in oil often face challenges like weaker democratic institutions, increased corruption, and a higher likelihood of internal conflicts. Recognizing these patterns can help us understand the complex impacts of oil wealth on governance and stability.[82] These effects work through three well-known mechanisms: the rentier effect, where reliance on oil revenues decreases the need for taxation and makes governments less accountable; the repression effect, which occurs as governments use petroleum rents to fund security forces that suppress dissent; and the modernization effect, which can slow down societal and economic changes usually linked to democratic progress. Moreover, oil wealth is often associated with a greater risk of civil conflict, especially when resources are concentrated in specific areas or extraction leads to significant local issues grievances.[83] Overall, these institutional and political issues make it hard for the state to effectively manage the petroleum industry. In this situation, external investment flows do not help fix these weaknesses; instead, it tends to reproduce and amplify them worse. Foreign direct investment mainly goes into big, capital-heavy projects geared toward export markets, like offshore platforms, LNG terminals, refineries, and pipelines, rather than focusing on sectors that could boost the local economy. The majority of energy-related investment has historically catered to the needs of extractive industries rather than tackling domestic energy constraints impacting households, agriculture, or small enterprises. This investment pattern reinforces the enclave nature of the petroleum sector and helps explain why substantial inflows of foreign investment have not resulted in widespread development. Finally, the high volatility of global oil prices makes it difficult to plan or project government spending levels. In almost all African oil-producing countries, various development schemes

[81] World Bank, *Angola Country Economic Memorandum: Moving Beyond Oil (2023–2024)* (Washington, DC: World Bank, 2024).

[8282] Michael L. Ross, "Does Oil Hinder Democracy?" *World Politics* 53, no. 3 (2001); Macartan Humphreys, Jeffrey D. Sachs, and Joseph E. Stiglitz, eds., *Escaping the Resource Curse* (New York: Columbia University Press, 2007).

[83] Michael L. Ross, *The Oil Curse: How Petroleum Wealth Shapes the Development of Nations* (Princeton, NJ: Princeton University Press, 2012).

launched over the past decades have been abandoned because of declines in oil revenues following a sudden drop in the oil price, such as in early 2020. The volatility of oil prices, the rapid fluctuation from $20 to $100 per barrel and back, makes planning extremely difficult and undercuts efforts to turn oil wealth into other, more permanent forms of sustainable development. This instability can negatively affect investment, income sharing, educational achievements, and efforts to reduce poverty. Over time, it creates a cycle of growth and decline that makes it hard for oil wealth to turn into lasting, productive assets. Taken together, these economic distortions, institutional weaknesses, political incentives, and investment behaviours create a self-perpetuating cycle of dependence and underdevelopment, often referred to as the resource curse trap.

2.5 Limits and Critiques of the Resource Curse Theory

A growing body of literature challenges the deterministic interpretation of the resource curse, which portrays natural resource abundance as an inherent obstacle to development. Benjamin Smith and David Waldner, in *Rethinking the Resource Curse*[84], offers a comprehensive reassessment of the debate by pointing out the empirical and methodological weaknesses present in many curse-based arguments. The authors illustrate how the political effects of oil wealth can differ greatly depending on the region and historical period, challenging the idea of a single, universal link between resource abundance and state dysfunction. While some Middle Eastern states exhibit patterns of autocratic durability associated with hydrocarbon rents, other resource-rich countries in Latin America and Southeast Asia have successfully democratised despite comparable endowments. From this perspective, the "curse" appears less as a general law than as a historically contingent outcome shaped by contextual factors.[85] A similar point is made by Paul Collier, who believes that the idea of a 'curse' can be somewhat misleading because it tends to draw attention away from how resource revenues are managed. In *The Bottom Billion*[86], Collier emphasises that natural resources do not mechanically produce underdevelopment; rather, they create fiscal and political risks that are mediated by institutional capacity. Poorly governed states struggle to manage large and volatile

[84] Benjamin Smith and David Waldner, *Rethinking the Resource Curse* (Cambridge: Cambridge University Press, 2021).
[85] Smith and Waldner, *Rethinking the Resource Curse*.
[86] Paul Collier, *The Bottom Billion: Why the Poorest Countries Are Failing and What Can Be Done About It* (Oxford: Oxford University Press, 2007).

revenue streams, while countries with effective institutions are better positioned to transform resource rents into long-term development gains. This institutionalist perspective is reinforced by Daron Acemoglu and James A. Robinson, who emphasize that the path of development is more influenced by political and economic institutions rather than just factor endowments. In their book *Why Nations Fail*, they suggest that resource wealth is harmful only when extractive institutions, which centralise power and rents among a few elites, dominate. Conversely, when institutions are inclusive and transparent, resource revenues can promote state-building, public goods, and economic diversification.[87] Even scholars who were initially linked to the early ideas of the resource curse, like Jeffrey Sachs and Andrew Warner, later recognize that with the right macroeconomic and institutional policies, its negative impacts can be turned around. Ongoing research shows that smart fiscal strategies, diversification efforts, and robust governance can really help reduce the risks usually tied to relying on resources. Overall, the literature makes it clear that the resource curse is not inevitable but depends on the circumstances. Simply having natural resources doesn't condemn countries to underdevelopment; instead, it's how institutions are managed and policies are made that truly shape the outcome. This nuanced perspective provides valuable insight into Nigeria, where the coexistence of resource wealth with regulatory confusion, weak policy enforcement, and rent-seeking behaviours has repeatedly resulted in less favourable development outcomes.

[87] Daron Acemoglu and James A. Robinson, *Why Nations Fail: The Origins of Power, Prosperity, and Poverty* (New York: Crown Business, 2012).

Chapter 3 – Nigeria

3.1 The Paradigmatic Case of Nigeria

Nigeria stands as the paradigmatic case of hydrocarbon dependency, where immense resource wealth, approximately 37 billion barrels of oil and 5600 bcm of natural gas, serves as the backbone of the external and fiscal structure of the economy. While oil now accounts for only about 6.2% of GDP following economic rebasing, they generate 89% of total export earnings and more than half of federal government revenues.[88] Although earnings peaked at nearly $31-47 billion annually during high-price years, this wealth has not enhanced the lives of the most vulnerable. In 2023, 56.2% of the population still lived below the national poverty line, and projections indicate that more than half of Nigerians may remain poor in 2025.[89] This failure is most acute in the Niger Delta, the world's third-largest wetland and home to 31 million people, which has been devastated by the spilling of 10 to 13 million tons of hydrocarbons over the last 50 years.[90] These spills have affected around 2,000 sites, unfortunately damaging traditional ways of life like farming and fishing. They've also posed serious health risks, with benzene levels in Ogale's drinking water reaching quantities 900 times higher than WHO safety limits. “For more than twenty five years, the degradation of living conditions in the Niger Delta has been accompanied by a persistent cycle of activism, militancy and state repression linked directly to oil extraction”.[91] In fact, among the population, a sense of injustice stemming from increasingly visible environmental destruction and repeated human rights violations has spread. Despite the oil companies transferring significant revenues to the federal government through taxes and royalties, they are considered responsible for the exclusion of local communities from the benefits of resource extraction perceived as their own. Over time, popular discontent has taken the form of violent protests, primarily organised by young people, which include sabotage of pipelines, kidnapping of oil workers and

[88] Energy Institute, *Statistical Review of World Energy 2025* (London: Energy Institute, 2025).; World Bank, “Nigeria Overview,” last modified October 2025, https://www.worldbank.org/en/country/nigeria/overview.

[89] World Bank, *Poverty & Equity Brief: Nigeria* (Washington, DC: World Bank, October 2025), https://documents1.worldbank.org/curated/en/099253204222517873/pdf/IDU-3e010784-3371-4dcb-b923-112e98052ed9.pdf.

[90] Zabbey, Nenibarini, Kabari Sam, and Adaugo Onyebuchi. “Remediation of Contaminated Lands in the Niger Delta, Nigeria: Prospects and Challenges.” *Science of the Total Environment* 586 (2017): 952–965. https://doi.org/10.1016/j.scitotenv.2017.02.075.

[91] Soala Ariweriokuma, *The Political Economy of Oil and Gas in Africa: The Case of Nigeria*, 1st ed. (London: Routledge, 2008), https://doi.org/10.4324/9780203891995.

occupation of oil facilities, including offshore platforms. These protests pose a direct threat to national and international energy security since they obstruct production and exports. Moreover, to claim the benefits of the resources, communities are increasingly turning directly to oil companies, rather than to local political institutions, as they are considered corrupted or absent. Oil companies, therefore, automatically become the only tangible representatives of authority accessible to local populations. Philippe Copinschi in "Energy and the Economy in Sub-Saharan Africa" describes how the oil companies operating in the Niger Delta thus find themselves trapped in a "structural vicious circle", where their activities and the revenues they generate have the effect of distorting the local political life, increase the tendencies towards the formation of the rent economy and the collapse of political institutions, and create the frustrations of which they are the first victims, while being considered responsible by the public opinion in the West.[92] To address these tensions, many multinational companies are now embracing corporate social responsibility (CSR) programmes in order to improve their reputation, and to soothe social conflicts. The major oil companies in the Niger Delta contribute more than $100 million annually to community development projects in education, healthcare, infrastructure development, vocational training, and support for local businesses. In this way, they demonstrate their commitment to making a positive impact and building trust with communities and global audiences as well. Copinschi explains how these initiatives are implemented to justify the corporate presence in the country, as they bring actual benefits for local communities. Reports show that some of these projects are thoughtfully planned and are able respond to local needs, offering evident short-term advantages. In other cases, projects resemble informal financial handouts to local elites, primarily intended to pacify discontented youth. If these practices continue unchecked, they could heighten tensions and deepen social divisions within communities, making it even harder to achieve sustainable economic progress in the long run.[93] There are also cases in which infrastructure projects are funded by oil companies in the Niger Delta but remain unused or fail because there's no public funding for salaries, equipment, and maintenance. "Without any lasting impact on local development, due to the lack of partnership with the public authorities (often non-existent), these programmes seem essentially to be a mere

[92] Philippe Copinschi, "Energy and the Economy in Sub-Saharan Africa" in *The Palgrave Handbook of International Energy Economics*, ed. Manfred Hafner and Giacomo Luciani (Cham: Springer Nature Switzerland, 2022), 700.
[93] Copinschi, "Energy and the Economy in Sub-Saharan Africa," 701.

response to the critics and to pressure from the local populations and international NGOs."[94] Copinschi underlines that the main goal of oil companies is their profit, not providing public services, which means that corporate philanthropy should not replace the role of local and national governments in meeting citizens' needs, even though some of their initiatives may have positive impacts. The risk is that by assuming the role of a quasi-state that helps maintain short-term social stability, they end up supporting the very issues that lead to conflict, and this situation can weaken institutions and encourage rent-seeking, in which economic gains are achieved by controlling the distribution of resources rather than through productive work. In the end, these practices result in redirecting wealth from diverse economic growth, tend to promote corruption, and increase dependence on hydrocarbons. On a broader scale, oil, gas, and mining are examples of extractive sectors that have a significant influence on Africa's trade with the rest of the world. The discrepancy between oil's potential and actual economic performance has been rather apparent, as Copinschi points out. According to numerous studies, African nations that primarily depend on oil exports typically perform worse than other emerging countries on a variety of economic metrics. Nevertheless, although the experience of sub-Saharan Africa's oil and gas exporters illustrates that dependence on oil can be a risky development strategy, negative outcomes from oil price bubbles are not always unavoidable.[95] One example is Norway, which ranks first among the major developed countries in the United Nations Development Program thanks to its exploitation of the advantages offered by the North Sea. This shows that the problems faced by resource-rich countries (especially gas and oil) are not caused by the resources themselves, and that a country's public policies can transform oil and gas profits into sustainable economic benefits for its citizens.

3.2 Nigeria's Stated Energy Policy Trajectory

The fundamental rationale of Nigeria's stated energy policy is to address a persistent national energy paradox, as the Energy Commission of Nigeria (ECN) characterises it: 'rich in energy resources but very poor in energy supply'. Official planning documents, primarily the National Energy Policy (NEP) and the National Energy Masterplan (NEMP), approved in April 2022, frame energy not merely as a commodity but as an 'all-

[94] Copinschi, "Energy and the Economy in Sub-Saharan Africa," 702.
[95] Copinschi, "Energy and the Economy in Sub-Saharan Africa," 701.

pervading factor in the quest for socio-economic development'.[96] According to the documents, the main objective of these policy tools is "to utilise the nation's viable energy resources in order to alleviate poverty, improve industrial productivity, and achieve the United Nations Sustainable Development Goal 7 on universal energy access by 2030".[97] This trajectory seeks an integrated development of the energy sector that aligns domestic resource mobilisation with international developmental agendas, including Nigeria's Agenda 2050 and the Africa Agenda 2063. As its main implementation pathway, the Federal Government uses the National Energy Plan (NEMP) to translate high-level policies into feasible projects. This framework is based on energy planning models, in particular the Model for Energy Demand Analysis (MAED) and the Model for Energy Supply Strategies and their Environmental Impacts, to identify the best supply options. Under these frameworks, the government articulates its developmental trajectory through three distinct growth scenarios based on a year 2000 or 2009 baseline: the Reference Scenario assumes a mean real GDP growth of 7% per annum, targeting a reduction of poverty by half in alignment with the previous Millennium Development Goals; The High Growth Scenario envisions an average GDP growth of 10% per annum, aiming to accelerate Nigeria's transition from an agrarian economy to a more industrialized one. In this projection, the manufacturing sector could account for 22% of GDP by 2030, based on estimates, which would represent a maximum electricity demand of 192,000 MW. Finally, according to the optimistic scenario, it forecasts rapid GDP growth of between 11.5% and 13% per year, placing Nigeria among the world's top 20 economies.[98] It is clear that these projections require a massive expansion of generation capacity, which, however, in light of the current context, appears difficult to achieve. For instance, per capita commercial energy consumption, recorded at 149.06 kgoe in the base year, is projected to increase by a factor of 7.33 under the 10% High Growth Scenario. Renewable energy (RE) is expected to play a revolutionary role in the official energy mix, from its current pilot project stage to becoming a fundamental pillar of the national grid. The NEMP argues that, despite the current low use of renewable energy, the country has untapped potential, including 427,000 MW of solar energy, 24,000 MW of large hydroelectric plants, and 3,500 MW of small hydroelectric plants. There are various policy instruments governing the development of renewable energy, namely the National

[96] Federal Republic of Nigeria, *National Energy Masterplan* (Abuja: Energy Commission of Nigeria, 2022).
[97] Federal Republic of Nigeria, *National Energy Masterplan*.
[98] Federal Republic of Nigeria, *National Energy Masterplan*.

