



EFFECTS OF CLIMATE CHANGE ON VEO  
RECRUITMENT AND INTERCOMMUNAL  
VIOLENCE IN WEST AFRICA

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# 1 EXECUTIVE SUMMARY

The Sahel faces long-standing human security and socio-economic challenges, including poverty, food insecurity, and violence. Since the early 2020s, the centre of the Liptako-Gourma region, the border area between Mali, Niger and Burkina Faso, has been significantly affected by these issues, raising humanitarian concerns. Weak governance and porous borders facilitate illicit activities such as arms trafficking and extremist violence. Competition over scarce resources exacerbates conflicts between ethnic groups, pastoralists, and farmers.

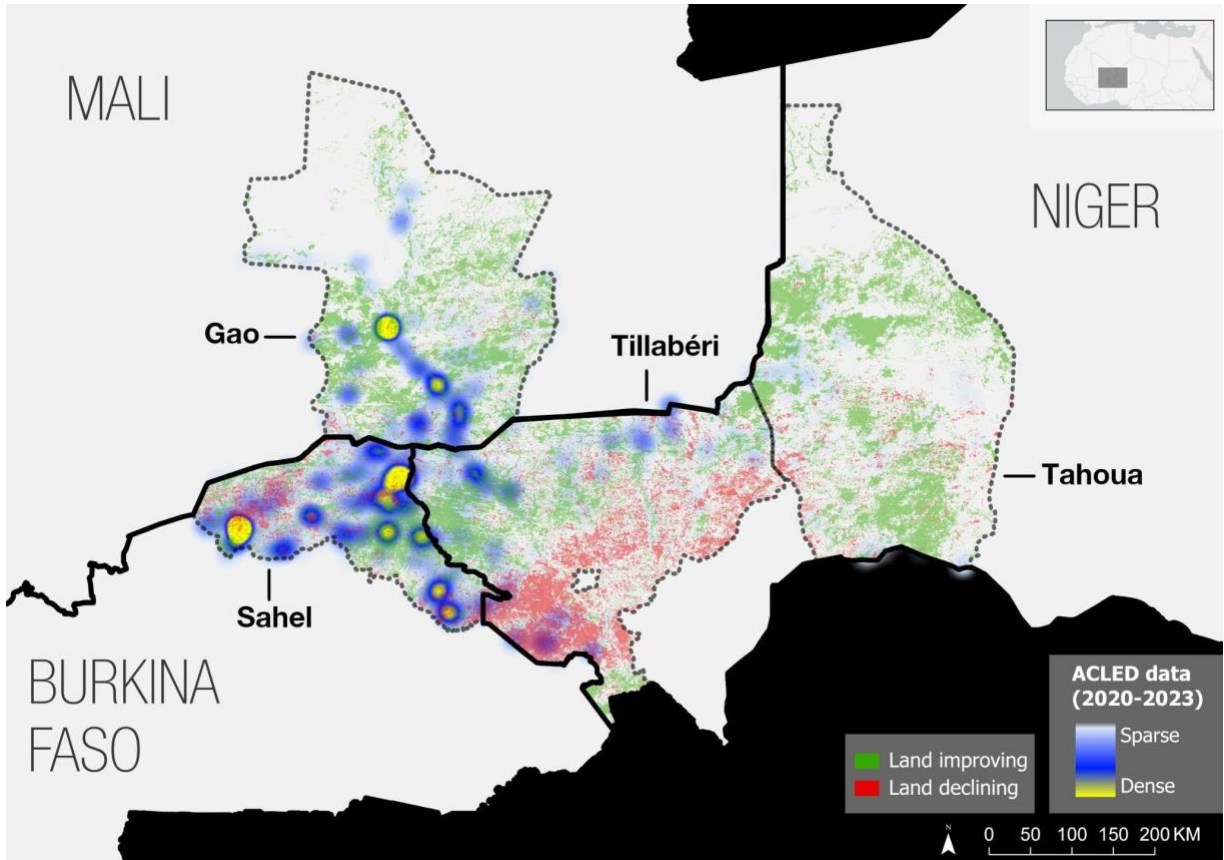
Historically, climate change has reinforced violence patterns in the Sahel, notably during severe droughts that reportedly strengthened political violence from the 1970s to the late 1980s. The persistence of this connection is explicitly acknowledged by a wide range of stakeholders ranging from international bodies and humanitarian organisations to supporters of armed actors. External conflict actors, such as pro-Russian private military company (PMC) accounts, have referenced climate as a justification for their intervention in the conflict. Understanding the relation between climate and conflict is thus crucial for directing efforts towards sustainable peace and addressing violence in the Liptako-Gourma region and beyond.

This report examines the impact of climate change on current conflicts at the confluence of Mali, Niger, and Burkina Faso. It analyses climate data (relating to land degradation, precipitation, and fires) produced by CIR and compares it to recent violence trends, using 2020-2023 data from the Armed Conflict Location & Event Data Project (ACLED). This is complemented by qualitative analysis on the roots of violence and additional factors leading to increased competition for natural resources are also considered. Finally, the gendered impact of climate change as well as its links to population displacement are examined.

Key findings include the following:

- CIR data shows that from 2001 to 2020 the productive capacity of the vast majority of land studied either increased or remained stable, with little to no signs of desertification. Rainfall became more significant but also more irregular, leading to floods. Fire data had remained stable since the early 2000s with a strong increase in 2020-2023. Some of these positive dynamics are due to the environment recovering from unusually strong drought periods in previous decades.

