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The trade-off between gender, energy and climate change in Africa: the case of Niger Republic

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Abstract This article examines the role of gender in climate change adaptation and energy access in Africa. Drawing on the energy situation in Niger Republic, it argues that redressing gender concerns is critical to mitigating the impact of climate changes and energy poverty in the Sahelean country. A gender sensitivity analysis reveals that Niger is a take-off stage, a state of gender equity verified from the willingness of men to support women, as well as the entrepreneurial mindset of respondents coupled with supporting policies at both macro and micro levels. The study nonetheless recommends a more significant continental effort toward gender integration in energy planning processes. It also justifies the pursuance of alternative livelihood activities and an adjustment of policy frameworks towards universal energy access by 2030, as a means to breaking the vicious circle of limited income, increased vulnerability and narrowed opportunities that thwart gender equality and mainstreaming efforts in the country and across Africa.

Keywords Renewable energy · Gender mainstreaming · Climate change · Africa · Niger

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Introduction

Climate change is today regarded as one of the threatening environmental issues confronting humanity (He and Silliman 2019). A greater realization has emerged that gender, energy access and climate change have a more significant impact on development because women are disproportionately vulnerable due to their socially determined roles and fewer resources to cope with uncertainties triggered by excess reliance on climate-sensitive resources (Onwutuebe 2019). Besides, energy collection and utilization are also regarded the primary responsibility of women, especially in rural African communities, where energy supply is from traditional biomass fuels such as wood, charcoal and agricultural waste (Ketlhoilwe and Kanene 2018). Admittedly, there have been efforts to address gender in renewable energy, particularly at household level through initiatives like clean cooking stoves and small-scale business opportunities (Nelson and Kuriakose 2017).

Nonetheless, there is still limited attention to gender perspectives, mainly related to renewable projects, as revealed by Ellabban et al. (2014). Such a phenomenon has contributed to many cases of failed renewable energy across the continent of Africa, of which Niger is no exception (ECREEE 2019; World Bank 2017). This paper, therefore, seeks to evaluate the trade-off between gender, energy and climate change in Sekoukou community in Niger, as part of

the authors master thesis on community acceptability of renewable energy and its implication for climate actions in Africa: the case of Niger.

Habtezion (2013) acknowledges that despite the social injustice women are battling with across developing countries, they can still play demanding roles concerning climate change due to their substantial local knowledge, and resource management capacity. Additionally, recent results show that women involved in local leadership have produced positive results (Rincón et al. 2017; Yang et al. 2019; Zenger and Folkman 2019). As such, the UNFCCC (2017) predicts that countries that allow more representation of women in parliament are likely to set aside protected land areas and to ratify multilateral environment agreements towards sustainable development.

Although some countries are making advances towards gender parity, there is still more room for improvement toward reducing inequalities which hinders over 2.7 billion women from having the same opportunities as men (Iqbal 2018). It has been estimated that 155 out of 173 countries have at least a law that deters the economic empowerment of women, with most women in these countries spending an average of 2.5 h more of time than men on either underpaid or unpaid domestic and care work (UN Women 2015b; World Bank 2016). There is also evidence of women who end up working for long hours, due to the presence of electricity in their communities because their families expect them to do house chores and still undertake other activities to increase their income levels (Ley 2017). All these worrying phenomena indirectly thwart efforts at promoting gender in climate change and energy planning, as the socio-economic development of women is highly critical to their empowerment (Mearns and Norton 2009). Habtezion (2013) believes that should countries up their efforts in closing the gender gap; it could translate into adding $12 trillion to annual global GDP growth by 2025. Gender mainstreaming in climate change and energy access initiatives should, therefore, be treated with all the seriousness it deserves to help achieve inclusive growth (UN Women 2015a).

Gender mainstreaming

Gender mainstreaming is a globally endorsed strategy for advocating gender equality in diverse fields (UN Women 2015b). It is regarded not as an end in itself, but a plan, an approach, and a means of achieving the goal of gender equality. Available pieces of literature on gender mainstreaming are consistent with the fact that gender mainstreaming is not a zero-sum game in which women alone stand to benefit while men suffer (ESF 2013; UN Women 2015b). The concept is explained as not "simply adding a women's component or even a gender equality component into an existing or planned activity", it is about thinking differently and modifying interventions so that they will benefit men and women equally, and transform social, economic and institutional structures towards gender equality and women's empowerment in climate action energy access and resilience-building (Glemarec et al. 2016).

As suggested by Habtezion (2013) and UNDP (2012) to comprehensively balance gender, energy and climate change impact, intended actions ought to be done in consultation with women, to help build and embody their knowledge and skills that could translate into revamped literacy, health and livelihood sources. Although Glemarec et al. (2016) predict that it will take 50 years to achieve gender parity in politics and 81 years for the closure of the gender gap in economic participation and opportunities, advancing women participation in both energy climate change discourse will still have a considerable impact on various SDGs, particularly Goal 7, 5 and 13, which target energy access, gender equality and action to combat climate change respectively. There is the need to, therefore provide adaptive actions aimed at improving the asset-based of women to empower them to respond to climate impact and energy poverty at both local and national levels proactively. It is a requirement, given the fact that productive resources like land, credit facilities, good health and education, can position women to read and understand earlier warnings, be financially empowered to diversify livelihood and income where necessary.

Gender and climate change

Gender concerns relating to climate change was first addressed in 2001 at the Conference of the Parties (COP 7) in Marrakech, Morocco; afterwards, at COP18 in Doha, Qatar, there was a decision to promote the goal of gender balance in regulations and as a standing item on COP agenda. At 2014, COP20 in Lima, Peru, the UNFCCC called for an action plan to develop a two-year programme on gender called the Lima Work Programme on Gender (Glemarec et al. 2016). It is from this background that in 2015, the UNFCCC Paris Agreement formalized and acknowledged that

> …Climate change is a common concern of humankind; Parties should, when taking action to address climate change, respect, promote and consider their respective obligations on human rights. The right to health, the rights of indigenous peoples, local communities, migrants, children, persons with disabilities and people in vulnerable situations and the right to development, as well as gender equality, empowerment of women and intergenerational equity (UNFCCC 2015).

