



Gendered Impacts of Energy Transition on Food Safety in Nigeria

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Abstract. The ongoing transition in energy landscapes within the Global South poses multifaceted implications, particularly regarding food safety measures and gender dynamics. This article critically examines the intersecting realms of energy transition, forensics, gender, and food safety. It delves into the intricate web of how the shifting energy paradigms influence food safety practices and the often overlooked, disparate impacts experienced by genders within communities. Through an exploration of changing energy infrastructures and their consequent effects on food safety standards, this work sheds light on the nuanced gender perspectives in the Global South. Drawing upon empirical data and case studies, it delineates the differential impacts of energy transitions on genders concerning food safety vulnerabilities, risks, and adaptations. Furthermore, this article proposes gender-sensitive strategies and policy interventions aimed at bolstering inclusive food safety measures amidst evolving energy sources and infrastructure. It advocates for the integration of forensic methodologies and gender-inclusive approaches to not only identify but effectively mitigate gender-specific food safety concerns in the wake of energy transition projects. Ultimately, this contribution underscores the imperative for collaborative efforts, involving policymakers, practitioners, and researchers, to holistically address the gendered impacts of energy transition on food safety. By amalgamating insights from gender studies, forensic science, and energy policies, this work advocates for comprehensive approaches to

safeguarding food safety, ensuring equity, and fostering resilience in the evolving energy landscape of the Global South.

Keywords: Gender, Energy Transitions, Food Safety, Forensics

1. Introduction

The 21st Century has witnessed an unprecedented global shift in energy dynamics, with the Global South at the nexus of this transformative landscape. Nigeria is not left out. A study by the International Energy Agency (IEA) found that over 140 million people in Nigeria which represents about 71% of the Country's population do not have access to energy.²⁶⁵ This situation has been further worsened by the first Presidential decision of the current President of the Federal Republic of Nigeria - President Bola Ahmed Tinubu to remove fuel subsidy.²⁶⁶ Even though the need for Energy Transition in Nigeria was apparent and already a goal as part of the SDG 7, this removal has forced many Nigerians most of whom were unprepared financially and otherwise to seek alternatives. The impact of this shift has serious consequences of energy access which impacts the female gender acutely. Energy access refers to the people's ability to access modern energy services, including electricity, clean cooking facilities, and modern fuels.²⁶⁷ This ability has been dismally truncated or at best hampered by the economic realities in Nigeria. Energy inaccessibility has

²⁶⁵ World Economic Forum, 'Here's How Nigeria Is Tackling the Barriers to Its Green Energy Transition' (2023) World Economic Forum <https://www.weforum.org/agenda/2023/05/how-nigeria-is-tackling-barriers-to-its-green-energy-transition/> accessed 24 December 2023.

²⁶⁶ That decision was followed by a hike in fuel prices which meant that a majority of the citizens who hitherto relied on

fuel for energy no longer have the economic capacity to do so.

²⁶⁷ IEA, 'Defining Energy Access 2020: Methodology' (2020) International Energy Agency <https://www.iea.org/articles/defining-energy-access-2020-methodology> accessed 23 December 2023.

significant negative impacts on health, education, and economic development.²⁶⁸ As renewable energy initiatives surge and traditional energy paradigms evolve, the impacts resonate far beyond the realms of power generation and infrastructure. Amidst this transition, a critical yet often overlooked dimension emerges—the intricate interplay between gender dynamics, food safety, forensics and the evolving energy matrix within the Global South.²⁶⁹

Within this dynamic context, the traditional frameworks of energy production, distribution, and consumption undergo profound metamorphoses, fundamentally altering established norms and practices. Yet, the nuanced repercussions of these changes on food safety standards, coupled with their differential effects on genders, remain an under explored terrain. The confluence of gender roles, socio-cultural dynamics, and the shifting energy landscapes casts a complex web that demands meticulous examination and proactive interventions. These interventions necessitate the use of forensics.

This article endeavors to unravel the intricate tapestry of intersecting themes: energy transition, forensics, gender, and food safety within the context of the Global South. Through an exploration of these converging realms, it seeks to delineate the nuanced impacts of transitioning energy sources and infrastructure on food safety practices and the often-observed gendered disparities prevalent within communities.

By probing the multifaceted dimensions of this evolving landscape, this work aspires to not only highlight the challenges but also envision pathways toward gender-sensitive, inclusive strategies for ensuring food safety amidst the ever-changing energy fabric. It underscores the imperative of collaborative, interdisciplinary approaches drawing from gender studies, forensic methodologies, and policy

frameworks to address the intricate challenges posed by energy transition on food safety through a gender lens.

As the Global South navigates the transformative waves of energy transition, this exploration aims to illuminate the hitherto obscured facets, advocating for equitable, resilient, and inclusive strategies that safeguard food safety while fostering gender justice in these evolving energy landscapes.

2. Conceptual Clarifications

Before delving into this discussion there is a need to clarify some concepts which will be used repeatedly in the course of this paper. These concepts include but are not limited to Energy, Energy Transition, Just Energy, etc

2.1 Energy

The word energy is a difficult concept to define. This is because it has multiple meanings. It cannot be seen, smelt, or sensed in a direct way. One can only perceive its effects.²⁷⁰ It pervades all branches of physics and encompasses types such as mechanical, gravitational, chemical, thermal, electric, atomic and even rest energy.²⁷¹

Energy is the ability to do work and work is the transfer of energy from one form to another. In practical terms, energy is what we use to manipulate the world around us, whether by exciting our muscles, by using electricity, or by using mechanical devices such as automobiles. Energy comes in different forms - heat (thermal), light (radiant), mechanical, electrical, chemical, and nuclear energy.²⁷²

As fluid and challenging as the term energy is to define, it is important to note that the different forms of energy can be converted into each other.²⁷³ Energy

²⁶⁸ It is worthy of note that the energy service electricity is inextricably linked to the petroleum/fuel as the case may be in Nigeria because the epileptic supply of electricity in Nigeria has resulted in a situation where households generate their energy themselves and the easiest way to do that is to use a generator which is powered by fuel. Thus, the removal of subsidy further hampers the Nigerians ability to generate energy for their household.

²⁶⁹ It is necessary to state that the term Global south generally encompasses countries that are less economically developed, often facing socio-economic challenges, and historically have been affected by colonialism or exploitation. These regions are commonly found in Latin America, Africa, Asia (excluding Japan), and parts of Oceania.

²⁷⁰ 'What is Energy' (Physics, Weber State University) <https://physics.weber.edu/schroeder/eee/chapter1.pdf> accessed 24 September 2025.