Renewable Energy and Energy Efficiency Policy (NREEEP) and the National Renewable Energy Action Plans (NREAP), approved in 2015 and 2016 respectively. Quantitatively, the government projects that RE will account for 17% to 20% of the total electricity demand in the long term.[99] Under the 7% growth scenario, specific goals include achieving 32,613 MW of total renewable capacity by the long run, of which 20,000 MW will come from solar PV and 6,000 MW from large hydropower. In contrast, the 10% High Growth Scenario increases the renewable capacity target to 46,451 MW in the long term. Consolidating its position on the global climate stage, Nigeria's commitment to reducing its carbon footprint has become a legally binding obligation. With the Climate Change Act of 2021, Nigeria sets a national target of net-zero emissions by 2060, demonstrating a committed and optimistic attitude toward a sustainable future. This target is also incorporated into the Third Nationally Determined Contribution (NDC 3.0), which was finalised in September 2025; unlike previous iterations that used relative reductions against a 'Business-As-Usual' baseline, NDC 3.0 adopts an absolute emissions reduction approach.[100] Nigeria sets 2018 as its reference year, with baseline emissions recalculated at 573.5 Mt CO_2e. The state officially commits to the following absolute reduction targets: a 29% reduction by 2030 (an absolute reduction of 168.2 Mt CO_2e); a 32.2% reduction by 2035 (an absolute reduction of 184.9 Mt CO_2e). To meet these targets, the government identifies a mitigation potential of 347.9 Mt CO_2e within the Land Use, Land-Use Change, and Forestry sector and 134.6 Mt CO_2e within the energy sector. In addition, the commitment includes a 20% 'unconditional' target to be met through domestic resources and an 80% "conditional" target dependent on international support.[101] Finally, one of the main elements of Nigerian energy policy is the National Gas Expansion Program (NGEP) launched in 2021. Here, natural gas is seen as a 'bridge fuel' that can be used to balance long-term climate sustainability with the urgent needs of industrialization and energy access. Nigeria's goal is to exploit its 5761 billion cubic meters of proven gas reserves in order to implement an energy transition that is also capable of ensuring stability and socioeconomic development.[102] In fact, according to the official policy narrative, this strategy is presented as a low-risk approach to energy security that facilitates a just energy

[99] Federal Republic of Nigeria, *National Energy Masterplan*.
[100] Federal Republic of Nigeria, *Nigeria's Third Nationally Determined Contribution (NDC 3.0)* (Abuja: National Council on Climate Change, September 2025).
[101] Federal Republic of Nigeria, *Nigeria's Third Nationally Determined Contribution*.
[102] Energy Market and Rates Consultants Limited (EMRC), *Nigeria's Gas Expansion Programme: Bridge Fuel or Long-Term Strategy* (Abuja: EMRC, April 2025).

transition by lifting millions of people out of poverty through gas-related employment and stable industrial growth. In summary, Nigeria's stated energy policy trajectory is characterised by an ambitious effort to align high-growth industrialisation scenarios with a legally mandated net-zero target by 2060. This pathway relies on a dual-track strategy of rapidly scaling renewable energy capacity while utilising natural gas as the essential baseload 'bridge' for a growing economy. These are the government's goals and estimates, but the actual success of these plans in reality depends on Nigeria's unique institutional, legal, and market challenges, which have historically limited the country's energy sector.

3.3 The Political Economy of Implementation: Institutional, Legal, and Financial Pathologies in Nigeria's Energy Sector

This paragraph aims to highlight the gap, or at least possible disparities, between stated objectives and tangible results from an institutional political economy perspective. This is not simply a matter of technical or infrastructural shortcomings, but rather a complex and unstable political economy characterized by governance failures, ambiguous laws, and a dysfunctional market system, suggesting a constant divergence between Nigeria's stated energy policy objectives and actual, measurable outcomes. Today, the regulatory and legislative framework does not allow for, and even creates systemic barriers to, the implementation of universal access and decarbonization plans such as those described in official documents such as the National Energy MasterPlan (NEMP) and NDC 3.0. Ambitious mandates are transformed into stagnant realities due to legal, structural, and financial mechanisms, which are analyzed below. First, the legal and institutional dispute between federal and subnational authorities is one of the factors causing misalignment in implementation. There is a dichotomy between the provisions of the 1999 Nigerian Constitution, which grants the 36 state governments the power to regulate off-grid electricity, and the historical reasons cited by the federal Nigerian Electricity Regulatory Commission (NERC) for maintaining unified control over licensing and regulation. This applies to both urban and rural communities.[103] The nature of this conflict of jurisdiction creates an uncertain and counterproductive legal environment, discouraging initiatives at

[103] Godwin Emmanuel Oyedokun and Matilda Chukwuemeka, "Examining Legal Impediments to Renewable Energy Development in Nigeria's Regulatory Landscape," *OAU Journal of Public Law* 6, no. 1 (2025): 1–18.

the state level and making it more difficult for decentralized energy providers to enter the market.[104] Furthermore, many of Nigeria's energy policies, such as the National Renewable Energy and Energy Efficiency Policy (NREEEP), function as 'mere objectives' rather than enforceable laws, since in the absence of a legally binding framework to drive investment, these documents offer no regulatory guarantees to external actors. Consequently, international and domestic investors face high political and legal risks, viewing stated targets not as reliable roadmaps but as aspirational principles lacking the 'instrumentality of a strategic regulatory framework' necessary for industrial development.[105] The causal link between the 2005 privatisation reforms and current sector dysfunction lies in the failure to move from unbundling to genuine competition. While the Electricity Supply Industry (ESI) was unbundled into various generation and distribution entities, the process failed to create competition. Instead, the market remained monopoly-driven, preserving a structure in which single, often state-leveraged utilities account for a significant share of the value chain. This lack of competition is reinforced by the 'unbankable' status of many utilities, plagued by subsidised pricing and high technical and commercial losses.[106] These structural inefficiencies deter the entry of Renewable Energy Sourced Electricity (RES-E) providers, who cannot compete in a market characterised by low tariffs and substantial required investments. In this way, the resulting inertia maintains a centralised grid system that is technically fragile and commercially insolvent, effectively locking out the decentralised innovations promised in policy documents.[107] As discussed by Ismail in *"Investigating the Barriers to Climate Finance and ESG Integration in Nigeria's Energy Transition"*, the highly capital-intensive nature of energy projects in Nigeria is exacerbated by a prohibitive cost of capital and a lack of domestic financial depth.[108] Projects face higher capital costs, exacerbated by funding cost discrepancies and the lack of suitable domestic equity finance, and the absence of debt finance maturity in the Nigerian private equity market

[104] Ukponu, Michael Uche, Yusuf Sulayman, and Kester Oyibo. "Role of Law in the Energy Transitions in Africa: Case Study of Nigeria's Electricity Laws and Off-Grid Renewable Energy Development." In *Energy Transitions and the Future of the African Energy Sector: Law, Policy and Governance*, edited by Victoria R. Nalule. Cham: Palgrave Macmillan, 2021.
[105] Noreen Kidunduhu, "Energy Transition in Africa: Context, Barriers and Strategies," in *Energy Transitions and the Future of the African Energy Sector: Law, Policy and Governance*, ed. Victoria R. Nalule (Cham: Palgrave Macmillan, 2021).
[106] Kidunduhu, "Energy Transition in Africa."
[107] Oyedokun and Chukwuemeka, "Legal Impediments."
[108] Al-Amin Ibrahim Al-Amin, Sule Magaji, and Yahaya Ismail, "Investigating the Barriers to Climate Finance and ESG Integration in Nigeria's Energy Transition," *GAS Journal of Arts Humanities and Social Sciences* 3, no. 9 (2025): 32-40, https://doi.org/10.5281/zenodo.17113171.

forces a heavy reliance on external loans, often leading to 'debt traps' where control over strategic energy assets is jeopardised.[109] There is a risk of a vicious circle of underinvestment due to significant technical and economic losses in the national sector. Indeed, buyers will continue to run risks due to investors' reservations about the ability of indebted distribution companies (DISCOS) to honor their payment commitments. Without a 'national support system' to guarantee the security of large-scale offshore financing, the massive capacity expansion envisioned in the NEMP remains financially stranded.[110] The clear difference between installed capacity and effective supply really highlights how large Nigeria's energy challenges are: as of 2022, Nigeria's total installed grid capacity stood at 12,522 MW, yet the available average output remains a 'trifling' 3,500 MW to 5,000 MW. [111] When measured against a hypothetically estimated daily requirement of roughly 180,000 MW that are necessary to support an industrialising economy, current capacity appears mathematically insignificant. This deficit has created a state of 'suppressed demand', where in the end, businesses and households rely on private, decentralised generators that match an estimated 80% of the national grid's installed capacity. These generators produce power at costs far exceeding grid electricity, eroding industrial competitiveness and reinforcing the energy poverty that the NEMP officially aims to eradicate. [112] Regarding the renewable energy potential, Victoria Nalule analyses the structural barriers that hinder their development: the existence of 427,000 MW of solar potential, 8,824 MW of hydro potential, and massive biomass reserves (contributing 78% of primary energy consumption) coexist with nearly non-existent deployment of modern renewable technologies.[113] Although dominant, the biomass sector relies on unsustainable first-generation feedstocks and fuelwood, which directly threaten national food security and contribute to rapid deforestation. This delay in deployment isn't due to a lack of resources but rather a challenge rooted in political and institutional factors. Weak and corrupt institutions, along with an over-reliance on fossil fuels, have slowed down the transition to renewable energy. Regarding solar radiation, while it is high in the north of the country (up to 7.0 kWh/m²/day), the use of solar for power

[109] Al-Amin, Magaji, and Ismail, "Investigating the Barriers to Climate Finance,".
[110] Al-Amin, Magaji, and Ismail, "Investigating the Barriers to Climate Finance".
[111] Chika Nwedu, "Energy Security and Power Sector Reform in Nigeria," in *Energy Transitions and the Future of the African Energy Sector: Law, Policy and Governance*, ed. Victoria R. Nalule (Cham: Palgrave Macmillan, 2021).
[112] Nwedu, "Energy Security and Power Sector Reform."
[113] Victoria R. Nalule, *Energy Transitions and the Future of the African Energy Sector: Law, Policy and Governance* (Cham: Palgrave Macmillan, 2020).

generation remains slow due to a lack of political will and the absence of clear, market-strategy-based incentives. Concerning natural gas, which accounts for 77% of total daily energy generation[114], it is prioritised for its comparative efficiency and lower CO_2 emissions relative to coal, but its dominance can potentially create a resource monopoly that intensifies energy insecurity, as with oil dependence. However, Africa's future development and monetisation of its natural gas resources/reserves appear to be caught between two diametrically opposed views, which will be examined in the next chapter. Finally, Nalule underlines demonstrate how energy security has to be understood as a multidimensional concept embracing availability, affordability, accessibility, and acceptability.[115]

