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The Path from Climate Change to Conflict in the Sahel Region of Africa

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Abtract
The impacts of climate change induced environmental shocks on society are not uniform around the world and differs according to the various natural conditions of each region as well as the social, economic, political, and cultural environment. While focusing on a case study in Burkina Faso, this paper reviews previous research and describes the path through which the variability of precipitation/rainfall and temperature as well as drought, floods, and other extreme weather events lead to the onset and exacerbation of conflicts through social, economic, political, and cultural factors in the Sahel region of Africa, where most of the population is dependent on rain-fed agriculture and livestock production for their livelihoods.

1. Impact of Climate Change in Africa

Concerns that "climate change might be causing serious social problems" have been growing. In "The Global Risks Report" which the World Economic Forum (WEF) publishes each January, climate change appeared in 2011 as a top global risk by likelihood. In subsequent years, the risk of water crises joined the rankings in 2012 followed by climate action failure in 2014. In 2020, environmental problems consisting of extreme weather, climate action failure, natural disasters, biodiversity loss, and human-made environmental change have dominated the top five risks (Figure 1). The global spread of the COVID-19 in 2020 and the addition of infectious diseases among the top risks in the 2021 edition of the report demonstrated how such a risk perception was biased. Nevertheless, we can detect a sense of crisis that the world has entered a stage in which environmental shocks pose a significant risk to society due to climate action failure.

	1st	2nd	3rd	4th	5th
2021	Extreme weather	Climate action failure	Human environmental change	Infectious diseases	Biodiversity loss
2020	Extreme weather	Climate action failure	Natural disasters	Biodiversity loss	Human-made environmental change
2019	Extreme weather	Climate action failure	Natural disasters	Data fraud or theft	Cyberattacks
2018	Extreme weather	Natural disasters	Cyberattacks	Data fraud or theft	Climate action failure
2017	Extreme weather	Involuntary migration	Natural disasters	Terrorist attacks	Data fraud or theft
2016	Involuntary migration	Extreme weather	Climate action failure	Interstate conflict	Natural catastrophes

2015	Interstate conflict	Extreme weather	Failure of national governance	State collapse or crisis	Unemployment
2014	Income disparity	Extreme weather	Unemployment	Climate action failure	Cyberattacks
2013	Income disparity	Fiscal imbalances	Greenhouse gas emissions	Water crises	Population ageing
2012	Income disparity	Fiscal imbalances	Greenhouse gas emissions	Cyberattacks	Water crises
2011	Storms and cyclones	Flooding	Corruption	Biodiversity loss	Climate change

Figure 1 Top global risks by likelihood

Source: Created by the author from the WEF, *The Global Risks Report (2021 and 2020 editions)*

Among those risks, the greatest concern with respect to the impact of climate change on people's livelihoods lies in the Sahel region which is located at the southern edge of the Sahara Desert in Africa. Over the past 100 years, the trends in rainfall have varied significantly in the semi-arid Sahel region. Figure 2 is a graph which standardizes the total rainfall and the number of rainy days from July to September in the region which includes the Sahel (10ºN-20ºN and 20ºW-30ºE). While anomalously wet years occurred during the decades of the 1950s and 1960s, severe droughts hit the region in 1972 and the period from 1983 to 1984. The rainfall trend has continued to significantly fluctuate in subsequent decades. It is not simply a matter that the total precipitation has decreased as years with substantial rainfall in which flooding occurs and years with low precipitation resulting in droughts both occur alternately, and the variability of rainfall patterns are impacting agriculture and livestock production.

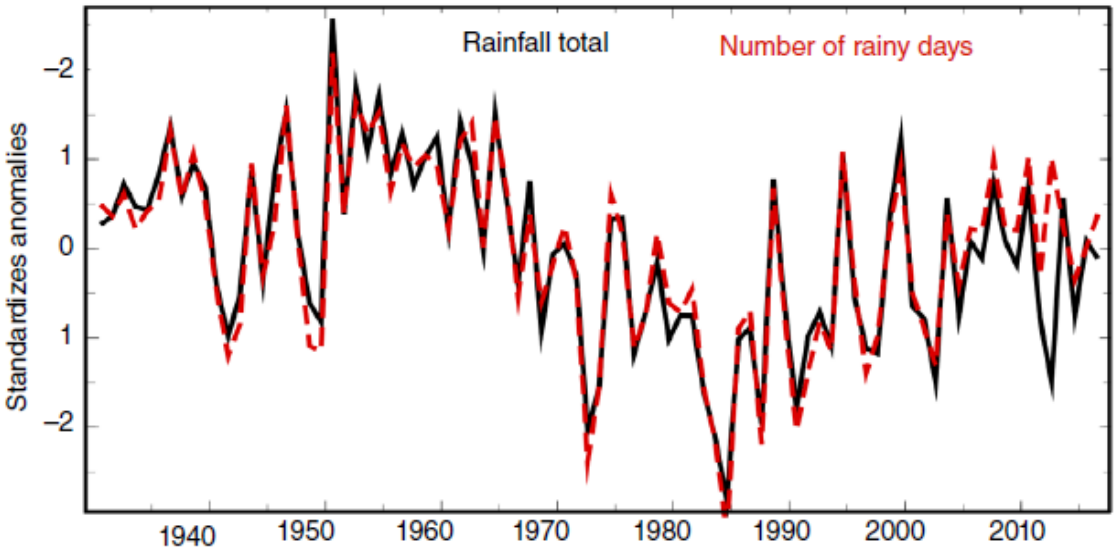


Figure 2 Rainfall variability in the Sahel region

Source: Biasutti 2019

It should also be taken into account that the Sahel and the surrounding countries in the region have suffered not only from the impact of climate change but also from serious poverty. Looking at the bottom ranks of the Human Development Index (HDI) of the United Nations Development Programme (UNDP), we can see the names of countries in the Sahel and nearby countries including Niger (189th out of 189 countries), Chad (185th), Mali (184th), and Burkina Faso (182nd) (UNDP 2020). As James Scott describes in his research on rural societies in Southeast Asia, peasants are like "a man standing up to his nose in water; the smallest wave will drown him" (Scott 1977). For people living below the extreme poverty line of $1.25 per day, environmental changes due to climate change produce a significant impact on their ability to maintain a living, and food and water shortages are life-threatening. Therefore, competition over securing farmland and grazing land to ensure food supplies and access to water resources is fraught with risk that it may develop into a conflict. In its Fifth Assessment Report (IPCC 2014), the Intergovernmental Panel on Climate Change (IPCC) states that, "Climate change can indirectly increase risks of violent conflicts in the form of civil war and inter-group violence by amplifying well-documented drivers of these conflicts such as poverty and economic shocks" (IPCC 2014). There are concerns that the effects of climate change may increase the risks of conflict and violence all over the world.