Over a period, climate change attention has always been on renewable energy sources and technologies that aim at reducing carbon emissions to the neglect of gender participation in addressing various climate concerns. It is, however, a known fact that the fatal ramification from earth failure to keep warming low, leading to droughts, flooding, water scarcity among others is being felt more by the poorest and vulnerable particularly women (Habtezion 2013; Rao et al. 2019). There is again a crossing between gender and climate change with women sharing a greater brunt due to their excessive dependence on natural resources and societal inequalities shaped by structured and institutionalized disparities. Even at levels of negotiations, policy-making and implementation, women are disproportionately left out, with their voices and needs absent just as in research where there is an undermined interaction between gender and climate change (Jerneck 2018; Schuller 2018; UNFCCC 2017). In light of this, Jerneck (2018) advocates for gender inclined studies that expound women as not belonging to a homogenous entity. It is also imperative to critically examine policies and programmes at both national and local levels tailored to address vulnerability and poverty, primarily, as the world moves towards the post-Kyoto climate regime. Moreover, there is the need to keep an eye on the interplay between gender and climate change, and this ought to also include technologies and strategies, meaning that "actions, technologies and strategies need to be pro-poor and gender-responsive in their design, implementation, monitoring and evaluation" (Habtezion 2013). Besides, undertaking an inside out and proof-based analysis of women and men's roles in areas affected by climate change and their approach for adapting to the changes is imminent.

Renewable energy and gender

Renewable energy is also indispensable in ensuring gender equality, energy security, climate change mitigation and a scale down health effect of conventional energy usage (IRENA 2019). It also carries enormous consequences in achieving the SDG's goals particularly on gender equality (SDG 5), clean and affordable energy (SDG 7), inclusive growth and economic growth (SDG 8) and climate action (SDG 13) which are all jointly reinforcing. It is in light of this circumstance that the 2030 Sustainable Development Goals emphasizes gender equality by stressing that the "systematic mainstreaming of a gender perspective in the implementation of energy initiative is crucial". Alarmingly, comprehensive information on the gender trends and progress in the renewable energy sector is still limited, coupled with complicated socio-economic and environmental difficulties and unequal energy access and consumption (IRENA 2019; UNDP 2012). Studies reveal that the majority of women in developing countries spend on the average over 1.4 h fetching firewood a day and 4 h cooking, these increases their proneness to ailments that emanates from indoor pollution. The World Health Organization reveal that over 4 million deaths per year from pneumonia, heart disease, lung cancer and strokes are associated with household air pollution (WHO 2018), this phenomenon also translates into over 58 million children globally, not attending school and 100 million not completing primary school education, of which the majorities are females (IEA 2018). Sustainable energy in the form of clean fuels and efficient cookstoves have the potency to reduce the average

time women use in fetching fuelwood. Such hours can be used for other economic activities to generate income (GGCA 2016; IRENA 2019). In addition, steady alterations in social and cultural patterns, improved self-perception and empowerment, as well as overall livelihood enhancement, are some premiums that can be derived from gender mainstreaming in the energy sector. In Indonesia, for example, the training of women in clean energy technologies has indirectly influenced the lives of over 250,000 families. About 20% of these women are empowered within their communities to take on a more significant role in household decision making –and almost half of them perceived an improvement in their status (IRENA 2019). There are about 10.3 million people who have been employed in the energy sector globally since 2017, and this represented a 5.3% growth in previous years; out of this figure, 3.4 million were in the solar industry alone (IRENA 2018). In South Africa, over 35,000 renewable energy sector jobs have been created in solar PV, concentrated solar power (CSP) industry and wind energy sector in the year under review (2018). A 155 MW Nzema Solar plant in Ghana has created 500 jobs during its 2-year construction, and 200 permanent operational jobs. The facility could create additional 2100 local jobs through subcontracting and demand for goods and services (IRENA 2018). Other efforts across Africa include the training of 37 women from 22 countries in the Women in African Power (WiAP) program. Under the auspices of Power Africa and the University of South Africa graduate school of Business leaders (UNISA-SBL), the WiAP programme provides a regional platform for networking, mentorship and business opportunities in the energy sector for women across Africa (African Energy Portal 2019). In a related manner, the government of Niger through the Nigerian Agency for the Promotion of Rural Electrification (ANPER) has secured a 9.5 million euro grant to train over 21,000 women in rural areas on renewable energy technologies, the joint programme between Senegal, Mali and Niger seeks to create employment for the rural folks through renewable energy training. These examples above and many others suggest that women involvement in renewable energy is gaining popularity because of the unending socio-economic benefits it can offer a country. It also augment the prediction by IRENA (2018) that women will be an essential part in the estimated 23.6 million and 28.8 million jobs that are to be created in the renewable energy sector alone in 2030 and 2050 respectively.

Barriers to gender in the renewable energy sector

Despite the promising prospects women have in the renewable energy sector, there are still numerous barriers forestalling their entry into the sector, as indicated in IRENA (2019) survey report. The survey summary as depicted in Fig. 1 establishes that women are discriminated in the renewable energy sector with causative factors varying from continual stereotypes about gender roles to imbalances in the Science, Technology, Engineering and Mathematics (STEM) fields. Other factors include narrowed awareness about a career path in the renewable energy sector as well as lack of enthusiasm in both private and public institutions working in the renewable energy sectors to employ women.

The inadequate involvement of women in decision making about energy and to a more considerable extent their prevailing hiring practices affirms Fakier (2018) assertion that women inclusion in decision making especially in Africa is highly being ignored with its root traced to environmental racism and sexism. For some women who have even had some form of education in the field of STEM, there are still excuses such as "marriage should be the next accomplishment for a lady especially after a degree instead of pursuing a career in the field of STEM" (Ahmad et al. 2019), this has resulted in a missed opportunity in the energy sector for skilled and talented women who can influence the renewable energy value chain in Sub Saharan Africa (Ahmad et al. 2019; Allen et al. 2019; Danielsen 2012).

Case study

The geographical location of Niger Republic

Niger Republic is a landlocked country located in West Africa just to the south of the Sahara Desert. The country shares a border with Algeria and Libya to the North, on the West by Burkina Faso and Mali, on the South by Benin and Nigeria and on the East by Chad. Niger has a landmass of 1,267,000 km^2 (490,000 sq. mi), which makes it the largest country in West Africa.