- Decreased land productivity and conflict appear to be linked in the region. The locations affected by land degradation (9.1% of total area), especially in the Sahel and Tillabéri regions, are disproportionately affected by violent incidents (three times more than average). The vast majority of these incidents have involved violent extremist organisations (VEOs) and state armed forces.
- In all likelihood, the significant increase in fires (+180%) from 2020-2023 is an effect of heightened violence in the region rather than a direct effect of climate change.



*Heatmap of 2020-2023 ACLED data overlaid with with 2001-2020 land degradation*

- Factors other than climate change also lead to conflicts through increased competition for limited resources. These include significant population growth, additional pastoral pressure related to the rise in meat demand, and the recent expansion of gold mining activities.
- Significant numbers of displacements across the area of focus are linked to climate variability and related environmental events such as increased floods. They have decimated livelihoods, created food and water insecurity, and exacerbated conflict dynamics surrounding key resources, such as the targeting of water sources by VEO groups.

- Women and girls are extremely reliant on natural resources given their involvement in agro-pastoral livelihoods and household responsibilities. This, paired with their limited alternative opportunities and coping mechanisms, means that women and girls are disproportionately vulnerable to climate change.

## 2 INTRODUCTION

The Sahel, characterised by its semi-arid climate and vast stretches of desolate land, has long witnessed significant security and economic difficulties, including poverty, low food resources, and protracted violence<sup>3</sup>. According to numerous reports, including from the [Stockholm International Peace Research Institute](#), in recent years these issues have particularly affected the Liptako-Gourma area and, more specifically, the Tri-border region at its centre, comprising in particular the Gao (Mali), Sahel (Burkina Faso), Tillabéri and Taouha (Niger) regions (Figure 1), raising significant humanitarian concerns.



Figure 1: Map of the Sahel, Gao, Tillabéri and Tahoua regions at the intersection of Mali, Niger and Burkina Faso

<sup>3</sup> L'enchevêtrement des crises au Sahel. Niger, Mali, Burkina Faso, Olivier de Sardan, 2023

The area's porous borders and weak governance structures create fertile ground for the proliferation of illicit activities, including arms trafficking, smuggling, and extremist violence as shown in various reports, including from [Institut d'études de sécurité](#). Scarce resources also fuel competition and conflicts between diverse ethnic groups, pastoralists, and farmers, vying for control over land, water, and other critical natural resources.

Climate change has been shown to strengthen violence in the Sahel.<sup>4</sup> This was particularly evident during severe periods of drought between the 1970s and late 1980s. It was considered one of the causes of demands for autonomy and political conflict since the middle of the 20th century<sup>5</sup>. The droughts caused massive losses of agricultural production and livestock, loss of human lives to hunger, malnutrition and disease, massive displacements of people and shattered economies, contributing to political instability.

Apparently, this has not changed in recent years. The [International Committee of the Red Cross](#), the [International Rescue Committee](#), and prominent newspapers such as [Le Monde](#) have examined the interconnection between conflict and climate change in the area, with climate shocks and desertification increasing the competition over limited resources. In 2022 the [UN Refugee Agency](#) warned that if climate change is not mitigated, the conflict will only worsen, establishing a clear link between both elements.

The link between climate change and violence has also been cited by [pro-Russian accounts on telegram](#) to explain trends in the current conflict. These accounts have used these explanations to further rationalise the involvement of Russian armed actors in the conflict. Thus, as [violence reportedly keeps increasing in the Liptako-Gourma area](#) and climate variability is cited by a range of actors to support humanitarian and military strategies, it is essential to understand to what degree the ongoing conflicts are indeed linked to climate change. Findings on this topic would also help direct efforts towards sustainable peace and a more cohesive understanding of drivers of conflict, both within the Liptako-Gourma region as well as across the broader Sahel. The region's strategic location at the crossroads of West Africa makes it a focal point for regional security, with implications for regional terrorism, transnational crime, and migration flows.

In light of these considerations, this report seeks to provide an analysis of the impact of climate change on current conflicts at the confluence of Mali, Niger, and Burkina Faso.

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<sup>4</sup> States, Scarcity, and Civil Strife in the Developing World, Kahl, 2006

<sup>5</sup> Ibid

## LIMITATIONS

CIR's analysis focuses on the regions of Gao (Mali), Sahel (Burkina Faso), and Tillabéri and Taouha (Niger). The climate data used in this report is largely extracted from remote sensing techniques.<sup>6</sup> Although in some specific cases this type of analysis is not as accurate as field studies, it allows for large-scale assessments and is a widely recognised methodology for climate research.

Some of the satellite datasets used in this document only go back to the beginning of the 2000s, while others have not yet been updated to include data beyond 2021. As a result, the study of climate patterns is, in some instances, temporally limited.

In addition, this report does not aim to draw clear causal relationships between the different factors at hand. It provides an overview of general correlations and possible hypotheses explaining them. However, a precise assessment of the nature and proportion of the relations between the different elements is not possible given the lack of controlled parameters and the complex multi-factorial environment of human affairs.

## STRUCTURE OF THE REPORT

The first part of this report details climate data produced by CIR over the region of interest. It includes results on land degradation, precipitation, and fires. The second section then compares these elements with conflict-related data encompassing violent incidents and armed group recruitment. The third segment analyses additional factors also contributing to increased competition for natural resources in the region, such as demographic growth, pastoral pressures, and gold mining. The fourth and final parts provide an overview of the links between climate change and population and delves into the gendered impact of global warming in the area.

## 3 CIR CLIMATE CHANGE DATA

In order to assess the links between climate change and conflict in the area of interest, precise climate change data must first be obtained. Some of the most critical factors when examining climate trends in the Sahel are land degradation, changes in rainfall, and the evolution of fires. When combined, land degradation and relatively low precipitation form desertification.

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<sup>6</sup> See the annex for more details on the methodology used, in particular regarding the use of satellite data.

