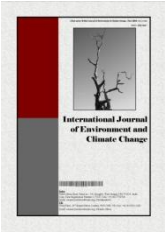

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Private Telecommunication Companies and Climate Finance: Evidence from the Niger Republic

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Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

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ABSTRACT

Recently, the number of private telecommunication companies is increasing in the West African region. These private companies could be key actors in financing climate actions in their operating countries**.** Yet, the contribution of private telecommunication companies in financing climate actions in West African countries is not well documented. Accordingly, this study aims to examine the contributions of private telecommunication companies in financing climate actions in the Niger Republic. This study is based on secondary data collected through a systematic review. The literature search was conducted through Web of Science, Google Scholar, and the blog pages of the websites of the key private telecommunication companies operating in the Niger Republic. The findings of the study showed that several climate actions were executed by the key private telecommunication companies operating in the Niger Republic. These included both climate adaptation and mitigation strategies that targeted to combat desertification, fight against youth unemployment, alleviate poverty, reduce population illiteracy, and reduce the exposure of the

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vulnerable groups to food insecurity. Consequently, an implementation of a comprehensive public-private strategy between the government and the private telecommunication actors to finance climate actions could significantly reinforce the effort of the country to achieve the United Nations Sustainable Development Goals**.**

Keywords: Climate actions; private telecommunication companies; climate finance; the Niger Republic.

1. INTRODUCTION

Climate change has become a great threat to the worldwide economy and ecology. Hence, climate change affects negatively the private sector and therefore hinders its financial performance [1,2]. Although, the effects of climate change on the private sector, the private sector could play a key role in financing change adaptation and mitigation [3,4]. Many of the private sectors [1,5] gave importance to financing climate actions to respond to the risks associated with the climate. For instance, the private sector finance the adaptation to climate change to reduce climate risks, alleviate poverty and enhance socio-economic and ecological resilience [4,6,7]. Added to that, the private sectors financed climate change adaptation in many urban areas [8]. Furthermore, public-private partnership has been reported to be a great policy response to climate change [9] such as a partnership for adaptation [8]. In addition to that, the private sectors play a major role in reducing greenhouse gases and enhancing carbon sinks [3,10,12] by investing in sustainable forest management [13,14]. In Niger, the private telecommunication companies implemented several initiatives and some of them are shown in Pictures 1, 2, 3, 4, 5 and 6. Picture 6 showed job creation related to women.

Picture 1. Food distribution Airtel Niger, floods 2020)

Picture 2. Primary school built by Airtel Niger in Niamey)

Picture 3. Moov Niger Monetary assistance

Picture 4. Orange Niger Solar energy (Dantchandou)

Picture 5. Tree planting initiative (One Airtel employer, one tree)

Picture 6. Woman phone repairer (Niamey)

Sources: [37-40]

In fact, the private sectors played a crucial role in financing adaptation and mitigation [4,9,15]. Though most studies focused mainly on the role of private mining sectors in climate change adaptation [16] and the role of private energy sectors in supporting the sustainable development goals [17]. Other scholars explore dressed the impacts of the performance of the corporate social responsibility on the perception of the telecommunication companies in a specific country (Nigeria), [18], focused on the role of the private sector in cities climate change adaptation in urban areas [19], examined the responsibility of private sectors in adapting to climate change [20]. In Wes African countries, only a few studies explored the role of private sectors in financing climate change mitigation such as in Ghana [3] and some studies such as those of [6],21] who demonstrated the role of the private sector in financing adaptation.

In this respect, through the literature review above, it is evident that the private sector implemented climate change adaptation and mitigation strategies to support both the authorities and the population of their operating country to cope with various adverse impacts of climate change.

While the West Africa Sahel region has been acknowledged as one of the most vulnerable regions to climate change, it also has many private telecommunication companies. Hence, these private actors support the government to address climate change through climate finance initiatives/ interventions. [22] indicated the existence of a scarcity of data related to climate action.