However, various reports from international institutions and previous research disagree with the idea of considering climate change as a direct factor in conflicts. In its Fourth Assessment Report (IPCC 2007), the IPCC states that, "Stresses such as increased drought, water shortages, and riverine and coastal flooding will affect many local and regional populations. This will lead in some cases to relocation within or between countries, exacerbating conflicts and imposing migration pressures." to suggest the possibility of conflicts while also stating that, "An argument can also be made that rising ethnic conflicts can be linked to competition over natural resources that are increasingly scarce as a result of climate change, but many other intervening and contributing causes of inter- and intra-group conflict need to be taken into account" (IPCC 2007). According to Abroulaye et al., who conducted an interview survey regarding the impact of climate change on crop farmers and agro-pastoralists in Burkina Faso, which is presented as a case study in this paper, "The study finds that climate change is not a root cause of these conflicts but a factor that exacerbates them. The root causes are socio-economic, political, and land degradation factors such as poverty, population, growth and loss in soil fertility" (Abroulaye et al. 2015). This paper also agrees with that assessment.

To continue, how do environmental changes due to climate change lead to the onset and exacerbation of conflicts? How exactly does "climate change lead to the onset and exacerbation of conflicts through social, economic, political, and cultural factors?" When viewed on a global scale, while climate change is exerting a serious impact, conflicts are not occurring in the majority of regions. If we can clarify the factors which link climate change to conflicts and conversely those that would appropriately manage the impact of climate change and help prevent conflicts, it may suggest a way to prevent conflicts.

It is with an awareness of these issues that this paper uses the countries of the Sahel region as a case study to analyze the impact of climate change on the onset and exacerbation of conflicts. The methodology uses the format of existing research reviews. By assembling the survey research performed by aid organizations and researchers, this paper illustrates the path through which climate change leads to conflict.

Regarding the structure of this paper, Section 2 reviews the research concerning the relationship between climate change and conflicts in Africa. In addition, Section 3 illustrates the path through which climate change affects conflicts in the countries of Burkina Faso and Mali in the Sahel region based on existing research reviews.

Furthermore, this paper incorporates significant corrections and modifications based on the article "Climate Change and Conflict in Africa" by Kazuyo Hanai in the "SRID Journal" No.18 in 2020.

2. Research Trends Concerning the Relationship Between Climate Change and Conflicts

Research trends concerning the relationship between climate change induced natural changes and conflicts shall be examined according to the trends in quantitative research and area studies.

(1) Relationship between climate change and conflicts as viewed from quantitative research

A large amount of quantitative research has been conducted to verify the relationship between climate change and conflict. Koubi at the Swiss Federal Institute of Technology (ETH) published a paper in 2019 which broadly reviews the existing quantitative research. According to Koubi's review, the existing literature has not detected a robust and general effect linking climate to conflict onset. Nevertheless, Koubi concludes that substantial agreement exists that climatic changes contribute to conflict under some conditions and through certain pathways. In particular, the literature shows that climatic conditions breed conflict in fertile grounds in regions dependent on agriculture and in combination and interaction with other socioeconomic and political factors such as a low level of economic development and political marginalization (Koubi 2019).

In Figure 3, the Palmer Drought Severity Index map for the 2005-2014 period is overlaid by a map of all countries that experienced more than one civil conflict incident, i.e. a conflict with at least 25 battle-related deaths in a calendar year in the 1989-2014 period. This figure clearly shows that drought and conflict are correlated. However, at the same time, it can be said that drought and conflict coexist mostly in countries or regions that already suffer from adverse climatic changes, are highly dependent on agriculture for income and food generation, have few capabilities to cope with climatic changes, and are characterized by preexisting tensions and conflict. Koubi emphasizes that the relationship between climate change and conflict is more complex than the one depicted in this figure (Koubi 2019).

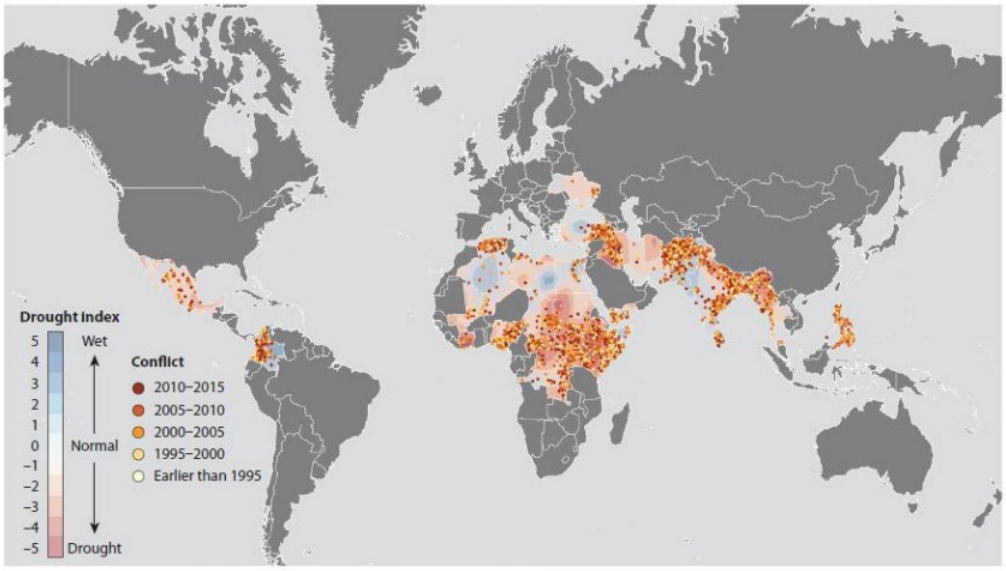


Figure 3 Regions where droughts and conflicts occur
*Index value of −3 or less indicates the occurrence of a drought
Source: Koubi 2019

Quantitative research regarding the relationship between climate change and conflict uses drought, floods, storms, and other extreme weather events in addition to temperature and precipitation/rainfall as climate change variables. The variables referring to conflict are violent

acts between individuals (murder, assault, rape, and robbery), intercommunal violence (conflicts between competing groups such as ethnic groups and local communities), inter-state conflicts, violence against government, protests, riots, and political repression.