CIR performed a land degradation analysis of the Sahel, Gao, Tillabéri, and Tahoua regions between 2001 and 2020 (Figure 2), where 'land degradation' is defined as a quantitative measurement of a reduction in productive capacity of the soil. The analysis used the Trends. Earth methodology<sup>7</sup> developed by Conservation International, Lund University, and NASA for report submission to organs of the United Nations Convention to Combat Desertification. This does not include information past 2020 as some of the data required has not yet been published. However, this limitation is mitigated by the fact that the focus is on climate, which tends to evolve over relatively long timeframes, although possibly in an increasingly rapid manner.<sup>8</sup>

Land degradation analysis results show "land improving", "land declining", and remaining areas - which either show no changes or correspond to water bodies.

CIR's findings indicate that 23.3% of the total area corresponds to land improving over the period of interest, and 9.1% to land declining. The remaining 67.6% of the area examined has not experienced any change. Thus, lands in the region of interest tend to improve more than they decline.

Of particular interest, the locations most affected by land degradation include the western part of the Sahel region, especially around Djibo, the southeastern section of the Sahel region, near Mansila, and the southern portion of Tillabéri, chiefly southwest of Niamey. A number of these areas have witnessed high incidences of conflict and violence (see section 2 below). Lands that improved between 2001 and 2020 are generally spread over the rest of the territory, with the notable exceptions of areas in the northwest of the Gao region, as well as the north and the east of the Tahoua region which were already desertic and remained mostly unchanged.

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<sup>7</sup> See more details on the methodology used in the annex.

<sup>8</sup> The matter does not appear to be fully settled - see for instance this [Washington post article](#)



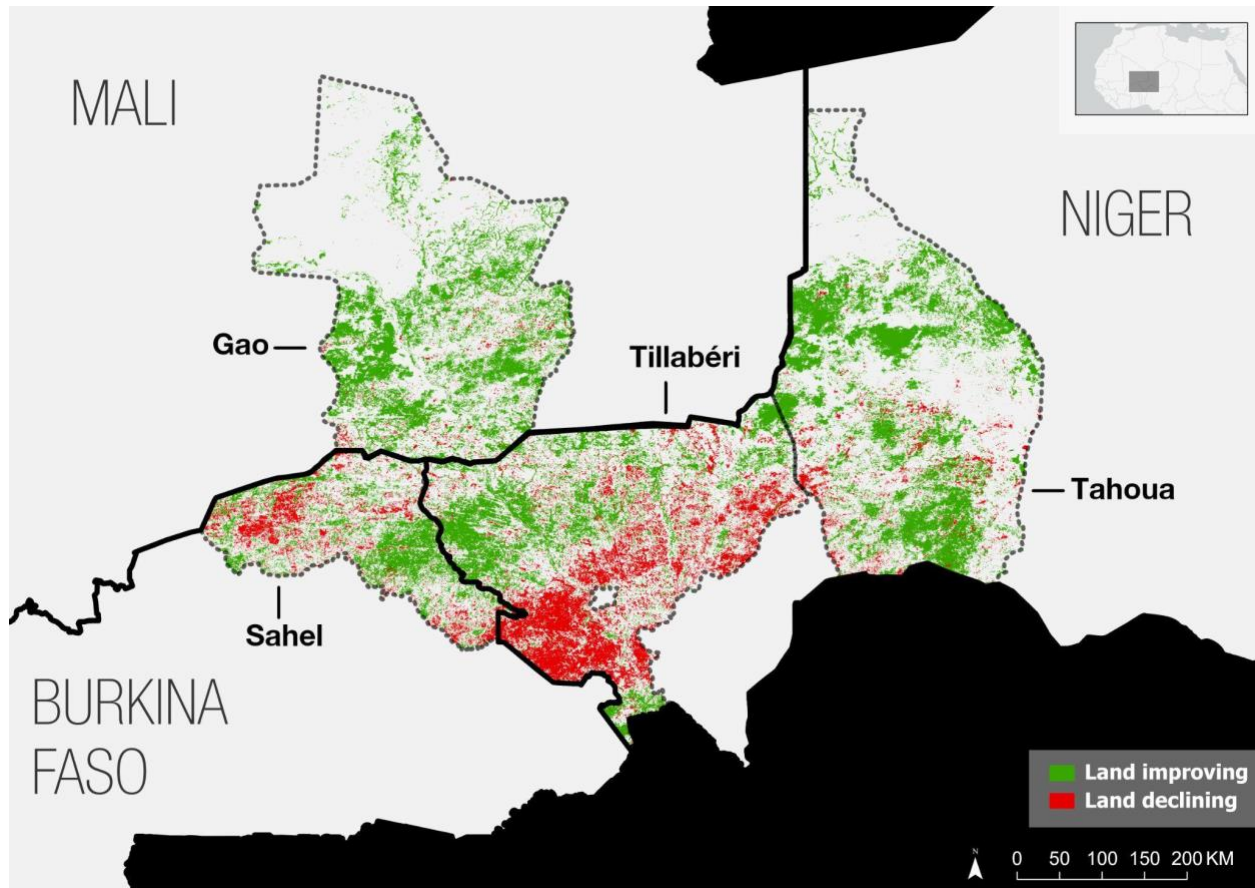


Figure 2: Map of land degradation between 2001 and 2020

These results appear relatively counterintuitive. Spontaneously, many would tend to associate global warming with desertification in the Sahel, but CIR's data in the area of interest shows that this is not the case. Such results may be explained by some of the specificities of the local context. Climate change does not affect all areas of the world equally. Despite some of the largest increases in [temperature](#) on record noted over the past decades, according to the [Climate & Development Knowledge Network](#), the Sahel also reportedly witnessed generally improved environmental conditions since the 1990s, as mentioned in this recent study from the [Council on Foreign Relations](#). This is particularly due to the dire conditions that affected the area between the 1970s and late 1980s. During this time, the Sahel experienced 9 periods of droughts<sup>9</sup> - including 5 major ones - which strongly affected the environment. It has slowly been recovering ever since. Hence, land degradation is a localised trend in the area.