Though the Niger Republic is one of the West African Sahelian countries that has been highlighted as vulnerable to climate change. This is due to the high rate of poverty and illiteracy, the weakness of the governance system and the high rate of corruption in the country, the lack of climate planning and the dependency of the country's agriculture on rainfall [23]. It is estimated that climate mitigation and adaptation in Africa regions requires about 10 billion U.S. dollars yearly [24] and Africa needs about $7-15 billion yearly to adapt to climate change [25]. However, the contributions of the African countries are not enough to finance climate mitigation in developing countries such as Niger due to the lack of financial resources to tackle the effects of climate change [26].

On the other hand, Niger is a signatory of the Paris Agreement, which indicates the country's ambition to combat the adverse effects of climate change, but the implementation of the country's national climate finance plan remains problematic due to insufficient financial resources. Accordingly, the involvement and the inclusion of the private sectors such as the private telecommunication companies in financing climate actions could contribute significantly to coping with the adverse impacts of climate change on the country. Likewise, the role of telecommunication sections in financing Nationally Determined Contribution (NDC) in the Niger Republic has not been explored. The private sectors have been acknowledged as an important contributor in supporting climate change adaptation and mitigation, however, the role of private sectors such as the private

telecommunication companies in the West Africa Sahel region is not yet well documented. This study attempts to fill this literature gap by examining the contributions of private telecommunication companies in financing climate actions in the Niger Republic. This could raise the awareness of the private telecommunication companies and public authorities in the necessity to implement/plan a comprehensive climate action finance strategy through a public-private partnership. Also, it provides a baseline study for future studies. The current study seeks to examine: (1) What are the initiatives implemented by the private telecommunication companies in the Niger Republic, (2) What the main climate change adaptation/mitigation initiatives executed by the private telecommunication companies executed in the country, and (3) To which extend the implemented initiatives contribute to climate actions?.

2. MATERIALS AND METHODS

2.1 Materials

2.1.1 Study area

This study was carried out in the Niger republic. The Niger Republic is located between longitude 16°N and latitude 8°E and accounts for a population estimated at 21 161 749 inhabitants [27]. Additionally, the Niger Republic is one of the poorest countries and that it recorded the highest population growth rate 3.9% [27]. Recently, the Niger Republic faced numerous challenges such as food crisis, famine, conflicts and insecurity and terrorism. The administrative map of the Niger Republic is shown in Fig. 1.