²⁷¹ Paolo Bussotti, 'Introducing the Concept of Energy: Educational and Conceptual Considerations Based on the History of Physics' Proceedings of the 5th International Baltic Symposium on Science and Technology Education, BalticSTE2023 <https://files.eric.ed.gov/fulltext/ED629206.pdf> accessed 24 December 2023.

²⁷² Basics of Energy and its Various Forms (n.d.) Bureau of Energy Efficiency India <https://beeindia.gov.in/sites/default/files/1Ch2.pdf> accessed 24 December 2023.

²⁷³ Ibid 6

facilitates essential necessities like prepared meals, comfortable living conditions, lighting, appliance usage, access to water and sanitation, crucial healthcare provisions (including refrigerated vaccines and emergency care), educational resources, communication mediums (radio, television, internet), and transportation. Moreover, it powers productive endeavors such as agriculture, commerce, manufacturing, industrial processes, and mining.²⁷⁴ In view of its functions and capabilities, it is safe to say that energy is essential for life as it is what we use to manipulate every single endeavor of life.²⁷⁵

It is worthy of note that enhancing access to energy services stands as a pivotal element in enhancing the living standards in developing nations or the global south, particularly among the most impoverished.²⁷⁶ A United Nations Development Programme (UNDP) report emphasizes that "...adequate energy services are integral to poverty alleviation and environmentally sound social and economic development...".²⁷⁷ The countries of the Global South like Nigeria do have some energy resources available—for instance, residents purchase kerosene for lighting, fuel for their vehicles and for generators in the absence of adequate electricity, use dry cell batteries for various purposes, and often spend significant time gathering biomass. Surveys on willingness-to-pay and trials of commercial energy initiatives reveal an existing market, but "many times, the poor lack the option to access commercial energy".²⁷⁸

Energy is profoundly significant across all three pillars of sustainable development—enhancing social, economic, and environmental well-being. It facilitates lighting and transportation, establishing networks that link people and communities. Energy for heating, cooling, and refrigeration supports human comfort and health. Furthermore, energy for both industrial and consumer applications drive economic activity.

2.2 Energy Transition

Energy Transition has been defined to mean 'the global energy sectors shift from fossil-based systems of energy production and consumption - including oil, natural gas and coal - to renewable energy sources like wind and solar as well as lithium-ion batteries.'²⁷⁹ According to the UN, the major driver for a transition from a fossil fuel dominated energy sector to one based on renewable energy sources is the need to address climate change.²⁸⁰ Peter A. O'Connor defines it as 'a particularly significant set of changes to the patterns of energy use in a society, potentially affecting resources, carriers, converters, and services.'²⁸¹ According to him, energy transition is inevitable. He explains this further by stating that when the need for energy services evolves, the fuels and technologies used to fulfill these needs also change. With growing populations and expanding economic activities, energy consumption has surged, mainly relying on fossil fuels.²⁸² Given the challenges posed by climate change, limitations in fossil fuel reserves, and the aspirations for progress, it is evident that an energy transition is necessary. Analysis indicates that relying

²⁷⁴ S.O. Oyedepo, 'Energy and Sustainable Development in Nigeria: The Way Forward' (2012) 2 *Energy Sustain Soc* 15 <https://doi.org/10.1186/2192-0567-2-15>. accessed 24 December 2023

²⁷⁵ C. Nnaji et al., CIA World Factbook, edited by C.E. Nnaji and C.C. Uzoma (Nigeria, 2010) <http://www.cia.gov/library/publications/the-world-factbook/geos/ni.html> accessed 28 December 2023.

²⁷⁶ Energy services being the forms of energy demanded by consumers and industry which generally include but are not limited to heating, cooling lighting, mechanical power and information; World Summit on Sustainable Development (WSSD), 'Plan of Implementation of the World Summit on Sustainable Development' (2002) http://www.un.org/jsummit/html/documents/summit_docs/2309_planfinal.htm accessed 24 December 2023; A. Townsend, 'Energy Access, Energy Demand, and the Information Deficit', in *Energy Services for the World's Poor* (World Bank/Energy Service Management Assistance Program, Washington DC, 2000) referred to in Peter A. O'Connor, *Energy Transitions THE PARDEE PAPERS* / No. 12/ November 2010 <https://www.bu.edu/pardee/files/2010/11/12-PP-Nov2010.pdf> accessed 28 December 2023.

²⁷⁷ T. Johansson with J. Goldemberg, 'Overview and a Policy Agenda', in *Energy for Sustainable Development: A Policy Agenda* (United Nations Development Programme, Sweden, 2002): Rahms i Lund AB referred to in Peter A. O'Connor, *Energy Transitions* ibid.

²⁷⁸ A. Townsend, 'Energy Access, Energy Demand, and the Information Deficit', in *Energy Services for the World's Poor* (World Bank/ESMAP, Washington DC, 2000). Ibid 12.

²⁷⁹ S&P Global, 'What is Energy Transition' (24 February 2020) <https://www.spglobal.com/en/research-insights/articles/what-is-energy-transition#:~:text=Energy%20transition%20refers%20to%20the,well%20as%20lithium%20Dion%20batteries> accessed 28 December 2023.

²⁸⁰ *Theme Report on Energy Transition: Towards the Achievement of SDG 7 and Net-Zero Emissions* (United Nations, 2021) https://www.un.org/sites/un2.un.org/files/2021-twg_2-062321.pdf accessed 28 December 2023.

²⁸¹ Peter A. O'Connor, *Energy Transitions, The Pardee Papers* No. 12 (Boston University, November 2010) <https://www.bu.edu/pardee/files/2010/11/12-PP-Nov2010.pdf> accessed 28 December 2023.

²⁸² Ibid at pg 3.

solely on petroleum as is the case in Nigeria, even with unconventional sources, may not suffice for developing nations like Nigeria to create and sustain economies and transportation systems akin to those in the United States.²⁸³ Thus, if the systems in Nigeria must improve, the energy system must transition to something better than the current state which is mainly fossil fuel. Even though sustaining the current petroleum demand may prove challenging, the recent removal of subsidy has made the need for an alternative imperative as diverse transportation fuel alternatives have become essential.

2.2.1 Just Energy Transition

A just energy transition refers to the shift from current energy systems, often reliant on fossil fuels, to more sustainable, low-carbon, and equitable energy sources and practices. The concept emphasizes the need to not only address environmental concerns like climate change but also to ensure social equity, economic stability, and inclusivity throughout the transition process.