Figure 3.1 Domestic energy production, Nigeria, 2023. *(Source: IEA, 2023).*

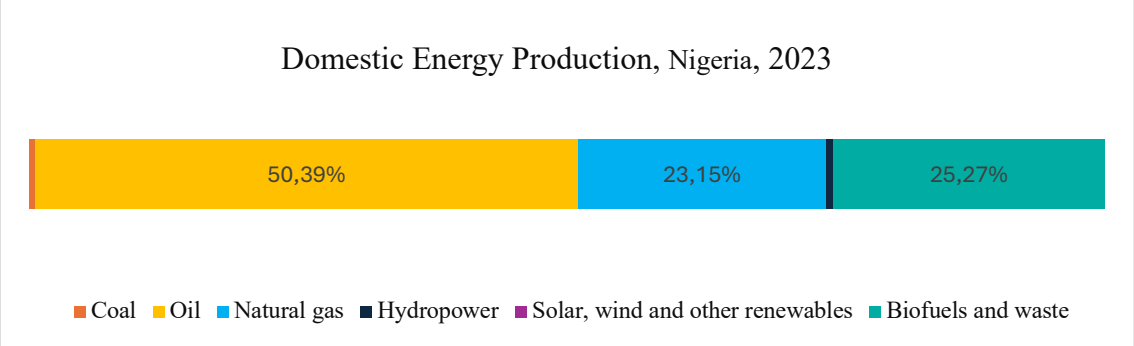
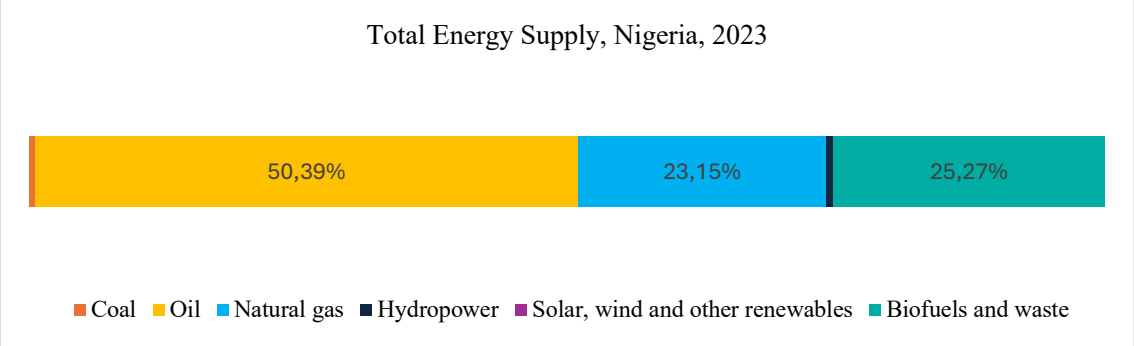


Figure 3.2 Total Energy Supply, Nigeria, 2023. *(Source: IEA, 2023).*



[114] International Energy Agency, "Nigeria," *IEA Country Profiles*, accessed February 18, 2026, https://www.iea.org/countries/nigeria.
[115] Nalule, *Energy Transitions and the Future of the African Energy Sector*.

Chapter 4 - The Role of Natural Gas

'Natural gas is a fossil fuel and a mixture of hydrocarbons (e.g., methane, ethane, propane, and butane) and non-hydrocarbons (e.g., nitrogen, hydrogen sulphide, carbon dioxide, helium, and water vapour). It is odourless, colourless, tasteless, and highly flammable.'[116] Historically considered a by-product or nuisance of oil production, natural gas was disposed of by burning it in flares, saving producers storage and transportation costs but also causing significant environmental degradation. Over time, perceptions of natural gas have changed as its economic and environmental potential have become evident. In recent years, the role of natural gas has gained importance in the search for cleaner and more sustainable energy sources, and it is increasingly being considered as a *bridge fue*l. It may seem counterintuitive, but natural gas has become a key element of the transition, capable of supporting the shift from traditional fossil fuels such as oil and coal to renewable energy. Recent studies indicate that natural gas emits about 50-60% less carbon dioxide than coal and 30% less than oil, making it a useful factor in reducing greenhouse gas emissions and improving energy security.[117] Thanks to advances in capture, transportation (e.g., pipelines and liquefied natural gas), and utilization (e.g., power generation, heating, and petrochemical production) technologies, natural gas has gone from being a waste byproduct to a valuable resource. Today, it accounts for over 23% of the global energy mix, contributing to both energy transition and economic development worldwide.[118] Despite these premises, the role of natural gas in global climate policies remains widely debated and, in general, hampered by geopolitical considerations and divergent national approaches. Although the use of existing reserves is theoretically compatible with the objectives of the Paris Agreement, policies favoring their expansion are often subordinated to considerations of energy security or national sovereignty. This dichotomy is particularly evident on the African continent, where the 'gas renaissance' is clashing with growing polarization: on the one hand, the need for countries such as Nigeria to exploit their resources for domestic development, and on the other, international pressure and new financial restrictions linked to ESG criteria. This chapter therefore aims to

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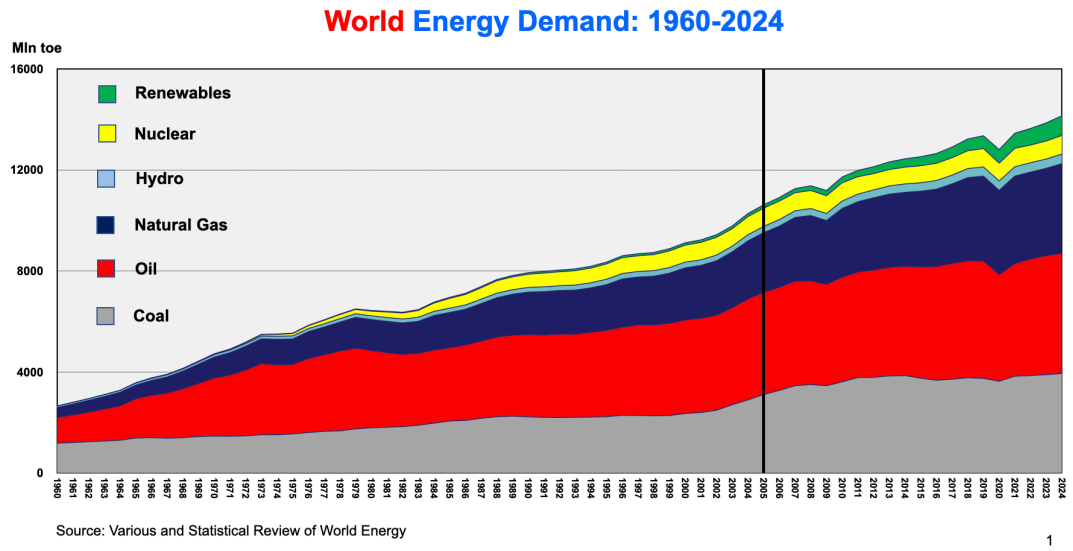
[116] Evro Evans O. and Obiwale Fortune O., *The Role of Natural Gas in Nigeria's Energy Transition and Economic Growth – An Econometric Approach* (Society of Petroleum Engineers, 2025), https://doi.org/10.2118/228755-MS.

[117] Evans et al., "Role of Natural Gas in Nigeria," 4.

[118] International Energy Agency, "Natural Gas and Energy Data," accessed January 6, 2025, https://www.iea.org.

examine whether, and to what extent, natural gas can be a pragmatic response to the challenges of the energy transition. Through an econometric analysis of the Nigerian context (1970–2023), the research investigates the relationship between gas production and GDP growth, assessing the potential of this resource as a catalyst for socio-economic development.

Figure 4.1 World Energy Demand:1960-2024 *(Source: teaching material by Prof. Angelo Taraborrelli, Energy and Climate Change Policies Academic Year 2024/2025.)*



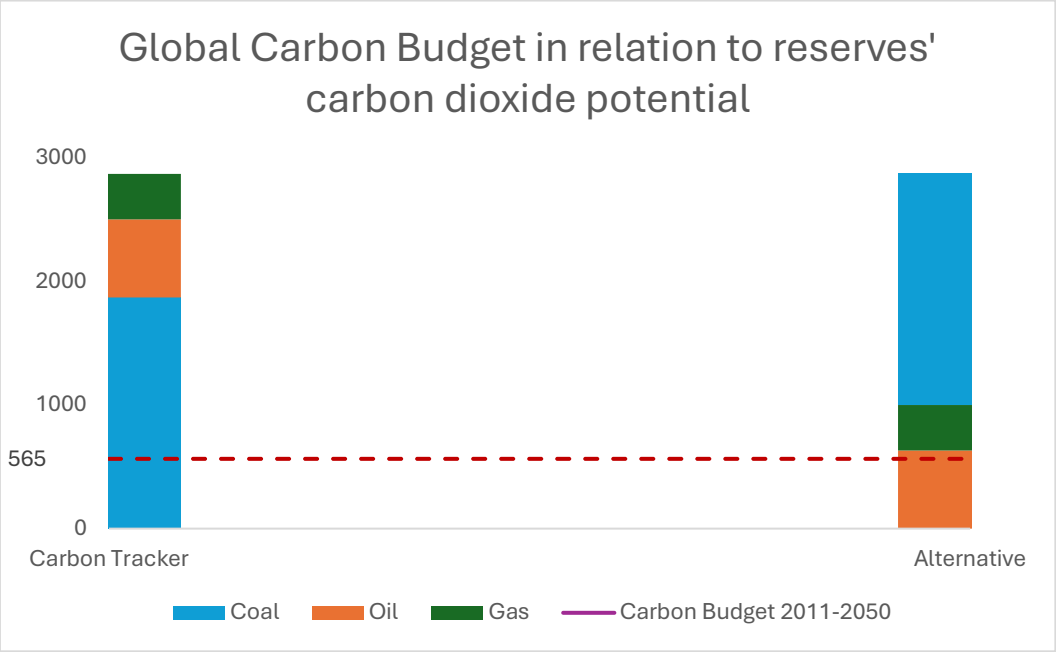
4.1 The Case for Natural Gas as a Transition Fuel

According to the analysis provided by Franza, de Jong, and van der Linde in *The Future of Natural*, the energy supply sector remains the largest contributor to climate change, accounting for 35 per cent of total anthropogenic greenhouse gas emissions.[119] To date, policymakers globally have adopted two main strategies to steer the energy mix towards a more sustainable model: supporting low-carbon energy sources and promoting energy efficiency. However, given the current state of technology, and in particular the lack of commercially viable energy storage solutions at present, it is not yet feasible to switch exclusively to renewable energy sources. The economic replacement of existing plants that mainly use fossil fuels with renewable resources is not currently feasible; therefore, most renewable energy sources (RES) used in energy production need to be supported by more predictable and reliable energy sources such as nuclear energy (absent in many legal systems) and fossil fuels.[120] Within the fossil fuels category, natural gas plays a key role, as it is the fuel that produces the lowest emissions per unit of energy generated. This becomes relevant when we consider the tightening of the remaining 'carbon budget' in the world. It should be noted that the Intergovernmental Panel on Climate Change (IPCC), in its 2014 report on climate change indicated that limiting total human-induced global warming to less than 2°C compared to the period 1861-1880, with a probability greater than 66%, would require limiting total CO2 emissions from all anthropogenic sources to approximately 2900 gigatons (Gt).[121] "Now, considering that by 2011, 1900 Gt had already been emitted, the remaining carbon budget until 2100 would be 1000 Gt. Previous scientific reports, on which the discussion about the carbon bubble is based, concluded that total CO2 emissions must be limited to 886 Gt during the first half of the 21st century to have an 80% chance of achieving the 2°C target. Taking into account emissions already released, the carbon budget for the period 2011-2050 is 565 Gt of CO2. Since the overall potential CO2 emissions from proven fossil fuel reserves is approximately 2795 Gt, it would mean that a significant portion of these should remain underground".[122] A discussion has been initiated by the Carbon Tracker Initiative (CTI) on the possibility of

[119] Luca Franza, Dick de Jong, and Coby van der Linde, "The Future of Gas: The Transition Fuel?" in *The Future of Natural Gas: Markets and Geopolitics*, ed. Silvia Colombo, Mohamed El Harrak, and Nicolò Sartori (Rome and Rabat: Istituto Affari Internazionali and OCP Policy Center, 2016), 25–39.
[120] Istituto Affari Internazionali (IAI) and OCP Policy Center, *The Future of Natural Gas* (Rome and Rabat: IAI and OCP Policy Center, 2016).
[121] Istituto Affari Internazionali (IAI) and OCP Policy Center, *The Future of Natural Gas* (Rome and Rabat: IAI and OCP Policy Center, 2016).
[122] Istituto Affari Internazionali (IAI) and OCP Policy Center, *The Future of Natural Gas* (Rome and Rabat: IAI and OCP Policy Center, 2016).

a ‘carbon bubble’ in the fossil fuel industry, arising from untapped reserves. However, the CTI's approach does not highlight that coal, oil, and gas emit very different amounts of CO_2. Two recent studies by the Clingendael International Energy Programme (CIEP) seek to fill this gap.