According to the [Council on Foreign Relations](#), the general improvement of environmental conditions in the past decades was also accompanied by increased

<sup>9</sup> States, Scarcity, and Civil Strife in the Developing World, Kahl, 2006

rainfall, although it also appears to be more intense and irregular, leading to more numerous flooding events. This is also confirmed by CIR's analysis of the 2020-2023 period.

CIR calculated a 48-month Standardised Precipitation Index of the region, comparing the total 2020-2023 rainfall to previous 4-year periods beginning in 1981 (Figure 3).<sup>10</sup> This drought indicator is used to assess long-term precipitation trends and anomalies. Results indicate that, on average, precipitation between 2020-2023 has increased considerably compared to similar timeframes in previous decades. 93.3% of the total area saw more precipitation or the same amount of precipitation, while only 6.7% witnessed decreased rainfall. Specifically, the latter includes the northern, eastern, and central parts of the Gao region, the central part of Tillabéri, and the eastern part of Tahoua. These areas do not show a strong correlation with lands declining between 2001 and 2020. As mentioned earlier, both phenomena should be present simultaneously to fulfil the desertification criteria. Such regions are thus subject to low precipitation, but not to desertification.

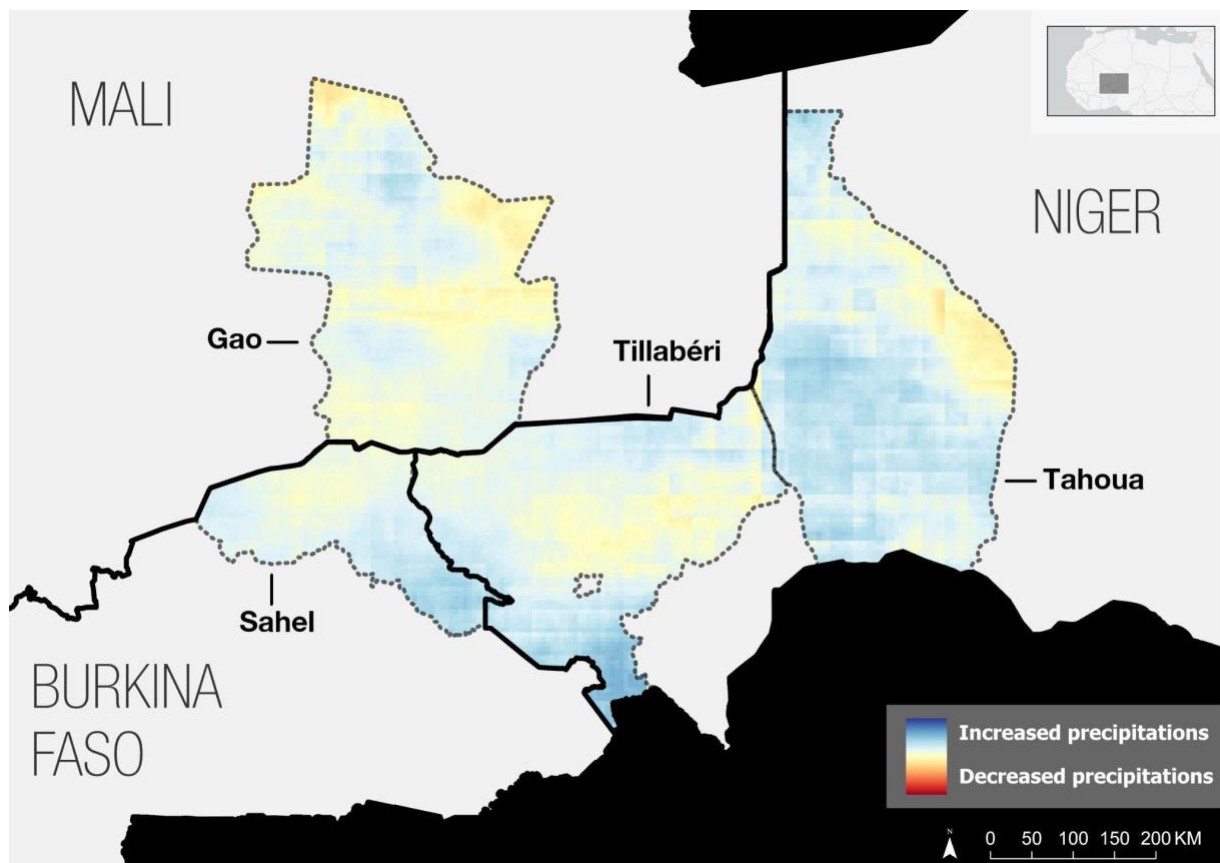


Figure 3: SPI-48 map comparing 2020-2023 precipitation to previous 4-year periods since 1981

<sup>10</sup> See more details on the methodology in the annex.

With temperatures rising, some of the land declining, and increasingly irregular rainfall, an increased fire count may also be a direct effect (and sign) of climate change. CIR collected fire data<sup>11</sup> from the 2020-2023 period and completed a temporal analysis against data from the years prior, going back to 2004. More fires took place between 2020-2023 than during any other 4-year period analysed.

Between 2020 and 2023, satellites detected 6,867 fires in the zone of interest (Figure 4). In contrast, the average number of fires during previous 4-year periods was only 2,454, with a maximum of 2,659 between 2016 and 2019 (low deviation) (Figure 5). The 2020-2023 fire count thus represents a very important spike compared to the average of previous 4-year periods (+180%).