According to the International Labour Organization, to address urgent environmental issues such as climate change, pollution, and the rapid decline of biodiversity, nations and businesses must shift towards more environmentally friendly, resilient, and climate-neutral economies and societies.²⁸⁴ A Just Transition implies transforming the economy in a manner that is as equitable and inclusive as possible for all involved, generating decent job opportunities and ensuring no one is left behind. It aims to maximize the social and economic benefits of climate action while minimizing and effectively managing any associated challenges.²⁸⁵ This involves fostering constructive social discussions among all affected groups and upholding fundamental labor principles and rights.

Securing a fair transition is crucial for all countries regardless of their developmental stage. It is equally essential for all economic sectors, extending beyond energy provision, and spans both urban and rural regions alike.

Key aspects of a just energy transition include:

Equity and Social Justice: It focuses on minimizing negative impacts on vulnerable communities, ensuring

fair access to new opportunities, and addressing historical inequalities associated with energy production and consumption.

Workers' Rights and Employment: It involves supporting workers in industries affected by the transition (such as coal or oil) by providing training, alternative job opportunities, and ensuring a just transition for these workers to new employment in clean energy sectors.

Community Engagement and Participation: A just transition involves communities in decision-making processes, considering their needs and preferences, and ensuring that benefits from the transition are distributed equitably.

Environmental Sustainability: While addressing social aspects, a just transition also aims for environmental sustainability by reducing greenhouse gas emissions, minimizing environmental degradation, and promoting renewable energy sources.

Policy Frameworks and Governance: It requires robust policies, regulations, and governance structures that prioritize fairness, inclusivity, and sustainability, ensuring that the transition is managed effectively and fairly.

Overall, a just energy transition acknowledges that the shift to cleaner and more sustainable energy systems should not exacerbate existing social inequalities or leave certain groups disproportionately affected. Instead, it aims for an inclusive and equitable process that considers both environmental and social dimensions to ensure a fair and sustainable future for all.

3. Significance/Relationship of Subsidy Removal to the Energy Transition in Nigeria

Nigeria stands as the foremost crude oil producer in Africa, yielding approximately 1.36 million barrels per day, with Libya following closely at 1.17 million bpd.²⁸⁶ Despite its noteworthy oil production, Nigeria grapples with the paradox of importing a significant portion of Premium Motor Spirit (PMS) due to corruption, extended neglect of local refineries, and the export-oriented nature of its crude oil industry. Consequently, roughly 70% of the country's petrol is sourced from abroad, impacting citizens who allocate nearly half of their daily \$2 budget to fuel expenses.

²⁸³ Ibid

²⁸⁴ UNIDO and UNWOMEN, 'Gender Equality in the Sustainable Energy Transition' (2023) <https://www.unwomen.org/sites/default/files/2023-05/Gender-equality-in-the-sustainable-energy-transition-en.pdf> accessed 1 January 2024.

²⁸⁵ Ibid

²⁸⁶ Chi Johnny Okongwu and Simon Ejokema Imoisi, 'Removal of Petrol Subsidy: Legal Implications for the Nigerian Economy' (2022) 2(13) Nnamdi Azikiwe University Journal of International Law and Jurisprudence.

Responding to this challenge, the Federal Government implemented a fuel subsidy.²⁸⁷

These subsidies, a mechanism employed by the Nigerian government, aim to stabilize domestic petroleum and gasoline prices, shielding citizens from the volatility of global oil price fluctuations. Originating in response to the 1973 oil price shock, Nigeria's economy heavily relies on crude oil, further intensified by unreliable electricity supply, compelling households and businesses to rely on fuel-based generators.²⁸⁸ In fact, Nigeria has a perennial problem of power which has persisted till today. In a 2012 article, Sunday Oyedepo stated that 60% to 70% of the Nigerian population does not have access to electricity and he opined that the situation will not change for the better if the Nigerian government does not take drastic steps to arrest the situation.²⁸⁹ The reality of the power/energy situation in Nigeria in 2023 shows that the drastic steps were never taken. Attempts to remove subsidies encountered resistance, notably in 1986 under President Babangida, sparking widespread protests.²⁹⁰ Similarly, in 2012, the subsidy removal by Goodluck Jonathan triggered vehement public outcry, culminating in a week-long protest and eventually a 30% reduction in petrol prices.²⁹¹ Subsequent cancellations of subsidies in 2016, owing to declining global oil prices and alleged corruption in subsidy payments, further highlighted the complexities of the subsidy issue.

Despite the government's intentions to eliminate the subsidy in 2022—an action eventually executed by the Tinubu Administration—Nigerians remain staunchly opposed to it, reflecting the persistent contention surrounding the subsidy removal. Although the removal of fuel subsidy, results in far less people using the PMS which is a form of fossil fuel, it is doubtful whether the removal was predicated on the need for cleaner energy in line with SDG 7. It is also worthy of note that its removal did not comply with the just energy transition model.

4. Energy Transition and Its Effects on Food Safety

The global energy supply is at the crossroads. Despite continuous calls for reduced reliance on fossil fuels, nations like Nigeria persist in heavily using coal, oil, and gas to power their economies. This reliance not only escalates carbon emissions, driving global warming, but also creates a globally interconnected system where food and energy are highly centralized, making them exceptionally susceptible to disruptions. In Nigeria the most recent disruption came in the form of the removal of subsidy.²⁹² Notably, prior to the current energy crisis, the world has struggled to ensure fair access to energy for everyone. Around 770 million individuals lack electricity access worldwide, hindering efforts to eliminate poverty and achieve development objectives. The statistic in Nigeria exceeds 70% that lack access to electricity.²⁹³ Simultaneously, about 2.5 billion people lack access to clean cooking, meaning nearly a third of the global population still relies on firewood and charcoal for meals, leading to adverse health effects, particularly affecting women and girls. In Nigeria, the removal of subsidy has resulted in a situation where those who had stopped using firewood and charcoal have had to go back to their previous methods. Although these methods are still different methods of fossil fuel, it is indeed a retrogression that has far reaching consequences for food safety. This reliance further contributes to deforestation and resource depletion, potentially sparking social tensions.

The interconnection of agriculture and energy impacts all stages of the food supply chain, from production to marketing.²⁹⁴ Fertilizer costs are closely linked to primary fuel prices like natural gas which is crucial in making ammonia. With gas contributing 70 to 80 percent of ammonia production expenses, surges in

²⁸⁷ Evelyn Bankole, 'What is Fuel Subsidy History in Nigeria' (9 January 2018) Legit.ng <https://www.legit.ng/1144554-what-is-fuel-subsidy-history-nigeria.html> accessed 29 December 2023.