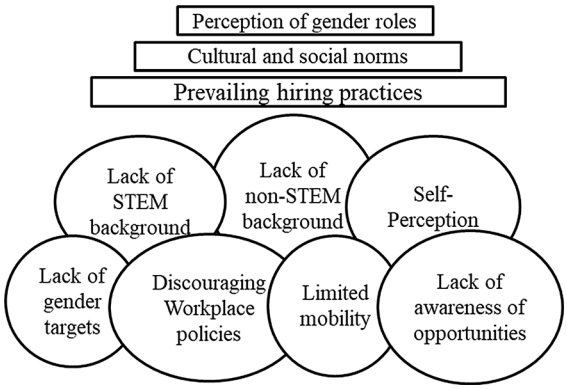

Fig. 1 Summary of barriers preventing women from the renewable energy sector. *Source*: IRENA (2019)

Most of the territory lies in the semi-arid and arid areas such as the Sahel and the Sahara with two-thirds of the country's landmass covered by desert. The population of Niger as of 2017 stood at 21 million with a growth rate of 3.9%; this growth rate is considered one of the highest rates globally (World Bank Group 2017). Niger also has a tropical climate with two main seasons, which are the dry season extending from October to May, and the rainy season from May to September. The humid regions are mainly located in the southern part of the country and around the Niger River valley, which is the largest river in the country. The Niger River extends to 500 km across the country (Saddam 2018). The country records hot temperatures up to 44 °C at certain times of the year, especially around April and May. The rising temperatures and food crisis are attributed to climate change (UNDP 2016). Niger is very rich in terms of energy potential with varied sources ranging from biomass (firewood and agricultural residues), mineral coal, oil, natural gas, uranium, hydroelectricity and solar energy. The national average annual production of uranium is around 5000 tons, which makes the country the biggest uranium producer in Africa and the fourth in the world behind Australia, Canada and Kazakhstan (Kløcker Larsen and Alzouma Mamosso 2013). According to ANPER (2018), the national energy access rate of Niger is 12.93%. The energy production and usage are more than 80% dominated by biomass in the country. While over 90% of total energy consumption is by household, the transport sector uses close to 8% of energy. Trade, industry and agricultural sectors also use 2% of the total energy in the country (Cudennec 2017).

The case study location

Sekoukou community is a remote village about 46 km from Niamey (the capital city of Niger) as shown in the Map of Niger in Fig. 2. The community is geographically on latitude 13,016′24.1 and longitude 2021′54.8 with an altitude of 185 m above the sea level. Five main groups of agglomerated hamlets form Sekoukou community. Saberi and Kollo are the nearest towns' inhabitants' visit for administrative purpose, health care and other needs, which are not available in the community. Agricultural activities, mainly farming and fishing, are also the primary income sources for the community. Sekoukou was chosen as the case study location because of its energy supply which is dominated by the traditional use of biomass mainly firewood and lamps with disposal batteries. Additionally, gender inequalities and climate change influence on livelihood activities equally lead to the choice of Sekoukou community. The community, was also an ideal place to assess awareness of alternative energy because it had benefited from a solar demonstration project by the West African Science Service Center on Climate Change and Adapted Land Use (WASCAL) centre of the Abdou Moumouni University in 2018.

Methodology

This study used a concurrent mixed-method approach that relied on phenomenological approaches (Giorgi 2016). These approaches helped in physical observation, interviews and inquiries that led to an in-depth understanding of various questions asked (Creswell 2009). It further aided in appreciating the socio-economic dimension of responses, the experiential and psycho-social aspect of respondents and as well the conclusive remark on the relationship between gender, and as renewable energy within the research duration without any form of bias or personal experience (Batel 2018; Creswell 2009).

A gender sensitivity analysis to further examine the role of women towards bridging energy access gap and climate adaption processes were used to measure the level of gender influence and participation and how

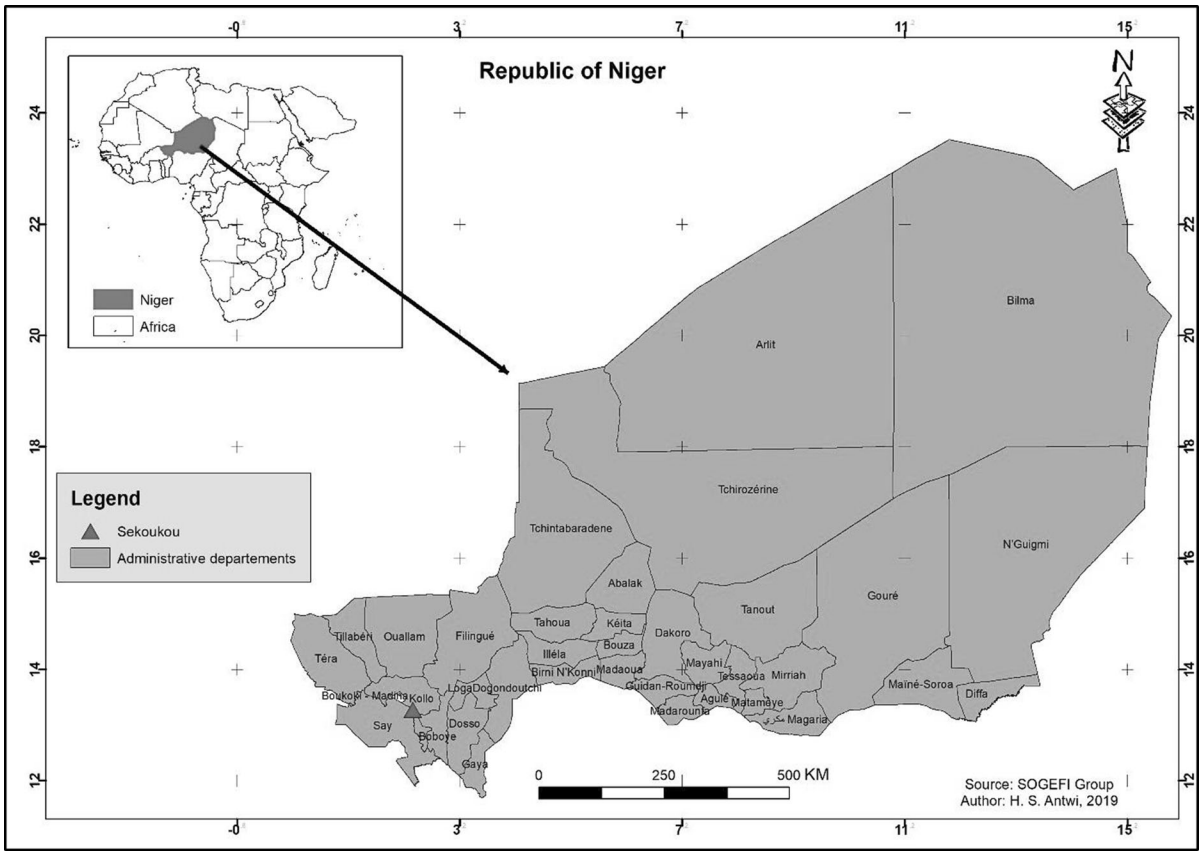

Fig. 2 Map of the Niger Republic. *Source*: Nationsonline (2017)

that can could help mitigate climate change and reduce energy poverty. The target population of respondents ranged from 15 years and above from 120 households. Yamane (1967) formula (*explained below*) was used to extract the sample size from the target population.