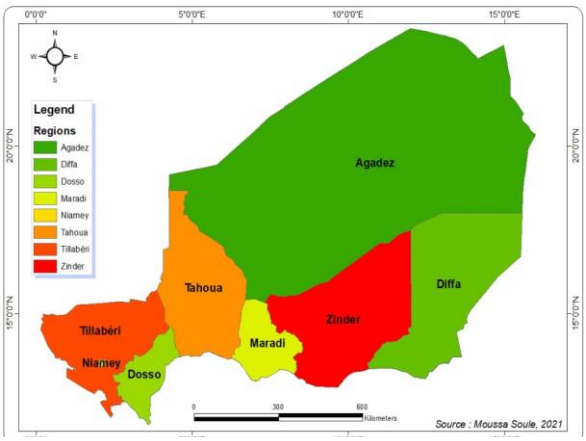

Fig. 1. The administrative map of the Niger Republic

2.2 Methods

2.2.1 Data sources and searches

A systematic review was used in this study. [28] indicated that systematic review focuses on clear questions and reformulation, and well-defined criteria to select relevant research. Accordingly, literature searching was conducted through Web of Science, Google Scholar, social media and the blogs of the Websites of key private telecommunication companies operating in the Niger Republic. The keywords used in the literature search are the Niger Republic AND telecommunication companies, the Niger republic AND private companies, climate action in the Niger Republic AND private telecommunication companies, climate action AND private telecommunication companies, Moov Niger and Climate actions, Moov Niger AND climate adaptation AND mitigation, Moov Niger AND poverty alleviation, Orange Niger AND climate action, Orange Niger AND climate mitigation AND mitigation, Orange Niger AND poverty alleviation, Airtel Niger AND climate action, Airtel Niger AND climate adaptation AND mitigation, Airtel Niger AND poverty alleviation, Orange Niger AND climate adaptation AND mitigation, Airtel Niger AND climate action, Airtel Niger AND poverty alleviation (Table 1). Then, a literature screen was conducted to select relevant studies whilst the titles and abstracts of these studies were screened and saved as full reports. These studies were further reviewed to broaden the search and other relevant blogs of the private telecommunication companies related to climate action, adaptation, and mitigation were manually examined and the appropriate abstracts were retained. The keywords used in the literature searching were firstly used as mentioned above and their meanings in French and English to ease collecting the literature as well as the official language of Niger republic is French. This eased especially selecting the relevant blogs of the private communication companies and the authors took some fields photos of some climate actions executed by these companies in the Niger Republic (Photos 2 and 4).

2.2.2 Study selection

The studies were selected based on the current studies dedicated to the key initiatives executed by the private telecommunication companies, which could play a climate either climate adaptation or mitigation or both climate change adaptation and strategies in the Niger Republic.

Then, the search narrowed to the subject areas of climate action and finance in the Niger Republic. A total of 2010 studies were collected but only 78 relevant studies were retained for this study.

2.2.3 Data extraction

This systematic review was carried out from the only Niger Republic and focused on the implemented initiatives by the private telecommunication companies to support the public authorities and population in fighting against the adverse impacts of climate change. The authors did not experience any major divergences in this systematic review process and the PRISMA flow chart used in this study is shown in Fig. 2.

2.2.4 Quality assessment and synthesis

The quality of the studies was evaluated by a means of Critical Appraisal Skills Programs (CASP) checklists [29] and the studies were stated poor or good quality according to the criteria suggested by [30] (Table 2).

Table 1. Summarize of used inclusion and exclusion criteria

Inclusion criteria		Exclusion criteria
Any initiatives implemented by one of the three key Private telecommunication companies in the Niger Republic	Any initiatives implemented by Airtel Niger, MOOV Niger, Orange Niger in the Niger Republic	Any initiatives implemented by other private companies not related to Airtel Niger, MOOV Niger, Orange Niger in the Niger Republic
Any initiatives implemented by Private telecommunication Companies in the Niger Republic that contribute to climate change adaptation	Any initiatives implemented by Airtel Niger, MOOV Niger, Orange Niger in the Niger Republic that contribute to climate change adaptation	Not relevant to the initiatives implemented by Airtel Niger, MOOV Niger, Orange Niger in the Niger Republic that contribute to climate change adaptation
Any initiatives implemented by Private Telecommunication Companies in the Niger Republic that contribute to climate change mitigation	Any initiatives implemented by Airtel Niger, MOOV Niger, Orange Niger in the Niger Republic that contribute to climate change mitigation	Not relevant to the initiatives implemented by Airtel Niger, MOOV Niger, Orange Niger in the Niger Republic that contribute to climate change mitigation