²⁸⁸ Neil McCulloch, Tom Moerenhout and Joonseok Yang, 'Fuel Subsidy Reform and the Social Contract in Nigeria: A Micro-Economic Analysis' (2020) <https://www.ictd.ac/publication/fuel-subsidy-social-contractmicroeconomic-analysis-nigeria-rib/> accessed 29 December 2023.

²⁸⁹ Ibid 10

²⁹⁰ Ibid 23.

²⁹¹ 'Fuel Subsidies in Nigeria: They're Bad for the Economy, but the Lifeblood of Politicians' (The Conversation, 4

November 2021) <https://theconversation.com/fuel-subsidies-in-nigeria-theyre-bad-for-the-economy-but-the-lifeblood-of-politicians-170966> accessed 29 December 2023.

²⁹² 'UN WFP, 'Understanding the Energy Crisis and its Impact on Food Security' (2022) <https://docs.wfp.org/api/documents/WFP-0000141923/download/> accessed 30 December 2023.

²⁹³ Ibid 10

²⁹⁴ Energypedia, 'Energy within Food and Agricultural Value Chains' https://energypedia.info/wiki/Energy_within_Food_and_Agricultural_Value_Chains accessed 28 December 2023.

gas prices sharply raise fertilizer costs.²⁹⁵ From April 2020 to March 2022, fertilizer prices soared by 220 percent, straining agricultural operations. While there's been a slight decrease since, prices remain over three times higher than two years ago.²⁹⁶ These challenges worsen with increasing water scarcity and erratic rainfall, boosting reliance on energy-demanding water infrastructure and affecting energy supply. This creates tough decisions between energy, water, and food resources.

Down the food supply chain and in particular at the food processing stage, the high cost of energy creates a need for producers to cut corners so that they can maximize profits. This results in adulteration of food items.²⁹⁷

Nigeria's fuel subsidy removal and energy transition has interconnected effects on food safety. Some of these effects are:

4.1 Higher Cost of Living: The removal of fuel subsidies has led to an increase in fuel prices, affecting the cost of living generally, particularly as it is used by all. The unstable state of electricity in Nigeria necessitates the use of petrol by small businesses and household. Thus, the concomitant effect of subsidy removal is that households and small businesses have to spend more to run their houses and their businesses and these extra costs are transferred as much as possible to the consumers by increasing the cost of goods and services. The result is that the cost of living in that community is affected negatively. agricultural inputs such as fertilizers, pesticides, and transportation.²⁹⁸

4.2 Cost of Agricultural Inputs: Higher input costs often impact agricultural production, potentially influencing food safety by altering farming practices

or limiting access to resources that ensure safe food production. At the farming stage, farmers start adding certain chemicals for faster ripening of fruits so they can enhance their economic wellbeing faster. They begin to mix decomposed fruits and vegetables with the good ones.²⁹⁹ At the market stage, sellers begin to add certain natural and chemical dyes to food products in order to attract consumers with the 'freshness' of their food items. They also mix clay, pebbles, stones, sand, and marble chips, to the grains, pulses and other crops. This is done to increase the quantity of the goods and maximize profit. They also add cheaper and inferior substances whether wholly or partially to the good ones to increase the weight or nature of the product. All this is done for economic reasons.³⁰⁰

4.3 Transportation Costs: Rising fuel prices translate to increased transportation costs for moving food from farms to markets. This increases the final price of food for consumers. In Nigeria, one factor that also affects transportation costs is bad roads, thus the rising fuel price combined with bad roads, not only affect the costs of transportation but it also affects the timeliness of food delivery, potentially impacting the freshness and safety of perishable food items during transit.³⁰¹ Transportation costs also impact the markets negatively in that it affects the income/profit to be made from the seller of the goods. The quest for economic gains then leads to adulteration of food/consumable items. This is very rampant in Nigeria right now and scores of people are arrested often for selling fake/adulterated food/consumables.³⁰²

4.4 Energy Transition Impact: Nigeria has wholeheartedly embraced this initiative, showcasing its dedication by actively engaging in the Paris Agreement.³⁰³ Specifically, the country has strengthened its commitment to climate action by

²⁹⁵IMF, The Food and Energy Crisis – Weathering the Storm (2022) <https://www.devcommittee.org/content/dam/sites/devcommittee/doc/documents/mgr/Final%20Food%20and%20Energy%20DC2022-0005.pdf> accessed 29 December 2023, p. 10.

²⁹⁶ Ibid

²⁹⁷ Food adulteration is the practice of adding adulterants or contaminants to food materials

²⁹⁸ PwC, Fuel Subsidy in Nigeria - Issues, Challenges and the Way Forward (May 2023) <https://www.pwc.com/ng/en/assets/pdf/fuel-subsidy-in-nigeria-issues-challenges-and-the-way-forward.pdf> accessed 3 January 2024.

²⁹⁹ Byjus, 'Food Adulteration' <https://byjus.com/biology/food-adulteration/> accessed 30 December 2024.

³⁰⁰ Ibid

³⁰¹ Stephen Ocheni, 'Impact of Fuel Price Increase on the Nigerian Economy' SCISPACE <https://typeset.io/papers/impact-of-fuel-price-increaseon-the-nigerian-economy-2wzipme0ji> accessed 3 January 2024.

³⁰² Lara Adejoro and Godfrey George, 'Producers, Merchants Put Nigerians at Risk, Flood Market With Fake Food, Drinks' Punch Newspaper <https://punchng.com/producers-merchants-put-nigerians-at-risk-flood-market-with-fake-food-drinks/> accessed 3 January 2024.

³⁰³ On the 12th of December 2015, different countries worldwide adopted an international agreement to address climate change that requires deeper emissions reduction commitments from all countries—developed and developing. Countries that are responsible for 97 percent of global emissions submitted their climate commitments prior to the conference.

unveiling its Long-Term Low-Emission Development Strategy (LT-LEDS) through the National Council on Climate Change.³⁰⁴ This strategic reveal marks a proactive move toward combating global warming which is hindered by the fact that the substantial financial investments needed for the energy transition surpass the capabilities of both the public sector and domestic private sector.³⁰⁵ Nigeria's primary revenue and foreign exchange source, the oil and gas sector, confronts dwindling production, reduced prices, and mounting competition from cleaner alternatives.³⁰⁶ Additionally, international financial institutions and development partners are hesitant to support fossil fuel endeavors, particularly gas-related projects, due to environmental apprehensions.³⁰⁷ To facilitate its energy transition, Nigeria must harness inventive and varied financing channels, including green bonds, carbon markets, blended finance, and collaborations between the public and private sectors.³⁰⁸

However, Nigeria's move towards an energy transition, aiming for cleaner and more sustainable energy sources, would be unsuccessful if the government does not take adequate and pro-active steps to quit the wasting of the resources of the country as depicted in the National Budget for the year 2024 which was focused more on enriching the already rich executives, legislatives and cronies instead of sustainable development.³⁰⁹ There is a need to eschew corruption and focus on achieving the SDG goals. It is notable that for the SDG goals on Energy transition to be met there will be effects/ consequences that would bring changes in energy infrastructures. While this shift is beneficial for environmental sustainability, the transition period could initially affect energy availability and accessibility. Potential disruptions in energy supply would impact food processing, storage, and refrigeration, which are crucial aspects of food safety.