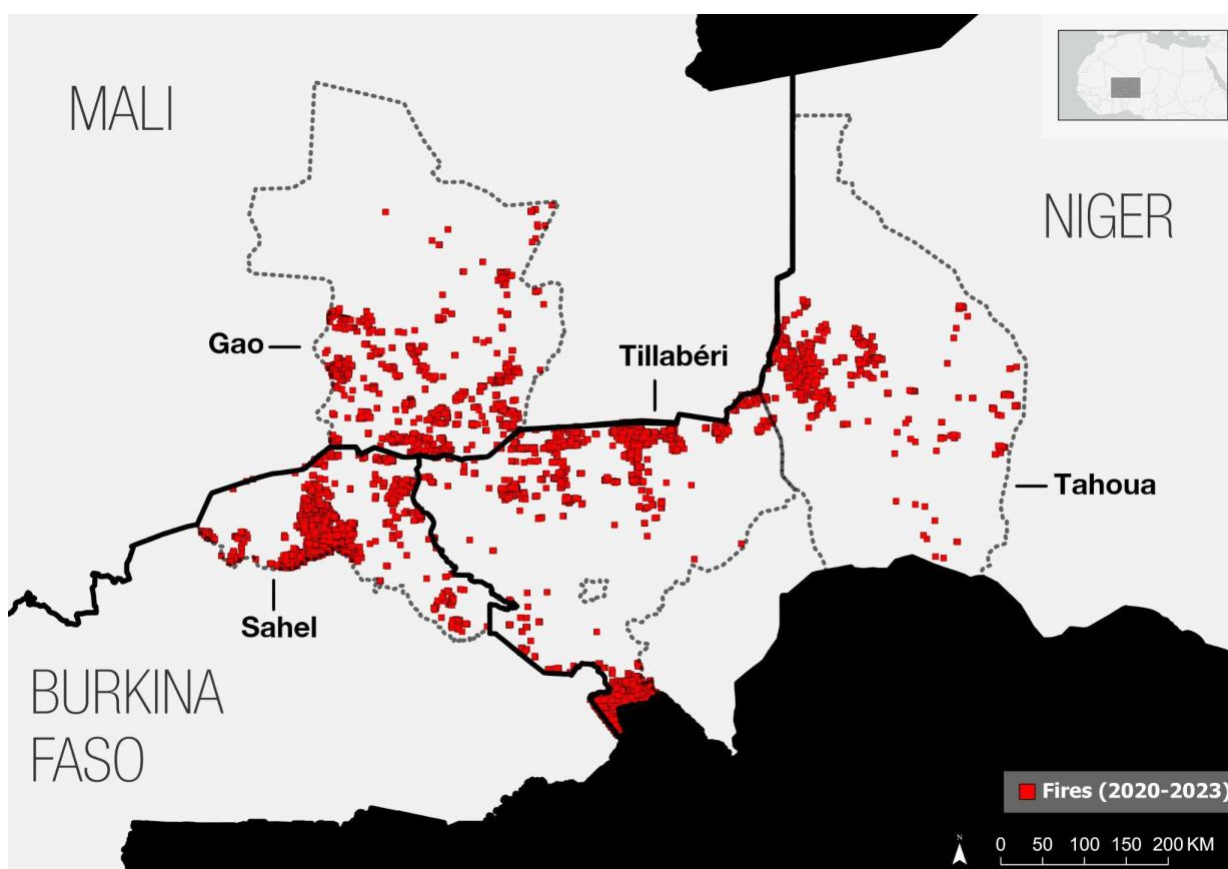


Figure 4: Map of FIRMS (MODIS) fires between 2020 and 2023

<sup>11</sup> See more details on the methodology in the annex.