Figure 4.2 Global Carbon Budget in relation to reserves’ carbon dioxide potential. *(Source: Author’s elaboration based on BP Statistical Review (2010) data as reported in van der Veen (2015)*



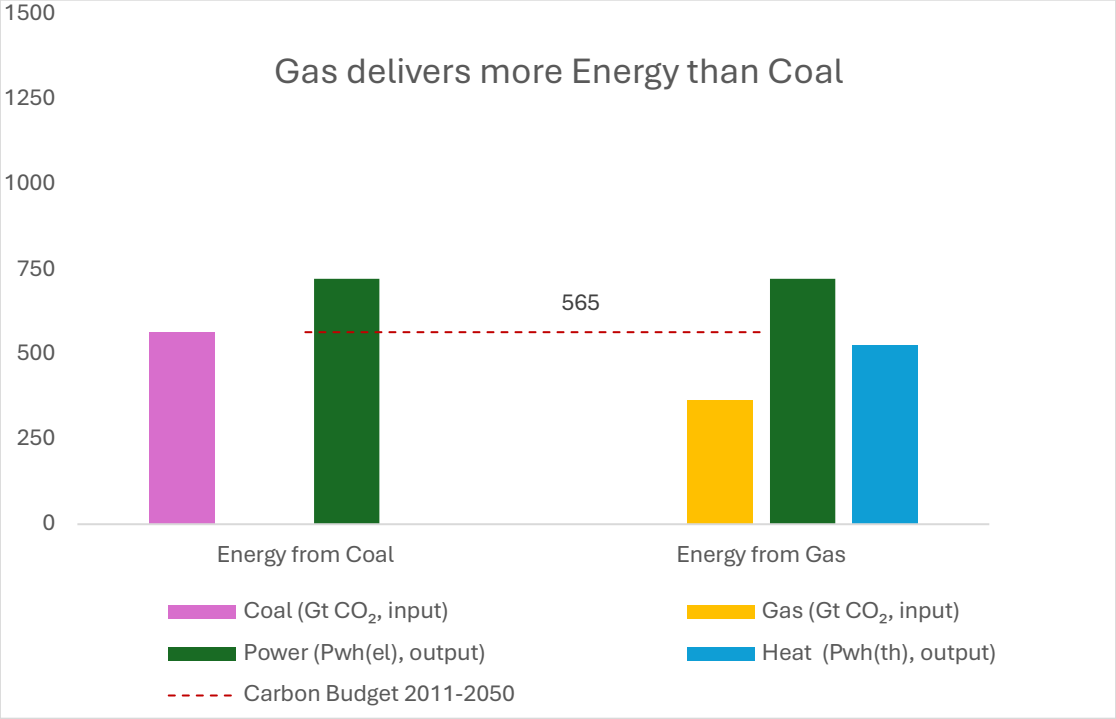
In this graph, the CTI creates an alternative visualization in which the emission potential of different fossil fuels is compared with the residual carbon budget, offering a different perspective in the discussion on the exploitability of existing fossil fuel reserves.

The study shows that by placing fuels with the lowest emission sources at the bottom, burning all gas reserves could still be compatible with respecting the carbon budget.

While this scenario is theoretical, as it would require an unrealistic the total cessation of coal mining worldwide, it is nevertheless interesting to note that if countries around the world committed to a common policy for a complete transition from coal to gas, we could be on track to achieve the 2°C target, while still benefiting from the predictability and reliability of fossil fuels, which are essential to sustaining global economic growth, especially in certain geographical areas such as sub-Saharan Africa. It is therefore clear that differences in the carbon content of fossil fuels must be taken into account, as they could reveal different transition paths that would otherwise be ignored. Appropriate fuel

choices could reduce emissions and delay reaching the carbon budget limit. The energy mix of this alternative provides about 60% more energy per CO_2 equivalent, and since gas is mainly used for electricity generation, it would be able to generate about 100% more electricity than coal with the same CO_2 emissions. An appropriate choice of fuels could reduce emissions and delay reaching the carbon budget limit. The energy mix of this alternative provides about 60% more energy per CO_2 equivalent, and since gas is mainly used for electricity generation, it would be able to generate about 100% more electricity than coal with the same CO_2 emissions.

Figure 4.3 Gas delivers more Energy than Coal. *(Source: Author's elaboration based on BP Statistical Review (2010) data as reported in van der Veen (2015)*



As can be seen from Figure 4.3, if the remaining carbon space (565 Gt of CO_2) were filled by modern coal-fired power plants, the potential electricity production from "fuel" coal reserves would be approximately 722,000 TWh (or 722 PWh). Conversely, if gas production were used to generate the same 722,000 TWh of energy, only part of the carbon space would be exploited, leaving the rest of the world's gas reserves available for heating and approximately 465 billion barrels of oil for use in other sectors. In other words, using natural gas resources to meet energy needs has the effect of extending the "within limits" timeline compared to coal. In any case, setting limits on emissions and optimising energy production within the carbon budget remains a challenge. Policies often focus on reducing carbon emissions and supporting renewable energy, without

distinguishing between fossil fuels that have different energy contents and carbon footprints. The International Energy Agency, in its Golden Age of Gas scenario, suggests that with increased use of natural gas, global CO_2 emissions can decrease even if the share of fossil fuels increases. In addition to reducing CO_2 emissions compared to oil and coal, natural gas can improve local air quality when used in power generation, industry and transport by reducing emissions of sulphur dioxide (SO_2), nitrogen oxides (NOx) and particulate matter, which cause health and visibility problems. Furthermore, the rapid commissioning of combined cycle power plants makes natural gas ideal for integrating renewable energy systems, offering operational flexibility and environmental benefits at lower costs.[123]

4.2 Sectoral applications of natural gas: energy production and transport

While the debate on natural gas as a 'transition fuel' generally falls within the constraints imposed by the carbon budget and the need to reduce emissions in the short and medium term, it is at the sectoral level that this debate gains analytical substance. The role of gas in the energy transition is not uniform nor abstract; rather, it varies depending on the technical, economic, and infrastructural characteristics of different energy sectors. In particular, electricity generation and transportation emerge as two key areas, as they are both responsible for a significant share of global emissions and, at the same time, have structural limitations that make immediate decarbonization based exclusively on renewable sources technically and economically problematic. In this context, natural gas is often considered a supporting solution, capable of playing a supporting and integrating role rather than a definitive replacement. A recent contribution by Kulušić et al. focuses on assessing its operational functions, the trade-offs associated with its use, and the conditions under which it can effectively play a transitional role. To this end, recent literature, particularly contributions that adopt a socio-technical perspective, provides a useful framework for understanding the complementarities and tensions between natural gas, renewable sources, and decarbonization goals.[124]

[123] Kulušić et al., "Role of Natural Gas in the Socio-Technical Transition."
[124] Ivor Kulušić, Lucija Jukić, Ivan Smajla, and Daria Karasalihović Sedlar, "The Role of Natural Gas in the Socio-Technical Transition to a Carbon-Neutral Society and a Review of the European Union's Framework," *Sustainability* 16, no. 9 (2024) https://doi.org/10.3390/su16093791

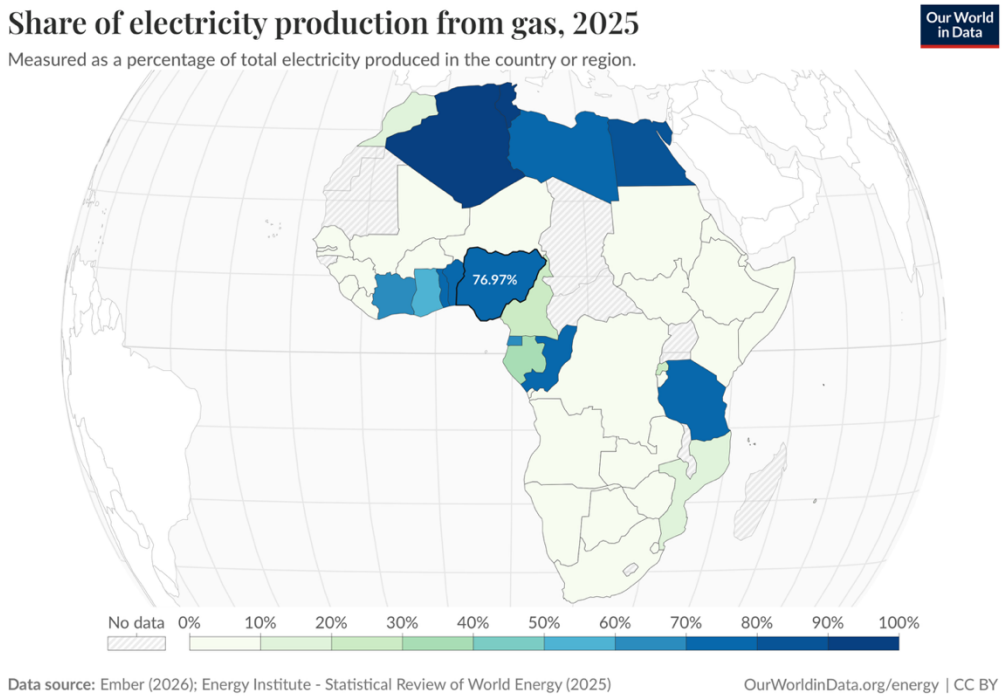
4.2.1 Natural Gas in Electricity Production

There remain technological and economic barriers to the adoption of renewables, and natural gas can help overcome them. It is paramount to note, however, that these barriers should not be used as arguments against renewables, but rather be perceived as realistic observations that make us understand that we need to consider different paths to achieve the transition. A first constraint concerns energy output, as the average power output of conventional plants is significantly higher than that of renewables. According to the study conducted by Kulušić et al., natural gas results in the best power-to-price ratio.[125] However, this analysis does not reflect the influence of the operational cost, meaning the cost of fuel supply, which is dependent on its price. Moreover, the problem of intermittency requires attention. Putting aside the need for a smart grid and its cost and imperfections for a moment, a more fundamental problem lies here. "There are currently two possible solutions to the intermittency problem: energy storage during periods of high production and electricity generation in conventional plants during periods of need. Energy storage basically continues to remain at its technological/commercial inception and does not seem to be a viable option at the moment, but it will be increasingly significant, especially after 2030".[126] Therefore, we must maintain a squadron of conventional plants as a backup to ensure that the entire system operates at all times. Among the most suitable option there is natural gas, being the cleanest among the fossil fuels (as well as technologically simpler and less controversial than nuclear energy). Additional constraints concern the material and space needs of renewable energy technologies. Building wind and solar infrastructure relies on various metals and materials that are non-renewable and unevenly distributed worldwide, often concentrated in regions where extraction harms the environment and involves poor labour practices. Moreover, several studies have identified land-use intensity as a potential trade-off of large-scale renewable deployment. In this context, gas-fired power plants generally have a much higher power density, generating similar electricity levels while using significantly less land. Specifically, a typical wind or solar farm requires about 90 to 100 times more space than an average gas power plant for the same power output. These are just some of the reasons why a certain transitional period in which we will still use mostly conventional fuels is necessary. However, in that period, efforts must be made to

[125] Kulušić et al., "Role of Natural Gas in the Socio-Technical Transition.", 4.
[126] Kulušić et al., "Role of Natural Gas in the Socio-Technical Transition.", 5.

continuously increase the share of renewables and cut the share of coal in electricity production, because these remain the biggest polluters.

Figure 4.4 Share of electricity production from gas, 2025. *(Source: Our World in Data, World Bank)*



4.2.2 Natural gas in the transport sector

Unlike the electrical sector, where electrification based on renewable sources represents a relatively clear long-term goal, the transport sector has a much more heterogeneous structure. Although electrification is progressing rapidly in rail transport and light vehicles, there are segments in which an immediate transition to fully electric solutions is technically and economically problematic, notably road freight transport and maritime transport, two sectors that account for a significant share of the sector's emissions. The article “The Role of Natural Gas in the Socio-Technical Transition to a Carbon-Neutral Society and a Review of the European Union’s Framework”[127] investigate show constraints related to energy density, range, refuelling times, and infrastructure make a complete electrification of these modes of transport unrealistic in the short and medium term. Heavy vehicles used for long-distance transport indeed require high-energy-density

[127] Kulušić et al., “Role of Natural Gas in the Socio-Technical Transition.”.

fuels and reduced refuelling times, requirements that current electrical storage technologies struggle to meet without significant penalties in terms of weight, costs, or range. Similarly, in maritime transport, the size of the energy demand and the operational needs of long-distance routes strongly limit the applicability of fully electric solutions. For these reasons, such sectors are often classified as hard-to-abate in decarbonisation pathways. In this context, natural gas, mainly in the form of compressed natural gas (CNG) and liquefied natural gas (LNG), has been proposed as a possible transitional solution. Compared to petroleum-derived fuels, such as diesel and marine fuel oil, natural gas has a lower carbon intensity per unit of energy and can be integrated, at least in part, into existing infrastructure.[128] In the maritime sector, in particular, the tightening of regulations on sulphur emissions and other local pollutants has helped to strengthen interest in LNG as an alternative fuel, while in heavy road transport, the adoption of vehicles powered by CNG or LNG has been promoted as an interim solution pending the development of large-scale zero-emission technologies. In addition, as we said in the previous paragraph, the use of gas in heavy transport segments can generate short-term environmental benefits, especially in contexts characterised by high traffic density by emitting lower pollutants. At the same time, the role of natural gas in the transport sector remains inherently controversial and very limited over time. The biggest problem concerns methane leaks along the supply chain, from production to final use, as it would significantly reduce the climate benefits of gas due to methane's high global warming potential. A second risk is represented by carbon lock-in: large-scale investments in CNG and LNG infrastructure could delay the adoption of truly low or zero-emission solutions in the long term. This contribution can therefore be understood only as temporary and highly context-dependent, subject to strict management of methane emissions, careful infrastructure planning, and parallel investments in zero-emission alternatives.[129]

[128] Kulušić et al., "Role of Natural Gas in the Socio-Technical Transition.", 5.
[129] Kulušić et al., "Role of Natural Gas in the Socio-Technical Transition.", 7.