4.5 Resource Allocation: As the country focuses on energy transition initiatives, the allocation of resources and attention must shift away from other sectors as

well as corrupt tendencies in the system.³¹⁰ For example, the Nigerian government's 2024 proposed budget allocates N1.2 billion for office building purchases for the newly established National Agricultural Development Fund. Additionally, N70 million is designated for office furniture and fittings. Out of a total N102.5 billion budget for the agency, N27.5 million is for office rent, N450 million for operational vehicles, and N10 million for maintenance. This fund aims to empower Nigeria's agricultural sector, established by an act in 2022 to support food production, security, and sustainable farming practices. However, some budget allocations lack specifics—such as the number of buildings or vehicles—raising questions about the inflated amounts for furniture and maintenance, considering the absence of purchased buildings.³¹¹ While it would be commendable for the Country to focus on achieving the Energy Transition goals, it is inevitable that certain sectors will be marginalized to enable the focus. Some of these sectors that are bound to be marginalized are agriculture and food safety because a reallocation of priorities might lead to gaps in ensuring adequate measures for food safety and agricultural development.

4.6 Adoption of Cleaner Technologies: On the positive side, Nigeria's energy transition might encourage the adoption of cleaner technologies in agriculture, such as solar-powered irrigation or renewable energy-based storage facilities.³¹² This shift can enhance food safety practices by ensuring better control over factors like irrigation water quality and proper storage conditions.

Policy Adjustments: The removal of fuel subsidies and the energy transition might necessitate policy adjustments. Ensuring that these policies consider the impact on food safety and incorporate measures to mitigate any potential risks or challenges becomes crucial.

³⁰⁴ Emmanuel Onyedikachi Idogwu, 'Nigeria's Energy Transition: Challenges, Commitments and Solutions' Medium <https://medium.com/@OnyedikachiIdogwu/nigeria-as-energy-transition-challenges-commitments-and-solutions-7f59b2739e9c> accessed 3 January 2024.

³⁰⁵ Ibid

³⁰⁶ The Nigerian Economic Summit Group (NESG), 'Oil Price and Nigeria's Inflows' (2022) https://app.nesgroup.org/download_resource_documents/OIL%20PRICE%20AND%20NIGERIA'S%20INFLOWS_1650466753.pdf accessed 3 January 2024.

³⁰⁷ Ibid 39

³⁰⁸ Ibid

³⁰⁹ Okiki Adeduyite, "Breakdown of 2024 budget presented by Tinubu" Punch Nigeria, <https://punchng.com/breakdown-of-2024-budget-presented-by-tinubu/> last accessed on 2nd January 2024

³¹⁰ Ibid

³¹¹ Chinagorom Ugwu, '2024 Budget: Nigerian Govt's Curious Allocation of N1.2 Billion for Purchase of Office Building for Agric Agency' Premium Times Nigeria <https://www.premiumtimesng.com/news/headlines/655166-2024-budget-nigerian-govts-curious-allocation-of-n1-2-billion-for-purchase-of-office-building-for-agric-agency.html> accessed 2 January 2024.

³¹² Ibid 10

In summary, Nigeria's fuel subsidy removal and energy transition can have diverse effects on food safety. While shifts in energy sources towards cleaner technologies might offer long-term benefits, such transitions could initially pose challenges affecting agricultural practices, transportation, and energy availability, potentially influencing food safety practices within the country. Balancing these changes with adequate policy adjustments and targeted interventions is crucial to mitigate potential risks and ensure continued food safety.

5. Gender Perspectives on Food Safety in the Global South

In the Global South, gender roles and dynamics significantly influence food safety practices within diverse communities. These roles often shape responsibilities, access to resources, and decision-making processes related to food preparation, handling, and distribution.

5.1 Household Food Preparation: Food-related responsibilities, spanning production, acquisition, preparation, cooking, and disposal, tend to align with specific genders, varying across cultures. In traditional patrilineal societies, women typically assume unpaid homemaking roles, managing tasks centered within and related to the household. The care and handling of food are frequently linked to the identity of "being a good mother."³¹³

Traditionally, women have been primarily responsible for household food preparation in many communities. Their roles encompass not just cooking but also decisions related to food sourcing, storage, and serving. These responsibilities entail ensuring food safety measures, handling ingredients, and implementing hygiene practices within the household.³¹⁴

5.2 Local Agricultural Practices: In agricultural communities, gender roles often delineate tasks related to food production. Men might engage in larger-scale farming activities or livestock management, while

women are involved in subsistence farming, tending to home gardens, or small-scale agricultural activities.³¹⁵ These roles influence exposure to agricultural hazards, access to safe farming practices, and subsequent impacts on food safety.

5.3 Access to Resources and Knowledge: Gender disparities in access to resources like clean water, sanitation, education, and healthcare can significantly impact food safety practices. Women's limited access to resources and decision-making power may affect their ability to adopt safer food handling techniques or access information about proper food storage and hygiene practices.

Social and Cultural Norms: Societal norms and cultural practices often define acceptable roles and behaviors related to food safety. These norms can influence who is responsible for ensuring food safety within a community, shaping perceptions of foodborne risks, and affecting the implementation of safe food practices.

Vulnerabilities and Resilience: Gender-based vulnerabilities, such as unequal access to resources, limited education, or societal restrictions, can increase the risk of foodborne illnesses for women in particular contexts. Understanding these vulnerabilities is crucial to developing interventions that build resilience and promote equitable food safety practices.

Exploring these gender roles and dynamics reveals the multifaceted nature of food safety practices within the Global South. Acknowledging the influence of gender in shaping these practices is pivotal in devising inclusive strategies that empower both men and women to adopt safer food handling, storage, and preparation methods, fostering healthier and more resilient communities.