N = population size, n = corrected sample size, e = margin of error (MoE), e = 0.05.

$$N = \frac{N}{(1 + Ne^2)}. \text{ Therefore } N = \frac{102}{(1 + 102 \times 0.05^2)} = 81.27 \simeq 82.$$

To avoid research bias while allowing every member in the selected household to have the same chances of being interviewed; a simple random (a probability) technique was employed. Numbers were assigned to the 82 households and then 50 households randomly selected through the lottery method. In each of the fifty houses, selected persons aged 15 years and above became the respondents. Only 50 households were interviewed due to respondent absences and the realization of no significant differences in responses given by most of the household members visited. It could not, however, affect the study results as Nachmias and Nachmias (1996) supports generalizing findings from a halved sample size. In addition to the bio-data of respondents gathered, other questions centred on climate variation, challenges with lighting and cooking sources of energy as well as sets of questions as inputs for the gender sensitivity analysis. Two separate focus group discussions (FGD) were also held for males and females in the community. The first discussion was on Tuesday, 17 April 2019, with 13 men in attendance. On Wednesday, 18th April 2019, 17 women also participated in the second focus group discussion. The two FGDs were used to gather more perspectives and opinions and also to verify some earlier responses gathered interviews. Purposive sampling was also used in selecting five key

informants from the Ministry of Energy, ANPER,[1] a private firm and the Ministry of Environment (water and forest) and community elders (including the chief of Sekoukou, women leader, and the head-teacher of the local primary school).

Results and discussions

Sex ratio

Households interviewed consisted of 29 females and 21 males. Table 1 also indicates that respondents studied (36%, n = 18) were female household heads while 64% (n = 32) of household heads were males. The gender of household heads has a profound impact on household energy usage.

As indicated by Rahut et al. (2017) unless considered well-off, female-headed households would remain prone to fuelwood, to meet their energy needs.

Energy sources

Sekoukou community just as numerous other rural comminutes in Niger has no connection to the national grid or any mini-grid. Both primary and secondary sources revealed that only 0.93% of rural Niger has electricity connection (World Bank 2018). Survey data shows that the majority of the sampled household in Sekoukou (62%) use torchlight as a primary energy carrier for lighting. Cooking in Sekoukou is also done on three stone traditional stoves with firewood. The community identifies firewood as an abundant gift of nature or resource that comes with no cost to meet various demands. Respondents were oblivious of any other cooking fuel aside that of firewood. Some respondents during FGD, however, acknowledged knowing about Liquefied Petroleum Gas (LPG), but they grimaced as it as an alternative option to consider. A respondent said, "We hear about gas burning homes and property in Niamey sometimes, bringing it here can cause damage to us". Another respondent gave an account of a gas-related disaster "I was in Niamey for my brother's wedding. There is a shop close by where they use gas in working, we heard a loud blast, and when we later came out all the shops along the road was burning, we helped in fighting the fire with sand while others brought water from their houses, but many shops got burnt"—she narrated. These series of responses brought to light the ill-informed perception of alternative fuels like LPG. With an average household size of seven in Sekoukou, most families were either cook ones or twice instead of the usual thrice (breakfast, lunch and supper) as a result of increasing scarcity of firewood triggered by climate variation and excess demand. A respondent narrated—"I cook twice nowadays because I cannot waste firewood. I do all the cooking in the evening, and then the next morning we eat the remaining. I leave the food on the pot so by morning between 5 and 7 am it will still be in good condition to eat. There is no option to heat the food every morning because I am the only one at home fetching firewood." A respondent also related that "We do not even sometimes get the firewood. Therefore, the little one gets cannot be used within a day. You have to manage it for at least 2 days or a week. Even if you want to buy, sometimes they are out of stock". On the other hand, the field observation and interviews showed, women and children were mainly responsible for the time-consuming activity of collecting the firewood, which invariably affected the time the young children especially the females spent in school, and for other productive activities. Respondents indicated that they spend an average of 6–7 h in searching for firewood to meet household energy needs. In line with what Burke and Dundas (2015) said, "the income capabilities of a household may be affected if it spends more time in search of firewood for household consumption. Other severe implication is the prevalent health concerns and ailments suffered by respondents. Such ailments include cough, headache, chest pains, and catarrh as well as eye problems, burns and smelly bodies as indicated by respondents. These revelations affirmed Silwal and McKay (2015) and Langbein (2017) studies that firewood could lead to respiratory and cardiovascular health effects on users. It also justified the World Bank report of over 384 million premature deaths a year worldwide caused by cooking with open fire from sources like firewood (World Bank 2015).

Climate change in Sekoukou

Respondents in Sekoukou believe strongly that climate change is caused by natural, man-made and other

[1] The Nigérienne Agency for the Promotion of Rural Electrification (ANPER).

Table 1 Respondents gender and household heads. *Source*: Author's field data (2019)

Gender	Frequency	Percentage	Household head	Frequency	Percentage
Female	29	58	Female	18	36
Male	21	42	Male	32	64
Total	50	100	Total	50	100

factors, with 64% (n = 32) alluding climate change to natural causes. Respondents were conscious of tree cutting, and its impact on the environment as a leading cause of climate change as such 32% (n = 16) believe it is caused by human activities; nonetheless, a few had a divergent perception, they attribute climate change to different factors. One indicated that it was the wickedness of the government, that has brought about the harsh weather condition. Another respondent also believes it to disobedience on the part of the community members. "Previously we all worshipped one God, but presently some people have travelled and brought in smaller gods from some places, Allah is angry with us here, so he is punishing us with hot conditions until we change our attitude"—he alleged.