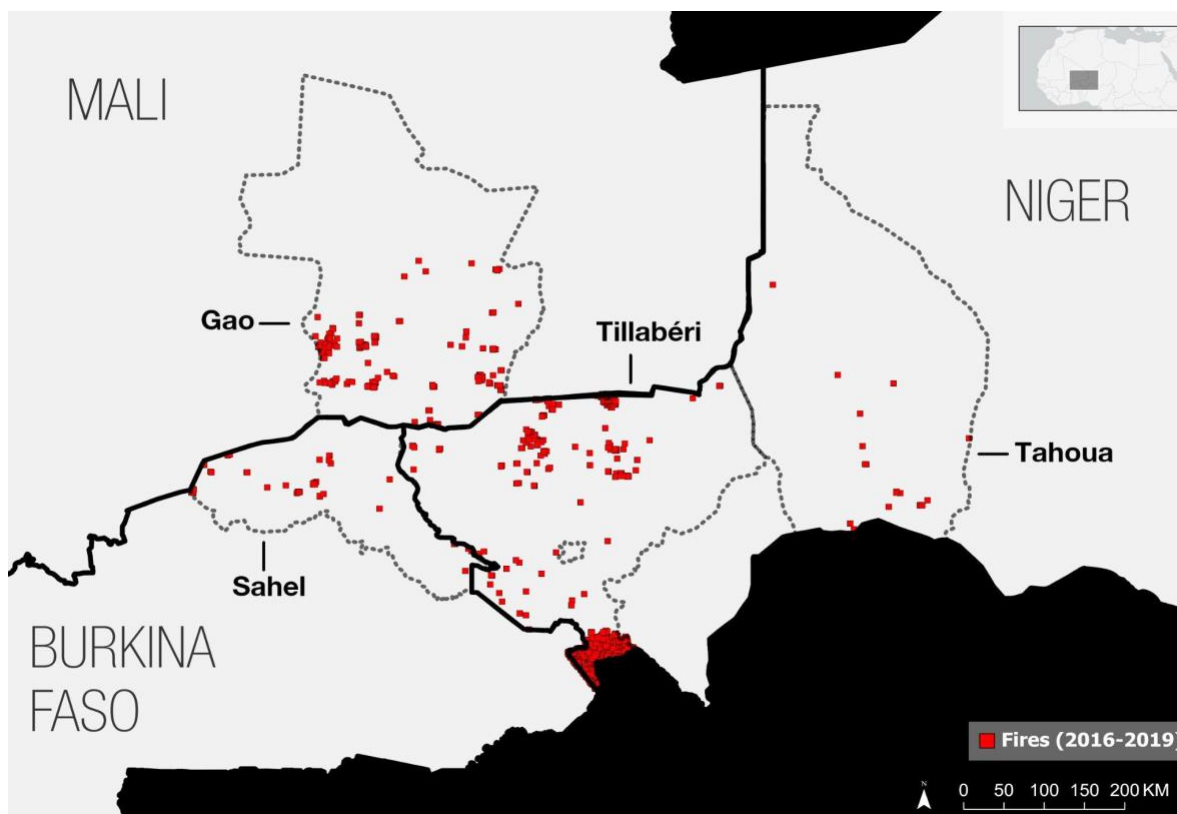


Figure 5: Map of FIRMS (MODIS) fires between 2016 and 2019

This increase generally concerned all areas previously affected by fires. However, there was also a significant increase in fires in areas that were not substantially affected previously. This phenomenon occurred in large parts of the Sahel region in Burkina Faso, specifically in the Djibo, Arbinda, Markoye, Dori, Sebba, and Mansila areas. In Niger, some areas bordering Mali, in particular north of Bani Bangou, south of Ayawa, and northwest of Tahoua, as well as the eastern part of the Tahoua region share this trait. Locations surrounding Tessit, in Mali, also appear to have witnessed an unprecedented pattern of fires. There is no general correlation between areas affected by fires and those that saw their lands and rainfall decline.

In conclusion, in terms of land degradation and precipitation, conditions generally improved more than they declined over the past decades in the area of interest. In particular, declining land and lower precipitation do not appear to match in recent years, which denotes an absence of desertification *stricto sensu*. However, some specific areas, especially in the Sahel and Tillabéri region, were still affected by declining land (e.g. Djibo, Mansila, and southwest of Niamey).

Although somewhat counterintuitive, this generally favourable trend is due in large part to the region recovering from important drought events that took place before 1990. On the other hand, fires have skyrocketed in the past few years, reaching areas

that were previously mostly left untouched, especially in the Sahel region and along the Nigerien border with Mali. The data does not show any strong correlations between the evolution of fires and the other phenomena.

## 4 CLIMATE CHANGE AND VIOLENCE

As shown by our data, the area comprising the Sahel, Gao, Tillabéri, and Tahoua regions has generally improved in terms of environmental conditions in recent years. Land degradation and precipitation rates tend to ameliorate as a whole. But some specific zones still show signs of declining land, and fires have seen an impressive surge.

As mentioned earlier, numerous reports claim that climate change and conflict are deeply interconnected in the zone of interest. This section will thus examine these claims by assessing whether CIR climate data is linked to violence.

### 4.1 VIOLENT EVENTS TRENDS

ACLED data<sup>12</sup> provides a reliable dataset of violent events, allowing for systematic analysis and comparison of trends over the past 8 years. It shows that the 2020-2023 period was characterised by 6,748 recorded incidents, compared to 1,759 between 2016-2019, representing a 284% increase. According to the [ACLED team](#), a significant part of this evolution is most likely due to the escalation of the conflict between the military juntas in power (as well as their Russian allies) and the VEOs over the past five years.

However, this does not mean that climate change did not have an impact on violence. The evolution of the environment may factor in the determination of areas where some of the violence involving non-state armed groups (particularly VEOs) occurred. For instance, a reduction in the availability of productive lands may lead to increased food and economic insecurity. Although publicly available data on this topic is relatively scarce and generally not detailed, in such a context, VEO and criminal engagement may and have become a viable economic path for many individuals, according to research by the [Africa Center for Strategic Studies](#) and the [Journal of Political Geography](#).

Additionally, due to increased pressure on shared resources, climate change may also directly translate into conflicts between communities, especially between pastoralist and farmer populations. According to the [Africa Center for Strategic Studies](#), in West

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<sup>12</sup> See more details on the methodology used in the annex.

and Central Africa, heightened pressure on common resources (which may be the result of land degradation for instance) tends to result in worsening intercommunal relationships. It elevates tensions between farmers and herders and, ultimately, may lead to more frequent instances of farmer-herder violence.

The geographical distribution and density of violent incidents should thus be studied alongside climate data to better understand the links between the two elements.