4.3 The Failure of Policy-Making in Promoting Gas as a Transition Fuel

Despite the credentials of natural gas mentioned above and policies aimed at decarbonising the global energy system, coal consumption has continued to increase worldwide, while natural gas consumption has decreased within the EU. This casts a shadow over the prospects of a significantly greater adoption of natural gas globally, suggesting that the golden age of gas might be illusory, especially in Europe. The book *'The Future of Natural Gas'* analyses the main reasons. Starting with the economic aspect, the production costs of energy from existing gas-fired power plants are higher in most economies compared to coal-fired plants. For new plants, the issue of competitiveness is more complex, as a gas plant can be built at significantly lower capital costs, but fuel costs generally remain higher and more volatile, depending on market fluctuations, than those of a coal plant.[130] The economic choice will depend on expectations about gas and coal prices, operating hours, and the price of CO_2. Promoting gas at the expense of coal would therefore entail a cost that countries are reluctant to bear, given the precarious situation of many current economies and the importance of competitiveness. Moreover, as Franza, de Jong and van der Linde argue, several structural factors explain, it should not be forgotten that a comprehensive transition, driven by policies towards a new energy mix, often involves additional initial costs, as it requires converting existing infrastructure designed for a specific energy source. This is one of the reasons why energy systems tend to resist change. Secondly, there are environmental concerns. Although relatively clean, natural gas remains a fossil fuel, and since the long-term goal of policies appears to be the elimination of all fossil fuels, measures supporting gas can be considered unnecessary distractions. Additionally, a particular concern relates to methane emissions, which are amplified by unconventional gas production and are difficult to measure, as such activities require high infrastructure and operational intensity, increasing the number of potential leak points along the supply chain. The production of unconventional gas and plans to exploit Arctic gas reserves also raise other environmental concerns that threaten to overshadow the environmental credentials of natural gas as a whole. Another reason why gas is not widely supported domestically relates to various sensitivities regarding energy sovereignty, including sovereignty over energy resources, diversity of the energy mix, employment, and macroeconomic considerations. Coal, in particular, has a strong

[130] Luca Franza, Dick de Jong, and Coby van der Linde, "The Future of Gas: The Transition Fuel?" in *The Future of Natural Gas: Markets and Geopolitics*, ed. Silvia Colombo, Mohamed El Harrak, and Nicolò Sartori (Rome and Rabat: Istituto Affari Internazionali and OCP Policy Center, 2016), 31.

political base in producing countries, supporting the economy due to its low cost and abundance (this is especially the case in China, the United States, Poland, Russia, South Africa, and Germany).

4.4 The Perception of Gas as a Politicised Commodity

In *The Future of Natural Gas*, experts Luca Franza, Dick de Jong, and Coby van der Linde, who are studying the relationship between natural gas and politics, state that natural gas is considered a highly politicised commodity and that this is the reason its use as a transitional fuel has so far been limited. [131] This paragraph analyses the reasons why gas is perceived as political and discusses to what extent this perception is justified. Firstly, the main concerns of consumer countries include anxiety over excessive dependence on a few suppliers (nearly two-thirds of the world's total gas reserves are concentrated in only Russia, Iran, Qatar, Turkmenistan and the USA), the geopolitical leverage granted to gas-producing countries by their reserves, and the possibility that producers could coordinate to influence the market. It is not only the concentration itself that generates fears, but especially the geographical location of the reserves and the political relations between major gas importers and some of the main reserve holders; indeed, the potential gas supply from various countries is hindered by geopolitical instability. Even if reserves and production of coal and oil are also highly concentrated, however, coal has a marked domestic profile (the share of coal consumed locally exceeds that of gas), and most of the largest coal exporters seem to have good political relations with major importers and/or are located outside areas of major political instability. Regarding oil, a notable difference is that it is typically a globally traded commodity, making it freely accessible in markets around the world. In contrast, gas trade tends to be more limited, mainly because it depends heavily on existing infrastructure such as LNG facilities and pipelines. To respond to these concerns, consumer countries are looking for ways to diversify where they get their energy from, especially by exploring different routes and sources for gas supply. They’re also doing their best to support the use of local resources whenever possible. For example, Spain has introduced laws to reduce reliance on just one gas source to enhance energy security. Similarly, China has carefully

[131] Luca Franza, Dick de Jong, and Coby van der Linde, “The Future of Gas: The Transition Fuel?” in *The Future of Natural Gas: Markets and Geopolitics*, ed. Silvia Colombo, Mohamed El Harrak, and Nicolò Sartori (Rome and Rabat: Istituto Affari Internazionali and OCP Policy Center, 2016), 34.

considered pipeline proposals from various suppliers and has established connections with Turkmenistan and Myanmar, making their energy supply more stable and secure. Indeed, a deep and liquid global oil market that involves many actors, limits the potential for pursuing discretionary political agendas and provides importers with confidence that they can replace supplies if disruptions occur. On the contrary, gas trade (especially through pipelines) does not possess this level of flexibility also due to the physical characteristics of gas itself. However, the growth of LNG has a positive impact on the perception of gas as a reliable energy source. Thanks to its flexibility in destination and reduced exposure to transit risks, LNG represents a dynamic element in the gas markets and is considered a potential factor in depoliticising gas trade. In long-term relationships within the pipeline sector, there is also a greater risk that supply and market conditions will change on both sides, leading to the development of political or economic frictions. In the last 15 years, the share of LNG in total gas trade has grown rapidly, with an increasing number of actors participating who are helping to increase its liquidity. Although still far from exhibiting the same characteristics as the oil market, LNG certainly contributes to decentralising flows and globalising gas trade.[132] The inherent rigidity of gas trade relations is caused by: the need for long-term contracts to support investment in pipelines; point-to-point deliveries; a relative lack of competition; and often outdated negotiations. Political agreements therefore become crucial due to the massive scale of investment and the need to gather demand along pipeline routes. Other elements that further fuel the image of gas as a politicised commodity are the merging of state and corporate interests, and the fact that state-owned companies control most of the reserves and production of conventional gas. Furthermore, we saw in Chapter 2 that the perception of gas often contributes to dynamics of "resource curse" and rent-seeking, as with oil, concentrating money and power in the hands of elites. Public opinion (especially in Western importing countries) frequently questions the political acceptability of such elites, and oil and gas companies face substantial pressure not to do business with countries with poor records in areas such as corruption and human rights. Another recurring argument that reinforces the idea that gas is political is the increase in conflicts related to natural gas trade. Several studies suggest that countries are encouraged by energy wealth to foment conflicts and exploit market advantages and corporate profits as foreign policy tools, or are inclined to compete for unclaimed resources for fear of

[132] Franza, de Jong, and van der Linde, "The Future of Gas," 35.

vulnerability. On the other hand, however, multiple studies argue that gas trade actually creates positive interdependence links; cooperation in the pipeline and gas trade sector has been possible even between political adversaries. This is evidenced by various so-called "joint development" agreements in which countries have decided to set aside, at least temporarily, border disputes in order to jointly explore or exploit hydrocarbon deposits located across a disputed border. Examples include cooperation between Malaysia and Thailand in the Gulf of Thailand, between the Netherlands and Germany in the Ems estuary, and between the United Kingdom and neighbouring countries. Finally, it should be noted that political concerns are particularly relevant to gas trade via pipelines.[133]

4.5 The African Gas Renaissance

4.5.1 A highly polarised debate

Africa is a highly diverse continent, and its countries exhibit distinct characteristics across political, economic, financial, demographic, geographical, and natural resource dimensions; consequently, their strategies and pathways for the energy transition will reflect this diversity. In this paragraph, we explore what the energy transition means for African countries, considering both those that are already producing natural gas and those that might start developing it in the future. Beyond the use of liquid fuels and traditional sources or, in some cases, hydropower, African countries that lack natural gas resources will continue to attempt to develop renewable energy sources, wherever and whenever it is possible to mobilise investments in these cleaner alternatives. However, as explored in chapter two, this path remains difficult to implement on a continent with the lowest global level of access to electricity and clean cooking. In African countries that are already producers or potentially new producers of gas, natural gas continues to play a dominant role in the energy mix and in the pathways for energy transition. Nevertheless, the future development and monetisation of Africa's natural gas reserves appear to be caught between two diametrically opposed visions. On one hand there is the anti-fossil stance, primarily articulated by non-African institutions and some African NGOs, which advocates an immediate and unrealistic suspension of investments in hydrocarbon development projects in Africa. This position is not very different from that of some anti-

[133] Franza, de Jong, and van der Linde, "The Future of Gas," 36.

gas export nationalists, who argued for 'leaving the gas in the ground' if it could not be monetised solely at the domestic level, but they are not motivated by environmental or climate change reasons. [134] Today, this 'leave the gas in the ground' stance is strongly supported by various international and African NGOs, but obviously for entirely different reasons, focused on the exclusive development of renewable energy sources.[135] On the other hand there is also the position of African countries that possess existing and potential gas resources and reserves and are perplexed by this strongly anti-fossil fuel view. These developing economies, which emit only a small fraction of global greenhouse gas emissions, firmly believe they have the right to benefit from their indigenous natural gas resources. The African Union, in its 2022 Common Position, clearly stated that 'Africa will continue to utilise all its abundant energy resources, including renewable and non-renewable ones, to meet energy demand'[136]. However, assuming that the development of Africa's natural gas potential would follow old resource development patterns would be unrealistic, and ignoring the international pressure towards decarbonisation as well.

4.5.2 The African gas landscape: resources, projects, and regional dynamics

As analysed in chapter two, the African continent comprises over fifty countries but proven natural gas reserves are heavily concentrated: Nigeria, Algeria, Egypt, Libya, and Mozambique hold over 90% of the total. Significant discoveries have also been recorded in Tanzania, Mauritania, and Senegal, but the geography of production and consumption remains dominated by a few players: Algeria, Egypt, Libya, and Nigeria account for over 80% of the continent's production and consumption. Outside this core, smaller volumes are produced and consumed in about a dozen countries, while fewer than ten African states export gas via cross-border pipelines and/or LNG ships. In *Prospects for a Potential*

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[134] Mostefa Ouki, *Prospects for a Potential African Gas Renaissance en Route to a "Just Energy Transition"*, OIES Paper NG 185 (Oxford: Oxford Institute for Energy Studies, September 2023), https://hdl.handle.net/10419/280128.

[135] Mostefa Ouki, *African Gas Supplies to Europe: Between Hopes and Hard Realities* (Oxford: Oxford Institute for Energy Studies, July 2022), https://www.oxfordenergy.org/publications/african-gas-supplies-to-europe-between-hopes-and-hard-realities/.

[136] African Union (2022). "Africa Speaks with Unified Voice as AU Executive Council Adopts African Common Position on Energy Access and Just Energy Transition", *press release, 22 July.* https://au.int/sites/default/files/pressreleases/42071-pr-PR-_The_Executive_Council_Adopted_African_Common_Position_on_Energy_Access_and_Transition.pdf.

African Gas Renaissance en Route to a "Just Energy Transition", Ouka explains that so-called 'African gas renaissance' does not coincide with uniform growth: new development initiatives are mainly focused outside the historically producing countries, and a substantial share of new resources is located in areas still to be exploited (greenfield), predominantly in Sub-Saharan Africa, with start-ups expected in the second half of the current decade and beyond. Although most new projects are designed to support liquefaction (LNG), few have reached the Final Investment Decision (FID) stage (once again highlighting the gap between political ambitions and industrial sustainability analysed in the previous chapter). The conflict in Ukraine has renewed interest in Africa's export opportunities, with Nigeria standing out as a key potential supply hub for West Africa. It possesses significant reserves and could lead to regional growth if it can resolve longstanding issues concerning production, security, and especially infrastructure. Among the most significant projects is the expansion of Nigeria LNG (NLNG), while offshore floating LNG (FLNG) initiatives have been announced (memoranda and agreements with international and local operators).[137] Politically, the 'Decade of Gas' strategy (2020–2030) has revived the narrative of gas as a development and transition lever, but it fits into a historical trajectory characterised by repeated plans and discontinuous implementation: for this reason, Nigeria is both an 'opportunity' and a "test' of the gas renaissance. The regional dimension is crucial because gas growth depends not only on fields and LNG plants but also on cross-border infrastructure and therefore on cooperation between states.[138] A case in point is the West Africa Gas Pipeline Project (WAGP), a 678 km long pipeline transporting gas from the Niger Delta to Benin, Togo and Ghana. The pipeline was conceived within ECOWAS, initiated through inter-state agreements and built by an industrial consortium, and became operational after delays caused by technical and supply issues. Considered the first regional gas transmission system in sub-Saharan Africa, the WAGP exemplifies the dual nature of gas infrastructure: on the one hand, it promotes energy integration and in particular gas for power generation (the main share of gas transported), while on the other hand, it generates social and territorial trade-offs, such as restrictions on coastal activities (e.g. fishing), relocations and disputes over compensation, which fuel opposition and demands for procedural justice Even more ambitious, the Nigeria-Morocco Gas Pipeline (NMGP) project aims to extend the pipeline along the entire coast of West Africa to Morocco, with

[137] Ouki, Prospects for a Potential African Gas Renaissance, 5.
[138] Ouki, *African Gas Supplies to Europe*, 3.

the idea of connecting to the European market.[139] Compared to the WAGP, the NMGP represents a long-term strategic projection, much more complex in terms of timing, costs and governance. The path of gas in West Africa oscillates between operational infrastructure that creates regional interdependencies (WAGP) and mega-projects that incorporate geopolitical and export aspirations (NMGP), highlighting that the "energy transition" is not only a technical issue, but a political, social and financial process.[140]