Source: The authors

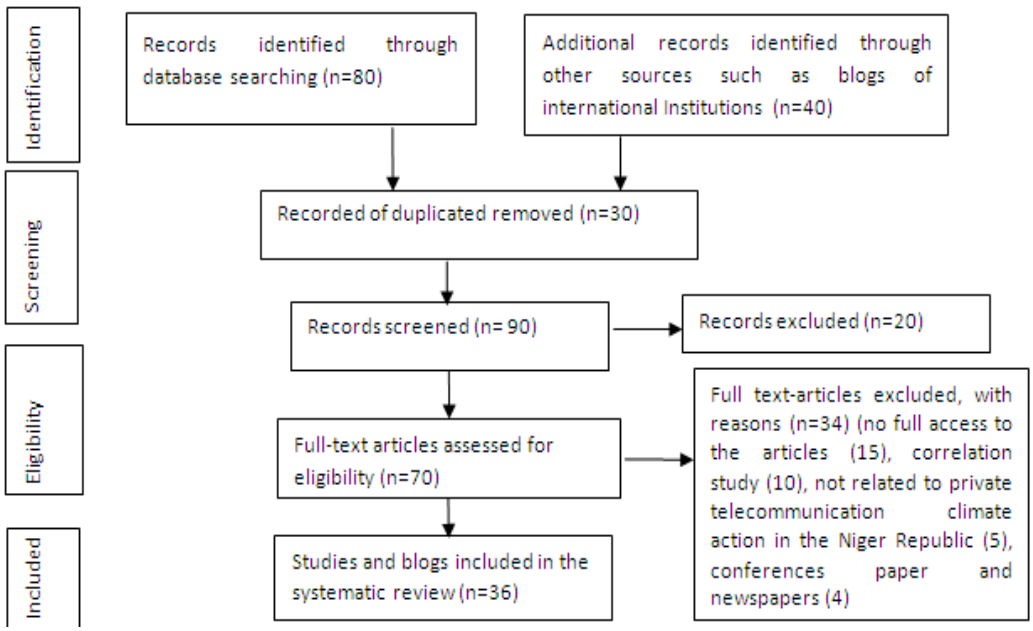

Fig. 2. PRISMA flow chart of following steps for systematic review

Table 2. Critical Appraisal Skills Program (CASP) checklist

No	Question
1.	Was there a clear statement of the aims of the research?
2.	Is a qualitative methodology appropriate?
3.	Was the research design appropriate to address the aims of the research?
4.	Was the recruitment strategy appropriate to the aims of the research?
5.	Was the data collected in a way that addressed the research issue?
6.	Has the relationship between researcher participants been adequately considered?
7.	Have ethical issues been taken into consideration?
8.	Was the data analysis sufficiently rigorous?
9.	Is there a clear statement of findings?
10.	How valuable is the research?

3. RESULTS

According to the types of climate actions (adaptation, mitigation), the authors designed Table 3 to give an overview of the types of initiatives implemented by the private telecommunication companies and their contribution to climate actions in the Niger Republic.

4. DISCUSSION

Table 3 showed that the key telecommunication companies operating in the Niger Republic implemented various initiatives that target contribute to climate actions so that they played an important role in climate finance. Accordingly, the climate action initiatives executed by Airtel Niger included the construction of primary schools, planting trees, in-kind assistance (food distribution, medicines and mosquitoes to flooded population, distribution), petit commerce to support youth (installation of solar panels for phone charging in the rural areas, mobile money transfer and phone repairing). Also, Airtel offered guarding activity for the company's equipment, cashless economy (Airtel mobile money) and provided financial donations to the Niger Solidarity Fund of combatting the spreading of the COVID-19 pandemic. For instance, Moov Niger gave 15.000.000 CFA (Picture 3) to the National CODVID-19 Solidarity fund to fight against the COVID-19 in Niger. Financing climate change adaptation strategies such as building classrooms for the student (picture 2) could reduce the level of illiteracy of the population and therefore increase their resilience to climate change. These results are aligned with those of [31,32] who noted that the illiteracy of the population increases the vulnerability of the society to climate change whilst educating society is a key climate change adaptation strategy because it raises the awareness of the society towards numerous impacts of climate change. Also, Airtel created small jobs such as selling credit cards, repairing phones, and money transfer initiatives that could contribute significantly to reducing rural poverty and therefore the risk of the rural youths migrating as well as being involved in some dangerous activities such as drug use, joining terrorist groups. Similarly, [33] indicated that the private telecommunication sectors played an essential role in alleviating poverty in Ghanaian by implementing numerous climate change adaptations, which promote inclusivity and gender equality**.**