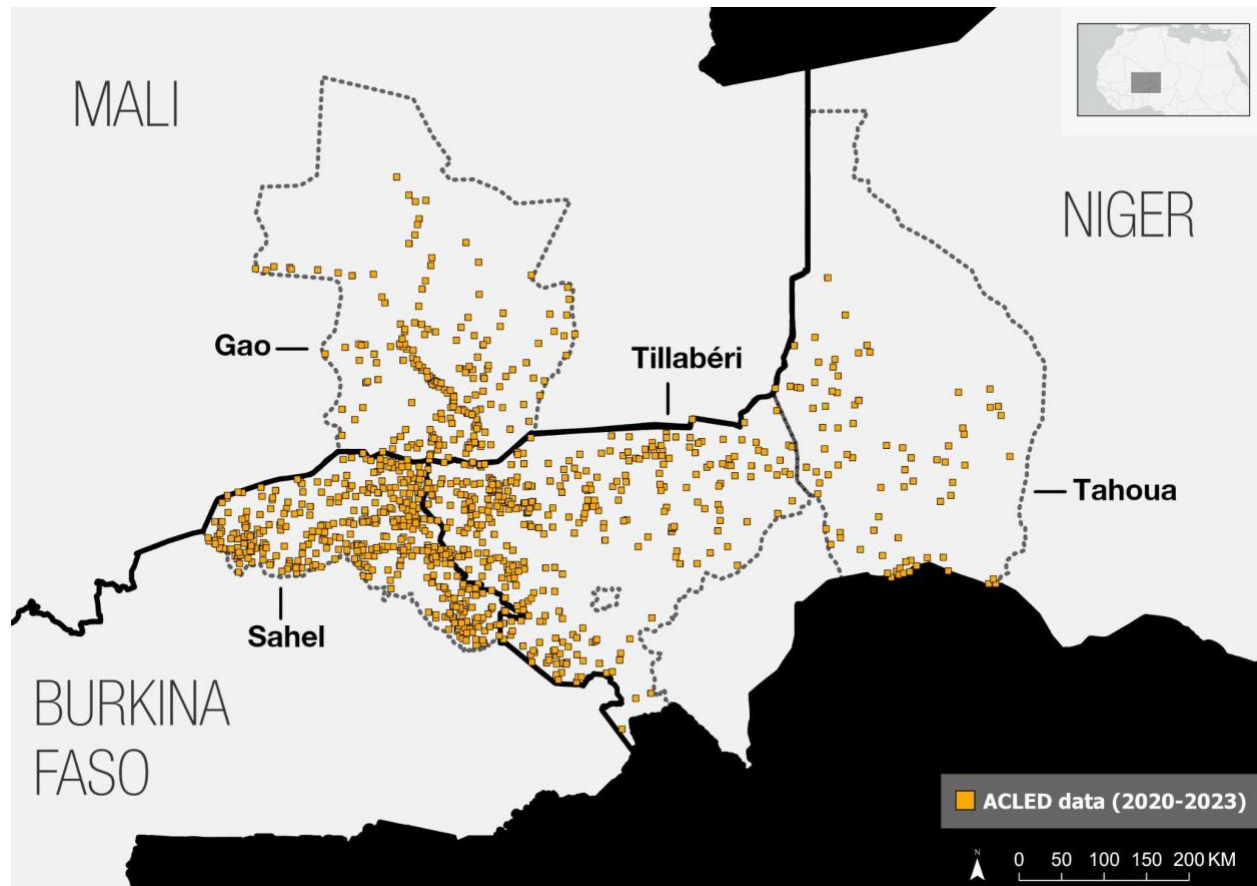


Figure 6: Map of 2020-2023 violent incidents (ACLED data)

On its own, 2020-2023 ACLED data provides some visual insights into conflict dynamics (Figure 6). For instance, almost half of all violent incidents have taken place in the Sahel region, which otherwise only represents 11% of the territory and 12% of the population in the total area.<sup>13</sup> As shown earlier, the Sahel region is one of the main locations showing important land degradation and substantially increased fire counts. The fact that it is also disproportionately affected by violence hints that the different factors may be linked, with reduced land productivity and increased burnt soil fueling heightened competition for scarce resources. In the Gao region, a

<sup>13</sup> All figures and statements on population are extracted from [2020 Facebook data](#).

significant portion of the incidents have taken place along the Niger river, which is where the population is the most dense. This is largely due to access to irrigation for agriculture, and where the main roads are located. The population is more evenly distributed in the three remaining regions, which could explain why they show less patterned signs of concentrated violence.

#### 4.2 VIOLENT EVENTS AND LAND DEGRADATION

Although violent incidents may appear to be present on both improving and declining lands (Figure 7), when visualised as a heatmap (Figure 8), they appear to be grouped more densely in areas that witnessed land degradation, in particular in the Sahel region of Burkina Faso.