A certain amount of research indicates a correlation between changes in temperature and violent acts between individuals. Mares and Moffett found that homicide rates increase as temperatures rise in a sample of 57 countries for the period from 1995 to 2012, and predicted that each degree Celsius increase in global temperature will increase homicide rates by 6% (Mares & Moffett 2016). However, violent acts between individuals cannot be defined as a conflict.

Meanwhile, there is an argument concerning the relationship between temperature and conflict. Burke (2009) analyzed the link between fluctuations in temperature and precipitation to the incidence of African civil war[1] for the period from 1981 to 2002 and asserts that a 1 ℃ increase in temperature leads to a 4.5% increase in conflict in the same year and an increase of 49% particularly in countries historically experience conflict. In addition, the research indicates this temperature effect on conflict is robust to explicit controls for country-level measures of per capita income and democracy over the sample period (Burke et al. 2009). However, Buhaug (2010) pointed out that since 2002, conflict incidence and severity in Africa have decreased while the warming and drying of the continent have persisted. While Burke et al. counter argued Buhaug's dispute, they agreed with his point that since 2002, the relationship between climate and conflict has weakened due to international peacebuilding efforts, economic growth, and improvements in domestic governance (Burke 2010). We can see from such debates that varying results have been obtained regarding the relationship between changes in temperature and conflict due to differences in the data used and analysis methods, and a clear conclusion has not been reached.

The same trends can be seen in the relationship between precipitation and conflict. O'Loughlin et al. (2012) analyzed 16,359 geolocated violent events (civil war, riots/protests, and attacks on civilians) in nine East African countries between 1990 and 2009. According to their statistical result, wetter deviations from the precipitation norms decrease the risk of violence, whereas drier and normal periods show no effects. Identically, much warmer than normal temperatures raise the risk of violence, whereas average and cooler temperatures have no effect. However, while there are examples climate change leads to the onset of geolocated violent events by affecting people's livelihoods, they emphasize that political, economic, social, and geographical contexts must also be considered (O'Loughlin et al. 2012).

If we were to describe the relationship between climate change and conflict linearly, the flow of events may appear as follows, for example. "The temperature increase and the precipitation decrease due to the climate change induce a drought, scarcity of food due to a decrease in agricultural products then induces famine, violence breaks out over limited water resources, food, and livestock, which develops into a conflict." However, many researchers claim that multiple factors are intervening in this causal path such as population growth, insufficient infrastructure, political corruption, poor governance, intergroup competition over land use, and the influx of weapons. Even if drought occurs as a natural phenomenon, famine will not occur nor will it seed conflict if there are appropriate irrigation plants, food stocks, and access to markets, etc. They claim that the problem lies in social conditions due to an inability to provide the appropriate response.

The same reasoning also applies to the situation of climate change migrants discussed below. Even if there are those people who must leave their homelands due to floods or desertification, if people have access to appropriate humanitarian aid and social services at the destination, and resources are redistributed fairly, so that competition over land and jobs does

[1] Burke et al. 2009 define civil war as the use of armed force between two parties, one of which is the government of a state, resulting in at least 1,000 battle-related deaths.

not arise between the migrants and the inhabitants of the host community, the migration due to climate change will not lead to conflicts. Therefore, although there is a possibility that climate change becomes one of the factors of the onset of conflict or prolongation and deterioration of on-going conflicts, the way in which climate change impacts such events also depends on other factors such as economic growth at the national and local level, the political system, and the administrative capabilities of the government, etc.

Now, through what sequence of events does the impact of climate change develop into a conflict in the climate change regions of Africa where it is assumed that climate change linked to the outbreak of conflict? This paper examines this question from an area studies perspective.

(2) Discussions on the impact of climate change in Africa

Concerns that an increase in the temperature and the variability of precipitation due to climate change may induce frequent violence as well as the outbreak of conflict in Africa have been voiced since the 2000s. These concerns were triggered by reports that climate change had an impact on some factors behind the conflict in the Darfur region in western Sudan which deteriorated in 2003 and resulted in the massacre of over 400,000 people. Then Secretary-General of United Nations Ban Ki-moon contributed an article to the Washington Post in June 2007 in which he stated, “Amid the diverse social and political causes, the Darfur conflict began as an ecological crisis, arising at least in part from climate change.” The Secretary-General continued by saying, “The average precipitation in Sudan has declined by 40 percent since the early 1980s.” “It is no accident that the violence in Darfur erupted during the drought. Until then, Arab nomadic herders had lived amicably with settled farmers. […] For the first time in memory, there was no longer enough food and water for all. Fighting broke out. By 2003, it evolved into the full-fledged tragedy we witness today.” Subsequently, he expressed his apprehension that conflict in Somalia, Ivory Coast, and Burkina Faso would worsen (Ban 2007).

Economist Jeffrey Sachs also published an article titled “Climate Change Refugees” in 2007. Sachs pointed out that the escalating conflicts in Darfur and Somalia in the 2000s were “fundamentally related to food and water insecurity. Ivory Coast’s civil war stems, at least in part, from ethnic clashes after people fled the northern drylands of Burkina Faso for the coast.” He listed four zones affected by climate change. In the first zone are low-lying coastal settlements affected by the rise in sea level. The second zone consists of farm regions dependent on rivers fed by snowmelt and glacier melt. The third zone consists of subhumid and arid regions which are frequently impacted by major droughts. The fourth zone consists of humid areas in Southeast Asia which are vulnerable to changes in monsoon patterns. (Sachs 2007).