Many of the respondents (94% n = 47) consented to the severe changes in the weather, which has triggered numerous negative consequences in the community, while 6% (n = 3) maintain the temperatures are average in contrast to what others had suggested. In the FGD with the men in the community, it became known that the increasingly hot temperatures were affecting agricultural productivity. A respondent recounted that he uses to far from 7 am to 10 am before the sun gets hot that that pattern has since changed, forcing him to work shorter period on the farm. Temperatures in Sekoukou as of the time of field study was between 29° and 37°, which certainly made it challenging to even be on the field for long hours for data collection in the afternoon. Majority of respondents ability to identify climate change in the community and its resultants impacts contradicted Tripathi and Mishra (2017) earlier assertion that rural farmers are somewhat aware of climate change but do not know the factors that cause the changes. The overall, responds reveal that Sekoukou community, like many other communities in Niger, have their domestic energy for cooking and lighting from firewood. Women also spend most of their time in fetching firewood. Not only are they limited in opportunities to pursue alternative, income-generating activities, the over-reliance on firewood also affects the environment. Inadequate access to energy at home and the lack of income-generating activities as stated by Alam et al. (2017), also results in poverty, low productivity and high exposure to health risks.

Gender sensitivity

A gender sensitivity analysis to understand the roles and levels of participation of both males and females opened the doors in understanding various regulations, by-laws and programmes pertinent to gender and its implications on living standards in Sekoukou. As recommended by the European Institute for Gender Equality (2019), the following indicators lead discussions in two separate focus group discussions.

Will the unequal distribution of income between women and men change? Responses from the two separate focus group discussions (*males* n = 13 males, *females* n = 17) and interviews (n = 50) confirmed the unequal distribution of income between women and men. "I have not undertaken any economic activity since I married; it is my husband who engages in fishing to feed us"—a female respondent commented. Another respondent also stated "Some of us do not have any income-generating activity. We rely on our husbands to buy us some necessities, especially after the farming season is over." Although these assertions were familiar, it also emerged that a few women were taking up initiatives like petty trading. Some women admitted in the FGD that their husbands were not allowing them even to go out, but after seeing, the success of others who were trading, the narratives of their husband started to change; a handful of men also admitted they were in the progress of giving their wives seed capital to start a business. One of the respondents acknowledged that her husband initiated the idea of fish selling in Niamey. Through that, she

confessed, earning enough income for her household. It also emerged that some men do force their wives to give them money from their business for self-gratification. Whereas the majority of male respondents at the FGD refuted such an assertion, a respondent during an interview raised the point of continuous misunderstanding with her husband over business and finances, which led to an ultimate divorce. By juxtaposing all comments and responses feedbacks together, one can conclude that the men of Sekoukou are not too keen on preventing their wives from undertaking activities that can help them earn an income to improve their standard of living.

Will the unequal use of time change? At the focus group discussion, male respondents expressed unflinching support for their wives to undertake income-generating activities; however, the issue with time remain topical because of the burdensome household activity schedules, which does not favour women, thereby limiting their chances of having enough time to undertake any other activities primarily related to income (Stratton 2015). For example, in Sekoukou, the gathering of firewood is the sole responsibility of women in the community. Thus, women spend most of their time in search of firewood, thereby leaving them with limited time for other productive ventures. Responses from the FGD and interviews alluded to the conclusion that disparities with time will somewhat remain open because some women themselves find the supply of firewood as a daily mandate that must be fulfilled. For instance, a female respondent said, "I must ensure that there is firewood in the house every day before I think of any other thing when I first wake up". Field observations also led to the realization that different group of women at different times of the day were seen with bundles of firewood on their heads. In essence, the time for both men and women may still vary because a more substantial proportion of the household activity schedule still favours the men.

Will women security improved? Issues of security related to fear, harm or death or severe domestic violence are infrequent in Sekoukou. As such, there may not be any harsh indictment on the security of women. Though negligible presently, incidents of petty robbery and theft may not be ruled out entirely in future as more women engage in buying and selling activities.

Can women employment increase? Although 74% of respondents stated not having any immediate business plan in mind, 13% knew a business they could venture into once there is electricity in Sekoukou. Selling of Sobolo (local drink), ginger drinks and ice-blocks, fish, and ice water, as well as recharge cards and general merchandise at night, are examples of businesses the women expressed interest in doing. At the national level, the involvement of women in renewable energy can help create jobs. For those who desire to be trained by the government through programmes and policy like the Economic Development of Women in Renewable Energy (DESFER) and ENSAP Project there has been funding to begin such training (ANPER 2018). Thus, all things being equal, the presence of electricity and training programmes on renewable energy can increase employment.

Can gender-based psychosocial health risk be reduced? The factors that trigger social, mental, emotional, and spiritual health risk from the use of unclean energy sources for cooking among others as mention by respondents will reduce to a significant level should there be an introduction of improved cookstoves and electricity in Sekoukou. "My daughter suffered first-degree burns and collapsed while she was cooking porridge with firewood; till today, she has red skin on her legs. She underwent over 5 years of traditional healing process. At a point, she was taken to Cotonou (in Benin where her father lives) for healing, but it did not work until she came back to Niger for healing"—a respondent recounted her ordeal with using firewood. Besides, other climate-induced health risks like vector-borne infections, heat rashes and headache would remain much higher in Sekoukou however, having alternative livelihood sources and income for medication and treatment can latently help beat down the overall impact (Ebi et al. 2017; Von Schirnding et al. 2002).

Tangible results and policies in place? Information from literature and key informants' interviews suggest that the government of Niger through various development partners and private agencies have rolled out plans and strategies that aim at promoting gender (therein women especially) in both climate and energy access programmes. These include women involvement in Sustainable Forest Use Project (CNEDD)—an afforestation and environmental training programme for women in rural communities. There is also the National Center for Solar Energy (CENES) training

for both men and women in solar installation. A legislative instrument, Act 1998, 056 Laws and the Forestry Law of 2004 also seeks to enforce forest laws across Niger through forest watchdog committees. Other plan interventions include the building of a food buffer stock and a fishpond to rear and sell fish to the nearby communities and at market centres. The government, in partnership with Plan International-Niger and a host of other agencies, has instituted the Economic Development of Women in Renewable Energy (DESFER) programme to mainstream women into the renewable energy sector.