On the other hand, MOOV Niger executed several initiatives that include promoting solar energy, food assistance to inundated persons, distribution of drugs and mosquito nets, Cashless economy (Moov mobile money), planting trees, income-generating activities (phones charging using solar energy, phones repairing), Operation ''Moov Tabaski'' and donation for the COVID-19 pandemic. Some of these initiatives such as planting trees could help to mitigate climate change and enhance numerous services from the future ecosystem generated by planting. Previously [34] highlighted that planting tree is a substantial climate change adaptation strategy as the trees provide countless ecosystem services that reduce considerably the negative effects of climate change and therefore promote climate sustainability. Also, [35] noted that planting trees in the cities create an urban forest and reduce significantly the consumption of energy so that lowers the carbon dioxide emission.

Table 3. Key climate action implemented by key private telecommunication companies in the Niger Republic

Name of private telecommunication companies	Initiatives	Types of climate actions		Contribution to climate actions
		Adaptation	Mitigation	
Airtel Niger	For instance installation of solar panels		X	Reduction of Carbon dioxide (CO_2) emission
	Construction of primary schools	X	X	Increase the literacy rate (education) which key to fight poverty, climate change. Through education, you can build the capacity of the young generation to become good leaders to manage climate change, gender education.
	Planting trees	X	X	Adaptation (fruit consumption to fight hunger and malnutrition, poverty (planting fruit trees is an income-generating activity) and mitigation (planting trees is an option of augmenting carbon sequestration potential and biodiversity conservation).
	Drugs and mosquito net distribution to the flooded people	X		Fighting malaria (climate change disease) is an option of increasing the resilience of the society and reducing their vulnerability to climate change disease
	Petit commerce (phone charging using solar panels in the rural areas, mobile money transfer, phone repairing)	X	X	This activity is a source of income to fight poverty thus increasing the adaptive capacity of the people. It creates jobs and promotes social cohesion
	Guarding activity Airtel equipment	X		Jobs creation, which provides an economic opportunity to fight poverty hence reducing people's vulnerability.
	Food items distribution to the flooded people	X		Combating hunger and malnutrition to increase the resilience of the flooded people
	Cashless economy (Airtel mobile money)	X	X	It allows people to pay electricity and water bills, which reduces people mobility thus fewer cars are used for example which goes with less CO_2 emission. Cashless economy via Airtel money aims to promote a low-carbon society. Airtel mobile money payment is promoting zero waste.
	Financial donations for the Niger Solidarity Fund for the fight against the Covid-19 pandemic	X		Increases the resilience of the society, fight against COVID-19
MOOV Niger	Tree planting	X	X	Mitigation (CO_2 reduction) and adaptation (use of food tree species such as fruit trees increases the resilience of the

Name of private telecommunication companies	Initiatives	Types of climate actions		Contribution to climate actions
		Adaptation	Mitigation	
				society by fighting malnutrition, hunger and poverty), biodiversity conservation
	Utilization of solar energy		X	Zero carbon emission/low carbon economy.
	Operation Moov Tabaski 2020	X		The operation supports vulnerable people to have sheep of Aid El Kebir. It is a social action, which consists to offer free to poor families the sheep.
	Distribution of the food items to the inundated persons	X		Building the flooded people resilience and fighting food insecurity.
	Distribution of the drugs and mosquito nets	X		Fighting climate-related diseases such as malaria.
	Job creation	X		Adaptation (poverty reduction), Fixing young people from joining the terrorism, migration.
	Cashless economy (Moov mobile money)	X	X	It reduces the vehicles based transport thus zero or low carbon economy/green economy.
	COVID-19 donation	X		It aims at building people resilience to cope with the COVID-19.
	Cashless economy (Orange mobile money)	X	X	It promotes low carbon emission and contributes to zero waste production.
Orange Niger	Solar energy		X	Mitigation (Zero emission of CO_2)/low carbon economy.
	Planting trees	X	X	Mitigation: increase in Carbon sink/carbon sequestration potential. Adaptation: reducing the vulnerability of the people via food production. It is also a source of income generation via the selling of fruits, leaves of the trees.
	Income-generating activities (phones charging using solar energy, phones repairing)	X	X	This aims to fight unemployment and fix young people from joining the terrorist or migration.
	Participation in the National tree planting and land reclamation competition by giving some prices in Niger (tree planting	X	X	Promote tree planting which increases the carbon sequestration potential (mitigation) and increases the adaptive capacity via the restoration of degraded lands, food production, and poverty alleviation.