Roughly 40% of the African continent consists of arid and semi-arid regions which fall under third zone. Figure 4 shows countries and regions in Africa which are considered to be severely affected by climate change according to the United Nations Environment Programme (UNEP) and other UN organizations as well as the US Agency for International Development (USAID) and other aid organizations. As stated previously, the precipitation decreased and drought occurred during the 1970s and 1980s in the Sahel region which is located at the southern edge of the Sahara Desert. While the region recovered in the 1990s, the trend in average temperature continues to rise. In the severely dry regions of Mali, Niger, and Burkina Faso, farmland has been reduced due to desertification resulting from a decrease in areas covered in vegetation, and the inhabitants are moving to regions which are better suited to agriculture. These climate change migrants are pouring into coastal nations such as Ivory Coast and Ghana as well as the urban areas of Nigeria. In the Darfur region of western Sudan, confrontations between nomadic herders and crop farmers due to drought expanded into a conflict on the national level. Droughts are also becoming more severe in the countries of Ethiopia and Somalia, which are referred to as the “Horn of Africa.” In addition, there are also concerns that deforestation in refugee camps and settlements is magnifying the effects of climate change in Uganda, the country which has accepted the largest number of refugees in Africa. Due to the fact that

agriculture which is dependent on rainwater is carried out in most regions of Africa, decreases in the amount of rainfall and drought have a severe impact on agriculture.

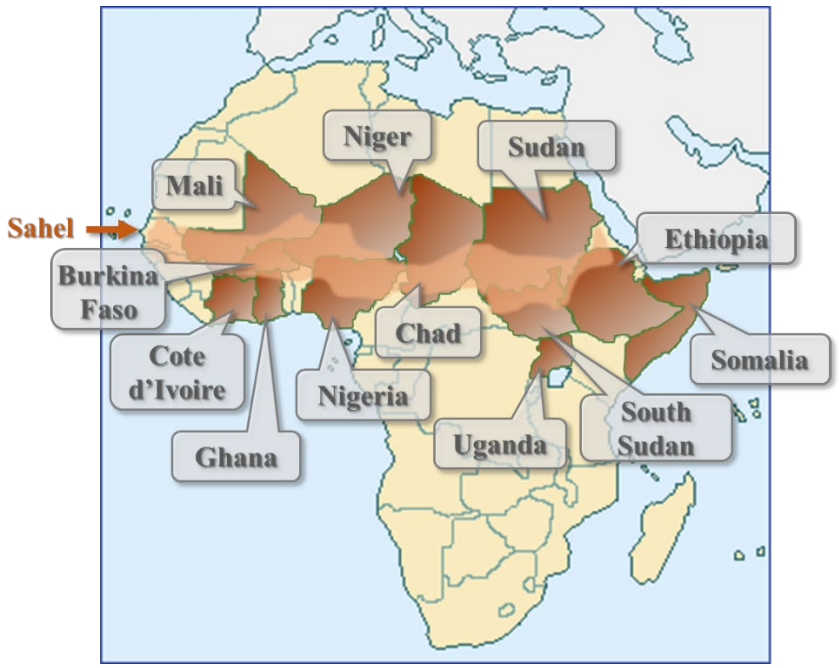


Figure 4 Primary regions of Africa affected by climate change
Source: Created by the author

Based on the existing field research performed in these regions affected by climate change, this paper focuses on the case study of Burkina Faso, a nation which has been prominently affected by environmental changes due to climate change while at the same time suffering from notable conflicts over land use and water resources between agro-pastoralists and the crop farmers which make up the majority of the people. Through that, this paper illustrates the path through which environmental changes due to climate change link to the onset and exacerbation of conflicts.

3. Path from Climate Change to Conflict: Case Study Research Surveys

Agriculture and livestock production are both important sources of livelihood and economies in the semi-arid region of the Sahel. Around 80% of the population is engaged in crop farming and animal husbandry in Burkina Faso (CIA 2020), the country which is the subject of this case study. As is the case in other Sahel countries, there are three types of farmers. Crop farmers whose main activity is crop farming while raising livestock, agro-pastoralists whose main activity is animal husbandry while also cultivating crops, and nomadic pastoralists who breed nomadic livestock. Historically, tension concerning access to land and water resources as well as the guarantee of transhumance routes has frequently increased in the semi-arid regions of Africa between crop farmers who exclusively use land as growing areas for farm products and pastoralists who require spacious communal land to graze their livestock or for transhumance. In addition to this historical context, the view that the variability of precipitation and temperature due to climate change are increasing conflict is spreading. According to an article in the New Humanitarian, the Ministry of Animal and Fishery Resources (Ministère des Ressources Animales et Halieutiques) in Burkina Faso estimates that as of 2012 some 600 conflicts occur

each year between crop farmers and agro-pastoralists, and that cases are rising year on year. For example, it was reported in one case that "herders attacked the dwellings of forestry agents after a herder was arrested for cutting leaves to feed his animals" (The New Humanitarian 2012).

Burkina Faso includes three climatic zones which run from the north to the south and consist of the Sahelian zone, the North-Sudanian zone, and the South-Sudanian zone. The precipitation decreases going further north. As people who have become unable to maintain their livelihood in the northern Sahelian region where desertification is advancing migrate to the southern and eastern areas, confrontations between the indigenous people and the migrants in the migration destination and tension due to differences in values within the communities of existing inhabitants are occurring.

In addition to such conflict at the community level, social unrest and conflict at the national level, such as dissatisfaction concerning the response to extreme weather events including droughts, floods, and locust plagues threatening the government, are also connected to climate change. This section illustrates the path through which climate change links to conflict from the perspective of conflicts between crop farmers and agro-pastoralists, social tension due to migration, and instability at the national level.