Conclusion and policy recommendations

The gender sensitivity analysis with indicators from the European Institute for Gender Equality (EIGE) shows that Sekoukou community is at a take-off stage. A stage of gender equity verified from the willingness of husbands to support their wives, as well as the entrepreneurial mindset of respondents and supporting policies at both macro and micro levels. Findings further reveal that the lack of improved energy sources and the implications of climate change has compelled Sekoukou community to work together regardless of socio-cultural barriers as evident from the affirm readiness of respondents to voluntarily engage in programmes or activities that can help reduce their level of energy poverty indirectly triggered by climate change impact in the community. The level of zeal, readiness and commitment to action among the people of Sekoukou is also a good indicator for a climate change or alternative energy initiative as their readiness to participate can be capitalised on to promote ownership and responsibility. In spite of these positive signs, there are still evidence of limited women involvement in decision making as a result of limited regards for gendered nature of daily realities and experiences at local communities which reflects the common trend in Niger and across many other Africa countries as also reported in other studies (see e.g. Agbemabiese et al. 2012; Allen et al. 2019; Hafner et al. 2018; Rao et al. 2019; UNDP 2016).

Although, economic empowerment of women through climate mitigation and adaptation can foster socio-economic development, reduce poverty, keep environmental problems in check, and increase the potential for adaptation, yet that has not been sufficiently exploited. Economic empowerment of women in Sekoukou community is therefore recommended. de Groot et al. (2017) assert that a transition from biomass fuels to modern energy services, for instance, can be possible when income increases. Without any income-generating opportunities, it will be difficult for sustainable energy transition and climate change actions to be realized. Emphasis also on energy for entrepreneurship and micro-credit facilities, will enable the community to break the vicious circle of limited income leading to deficient energy, which invariably affects gender equality, and mainstreaming efforts (Brew-Hammond 2010; Wamukonya 2002).

Also, the adaptation of educational training and skills development that empowers women to seize opportunities and to take charge of their environment will help strengthen the capacity of the community to respond to challenges related to energy and climate change. Such, training should be in both technical and non-technical areas in a formal and informal environment. The government and non-governmental agencies and private agencies can also support the process. These kinds of education and training can further help in intensifying the prominent roles women are playing and can play in the field of energy and climate actions. It can also assist in erasing the erroneous perceptions rooted in cultural and social construct people have about women leading economic and social changes.

At the level of policy and practice, deliberate effort to engender policies at national levels is essential. A biased approach with a gender equality vision; gender-sensitive operational guideline; and a database of sex-disaggregated data to execute gender-responsive projects and programmes will help in identifying the gaps, and to understand women's access to and control over resources, labour patterns, resources use patterns, the status of women's rights, and the distribution of benefits between and among women and men (Bdr and Leduc 2009). Institutional appreciation for gender in energy and climate change processes will go a long way to shape national and local policies and directions across Africa. One such remarkable case of gender inclusivity in a policy process so far is in the ECOWAS sub-region. The Economic Community of West African States (ECOWAS) in 2013 implemented a gender mainstreaming in energy access in ECOWAS policy formulation and implementation in the sub-region (ECREEE 2015; IRENA 2019). The policy

aims at making women critical players in the energy sector not just as end-users but also as business owners and policymakers, with the overall goal of promoting the achievement of 2030 universal access to energy. Since 2015, the implementation progress has been on track with regular inputs. One of such inputs is the 2017 regulation that ensured gender assessments in all energy projects. The success of this gender policy is a model presently being adopted by the East African regional bloc through the implementation of a Gender and Sustainable Energy Situation Analysis since 2018. The East African Regional gender analysis policy also focuses on identifying challenges that slack efforts to attain gender equality in the sub-region.

In terms of a research agenda, this study found a dearth in literature regarding gender, energy and climate change nexus, particularly in Africa. Exhaustive studies by researchers, interest groups, policymakers and civil societies that can buttress arguments on the roles gender can play in climate adaptation, and energy transition process will be required to help unearth various challenges in the nexus and to promote gender-aware policy programmes and decisions that will offer women, in particular, a voice at all stages of decision making. It will also enable not only Sekoukou community but Niger and for that matter sub Saharan African countries to leap from energy and climate vulnerability (Nelson and Kuriakose 2017; Rao et al. 2019). If these barriers and its underlying causes are not removed, it would be a lost opportunity not only for women in Niger and Africa alone but a jab at global efforts towards attaining an inclusive and sustainable development as women, in particular have proven capabilities to aid in reaching universal energy access and climate resilience when given the chance to function.

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Compliance with ethical standards

Conflict of interest I confirm that the article has conformed to all ethical standards. There are no conflicts of interest.

References

African Energy Portal. (2019). *African energy portal, young women from across Africa graduate from "Women in African Power" program.* https://africa-energy-portal.org/news/young-women-across-africa-graduate-women-african-power-program.

Agbemabiese, L., Nkomo, J., & Sokona, Y. (2012). Enabling innovations in energy access: An African perspective. *Energy Policy, 47*(Suppl 1), 38–47. https://doi.org/10.1016/j.enpol.2012.03.051.

Ahmad, A., Kantarjian, L., El Ghali, H., & Maier, E. (2019). *Shedding light on female talent in Lebanon's energy sector*. https://documents.worldbank.org/curated/en/825071556265367449/Shedding-Light-on-Female-Talent-in-Lebanon-s-Energy-Sector.

Alam, G. M. M., Alam, K., & Mushtaq, S. (2017). Climate change perceptions and local adaptation strategies of hazard-prone rural households in Bangladesh. *Climate Risk Management*. https://doi.org/10.1016/j.crm.2017.06.006.

Allen, E., Lyons, H., & Stephens, J. C. (2019). Women's leadership in renewable transformation, energy justice and energy democracy: Redistributing power. *Energy Research and Social Science*. https://doi.org/10.1016/j.erss.2019.101233.

ANPER. (2018). *National policy document on national electricity*. https://anperniger.ne/index.html.

Batel, S. (2018). A critical discussion of research on the social acceptance of renewable energy generation and associated infrastructures and an agenda for the future. *Journal of Environmental Policy & Planning, 20*(3), 356–369.

Bdr, M., & Leduc, B. (2009). *Guidelines for a gender sensitive participatory approach what is a gender sensitive participatory*. Lalitpur: ICIMOD. https://www.icimod.org/resource/1288.

Brew-Hammond, A. (2010). Energy access in Africa: Challenges ahead. *Energy Policy, 38*(5), 2291–2301. https://doi.org/10.1016/j.enpol.2009.12.016.

Burke, P., & Dundas, G. (2015). Female labor force participation and household dependence on biomass energy: Evidence from national longitudinal data. *World Development, 67*(March 2015), 424–437. https://doi.org/10.1016/j.worlddev.2014.10.034.