6. Assessing Gendered Impacts on Food Safety Amidst Energy Transition

The intersection of evolving energy paradigms and gender roles significantly influences food safety

³¹³ Cairns K, Johnston J, MacKendrick N, 'Feeding the 'Organic Child': Mothering through Ethical Consumption' (2013) 13(2) *Journal of Consumer Culture* in Eva C. Monterrosa et al, 'Sociocultural Influences on Food Choices and Implications for Sustainable Healthy Diets' <https://journals.sagepub.com/doi/full/10.1177/0379572120975874> accessed 2 January 2024.

³¹⁴ Brouwer ID, Hoorweg JC and van Liere MJ, 'When Households Run Out of Fuel: Responses of Rural Households to Decreasing Fuelwood Availability, Ntcheu District, Malawi' (1997) 25(2) *World Development* 255–

266, referred to in Eva C. Monterrosa et al, 'Sociocultural Influences on Food Choices' <https://journals.sagepub.com/doi/full/10.1177/0379572120975874> accessed 2 January 2024.

³¹⁵ SOFA TEAM & Cheryl Doss, 'The Role of Women in Agriculture' <https://www.fao.org/3/am307e/am307e00.pdf>, accessed on 3rd January 2024; Gender Roles, Family Relationships and Household Food and Nutrition in Ohafia Matrilineal Society in Nigeria Security <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6866251/> accessed on 3rd January 2024.

within the Global South. This section aims to evaluate the specific impacts of energy transition on food safety practices, elucidating the differential effects experienced by genders.

As energy transitions unfold, disparities in access to and utilization of modern energy sources can intensify existing gender-based vulnerabilities concerning food safety. Women, often bearing the primary responsibility for household food preparation, might encounter varied challenges in adapting to new energy technologies. Access to cleaner cooking methods or refrigeration, facilitated by evolving energy infrastructures, could enhance food safety measures.³¹⁶ Conversely, disparities in access might exacerbate existing burdens, reinforcing traditional roles and limiting women's opportunities to adopt safer food practices.

Conversely, alterations in agricultural practices driven by energy transitions may reshape men's involvement in food production, potentially impacting food safety from a production standpoint. Changes in agricultural techniques, irrigation methods, or post-harvest technologies influenced by new energy sources may impact the quality and safety of foodstuffs produced and handled by men.

Moreover, gendered impacts on food safety extend beyond production and preparation to encompass food distribution and market access. Changes in transportation infrastructure driven by energy transitions may create new opportunities or constraints for men and women engaged in selling and distributing food products. These shifts can influence the conditions under which food is stored, transported, and marketed, consequently affecting its safety and quality.³¹⁷

Understanding these nuanced gendered impacts on food safety amidst energy transitions is critical for devising targeted interventions. By recognizing and addressing the specific challenges faced by different genders, policymakers and stakeholders can develop

inclusive strategies that ensure equitable access to safer food practices and resources. Moreover, this comprehension fosters the integration of gender-sensitive approaches into energy policies, ensuring that energy transitions contribute positively to enhancing food safety across diverse communities within the Global South.

7. Toward Gender-Inclusive Strategies for Ensuring Food Safety

Addressing the gendered impacts of energy transitions on food safety demands proactive and inclusive approaches. This section aims to propose strategies that integrate gender perspectives into the promotion of food safety amidst evolving energy paradigms within the Global South.

7.1 Gender-Sensitive Education and Training:

Initiatives focused on education and training can empower both men and women to adapt to new energy technologies and modern agricultural practices. Tailored educational programs can equip women with skills to utilize cleaner cooking methods and food preservation techniques.³¹⁸ Similarly, providing men with training on improved agricultural methods can enhance their contribution to food safety.

7.2 Promotion of Inclusive Technologies: Designing and promoting energy-efficient cooking devices and post-harvest technologies that are accessible and user-friendly for both genders can contribute significantly to improving food safety.³¹⁹ Ensuring affordability and ease of use for women in household settings and men engaged in agricultural activities is pivotal for widespread adoption.

Enhanced Access to Resources: Equalizing access to resources such as finance, land, and agricultural inputs can empower both men and women to engage more effectively in safe food production and distribution. Ensuring equitable access to markets and transportation infrastructure is crucial for enhancing food safety practices across genders.

³¹⁶ UNDP, Gender and Energy, Gender and Climate Change Capacity Development Series Africa, Training Module 3 (2012) https://www.undp.org/sites/g/files/zskgke326/files/publications/TM3-Africa_Gender-and-Energy.pdf accessed 3 January 2024.

³¹⁷ FAO, The Future of Food and Agriculture, Trends and Challenges (2017) <https://www.fao.org/3/i6583e/i6583e.pdf> accessed 3 January 2024.

³¹⁸ UN Women, UNDP, UNEP, Empowering Women for Sustainable Energy Solutions to Address Climate Change

(2016) <https://africa.unwomen.org/sites/default/files/Field%20Office%20Africa/Attachments/Publications/2016/03/Empowering%20women%20for%20sustainable%20energy%20solutions%20to%20address%20climate%20change.pdf> accessed 3 January 2024.

³¹⁹ Archie Jarman et al., 'Post Harvest Technologies for Small Scale Farmers in Low- and Middle Income Countries: A Call to Action' <https://www.sciencedirect.com/science/article/pii/S0925521423002521> accessed 4 January 2024.

7.3 Policy Integration and Implementation:

Integrating gender perspectives into energy and food safety policies is imperative. Policymakers need to consider the differential impacts on genders and devise measures that mitigate disparities. Implementing policies that promote gender equality in energy access and agricultural practices can foster safer food production and distribution.

7.4 Community Engagement and Participation:

Involving both men and women in decision-making processes related to energy transition and food safety initiatives is essential. Community-based approaches that recognize and leverage the diverse knowledge and experiences of different genders can lead to more effective and sustainable solutions.³²⁰

By implementing these gender-inclusive strategies, stakeholders can pave the way for more equitable and safer food practices amidst energy transitions. Such approaches foster resilience, empower communities, and contribute to building sustainable and inclusive food systems within the evolving energy landscape of the Global South.

8. Integrating Forensic Science for Gender-Inclusive Food Safety Policies

Forensic science plays a pivotal role in elucidating and addressing gender-specific challenges within food safety amidst energy transitions. This section explores the integration of forensic methodologies to ensure gender-inclusive policies and effective mitigation strategies.

Some of these forensic methodologies include:

8.1 Data Collection and Analysis: Forensic techniques facilitate comprehensive data collection and analysis, enabling a nuanced understanding of gender-specific food safety challenges.