(1) Conflicts between crop farmers and agro-pastoralists

The household interviews of 50 crop farmers and 50 agro-pastoralists each (total of 100 farmers) conducted by the aforementioned Abroulaye et al. in two Burkina Faso communities in 2014 reveals the effects of climate change on conflicts between the crop farmers and agro-pastoralists based on the inhabitants' perspective of the issues (Abroulaye et al. 2015). According to their surveys, both the crop farmers and the agro-pastoralists felt that rainfall variability increases their vulnerability and insecurity for food and water. For the crop farmers, rainfall variability and its decrease lead to water scarcity and result in a decrease of their crop yields in addition to soil deterioration resulting from a rise in land usage due to population and livestock increases. In order to compensate for such a yield decrease, crop farmers tend to expand the cultivated areas. At the same time, such expansion of cropland reduces the communal land for grazing, reduces the diversity of plants preferred by livestock, and leads to obstruction of the transhumance routes of the agro-pastoralists. As a result, this not only reduces pastoral mobility but also lowers the immunity of livestock through nutritional deficiencies making them vulnerable to diseases, as well as increases their exposure to infectious diseases (trypanosomiasis) and ticks due to transhumance through subhumid zones. In other words, the agro-pastoralists recognize that in addition to a decrease in grazing land due to climate change, the expansion of cropland by crop farmers is becoming a factor which makes their own livelihood vulnerable. Furthermore, it is not only droughts which have a negative impact on agriculture and livestock production. Heavy rains and floods also drive conflicts over the remaining land and access to water by threatening their livelihood through washing away farmland and grazing land as well as destroying water supply systems (Abroulaye et al. 2015).

However, in response to the interview surveys conducted by Abroulaye et al., both the crop farmers and the agro-pastoralists answered that the root causes of conflict were not climate change itself but resource scarcities and competition, the marginalization of specific ethnic groups, increases in population and livestock, and political policies. The public institutions of Burkina Faso have a low governance capability. Within the central government, natural resources management is shared by the Ministries of Animal Husbandry, Agriculture, Environment, Water, and Energy which implement their own policies. At the district level as well, governance is poor due to a lack of human and economic resources. There are only a few technical experts who can monitor the raising of livestock at the community level and provide guidance to avoid overgrazing. In each community, there is a local system called "Espace de dialogue (space for dialog)" to prevent and resolve conflicts. When a conflict occurs, the local councils and chiefs intervene to provide amicable management. The question of whether the system functions

depends on the local characteristics (Abroulaye et al. 2015).

The challenges being directly faced by the agro-pastoralists were also revealed by the field research conducted by Zampaligré et al. through interview surveys in two villages in each of the three agro-ecological zones (total of six villages) of Burkina Faso. In all of the agro-ecological zones, while the temperature has been on an upward trend over the period from 1988 to 2008, the amount of annual rainfall has not decreased. However, the interviewed farmers perceived changes in temperature patterns, namely the increasing dry season temperature and longer duration of the dry season. They also perceived that the rainfall patterns have become less predictable and are interfering with agriculture and livestock production. As with the surveys by Abroulaye et al., those conducted by Zampaligré et al. show that the crop farmers recognize that climate change is accelerating the decrease of soil fertility while the herders and agro-pastoralists claim that the expansion of farmland to compensate for the decrease in crop yields leads to a decrease in grazing land and restrictions on their movement (Zampaligré et al. 2014)[2].

In addition, Abroulaye et al. indicate in their survey results that conflict between crop farmers and agro-pastoralists tends to occur during the sowing period from May to June and the harvest period from October to December. The impacts of violent conflicts are the injury and death of inhabitants, destruction of infrastructure, killing of livestock, loss of property, and the expulsion of people from villages and migration. However, Abroulaye et al. indicate that there are differences between the two villages that they surveyed as to whether conflicts between crop farmers and agro-pastoralists are managed amicably or develop into violent conflicts. Among the areas that they surveyed, 80% of the inhabitants in Boudry talked about violent conflict while just 10% mentioned it in Matiacoali. Abroulaye et al. emphasize that the aforementioned local system for preventing and managing conflicts is functioning in Matiacoali, which is the key to preventing conflicts from developing into violent conflicts. While intervention by local authorities or the courts very often revives the conflicts due to rampant corruption, local inhabitants tend to accept the intervention of local councils and chiefs. Therefore, Abroulaye et al. claim that traditional mechanisms function within natural resource conflict management and resolution and suggest that the authorities should provide opportunities for customary institutions to deal with the causes of conflict (Abroulaye et al. 2015).

From the previous research, we can see that the variability in precipitation/rainfall and temperature due to climate change threaten people's food and water security and exacerbate conflicts between crop farmers and agro-pastoralists over land use and access to water. However, if this idea is turned on its head, one could say that if food and water safety were guaranteed and alternative means were provided to enable each group to maintain their livelihood, such situations would not develop into a conflict even if water scarcity occurred due to climate change. Moreover, conflicts might be avoidable if resource management and conflict mediation systems are functioning. The low governance capability which is unable to provide such alternative means, resource management, or conflict mediation systems becomes the medium through which the impact of climate change linked to conflict.

(2) Cases in which international aid is the trigger

The fact that environmental changes caused by climate change have a severe impact on agriculture and livestock production in Africa is recognized by both international society and the governments of each country, and a wide variety of policies have been introduced. However, the case of the Mopti region in the country of Mali adjacent to Burkina Faso serves as an example of how intergroup conflict occurred despite the implementation of drought measures through international aid. Based on a survey conducted by Benjaminsen et al. from the Peace Research

[2] Zampaligré et al. define "agro-pastoralists" as those who primarily engage in agriculture as their livelihood while raising five or more livestock animals, but this paper uses the expression in terms of the definition provided by Abroulaye et al.

Institute Oslo, let us take a look at the details behind the conflict which occurred in the Mopti region (Benjaminsen et al. 2012).

Located in the Sahel region, the Niger River forms an inland delta as it flows across the land of Mali, and a massive wetland is created during the flooded season from July to December. Because fertile soil carried from upstream accumulates in the river delta, crop farmers have been cultivating rice there since the 1950s. Meanwhile, the herders live by moving to the delta pasture during the dry season and the dry, northern pasture during the rainy season.