Creswell, J. W. (2009). Editorial: Mapping the field of mixed methods research. *Journal of Mixed Methods Research*. https://doi.org/10.1177/1558689808330883.

Cudennec, S. (2017). *Niger: Electricity and renewable energy*. Norton Rose Fulbright Insight Africa. https://www.insideafricalaw.com/blog/niger-electricity-and-renewable-energy.

Danielsen, K. (2012). *Gender equality, women's rights and access to energy services An inspiration paper in the run-up to Rio + 20*. https://www.kit.nl/wp-content/uploads/2018/08/1975_Gender-Rights-and-Energy-Report-final.pdf.

de Groot, J., Mohlakoana, N., Knox, A., & Bressers, H. (2017). Fuelling women's empowerment? An exploration of the linkages between gender, entrepreneurship and access to energy in the informal food sector. *Energy research & social science*, *28*, 86–97. https://doi.org/10.1016/j.erss.2017.04.004.

Ebi, K. L., Hess, J. J., & Watkiss, P. (2017). *Health risks and costs of climate variability and change*. https://doi.org/10.1596/978-1-4648-0522-6/CH8.

ECREEE. (2015). Situation analysis of energy and gender issues in ECOWAS member states. In *The ECOWAS policy for gender mainstreaming in energy access*. ECOWAS Centre for Renewable Energy and Energy Efficiency. https://ecowgen.ecreee.org/wp-content/uploads/2015/11/Situation-Analysis-of-Energy-and-Gender-Issues.pdf.

ECREEE. (2019). Nigerian Energy Support Programme (NESP)—Rural electrification and sustainable energy access unit. In *Ecowas Center for renewable energy and energy efficiency* (Issue news and events). https://www.ecreee.org/news/nigerian-energy-support-programme-nesp-rural-electrification-and-sustainable-energy-access-unit.

Ellabban, O., Abu-Rub, H., & Blaabjerg, F. (2014). Renewable energy resources: Current status, future prospects and their enabling technology. *Renewable and Sustainable Energy Reviews, 39,* 748–764.

ESF. (2013). *European Standard on Gender Mainstreaming in the ESF*. European Community of Practice on Gender Mainstreaming; The European Community of Practice on Gender Mainstreaming. Swedish ESF Council. https://standard.gendercop.com/about-the-standard/what-is-gender-mainstreaming/index.html.

European Institute for Gender Equality. (2019). *European Institute for Gender Equality: Gender mainstreaming tool. Sensitivity analysis* (p. 4). European Institute for Gender Equality. https://eige.europa.eu/gender-mainstreaming/methods-tools/gender-analysis.

Fakier, K. (2018). Women and renewable energy in a South African Community: Exploring energy poverty and environmental racism. In *Journal of international women's studies* (Vol. 19, Issue 5). https://vc.bridgew.edu/jiws/vol19/iss5/11.

GGCA. (2016). Facts from gender and climate change: A closer look at existing evidence. In S. Sellers (Ed.), *Gender and climate change: A closer look at existing evidence. Global Gender and Climate Alliance* (2016th ed.). https://wedo.org/wp-content/uploads/2016/11/GGCA-RP-FINAL.pdf.

Giorgi, A. (2016). The descriptive phenomenological psychological method. In *Journal of phenomenological psychology* (Vol. 47, Issue 1, pp. 3–12). Boston: Brill Academic Publishers. https://doi.org/10.1163/156916212X632934.

Glemarec, Y., Qayum, S., & Olshanskaya, M. (2016). Leveraging co-benefits between gender equality and climate action for sustainable development. In *UN women* (2016th ed.). New York: United Nations Women. https://unfccc.int/files/gender_and_climate_change/application/pdf/leveraging_cobenefits.pdf.

Habtezion, S. (2013). *Overview of linkages between gender and climate change*. New York: Policy Brief. United Nations Development Programme.

Hafner, M., Tagliapietra, S., & de Strasser, L. (2018). The challenge of energy access in Africa. In *Energy in Africa: Springer briefs in energy*. Berlin: Springer. https://doi.org/10.1007/978-3-319-92219-5_1.

He, Q., & Silliman, B. R. (2019). Climate change, human impacts, and coastal ecosystems in the anthropocene. *Current Biology, 29*(19), R1021–R1035. https://doi.org/10.1016/j.cub.2019.08.042.

IEA. (2018). *Tracking gender and the clean energy transition*. Paris: International Energy Agency. https://www.iea.org/topics/energyandgender/gendercleanenergy/.

Iqbal, S. (2018). *Women, business and the law: Getting to equal*. Washington: World Bank Group. https://documents.worldbank.org/curated/en/926401524803880673/Women-Business-and-the-Law-2018.

IRENA. (2018). Renewable energy and jobs annual review 2018. In *International renewable energy agency annual review*. Washington: IRENA. https://irena.org/-/media/Files/IRENA/Agency/Publication/2018/May/IRENA_RE_Jobs_Annual_Review_2018.pdf.

IRENA. (2019). *Renewable energy: A gender perspective.* Abu Dhabi: International Renewable Energy Agency. https://irena.org/-/media/Files/IRENA/Agency/Publication/2019/Jan/IRENA_Gender_perspective_2019.pdf.

Jerneck, A. (2018). Taking gender seriously in climate change adaptation and sustainability science research: Views from feminist debates and sub-saharan small-scale agriculture. *Sustainability Science, 13*(2), 403–416.

Ketlhoilwe, M. J., & Kanene, K. M. (2018). Access to energy sources in the face of climate change: Challenges faced by women in rural communities. *Jamba: Journal of Disaster Risk Studies*. https://doi.org/10.4102/jamba.v10i1.375.

Kløcker Larsen, R., & Alzouma Mamosso, C. (2013). *Environmental governance of uranium mining in Niger-a blind spot for development cooperation?* (No. 2). https://www.econstor.eu/bitstream/10419/122272/1/771315864.pdf.

Langbein, J. (2017). Firewood, smoke and respiratory diseases in developing countries—The neglected role of outdoor cooking. *PLoS ONE*. https://doi.org/10.1371/journal.pone.0178631.

Ley, D. (2017). Sustainable development, climate change, and renewable energy in rural central America. In *Evaluating climate change action for sustainable development*. Berlin: Springer. https://doi.org/10.1007/978-3-319-43702-6_11.

Mearns, R., & Norton, A. (2009). *Social dimensions of climate change: equity and vulnerability in a warming world*. Washington, DC: World Bank. License: CC BY 3.0 IGO. https://openknowledge.worldbank.org/handle/10986/2689.