Understanding these nuanced perspectives of gender-specific food safety challenges necessitates the use of gender statistics.³²¹ For example, within the Christmas period of the year 2023, the National Agency for Food and Drug Administration and Control (NAFDAC), through intelligence gathering and data collection and analysis, intercepted counterfeiters who were involved in the production of a variety of beverages including wines, soft drinks and consumables in Eziukwu Market (Cemetery Market) Aba, Abia State. It destroyed over 1,500 cartons of the fake and substandard products and confiscated/evacuated about 300 cartons to NAFDAC warehouse.³²² These actions portend grave consequences to the unsuspecting masses who thronged to such markets to purchase drinks and beverages for the yuletide. It is worthy of note that the female gender is often responsible for purchasing these items meant for consumption and they very often are incapable of detecting the fakes. The food safety issues raised include but were not limited to microbiological hazards; misuse of food additives; chemical contaminants, biological toxins to say the least. According to Jane Ezirigwe, more than 200,000 persons in Nigeria die of food poisoning annually.³²³ This food poisoning is attributable to contamination through improper farming practices, processing, preservation and services. These improper farming techniques, food processing methods, as well as products adulteration are possible sources for food-borne diseases. By dissecting patterns and identifying vulnerabilities through forensic data collection, collation and analysis, policymakers gain insights crucial for tailored interventions.

8.2 Investigating Food Safety Incidents: Forensic science plays a pivotal role in examining incidents related to food safety. Its purpose is to uncover, recognize, and track threats to food safety, ensuring the production of safe, nutritious, and high-quality food for everyone.³²⁴ Increasingly, forensic science is employed in probing and resolving food-related

³²⁰ UN Women, UNIDO, Sustainable Energy for All: The Gender Dimensions (2014) https://www.unido.org/sites/default/files/2014-02/GUIDANCENOTE_FINAL_WEB_s_0.pdf accessed 3 January 2024.

³²¹ United Nations, Integrating a Gender Perspective into Statistics, Studies in Methods, Series F No. 111 (2016) <https://unstats.un.org/unsd/demographic-social/Standards-and-Methods/files/Handbooks/gender/Integrating-a-Gender-Perspective-into-Statistics-E.pdf> accessed 1 January 2024.

³²² Patience Ivie Ihejirika, 'NAFDAC Busts Fake Wines, Soft Drinks' Producers in Aba' Leadership <https://leadership.ng/nafdac-busts-fake->

[wines-soft-drinks-producers-in-aba/](https://www.leadership.ng/nafdac-busts-fake-wines-soft-drinks-producers-in-aba/) accessed 1 January 2024.

³²³ Premium Times, '200,000 People Die of Food Poison Annually in Nigeria - Prof. Ihenkurye' Premium Times ?? (11 October 2017); Nne Pepple, 'Environment and Food Poisoning: Food Safety Knowledge and Practice among Food Vendors in Garki, Abuja - Nigeria' (2017) 5 Journal of Health Education Research and Development 217; referred to in Jane Ezirigwe, 'Much Ado about Food Safety Regulation in Nigeria' file:///C:/Users/USER/Downloads/ajol-file-journals_549_articles_176459_submission_proof_176459-6469-451165-1-10-20180821.pdf accessed 1 January 2024

³²⁴ Saeida Saadat, Hardi Pandya, Aayush Dey, Deepak Rawtani, 'Food Forensics: Techniques

crimes, encompassing issues like food adulteration and fraud.³²⁵ ³²⁶ Investigations into food safety incidents using forensic methods aid in pinpointing the origin or cause of the issue, thereby attributing responsibility and preventing future occurrences.³²⁷ Sometimes, companies engage in food forensic inquiries with the aim of identifying issues that may have compromised the safety and quality of their products, to address consumer complaints or irregularities discovered during routine quality checks, and to safeguard the company's reputation and accountability.³²⁸

Without a doubt, forensic science aids in investigating foodborne illnesses or contamination incidents, helping identify the root causes and potential gender-based disparities. This knowledge informs targeted responses and preventive measures which address the specific vulnerabilities faced by different genders.

8.3 Ensuring Accountability and Justice: Forensic methodologies contribute to establishing accountability in instances of food safety breaches, ensuring justice and redressal for affected populations. Integrating gender-sensitive forensic approaches is crucial to address differential impacts on vulnerable genders.³²⁹

8.4 Enhancing Policy Implementation: Forensic science can enhance policy implementation in several ways:

Strengthening the quality and practice of forensic science: Forensic science research and development can help to improve the quality and practice of forensic science, including the development of new technologies and methods for detecting and analyzing evidence.³³⁰

Detecting and preventing food safety incidents: Forensic science can be used to detect, identify, and trace food safety threats and produce safe, healthy, and quality food for all.³³¹ It is increasingly being used to investigate and solve food crimes, including food adulteration and food fraud.³³²

Establishing Accountability: Forensic methodologies can help to establish the authenticity of food products and ensure that they are not counterfeit or adulterated.³³³ They can be used to detect the presence of harmful substances in food, such as pesticides, heavy metals, and other contaminants 2. Forensic investigations can help to determine the origin/cause of the incident and ultimately assign liability and prevent recurrences.³³⁴

Promoting Gender Equality: Skill-building programs tailored to the needs of different genders can be an effective way to promote safe food preparation and handling techniques, address gender inequalities, and empower women to become more active contributors to their households and communities.³³⁵

In summary, forensic science can enhance policy implementation by strengthening the quality and practice of forensic science, detecting and preventing

for Authenticity Determination of Food Products' Forensic Science International, Volume 333, April 2022 <https://www.sciencedirect.com/science/article/pii/S0379073822000731> accessed 1 January 2024.

³²⁵ Rainer Schubert, 'Food Forensics: Analysis of Food, Raw and Processed Materials with Molecular Biological Methods' Forensic Science International, Genetics Supplement Series (2008) https://www.academia.edu/74481854/Food_forensics_Analysis_of_food_raw_and_processed_materials_with_molecular_biological_methods accessed 3 January 2024.

³²⁶ Neil H. Mermelstein, 'Food Forensics: Investigating Food Crime' Institute of Food Technologists, Food Technology, January 2018, Volume 72, No. 1 <https://www.ift.org/news-and-publications/food-technology-magazine/issues/2018/january> accessed 3 January 2025.

³²⁷ John Schumacher, Charles Brown, Zachary Jason, Dennis Shelp, 'Forensic Investigations of Propane-Related Food Truck Incidents' Journal of the National Academy of Forensic Engineers, Volume 39, No. 2 (2022) <https://journal.nafe.org/ojs/index.php/nafe/article/view/811> accessed 3 January 2025.

³²⁸ Ibid 61.