Name of private telecommunication companies	Initiatives	Types of climate actions		Contribution to climate actions
		Adaptation	Mitigation	
	incentive measures)			
	Money donated to the national committee COVID-19	X		Increase the resilience of the Nigeriens to fight COVID-19 disease
	Creation of digital schools in Niger (Donation of computers, IT room and other student school items)	X		The promotion of quality education, which is central to the formation of green citizens, fight against poverty and support the most disadvantaged populations. It promotes the education of girls as means of enhancing the societal adaptive capacity.
Orange, Airtel and Moov are used	Use of SIM cards for climate information and TELE-IRRIGATION for climate information, tele-irrigation. They are all celebrating the 3 August, Niger' nation tree day plantation	X		Climate change education is key to producing zero greenhouse gases emitters, sustainable water management, food production, poverty reduction Increase in the carbon sequestration potential, dissemination of climate information and services.

In the Table 3 the symbol X refers to the types of climate action (adaptation/mitigation strategies) represented by the corresponding initiatives executed by the private telecommunication companies in the Niger Republic (Source: The authors)

Orange Niger implemented numerous multi-purpose initiatives playing a role in both climate adaptation and mitigation strategies. They encompassed promoting cashless economy (Orange mobile money), installing solar energy, planting trees, supporting income-generating activities (phones charging using solar energy, phones repairing), sponsoring the National tree planting and land reclamation competition (incentive measures for tree plantation), providing a monetary donation to the national committee in charge of combatting the spreading of the COVID-19 pandemic, promoting schools' digitalization in the Niger Republic (donation of computers and building IT room for students). Recently Orange Niger promoted the TELE-IRRIGATION system and climate information by mobile, which could significantly contribute to the development y of smart agricultural systems/ gardens (Greenhouse) and consequently enhance the country's food security. Also, sharing climate information such as meteorological information through the use of a mobile phone could raise the awareness of the population about climate change adaptation. Similarly, [36] underlined that the use of mobile phones raises the awareness of the populations about climate change adaptation.

5. CONCLUSIONS AND RECOMMENDA-TIONS

The study examines the contributions of private telecommunication companies in financing climate actions in the Niger Republic. It showed that the key private telecommunication companies operating in the Niger Republic executed several initiatives that could significantly contribute to attenuating the negative impacts of climate change. Some of these initiatives are either climate adaptation or mitigation strategies and others whilst played both a role of climate change strategies and mitigation. Globally these initiatives aimed at reducing the exposure and the vulnerability of the population to the adverse impact of climate change. Therefore, to improve the population resilience to the impacts of climate change.

From the findings of the study, an implementation of a comprehensive public-private partnership between the government of the Niger Republic and the private telecommunication companies could help to scale up appropriate climate action that would efficiently tackle the real impacts of climate change in the Niger Republic**.**

DISCLAIMER

The products used for this study are commonly and predominantly from the country of the study and there is no funding from producing companies that could influence the findings of the study.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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38. Picture 2: Moussa Soule, 2021, fieldwork in Maradi city.
39. Picture3:https://www.actuniger.com/societe/16202-lutte-contre-le-covid-19-moov-niger-contribue-au-fonds-de-solidarite.htm. Accessed at 03/01/2020.
40. Picture 4: Orange Niger Solar energy in the commune of Dantchandou, Moussa Soule, fieldwork, 2021.

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