Nachmias, D., & Nachmias, C. (1996). Research methods in the social sciences. In C. Frankfort-Nachmias, D. Nachmias (Ed.) (4th ed.). New York: St. Martin's Press. https://trove.nla.gov.au/work/5808987.

Nationsonline. (2017). Political map of Niger. Retrieved 16 September, 2018, from OneWorld - Nations Online website: https://www.nationsonline.org/oneworld/map/nigerpolitical-map.htm.

Nelson, S., & Kuriakose, A. T. (2017). *Gender and renewable energy: Entry points for women's livelihoods and employment*. https://www.climateinvestmentfunds.org/sites/cif_enc/files/gender_and_re_digital.pdf.

Onwutuebe, C. J. (2019). Patriarchy and women vulnerability to adverse climate change in Nigeria. *SAGE Open, 9*(1), 215824401982591. https://doi.org/10.1177/2158244019825914.

Rahut, D. B., Mottaleb, K. A., & Ali, A. (2017). Household energy consumption and its determinants in Timor-Leste. *Asian Development Review, 34*(1), 167–197.

Rao, N., Lawson, E. T., Raditloaneng, W. N., Solomon, D., & Angula, M. N. (2019). Gendered vulnerabilities to climate change: Insights from the semi-arid regions of Africa and Asia. *Climate and Development, 11*(1), 14–26. https://doi.org/10.1080/17565529.2017.1372266.

Rincón, V., González, M., & Barrero, K. (2017). Women and leadership: Gender barriers to senior management positions. *Intangible Capital, 13*(2), 319. https://doi.org/10.3926/ic.889.

Saddam, M. Z. (2018). *Assessing solar energy potential over West Africa under climate change: The case of Niger*. Tlemcen: Pan-African University Institute For Water And Energy Sciences (Including Climate Change).

Schuller, K. (2018). *Gender and climate change at COP 24*. British Columbia Council for International Cooperation (BCCIC); The British Columbia Council for International Cooperation (BCCIC). https://www.bccic.ca/gender-climate-cop24/.

Silwal, A. R., & McKay, A. (2015). The impact of cooking with firewood on respiratory health: Evidence from Indonesia. *Journal of Development Studies*. https://doi.org/10.1080/00220388.2015.1056784.

Stratton, L. S. (2015). The determinants of housework time. *IZA World of Labor*. https://doi.org/10.15185/izawol.133.

Tripathi, A., & Mishra, A. K. (2017). Knowledge and passive adaptation to climate change: An example from Indian farmers. *Climate Risk Management*. https://doi.org/10.1016/j.crm.2016.11.002.

UN Women. (2015a). Progress of the World's women 2015–2016: "Transforming economies, realizing rights" launches in seven cities. In *Press release*. https://www.unwomen.org/en/news/stories/2015/4/press-release-new-report-from-un-women-unveils-far-reaching-alternative-policy-agenda.

UN Women. (2015b). *United Nations Entity for Gender Equality and the Empowerment of Women*. New York: United Nation Women. https://www.un.org/womenwatch/osagi/gendermainstreaming.htm.

UNDP. (2012). *Gender and climate change—Thematic issue briefs and training modules*. New York: United Nations Development Programme. https://www.undp.org/content/undp/en/home/librarypage/womens-empowerment/gender-and-climate-change.html.

UNDP. (2016). *In Niger, climate change strategies keep hunger away*. https://www.undp.org/content/undp/en/home/ourwork/ourstories/reduire-les-risques-climatiques–le-niger-sadapete–.html.

UNFCCC. (2015). *Adoption of the Paris agreement* (No. 2015). 32. https://unfccc.int/resource/docs/2015/cop21/eng/l09r01.pdf.

UNFCCC. (2017). *Introduction to gender and climate change*. United Nations Framework Convention on Climate Change. https://unfccc.int/topics/gender/the-big-picture/introduction-to-gender-and-climate-change.

Von Schirnding, Y., Bruce, N., Smith, K., Ballard-Tremeer, G., Ezzati, M., & Lvovsky, K. (2002). *Addressing the impact of household energy and indoor air pollution on the health of the poor: Implications for policy action and intervention measures*. https://www.who.int/mediacentre/events/H&SD_Plaq_no9.pdf.

Wamukonya, N. (2002). A critical look at gender and energy mainstreaming in Africa. In *A critical look at gender and energy mainstreaming in Africa*, Vol. 14. https://genderandenvironment.org.

WHO. (2018). *Household air pollution and health*. Geneva: World Health Organization. https://www.who.int/news-room/fact-sheets/detail/household-air-pollution-and-health.

World Bank. (2015). *Super-clean cookstove, innovative financing in Lao PDR project promise results for women and climate*. Washington: World Bank Feature Story. https://www.worldbank.org/en/news/feature/2018/04/20/clean-cookstove-innovative-financing-lao-pdr-project-promise-results-women-climate.

World Bank. (2016). *Doing business 2017: Equal opportunity for all (English)* (1st ed.). Washington: World Bank Publications. https://documents.worldbank.org/curated/en/172361477516970361/Doing-business-2017-equal-opportunity-for-all.

World Bank. (2017). *Niger—Solar electricity access project*. Washington: Loans and Credit; World Bank. https://www.worldbank.org/en/news/loans-credits/2017/06/07/niger-solar-electricity-access-project.

World Bank. (2018). *International development association project paper on a proposed additional credit to the republic of Niger* (August 4th). Washington: World Bank. https://documents.worldbank.org/curated/en/630161534524243997/pdf/NIGER-ELECTRICITY-PAD-08142018.pdf.

World Bank Group. (2017). *The World Bank In Niger, overview*. Washington: World Bank. https://www.worldbank.org/en/country/niger/overview.

Yamane, T. (1967). *Statistics: An introductory analysis* (2nd ed.). New York, Evanston, London and Tokyo: Harper & Row and John Weatherhill, Inc.

Yang, P., Riepe, J., Moser, K., Pull, K., & Terjesen, S. (2019). Women directors, firm performance, and firm risk: A causal perspective. *Leadership Quarterly*. https://doi.org/10.1016/j.leaqua.2019.05.004.

Zenger, J., & Folkman, J. (2019). *Research: Women score higher than men in most leadership skills*. Brighton: Havard Business Review. https://hbr.org/2019/06/research-women-score-higher-than-men-in-most-leadership-skills.