³²⁹ Abby Reich, 'Shaping Gender-Sensitive Approaches to Food Safety in Traditional Markets' Global Alliance for Improved Nutrition <https://www.gainhealth.org/media/news/shaping-gender-sensitive-approaches-food-safety-traditional-markets> accessed 3 January 2024.

³³⁰ National Institute of Justice (NIJ), Forensic Science Strategic Research Plan, 2022-2026 <https://nij.ojp.gov/topics/articles/forensic-sciences-strategic-research-plan-2022-2026> accessed 3 January 2025.

³³¹ Joint Review of Forensics (2018) and Implementation Plan, GOV.UK <https://www.gov.uk/government/publications/joint-review-of-forensics-2018-and-implementation-plan> accessed 3 January 2024.

³³² Ibid 66.

³³³ Ibid 60

³³⁴ Jemimah Njuki, Sarah Eissler, Hazel Malapit, A Review of Evidence on Gender Equality, Women's Empowerment, and Food Systems, Science and Innovations for Food Systems Transformation (2023) ISBN 978-3-031-15702-8.

³³⁵ Ibid 66

food safety incidents, establishing accountability, and promoting gender equality .

By leveraging forensic insights, policymakers can fine-tune policy implementation, ensuring that gender considerations are embedded in regulatory frameworks. This approach strengthens the effectiveness of food safety policies, promoting inclusivity and equity.

8.5 Capacity Building and Training: Training programs integrating forensic techniques can empower stakeholders, including law enforcement, health authorities, and food regulators, to recognize and respond to gender-specific food safety challenges effectively.

The integration of forensic science in food safety policies fosters a more comprehensive and gender-sensitive approach. It not only aids in understanding the differential impacts but also strengthens the resilience of food systems within the evolving energy landscape of the Global South.

9. Strategies for Gender-Inclusive Food Safety Practices in the Global South

To ensure gender-inclusive food safety practices, it is essential to develop gender-inclusive strategies. This is paramount to ensuring equitable and effective food safety practices within the diverse communities of the Global South. key strategies that can promote gender equity and enhance food safety include:

9.1 Education and Training Initiatives: Implementing targeted educational programs that focus on food safety practices while addressing gender-specific needs. These initiatives should aim to empower both men and women with knowledge about proper food handling, storage, and hygiene practices, taking into account diverse cultural contexts and literacy levels. It should also educate them on the fact that practices related to food fraud/food adulteration will not harm strangers alone but can also harm themselves or their families as they could be subjected to the same adulterated foods outside their homes.

9.2 Capacity Building and Skill Development: Skill-building programs tailored to the needs of different genders can be an effective way to promote safe food preparation and handling

techniques³³⁶ These programs can equip women with skills in safe food preparation, while providing men with training in food handling techniques relevant to their roles in agricultural production and distribution.³³⁷

Such programs can help to address gender inequalities and negative gender norms affecting women's access to resources, services, and inputs, such as land, knowledge, food, and sociocultural taboos, which are both causes and consequences of poverty, food and nutrition insecurity.³³⁸ By providing women with the necessary skills and knowledge, they can become more empowered and better able to contribute to their households and communities .

In summary, skill-building programs tailored to the needs of different genders can be an effective way to promote safe food preparation and handling techniques, address gender inequalities, and empower women to become more active contributors to their households and communities .

9.3 Accessible Technologies: Promoting the development and dissemination of affordable and user-friendly technologies that enhance food safety. This includes innovations in food storage, preservation methods, and cooking technologies that are accessible and cater to the needs of both men and women in various settings.

9.4 Gender-Sensitive Policies: Developing policies and guidelines that explicitly consider gender dynamics in food safety practices. Policymakers should integrate gender-sensitive approaches into food safety regulations and programs, ensuring equal representation and participation of men and women in decision-making processes.

9.5 Community Engagement and Empowerment: Engaging local communities, including men and women, in participatory approaches that value their insights and experiences. This involvement fosters ownership of food safety practices and encourages the exchange of knowledge and best practices within communities.

9.6 Promoting Women's Empowerment: Empowering women by enhancing their access to resources, education, and decision-making power concerning food safety practices. Ensuring equal participation in community initiatives and programs

³³⁶ Food and Agriculture Organization of the United Nations (FAO), 'Gender and Food Security and Nutrition' [https://www.fao.org/gender/learning-](https://www.fao.org/gender/learning-center/thematic-areas/gender-and-food-security-and-nutrition/1/en)

[center/thematic-areas/gender-and-food-security-and-nutrition/1/en](https://www.fao.org/gender/learning-center/thematic-areas/gender-and-food-security-and-nutrition/1/en) accessed 4 January 2024.

³³⁷ Ibid

³³⁸ Ibid

fosters women's agency in implementing safer food practices.³³⁹

9.7 Monitoring and Evaluation: Implementing robust monitoring and evaluation frameworks that assess the effectiveness of gender-inclusive food safety strategies. Regular assessments help identify gaps and adapt strategies to better address gender-specific needs and challenges.

By implementing these gender-inclusive strategies, stakeholders can promote safer food practices that empower both men and women within the Global South. Ensuring gender equity in food safety not only contributes to healthier communities but also fosters resilience and sustainable development within diverse socio-cultural contexts.

10. Conclusion

The relationship between energy transitions and food safety is intricate and multifaceted, resonating across various stages of food production, distribution, and consumption. As nations navigate the shift towards cleaner and more sustainable energy sources, the implications on food safety within the Global South are undeniable.

From altered agricultural practices influenced by renewable energy adoption to changes in food processing, storage, and transportation, the effects of energy transitions ripple through the food supply chain. While these changes present opportunities for innovation, they also pose challenges that demand careful consideration.

The removal of fuel subsidies, a step seen in Nigeria's context, has brought to light the intricate balance between energy policies and food safety. Challenges stemming from increased costs, transportation hurdles, and shifts in resource allocation underscore the need for comprehensive strategies that safeguard food safety amidst evolving energy paradigms.

To navigate this landscape effectively, collaboration among policymakers, industries, communities, and consumers is imperative. Robust policies, innovative

technologies, and heightened awareness must converge to ensure that energy transitions not only advance sustainability but also bolster food safety standards.

The journey towards cleaner energy must be accompanied by a concurrent commitment to preserving and enhancing food safety. Striking this equilibrium is essential for fostering resilient and sustainable food systems that meet the needs of present and future generations across the Global South.

³³⁹ Das S and Mishra AJ, 'Dietary Practices and Gender Dynamics: Understanding the Role of Women' (2021) 8

Journal of Ethnic Foods 4 <https://doi.org/10.1186/s42779-021-00081-9> accessed 4 January 2025.