In the Mopti region of central Mali, the current land tenure system in the delta is based on the principles introduced in the 14th century. While the crop farmers are allowed to use the delta as farmland, the herders have recognized rights to determine routes in order to enter the pasture with their livestock. However, during the 1970s and 1980s, the Sahel region experienced an increase in temperature and a decrease in rainfall, which decreased the amount by which the Niger River rose and reduced the delta area while it became more difficult to make a living across the entire region due to frequent droughts. The Malian government emphasized agricultural policies in order to increase food production, and the World Bank launched the "Mopti Rice Project" in the 1970s to increase rice production through the construction of new polders. Starting in the 1980s, agricultural development was carried out as part of the "Mopti Region Rural Development Support Project." There were concerns about the risks of conflict between farmers and herders in the project plan as well, and measures were introduced to mitigate confrontation by strengthening the capacity of the herders to manage the grazing lands (African Development Fund 2001).

Nevertheless, according to Benjaminsen et al., the shrinking of the fertile delta and policies favoring agriculture led to conflict between the farmers and herders over land. According to the results of analyzing data on 820 distinct land/resource disputes in the Mopti region for the period from 1992 to 2009, Benjaminsen et al. indicate that while about 70% of all cases are disputes between crop farmers over land ownership and borders between fields, conflicts between farmers and herders represent 12% of the cases. The primary factors were livestock corridors being blocked through agricultural extension and the encroachment of rice cultivation on grazing lands. Moreover, they point out that while conflicts between crop farmers are between individuals, conflicts between crop farmers and herders are disputes between communities (Benjaminsen et al. 2012).

International aid was the trigger which caused such struggles over land to develop into larger conflicts. In 2001, the World Bank implemented a project on rehabilitation of the small-scale dam and expanded rice cultivation with the participation of the local residents. This project intensified the confrontations between crop farmers and herders over access to water. The crop farmers in the surrounding villages who paid half of the dam rehabilitation costs, prohibited the herders from using the dam for livestock drinking and blocked the path to the dam, because farmers wanted the exclusive use of the dam and fields. While the herders went to court to seek a solution to this problem, the local government treated the crop farmers more favorably under the decentralization which accompanied the democratization of the 1990s, and the herders were cut off from administrative and legal avenues to resolve this dispute. As a result, an incident of gun-related violence occurred between the herders and crop farmers in August 2001. Around three to five people were killed and 15-30 injured in this intercommunity conflict (Benjaminsen et al. 2012).

Policies and aid to increase food production in Mopti created confrontations over land and water between the crop farmers and herders which developed into a conflict between the two communities.

(3) Confrontations caused by migration

The path through which climate change links to conflict is not only limited to rural areas which are affected by aridification. According to a 2014 survey by USAID, the environmental

changes which have continued since the 1970s caused people to migrate from regions which can no longer be cultivated to other regions and triggered confrontations with the inhabitants of the migration destinations (USAID 2014).

As mentioned above, major changes in weather conditions, including "great droughts" in 1972 and between 1983 to 1984 have continued to occur in Africa, and the crop yield of agricultural products has decreased. Within Burkina Faso as well, land has been developed through deforestation, particularly in the arid northern region, in order to secure farmland to complement crop yields and grazing land to secure feed for livestock. According to a report from the Food and Agriculture Organization of the United Nations (FAO), it is estimated that 50,000 hectares of forest have been lost every year in Burkina Faso since 1990, and roughly 20% of the country's forests have been lost during the 30 year period leading up to 2020 (FAO 2020). When viewed from a broad perspective, it is clear that if forests are cut as aridification is advancing, it will lead to desertification. In 2006, the government of Burkina Faso drew up a National Adaptation Programme of Action (NAPA) to Climate Change and designated the water sector, agricultural sector, livestock production sector, and forestry sector as priority sectors. While simultaneously conserving forestry resources, the policies restore soil, improve water supply systems, and increase the productivity of both agriculture and livestock production. However, as decentralization has advanced since the 1990s, the policies have not been implemented in a consistent manner. As policies designed to guarantee food security fail to demonstrate their effectiveness, land is developed in order to maintain livelihoods, and as a result it creates a vicious circle in which people who have become unable to practice agriculture or livestock production on soil which has lost its water holding capacity are forced to migrate to other regions.

According to a survey conducted by USAID in Burkina Faso, people who left the northern area which borders the Sahara Desert migrated to the more humid southern and eastern areas. This led not only to strife between the existing inhabitants and the migrants but also opposing values within the community over land.

In the more developed southern area of Burkina Faso, depending on the generational differences of the society accepting the migrants, there were differences in their sense of values regarding land. While the young generation considered land to be a commodity and recognized the rights of outsiders to the land, the older generation considered land to be a community heritage and denied the rights of outsiders. In the less developed areas in the southeast, indigenous people traditionally have allowed the use of undeveloped land to new arrivals, but some in the community voiced opinions that were opposed to land use by outsiders, which developed into disputes in some cases (USAID 2014).

It is important to point out here that the impact of climate change links to land problems not only in Burkina Faso but most of sub-Saharan Africa. In most rural areas of Africa, the land has traditionally been held under "customary tenure." According to Takeuchi (2017) on the land system in Africa, customary land tenure is a system in which traditional authorities and local communities hold authority over land use, possession, and partitioning, etc. based on customary law. It has some elements which originate in the land tenure from before the period of colonization but was restructured under colonial policy. Since their independence from colonial rule, it was common for land ownership to belong to the state in many African countries, and while families and traditional authorities possessed land partitioning rights in customary lands, the rights of farmers and other users were still ambiguous. However, since the 1990s land reform has been implemented by African countries one after another, which has led to rapid changes concerning land ownership, use, and transfer, etc. Takeuchi points out that behind such rapid land reform lies the political transformation in African countries during the 1990s and the ideas of liberal democracy from influential donors in international society (Takeuchi 2017).

In Burkina Faso as well, the Rural Land Law was enacted in 2009. It has been assessed as the most advanced land law in Western Africa in terms of officially recognizing not only the Western concept of individual land ownership rights but also customary land tenure. As claimed

by Abroulaye et al., the traditional authorities are respected by the inhabitants and play an important role in conflict management and resolution. The government's recognition that the traditional authorities have authority with respect to land use, possession, and distribution is expected to help prevent and resolve conflicts over land.