4.5.3 Financing constraints

The feasibility of a potential African gas renaissance is heavily influenced by financing dynamics. According to the African Energy Chamber, the continent would need around 375 billion dollars over the next ten years to maintain existing production, develop new fields, and build the infrastructure necessary for gas commercialisation. Historically, major sector projects, particularly those with high capital intensity, such as LNG export projects, have relied heavily on export credit agencies (ECAs) and multilateral development banks, including the World Bank. However, the availability of such forms of financing has gradually diminished, leading to increased capital costs and a reduced number of projects considered financially viable. This trend predates the acceleration of global decarbonisation policies and reflects long-term structural constraints, including high political and security risks, weak regulatory and fiscal frameworks, the poor creditworthiness of national utilities, widespread energy price subsidies, and high levels of public debt. The result of these factors is increased project risk and, consequently, reduced competitiveness compared to gas developments in other regions. Access to long-term capital, even for projects presented as part of the energy transition or energy access initiatives, is further restricted by external pressures such as stricter ESG criteria, greater scrutiny by shareholders and a gradual disengagement of major international financial institutions from fossil fuel financing. As a result, Africa continues to attract less than 10% of global upstream investment in the hydrocarbon sector, despite renewed international interest in African gas from the European Union, which is seeking alternative solutions in response to the war in Ukraine."The financing gap raises doubts

[139] Muhammad Reza Suleiman, Mounia Slighoua, and Abderrahman Haddad, "Strengthening Transregional Cooperation: Morocco's Path to ECOWAS Integration through the Nigeria–Morocco Gas Pipeline," *Journal of African Union Studies*14, no. 1 (2025): 5–26, https://doi.org/10.31920/2050-4306/2025/14n1a1.
[140] Ouki, *African Gas Supplies to Europe*, 4.

about the continent's ability to fully monetise its natural gas resources and suggests that any real gas revival is likely to be selective, heavily export-oriented and highly dependent on global financial and political dynamics, rather than serving as a widespread driver of domestic energy transition."[141]

4.5.4 Gas monetization pathways: limits of domestic markets and trade-offs between export and domestic use

Ouki, illustrates that most new gas development projects in Africa are oriented towards export (mainly LNG), with a share allocated to the domestic market, often for electricity generation. This approach is common globally: many upstream projects are driven by the possibility of monetising gas through exports. In various African contexts, moreover, without foreign demand and sufficiently solid contracts, the investments needed to develop large reservoirs would be difficult to mobilise. The idea according to which the resources should be primarily allocated to the domestic market is challenged by structural limitations inherent to some countries: small size, lack of infrastructure, poor creditworthiness of buyers (particularly electricity utilities), administered price regimes, and subsidies that weaken financial sustainability and investment signals. In this context, gas subsidies (more frequent in North Africa) are a critical element: a significant portion of consumption is priced below procurement costs, with negative fiscal and environmental effects. Overall, gas consumption in Africa remains relatively low: around 160 bcm, about a third of European consumption. However, according to Ouki, this does not exclude future growth.[142] The energy demand can increase due to demographic dynamics and urbanisation, if domestic markets become commercially sustainable and adequate infrastructure is developed. In addition, the main option for domestic monetisation is gas-to-power, as today over half of the gas consumed on the continent is used for electricity generation. However, the growth of gas-to-power depends on the ability to convert 'repressed' demand into paying demand and, above all, on investments in generation and transmission/distribution networks. Thinking beyond electricity use, there is also potential for 'non-power' monetisation (fertilisers, methanol, petrochemicals, energy-intensive industries), but strong constraints emerge here: these projects are capital-intensive and they are often poorly integrated into the rest of the economy. If they

[141] Ouki, Prospects for a Potential African Gas Renaissance, 16.
[142] Ouki, Prospects for a Potential African Gas Renaissance, 13-15.

require subsidised gas prices to attract investors, they risk becoming an indirect form of export subsidy, which is hardly sustainable for already fragile economies. In summary, gas monetisation in Africa moves between a need for export to finance development and a goal of domestic use for energy access and industrialisation, but both depend on market reforms, infrastructure development, and financial credibility.

4.5.5 Industrial hubs and gas demand aggregation

Another interesting strategy analysed by Ouki is the aggregation of natural gas demand through the development of industrial hubs with the aim of capturing economies of scale and mobilising large amounts of funding. In Africa, this approach has been formally integrated into governments' economic development policies and strategies, but analysis of the performance of industrial hubs shows that the results are not always positive. For example, in Nigeria, the Lekki Free Zone, home to Africa's largest gas-based refining and fertiliser complex, has experienced long delays in the development of gas supply infrastructure. Anyway, in large African economies with relatively larger gas markets, such as Algeria, Egypt, Nigeria and South Africa, there are already parks or industrial zones focused on oil and gas, which could be expanded, while new settlements could be developed.[143]

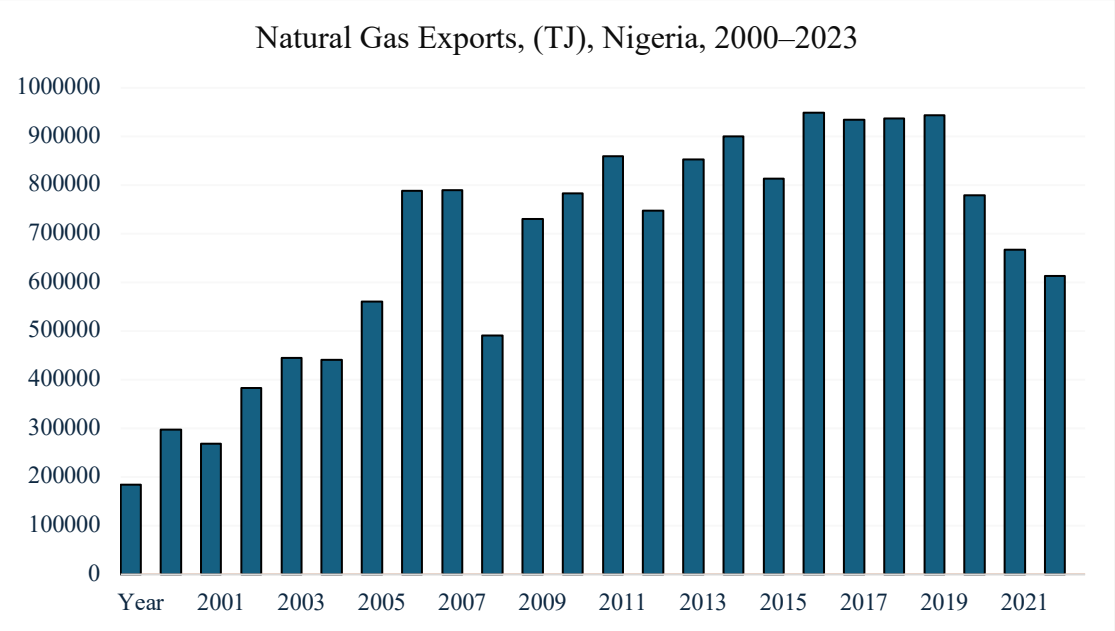
4.5.6 Uncertain export prospects in a post-2030 gas market

In 2022, approximately 90 per cent of total African gas exports, both via pipelines and LNG, will be destined for Europe. However, in the long term, this figure will be significantly reduced, given Europe's commitments to decarbonisation. It is very difficult for European buyers to secure new, capital-intensive gas export projects in Africa through long-term contracts due to uncertainty about long-term domestic gas demand. Ouki explains that all new export projects in sub-Saharan Africa scheduled to come online by the end of this decade and beyond will have to compete in other regional gas markets. It is therefore clear that Europe's current appetite for gas is temporary, and competitors such as US LNG exporters will continue to target this already established market. Unless African gas exporters adopt a more flexible contractual framework, European gas importers are likely to turn to flexible contracts with US LNG suppliers. In 2022, 13% of Europe's gas imports came from the US, which was the third largest source of imported gas (pipeline gas and LNG) after Norway and Russia, and by far the largest supplier of LNG. However, this does not mean that African gas flows to Europe will stop, but existing and new African gas exporters will continue to be able to market their gas in Europe, albeit in smaller volumes and with more flexible terms and conditions. Beyond 2030, new African gas export projects are likely to focus more on Asian markets. The largest of these projects is in Mozambique, which has signed several off-take agreements with Asian customers. Competition for a share of these rapidly growing gas

[143] Ouki, Prospects for a Potential African Gas Renaissance, 20.

markets will be intense, and the high price sensitivity of customers such as those in South Asia will be very challenging. A new wave of LNG projects is expected to come online by the second half of this decade, likely causing temporary downward pressure on international gas prices. Therefore, new African LNG export projects must focus on cost competitiveness to secure long-term import demand commitments. International natural gas prices can fluctuate widely, as we have seen over the past three years, and African LNG exporters must be prepared to mitigate this inevitable price risk. In addition to a declining European gas market, existing and potential African gas exporters targeting Europe will need to reduce the carbon intensity of their gas projects and, possibly, invest in reducing emissions from their gas production, as explained in the following section.[144]

Figure 4.5 Natural Gas Exports (TJ), Nigeria, 2023. *(Source: World Bank)*
In 2023, net gas exports accounted for 48.8% of Nigeria's total gas production, indicating a strong export orientation of the sector. Between 2000 and 2023, gas exports increased by 232%, reflecting the expansion of LNG capacity. However, gas represented only 19% of total energy exports in 2023, remaining secondary to oil in Nigeria's export structure.



4.5.7 Preparing Africa's gas sector for a carbon-constrained transition

A more realistic and balanced approach to the energy transition in African economies requires shifting focus from merely developing new gas projects to ensuring their compatibility with an increasingly decarbonisation-driven international context. The implications of a potential expansion of the gas sector in Africa go beyond marginal

[144] Ouki, Prospects for a Potential African Gas Renaissance, 18.

integration of renewable energies into hydrocarbon projects or the adoption of compensatory measures; they primarily concern the ability to reduce greenhouse gas emissions in a measurable and verifiable manner across the entire value chain. In this regard, there are three elements that emerge as central to the future sustainability of African gas: the first one is the reduction of routine flaring of associated gas; the second one is the containment of methane emissions; ad lastly, in the medium to long term, the adoption of carbon capture and storage (CCS) and carbon capture, utilisation, and storage (CCUS) technologies.[145] The flaring of associated gas is still one of the main environmental challenges in the African upstream sector, as seen in the previous chapters. According to data from the Global Gas Flaring Reduction Partnership, in 2022 African producers flared approximately 30 billion cubic metres of gas, accounting for about 20% of the continent's total gas consumption. Despite the commitment of several African countries to the Zero Routine Flaring by 2030 initiative, progress remains uneven, reflecting infrastructural deficiencies, regulatory limitations, and the absence of domestic markets capable of absorbing the recovered gas, as discussed in the previous paragraph. Alongside flaring, methane emissions represent another critical factor. Although several governments have joined international initiatives such as the Global Methane Pledge, the lack of robust measurement, reporting, and verification systems remains a significant obstacle. In the medium to long term, increasing international attention towards 'unabated' gas raises the issue of adopting CCS and CCUS technologies. However, at present, these solutions remain marginal within the African context, due to high costs and limited availability of dedicated funding. The few existing experiences and announced projects indicate that, without strong public support and international partnerships, the dissemination of these technologies will remain limited. Finally, the development of carbon pricing policies in Africa remains in its infancy. Beyond South Africa's case, the absence of carbon pricing mechanisms reflects both priorities for economic development and institutional shortcomings.[146] Nevertheless, the growing impact of decarbonisation measures adopted in destination markets means that African gas producers will need to confront implicit carbon costs even in the absence of formal domestic policies. Overall, the potential for natural gas to play a role in Africa's energy transition increasingly

[145] Ouki, Prospects for a Potential African Gas Renaissance, 20-23.
[146] Ouki, Prospects for a Potential African Gas Renaissance, 24.

depends on the ability of producing countries to credibly address these environmental challenges.

4.6. Nigeria: an econometric analysis

Although numerous studies have explored the role of natural gas in global energy transitions, limited research examines its dual impact on Nigeria's economic growth and energy transition using econometric approaches. The analysis presented in this section is based on the econometric study conducted by Evro Evans O. and Obiwale Fortune O., which aims to fill this gap by investigating the role of natural gas in facilitating Nigeria's energy transition and fostering economic growth, through an econometric approach. The aim of this study is to explore both short- and long-term relationships among the variables of interest, including natural gas utilisation, energy transition indicators, and economic growth metrics such as Gross Domestic Product.[147] The study focuses on the period 1970–2023, years in which significant advances were made in natural gas policies and infrastructure. The period analysed includes the growing importance of OPEC and the early stages of the oil and gas industry in Nigeria, covering its development from the 1970s to the present day. In terms of variables, gross domestic product (GDP) was considered as a dependent variable, an indicator of economic growth, in order to assess the contribution of gas to Nigeria's economic performance. As independent variables, natural gas production (measured in billion cubic metres) represents the scale of production activities, the use of natural gas (including domestic consumption and exports) highlights the role of gas in ensuring energy security and trade, CO2 emissions (metric tonnes per capita) represent the environmental impacts associated with gas use, and renewable energy generation capacity reflects the integration of renewable energies into Nigeria's energy mix.[148] The results of this research offer a detailed overview of the role of natural gas in the Nigerian economy: although the short-term impact on GDP was not statistically significant, the confirmation of a cointegration relationship unequivocally demonstrates that natural gas is a structural pillar for long-term economic growth. The study highlights that gas is not only an energy resource but also a strategic asset capable

[147] Evro O. Evans and Obiwale Fortune O., "The Role of Natural Gas in Nigeria's Energy Transition and Economic Growth – An Econometric Approach," paper presented at the SPE Nigeria Annual International Conference and Exhibition, Society of Petroleum Engineers, 2025, https://doi.org/10.2118/228755-MS.
[148] Evans and Fortune, "Role of Natural Gas in Nigeria," 5-7.

of acting as a “bridge fuel”. It can facilitate the transition to a low-emission system by reducing historical dependence on crude oil and promoting the adoption of cleaner technologies. “At the same time, the analysis suggests that the potential of renewable energy can only contribute substantially to GDP through forward-looking planning, as investments in the sector reach full maturity. However, it is essential to address the structural challenges identified, including infrastructure inefficiencies, regulatory instability and limited use of gas in the domestic market, so that Nigeria can maximise the benefits of this resource and attract the necessary foreign direct investment.”[149] The research highlights the importance of strategic integration between energy policies and environmental sustainability objectives: only by strengthening infrastructure and aligning regulatory frameworks will it be possible to transform natural gas into a catalyst for energy security and economic resilience. Ultimately, this work contributes to the existing literature by providing empirical evidence on the dual role of gas in the Nigerian context and paves the way for future research exploring non-linear relationships and sectoral dynamics, which are essential tools for defining truly effective and sustainable energy policies.[150]

Conclusions

Observing the role of natural gas in the African energy transition requires firstly to problematise the very concept of 'transition', avoiding to assume it as a linear process, universally desirable or already underway. In much of sub-Saharan Africa, in fact, the priority remains access to energy, both basic and industrial, in a context where a significant proportion of the population still lacks reliable electricity and where energy systems suffer from profound structural fragilities.[151] Within these limits, natural gas is not an ideal solution, but it can be a practical, albeit imperfect, response to the needs of development, energy security and emissions reduction in the short and medium term. As discussed in the chapter, gas has significant advantages over other fossil fuels (especially coal), both in terms of carbon intensity and operational flexibility, allowing it to be compatible with climate objectives when included in a transition strategy that is clearly defined in time and space. Denying these differences risks obscuring realistic and

[149] Evans and Fortune, “Role of Natural Gas in Nigeria,” 9.
[150] Evans and Fortune, “Role of Natural Gas in Nigeria”.
[151] Lapo Pistelli, “Africa and the Global Energy Transition,” in *The Geopolitics of the Global Energy Transition*, ed. Manfred Hafner and Simone Tagliapietra (Cham: Springer, 2020), https://doi.org/10.1007/978-3-030-39066-2.

alternative decarbonisation pathways, especially in areas with significant technological, financial and infrastructural constraints. However, the African case shows that the potential of gas is strongly influenced by factors that go beyond technical issues, such as the concentrated geographical distribution of resources, the prevalence of export-oriented projects and financing difficulties related to ESG criteria.[152]At the same time, an approach that precludes new investments in gas risks producing counterproductive effects, reinforcing dependence on more polluting fuels or traditional energy forms, especially in the absence of adequate financial and technological support for renewable development. Econometric analysis of the Nigerian case reinforces this view, showing how gas can constitute a structural pillar of long-term growth and a vector of diversification away from the country's historical dependence on oil, provided that critical issues of governance, infrastructure, and domestic resource utilisation are addressed. In this sense, gas does not represent an alternative to renewable energies but a potential complement, capable of supporting the stability of energy systems during a long and uncertain transition phase. In conclusion, the contribution of natural gas to the African energy transition cannot be assessed in absolute terms, nor idealised as a universal 'bridge' to decarbonisation. Rather, it should be interpreted as a contingent tool, whose legitimacy depends on the ability of producing countries to reduce its environmental impact, avoid lock-in effects, and integrate it into broader strategies of sustainable development and regional cooperation. From this perspective, the energy transition in Africa will not only be a matter of energy mix but a deeply political, financial, and institutional process, in which regional interdependencies and pragmatic choices will play an increasingly important role.[153]

[152] Ouki, *Prospects for a Potential African Gas Renaissance*.
[153] Lapo Pistelli, "Africa and the Global Energy Transition," in *The Geopolitics of the Global Energy Transition*, ed. Manfred Hafner and Simone Tagliapietra (Cham: Springer, 2020), https://doi.org/10.1007/978-3-030-39066-2.

Conclusion

In conclusion, the research explored the extent to which natural gas can be a legitimate and pragmatic component of a just energy transition, especially in a context characterised by energy poverty, institutional fragility and global pressures for decarbonisation.

To start, Chapter One contextualised the need for a current energy transition and studied the evolution of the concept of Just Energy Transition from its origins to its institutional embedding within global governance. The research highlighted how the idea of a fair energy transition is subject to different interpretations, particularly between the Global North and South, due to profound historical and structural differences.[154] While the North focuses on decarbonisation and social equity, aiming to minimise the social and economic costs of the transition to a carbon-free energy system, the global South, and specifically sub-Saharan Africa, prioritise universal access to energy, overcoming energy poverty, promoting socio-economic development and climate adaptation to cope with the disastrous effects of climate change. Added to this vision is the recognition of the long-term commitment to building a sustainable energy system in order to reduce emissions in a gradual and pragmatic manner. Scholars Sabato and Fronteddu criticise the European model of just transition, highlighting the top-down approach of the measures adopted, which does not involve local communities and workers in decisions, relegating social justice to compensatory mechanisms rather than addressing structural inequalities and development needs.[155] One voice from the African perspective is Victoria Nalule, who puts forward the theory of "energy progression", which challenges the prevailing view of "energy transition", advocating the idea of a cumulative process in which energy sources are gradually integrated over time, respecting the pace and capabilities of countries.[156] This concept emphasises the importance of gradual and adaptable strategies that connect climate goals with development needs. Finally, at the end of the first chapter, the global energy transition is presented as a complex geopolitical process that is reshaping international relations, markets and national political economies. According to the

[154] Andreas Goldthau, Laima Eicke, and Silvia Weko, "The Global Energy Transition and the Global South," in *The Geopolitics of the Global Energy Transition*, ed. Manfred Hafner and Simone Tagliapietra (Cham: Springer, 2020), https://doi.org/10.1007/978-3-030-39066-2_14.
[155] Fronteddu, Sebastiano, and Sabato, Boris. "A Socially Just Transition through the European Green Deal." *European Trade Union Institute* (2020).
[156] Nalule, Victoria R. "Energy Progression: A Pathway for Africa's Energy Transition." In *Energy Transitions and the Future of the African Energy Sector: Law, Policy and Governance*, edited by Victoria R. Nalule, 120-135. Cham: Palgrave Macmillan, 2021.

authors, the growing interdependence between different regional trajectories of the energy transition means that decisions taken in one context can affect other regions, with significant effects on financing, technologies and critical raw materials. [157] This interconnection raises new inequalities, particularly for regions involved in global supply chains. Furthermore, the chapter emphasises that the main challenge of the global transition is not the lack of objectives or narratives, but the difficulty of creating governance frameworks that manage these connections in a socially and politically sustainable way.[158]

After noting that there is no universal model for achieving a just energy transition, Chapter Two addresses the energy paradox that characterises sub-Saharan Africa: despite being rich in natural resources, particularly oil and gas, the region suffers from severe energy poverty, which severely limits economic, social and industrial opportunities, fuelling a cycle of poverty and slowing development.[159] This situation can be understood through the *resource curse theory*, which explains how this phenomenon occurs due to the ineffective management of resource wealth, primarily resulting from weak governance and institutions that fuel corruption.[160] A second cause is economic dependence, which prevents economic diversification and makes the country vulnerable to fluctuations in commodity prices. These factors, combined with competition for control of resources, trigger internal conflicts and political instability, continuing to slow down the country's sustainable development.[161] However, criticisms of the resource curse theory reject its deterministic view, asserting that the wealth of natural resources is not necessarily destined to hinder development, but can serve as a catalyst insofar as it is managed through appropriate macroeconomic policies, strong institutions, and

[157] Pastukhova and Westphal, "Governing the Global Energy Transformation," in *The Geopolitics of the Global Energy Transition*.
[158] Maria Pastukhova and Kirsten Westphal, “Governing the Global Energy Transformation,” in *The Geopolitics of the Global Energy Transition*, ed. Manfred Hafner and Simone Tagliapietra (Springer, 2020), 337–360.
[159] Copinschi, Philippe. "Energy and the Economy in Sub-Saharan Africa." In *The Palgrave Handbook of International Energy Economics*, edited by Manfred Hafner and Giacomo Luciani, 693–712. Cham: Springer, 2022. https://doi.org/10.1007/978-3-030-86884-0_34.
[160] Richard Auty, *Sustaining Development in Mineral Economies: The Resource Curse Thesis* (London: Routledge, 2002), https://doi.org/10.4324/9780203422595.
[161] Michael L. Ross, “The Political Economy of the Resource Curse,” *World Politics* 51, no. (1999), https://doi.org/10.1017/S0043887100008200;

diversification strategies.[162] These measures can mitigate the negative effects, allowing natural resources to act as a catalyst for sustainable development rather than a limitation.

Subsequently, in Chapter Three, we narrowed the scope of our research, analysing Nigeria, which represents a paradigmatic case for the analysis of a just energy transition in Sub-Saharan Africa. This chapter explores the main institutional, political, and economic barriers that hinder the implementation of Nigerian energy, climate, and development policies, explaining how the country's energy sector is outdated and how resource management is plagued by inefficiencies and corruption, which significantly reduce the effectiveness of investments and public policies aimed at improving energy access for the population. Finally, the chapter introduces the National Gas Strategy, defining gas as a "transition fuel", a response to the problem of universal access to energy and to support the country's industrialisation, while seeking to progressively reduce dependence on fossil fuels in the long term.[163]

Finally, the last Chapter, focusing on the characteristics of natural gas, introduces the debate on the potential and limitations of its use within the just energy transition, examining its role as a fuel bridge. A fuel bridge is a resource that can support growing energy demand while reducing emissions compared to more polluting fuels such as coal, thus fitting into a perspective of gradual and progressive decarbonisation.[164] In fact, although natural gas is a fossil fuel, its CO2 emissions are significantly lower than those of other fuels such as coal and oil, making it a potential choice for a just energy transition in the short and medium term.[165] Furthermore, natural gas can play a crucial role in integrating renewable energies into existing energy systems, given the intermittency of renewable sources such as solar and wind power. Gas can provide operational flexibility that allows energy supply and demand to be balanced, especially when renewables are not available, such as at night or during periods of low

[162] Benjamin Smith and David Waldner, *Rethinking the Resource Curse* (Cambridge: Cambridge University Press, 2021).
[163] Federal Republic of Nigeria, *National Energy Masterplan* (Abuja: Energy Commission of Nigeria, 2022).
[164] Luca Franza, Dick de Jong, and Coby van der Linde, "The Future of Gas: The Transition Fuel?" in *The Future of Natural Gas: Markets and Geopolitics*, ed. Silvia Colombo, Mohamed El Harrak, and Nicolò Sartori (Rome and Rabat: Istituto Affari
[165] CIEP (Clingendael International Energy Programme). *The Role of Natural Gas in the Global Energy Transition*, 2024.

production, thus ensuring greater stability.[166] However, despite its short-term potential, the chapter raises concerns about using gas as a long-term solution, as it remains a fossil fuel and continued use could slow progress towards complete decarbonisation. Challenges also include the geopolitical risk associated with natural gas, as gas production and trade are influenced by geopolitical rivalries and energy security issues. The concentration of gas resources in a few geographical areas creates energy dependence that can expose consumer countries to political and supply risks.[167] Furthermore, the infrastructure required to transport gas, such as gas pipeline networks and LNG terminals, is expensive and complex, with the risk of overloading markets and accentuating global energy inequalities. Environmental concerns related to methane emissions, which, being a very powerful greenhouse gas, can undermine the environmental benefits of gas, also pose a challenge.[168] Finally, in the African context, the financial barrier is emphasised due to the tension between African countries' need for short-term investment and the growing pressure for decarbonisation. The prospect of an African gas renaissance is analysed by highlighting both opportunities and barriers, primarily funding.[169] In the penultimate paragraph of the chapter, an econometric analysis of the relationship between natural gas production and economic growth in Nigeria showed that although the short-term impact of gas production on GDP growth was not significant, there is a long-term relationship between gas and economic growth, suggesting that natural gas could be a fundamental pillar for economic growth in Nigeria, provided that it is used as a temporary and conditional response, that structural challenges in the energy sector are resolved, and that policies to integrate renewable energy are promoted. The chapter concludes by affirming the importance of regional cooperation, which plays a crucial role in addressing common challenges. Sharing resources, infrastructure and policies can enable countries to tackle difficulties

[166] Ivor Kulušić, Lucija Jukić, Ivan Smajla, and Daria Karasalihović Sedlar, "The Role of Natural Gas in the Socio-Technical Transition to a Carbon-Neutral Society and a Review of the European Union's Framework," *Sustainability* 16, no. 9 (2024) https://doi.org/10.3390/su16093791

[167] Franza, de Jong, and van der Linde, "The Future of Gas," in *The Future of Natural Gas: Markets and Geopolitics*, ed. S. Colombo, M. El Harrak, and N. Sartori, 25–39.