However, as the effects of climate change continue to increase, excessive expectations cannot be placed on the degree to which such customary land tenure and the associated conflict prevention and resolution systems function. Takeuchi (2017) points out the following with respect to this issue (p. 19).

> The situation in which groups which migrated later create subsidiary relationships with groups that were originally living in an area to obtain land use rights is a type of social practice which is frequently observed in Africa. Such relationships are not fraught with any particular tension as long as there is surplus land, and despite the fact that these are subsidiary relationships, they are different from the relationships between landowners and tenant farmers in Asia in that they often involve only the offering of a symbolic gift. However, tensions may rapidly increase between both parties when triggered by the depletion of surplus land or the outbreak of a political power struggle between two groups. At that time, the group recognized as the original inhabitants distinguish themselves from the outside "strangers" using terms such as "autochthones" and "sons of the soil," and movements to exclude later settlers have been frequently observed in Africa in recent years. Within such "politics of belonging," the logic of questions concerning who the land belongs to and who possesses rights which should be prioritized forms the basis of characteristics for categorizing people and therefore makes it easy for them to become the cause of social tensions over land ownership rights.

When viewed from this perspective as well, the increase in migrants due to the impact of climate change as well as the large-scale movement of people referred to as "climate change refugees" have the potential to trigger conflicts over not only water and food scarcity but also land.

(4) Conflicts involving government rule

So far, previous sections have focused on conflicts at the community level such as confrontations between crop farmers and agro-pastoralists, and confrontations between inhabitants over migration. However, there is also a risk that environmental shocks due to climate change may threaten government rule. This section broadens our horizons to the three countries of Mali, Burkina Faso, and Niger in the Sahel region. Since their independence from French colonial rule in 1960, these countries repeatedly faced a common set of problems (Figure 5). One such problem was natural disasters. The three countries were stricken with droughts from 1968 to 1972 and from 1983 to 1984 as well as a locust plague in 2004. Moreover, the nomadic Fulani people follow their herds (transhumance) while moving across the borders of all three countries. Therefore, when the Dogon agro-pastoralists in northern Mali opposed the nomadic Fulani people over land and scarce water resources in 2015, the situation developed into an inter-community conflict, and the effects reached as far as Burkina Faso. In addition, while a rebellion aimed at achieving the independence of the Tuareg minority in the Sahel region occurred from 1990 to 1995 and from 2007 to 2009, after the fall of the Qaddafi regime in Libya in 2011, 2,000 to 4,000 Tuareg soldiers who had served the Qaddafi regime crossed the Sahara Desert to return to Niger and Mali, and a fierce struggle for independence started from 2012. This chaotic situation attracted Islamic armed groups and battles by the Islamic State in the Great Sahara (ISGS) and Jama'at Nasr al-Islam wal Muslim (JNIM) spread to the three countries. In response to this situation, local communities also formed their own armed groups for self-defense to oppose these groups (ACAPS Web). Figure 6 is a graph showing the number of geolocated

violent events (battle, riots, and attacks against civilians, etc.) which occurred in the three countries based on data from the Armed Conflict Location & Event Data Project (ACLED) which gathers geolocated violent event data from locations around the world. We can see from the data that conflicts have been occurring and intensifying since 2011.

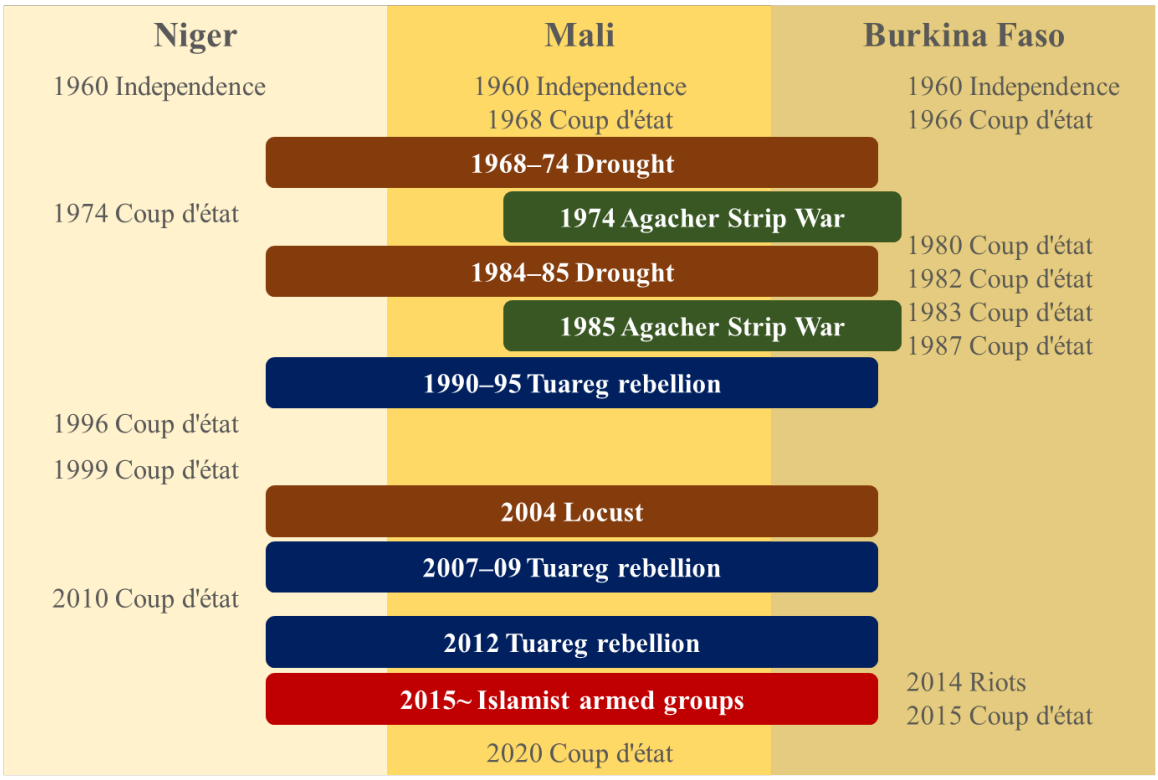
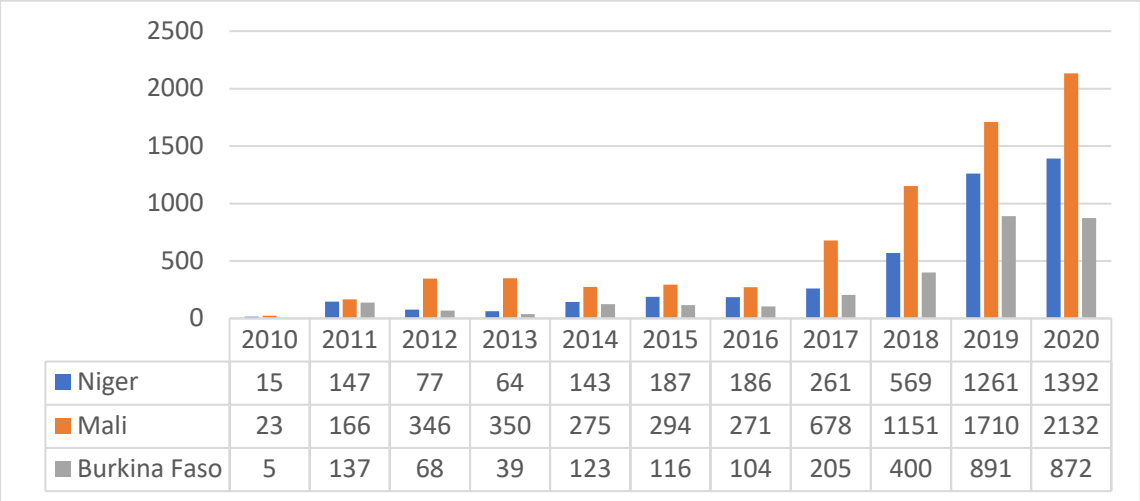