[168] Ouki, Mostefa. *Prospects for a Potential African Gas Renaissance en Route to a "Just Energy Transition"*, OIES Paper NG 185 (Oxford: Oxford Institute for Energy Studies, September 2023), https://hdl.handle.net/10419/280128.

[169] Ouki, Mostefa. *Prospects for a Potential African Gas Renaissance en Route to a "Just Energy Transition*". OIES Paper NG 185. Oxford: Oxford Institute for Energy Studies, September 2023. https://hdl.handle.net/10419/280128.

together, improving access to energy and creating integrated solutions that go beyond national borders.[170]

In the end, the thesis concludes that natural gas, if managed strategically, can support a fair energy transition in sub-Saharan Africa, and particularly in Nigeria, provided it is incorporated into a broader framework of long-term sustainable development. A joint commitment between states and major oil companies is necessary to avoid reproducing the existing model, which risks perpetuating an unjust and unequal system similar to that based on oil and coal. In this way, gas should not become a source of environmental or political instability, but rather a tool to lift millions out of poverty and ensure energy security. A comprehensive strategy is required that primarily recognises the legitimacy of multiple approaches to the energy transition, so that it can be tailored to the specific socio-economic and energy needs of each country. Secondly, at the national level, challenges related to institutions, infrastructure, and social equity must be addressed. Above all, however, the urgency of climate action must not be overlooked, and all efforts must be aligned in order to reduce emissions and combat climate change, ensuring that the path to a sustainable energy future is both equitable and climate-conscious.

[170] Evro O. Evans, Obiwale Fortune O., Mepaiyeda E. B., and Emeke Chukwu, "The Role of Natural Gas in Nigeria's Energy Transition and Economic Growth – An Econometric Approach," paper presented at the SPE Nigeria Annual International Conference and Exhibition, Lagos, Nigeria, 4–6 August 2025, https://doi.org/10.2118/228755-M

Bibliography

Acemoglu, Daron, and James A. Robinson. *Why Nations Fail: The Origins of Power, Prosperity, and Poverty*. New York: Crown Business, 2012.

African Climate Foundation. *African Perspectives of a Just Transition to Low Carbon Economies*. African Climate Foundation, 2022.

African Climate Foundation. *Exporting a Just Transition?* African Climate Foundation, 2022.

African Union. *The Executive Council Adopted the African Common Position on Energy Access and Transition*. Press release, 2022.

African Union and African Energy Commission. *Energy Transition Strategy and Action Plan (ETSAP): Towards a Sustainable, Low-Emission Energy Future by 2063*. African Union, 2025.

African Union Commission and African Energy Commission (AFREC). *African Energy Transition Programme*.

Ariweriokuma, Soala. *The Political Economy of Oil and Gas in Africa: The Case of Nigeria*. 1st ed. London: Routledge, 2008.

Auty, Richard. *Sustaining Development in Mineral Economies: The Resource Curse Thesis*. London: Routledge, 2002.

Bradshaw, Michael. "Global Energy Dilemmas: A Geographical Perspective." *The Geographical Journal* 176, no. 4 (2010): 275–290.

Chancel, Lucas, Thomas Piketty, Emmanuel Saez, and Gabriel Zucman. *Climate Inequality Report 2025*. World Inequality Lab, 2025.

Collier, Paul. *The Bottom Billion: Why the Poorest Countries Are Failing and What Can Be Done About It*. Oxford: Oxford University Press, 2007.

Copinschi, Philippe. “Energy and the Economy in Sub-Saharan Africa.” In *The Palgrave Handbook of International Energy Economics*, edited by Manfred Hafner and Giacomo Luciani, 693–712. Cham: Springer, 2022.

Copinschi, Philippe. “Sub-Saharan Africa: A Future Global Gas Player?” In *The Future of Natural Gas*, edited by Luca Franza, Dick de Jong, and Coby van der Linde, 181–203. Rome: Istituto Affari Internazionali, 2016.

De Simone, Sara, Mariarosaria Nicolò, and Louisa Parks. “Exporting the Just Transition? The European Investment Bank, the European Green Deal and Environmental and Social Rules for Green Projects Outside the EU.” *Journal of European Social Policy* 25 (2025): 285–301.

Doorey, David J. *Just Transitions Law: Putting Labour Law to Work on Climate Change*. SSRN Scholarly Paper no. 2938590, 2017.

ECOWAS. *ECOWAS Directive on Gender Assessment in Energy Projects*. ECOWAS, 2017.

Energy Institute. *Statistical Review of World Energy 2025*. London: Energy Institute, 2025.

Energy Market and Rates Consultants Limited (EMRC). *Nigeria’s Gas Expansion Programme: Bridge Fuel or Long-Term Strategy*. Abuja: EMRC, April 2025.

Evans, Evro O., and Obiwale Fortune O. *The Role of Natural Gas in Nigeria's Energy Transition and Economic Growth – An Econometric Approach*. Society of Petroleum Engineers, 2025.

Federal Republic of Nigeria. *National Energy Masterplan*. Abuja: Energy Commission of Nigeria, 2022.

Federal Republic of Nigeria. *Nigeria’s Third Nationally Determined Contribution (NDC 3.0)*. Abuja: National Council on Climate Change, September 2025.

Franza, Luca, Dick de Jong, and Coby van der Linde. “The Role of Natural Gas.” In *The Future of Natural Gas*, Rome: Istituto Affari Internazionali, 2016.

Gary, Ian, and Terry Lynn Karl. *Bottom of the Barrel: Africa's Oil Boom and the Poor*. Baltimore: Catholic Relief Services, 2003.

Geuskens, Isabelle, and Henrieke Butijn. *Locked Out of a Just Transition: Fossil Fuel Financing in Africa*. Amsterdam: BankTrack; Milieudefensie; Oil Change International, 2022.

Hafner, Manfred, and Giacomo Luciani, eds. *The Palgrave Handbook of International Energy Economics*. Cham: Springer Nature Switzerland, 2022.

Hafner, Manfred, and Simone Tagliapietra, eds. *The Geopolitics of the Global Energy Transition*. Cham: Springer, 2020.

Humphreys, Macartan, Jeffrey D. Sachs, and Joseph E. Stiglitz, eds. *Escaping the Resource Curse*. Columbia University Press, 2007.

Intergovernmental Panel on Climate Change. *Climate Change 2023: Synthesis Report*. IPCC, 2023.

Intergovernmental Panel on Climate Change. *Climate Change 2024: Impacts, Adaptation and Vulnerability – Summary for Policymakers*. IPCC, 2024.

Intergovernmental Panel on Climate Change. *Global Warming of 1.5°C*. IPCC, 2018.

International Energy Agency. *Are We Entering a Golden Age of Gas?* Paris: International Energy Agency, 2011.

International Energy Agency. *Golden Rules for a Golden Age of Gas*. Paris: International Energy Agency, 2012.

International Energy Agency. "Natural Gas and Energy Data." Accessed January 6, 2025.

International Energy Agency et al. *Tracking SDG 7: The Energy Progress Report 2019*. Washington, DC: World Bank, 2019.

International Labour Organization. *Guidelines for a Just Transition towards Environmentally Sustainable Economies and Societies for All*. ILO, 2015.

Ismail, Yahaya. “Investigating the Barriers to Climate Finance and ESG Integration in Nigeria’s Energy Transition.” *GAS Journal of Arts Humanities and Social Sciences* 3, no. 9 (2025): 32–40.

Kidunduhu, Noreen. “Energy Transition in Africa: Context, Barriers and Strategies.” In *Energy Transitions and the Future of the African Energy Sector: Law, Policy and Governance*, edited by Victoria R. Nalule. Cham: Palgrave Macmillan, 2021.

Kulušić, Ivor, Lucija Jukić, Ivan Smajla, and Daria Karasalihović Sedlar. “The Role of Natural Gas in the Socio-Technical Transition to a Carbon-Neutral Society and a Review of the European Union’s Framework.” *Sustainability* 16, no. 9 (2024): 3791.

McCauley, Darren, and Raphael Heffron. “Just Transition: Integrating Climate, Energy and Environmental Justice.” *Energy Policy* 119 (2018): 1–7.

Morena, Edouard, Dunja Krause, and Dimitris Stevis. *Just Transitions*. 1st ed. Pluto Press, 2019.

Nalule, Victoria R. *Energy Transitions and the Future of the African Energy Sector: Law, Policy and Governance*. Cham: Palgrave Macmillan, 2020.

Nalule, Victoria R. “How to Respond to Energy Transitions in Africa: Introducing the Energy Progression Dialogue.” In *Energy Transitions and the Future of the African Energy Sector: Law, Policy and Governance*, edited by Gavin Wood and Keith Baker. Palgrave Macmillan, 2021.

Newell, Peter, and Dustin Mulvaney. “The Political Economy of the ‘Just Transition.’” *The Geographical Journal* 179, no. 2 (2013): 132–140.

Organization of the Petroleum Exporting Countries. *Annual Statistical Bulletin 2024*. Vienna: OPEC, 2024.

Ouki, Mostefa. *African Gas Supplies to Europe: Between Hopes and Hard Realities*. Oxford: Oxford Institute for Energy Studies, July 2022.

Ouki, Mostefa. *Prospects for a Potential African Gas Renaissance en Route to a "Just Energy Transition"*. OIES Paper NG 185. Oxford: Oxford Institute for Energy Studies, September 2023.

Oyedokun, Godwin Emmanuel, and Matilda Chukwuemeka. "Examining Legal Impediments to Renewable Energy Development in Nigeria's Regulatory Landscape." *OAU Journal of Public Law* 6, no. 1 (2025): 1–18.

Pastukhova, Maria, and Kirsten Westphal. "Governing the Global Energy Transformation." In *The Geopolitics of the Global Energy Transition*, edited by Manfred Hafner and Simone Tagliapietra, 337–360. Cham: Springer, 2020.

Pistelli, Lapo. "Africa and the Global Energy Transition." In *The Geopolitics of the Global Energy Transition*, edited by Manfred Hafner and Simone Tagliapietra. Cham: Springer, 2020.

Ross, Michael L. *The Oil Curse: How Petroleum Wealth Shapes the Development of Nations*. Princeton, NJ: Princeton University Press, 2012.

Ross, Michael L. "Does Oil Hinder Democracy?" *World Politics* 53, no. 3 (2001): 325–361.

Ross, Michael L. "The Political Economy of the Resource Curse." *World Politics* 51 (1999): 297–322.

Sabato, S., and M. Mandelli. "Towards an EU Framework for a Just Transition: Welfare Policies and Politics for the Socio-Ecological Transition." *European Political Science* 23 (2024): 14–26.

Sabato, Sebastiano, and Boris Fronteddu. *A Socially Just Transition through the European Green Deal?* Working Paper no. 2020.08. European Trade Union Institute (ETUI), 2020.

Sachs, Jeffrey D., and Andrew M. Warner. "The Big Rush, Natural Resource Booms and Growth." *Journal of Development Economics* 59, no. 1 (1999): 43–76.

Smith, Benjamin, and David Waldner. *Rethinking the Resource Curse*. Cambridge: Cambridge University Press, 2021.

Suleiman, Muhammad Reza, Mounia Slighoua, and Abderrahman Haddad. "Strengthening Transregional Cooperation: Morocco's Path to ECOWAS Integration through the Nigeria–Morocco Gas Pipeline." *Journal of African Union Studies*14, no. 1 (2025): 5–26.

Ukponu, Michael Uche, Yusuf Sulayman, and Kester Oyibo. "Role of Law in the Energy Transitions in Africa: Case Study of Nigeria's Electricity Laws and Off-Grid Renewable Energy Development." In *Energy Transitions and the Future of the African Energy Sector: Law, Policy and Governance*, edited by Victoria R. Nalule. Cham: Palgrave Macmillan, 2021.

United Nations. *High-Level Dialogue on Energy: Concept Note, Technical Working Group 1*. New York: United Nations, 2021.

United Nations. *Transforming Our World: The 2030 Agenda for Sustainable Development*. United Nations, 2015.

United Nations Framework Convention on Climate Change. *COP30 High-Level Ministerial Roundtable on Just Transition*. UNFCCC, 2025.

United Nations Framework Convention on Climate Change. *Paris Agreement*. UNFCCC, 2015.

United Nations Framework Convention on Climate Change. *United Nations Framework Convention on Climate Change*. UNFCCC, 1992.

United Nations Framework Convention on Climate Change. *United Nations Framework Convention on Climate Change*. UNFCCC, 2022.

Wood, Geoffrey, and Keith Baker. *The Palgrave Handbook of Managing Fossil Fuels and Energy Transitions*. Reprint, Palgrave Macmillan, 2019.

World Bank. *Angola Country Economic Memorandum: Moving Beyond Oil (2023–2024)*. Washington, DC: World Bank, 2024.

World Bank. “Nigeria Overview.” Last modified October 2025.

World Bank. *Poverty & Equity Brief: Nigeria*. Washington, DC: World Bank, October 2025.

Zabbey, Nenibarini, Kabari Sam, and Adaugo Onyebuchi. “Remediation of Contaminated Lands in the Niger Delta, Nigeria: Prospects and Challenges.” *Science of the Total Environment* 586 (2017): 952–965.