Figure 5 Brief history of the three Sahel region countries
Source: created by the author



	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Niger	15	147	77	64	143	187	186	261	569	1261	1392
Mali	23	166	346	350	275	294	271	678	1151	1710	2132
Burkina Faso	5	137	68	39	123	116	104	205	400	891	872

Figure 6 Number of conflict related events in the three Sahel countries
Source: Created by the author from ACLED

What should be pointed out here is that the Fulani, Tuareg, and Islamic armed groups utilize existing conflicts between crop farmers and agro-pastoralists to mobilize agro-pastoralists who make a living from the same type of livestock production and expand conflicts. Worrying about their livelihoods and unable to stop the expansion of croplands by farmers, agro-

pastoralists who are anxious about food and water security have become easy to be mobilized by outside armed groups. It should be emphasized that while such conflicts appear at first glance to be ethnic conflicts due to the fact that they occur in line with ethnic groups, the impact of climate change is also making its presence felt in these conflicts.

Conflicts by armed groups intensified in 2019, and 560,000 people were forced to flee. At the same time, 71,000 people suffered damage due to heavy rain in April 2020, which resulted in the deaths of 13 people and the destruction of 3,300 houses.

Due to policies to contain the COVID-19 in 2020, restrictions were put in place on humanitarian aid. Meanwhile, schools and medical institutions were targeted by armed groups, which made a difficult situation even worse (ACAPS Web).

4. Conclusion: Path Through Which Climate Change Links to Conflict

This paper emphasizes the following three points as problems made visible by the existing research reviews.

Firstly, when it comes to climate change in the Sahel region where 80% of the inhabitants are engaged in agriculture and livestock production, the variability of rainfall and temperature threaten the security of people's food and water and link to the causes of conflict outbreaks at the community level by exacerbating confrontations over land use and access to water between crop farmers and agro-pastoralists. However, one could say that if food and water safety were guaranteed and alternative means were provided to enable each group to maintain their livelihood, such situations would not develop into a violent conflict even if a water scarcity occurred due to climate change. Moreover, conflicts might be avoidable if resource management and conflict mediation systems are functioning. The low governance capability which is unable to provide such alternative means, resource management, or conflict mediation systems becomes the medium through which the impact of climate change links to conflict.

Secondly, migration due to desertification, floods, droughts, and other extreme weather events not only leads to strife between the existing inhabitants in the migration destination and the migrants but also provokes a clash of values within the community over land. This problem is founded on the customs concerning land ownership and use in Africa. In most rural areas of Africa, land has been held under a customary tenure. While land is still in surplus, the existing inhabitants are occasionally permitting the migrants to use the land, but tensions increase when there is not enough land due to population and livestock increases and the expansion of cropland, etc. In addition, this also becomes a source of strife between the younger generation which considers land to be a commodity and the older generation which views it as a community heritage. There is a potential risk that conflicts over land may occur at the community level with the increases in the number of migrants and refugees due to climate change.

Thirdly, since the fall of the Qaddafi regime in Libya in 2011, conflicts due to the struggle for independence by the Tuareg minority in the Sahel region and Islamic armed groups have intensified, which increases the potential risk that conflicts between crop farmers and agro-pastoralists may be used by armed groups to mobilize them for conflicts on the national level. It may be said that a phenomenon is occurring in which ethnic grievances produced by climate change are being used for the greed of armed groups.

As was pointed out in the beginning of this paper, it is important to remember that Burkina Faso and the other countries of the Sahel region are the poorest countries in the world, and problems such as the variability of rainfall and increases in temperature which could be overcome through technology by advanced countries have an impact to the point where they threaten people's lives. To put it another way, if we can achieve the goal to "build the resilience of the poor and those in vulnerable situations, and reduce their exposure and vulnerability to climate-related extreme events and other economic, social and environmental shocks and

disasters" of the Sustainable Development Goals (SDGs) target 1.5, the possibility that environmental shocks due to climate change will link to conflicts may be reduced. This paper points out that promoting the achievement of SDGs directly contributes to the prevention and resolution of conflicts.

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