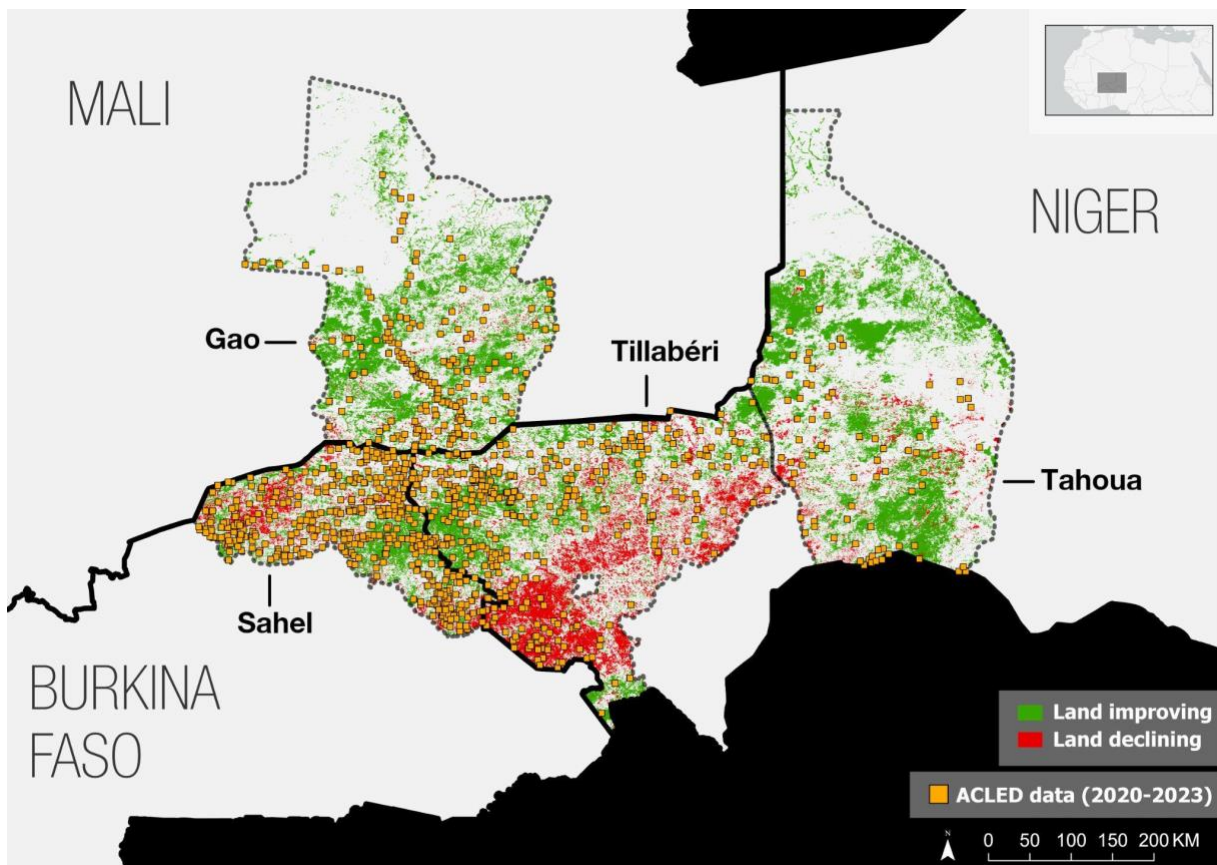


Figure 7: Map overlapping 2020-2023 ACLED data with 2001-2020 land degradation

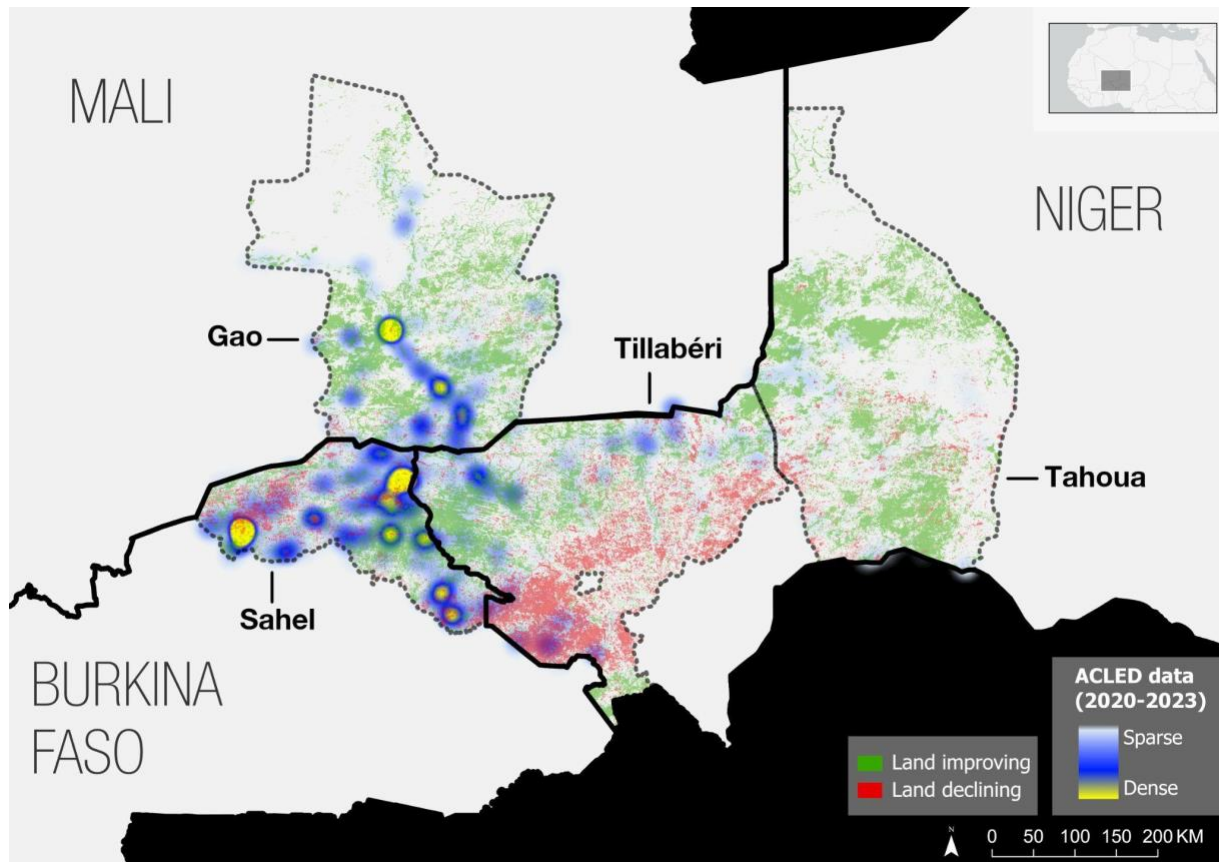


Figure 8: Map overlapping a heatmap of 2020-2023 ACLED data with 2001-2020 land degradation

Further analysis shows that 15.9% of ACLED events took place on improving land, which otherwise represents 23.3% of total land area, indicating an under-representation, and little probability of a causal link. On the other hand, 27% of ACLED events occurred on declining land, which accounts for 9.1% of the total area, an incidence rate 3x higher than average. That such a high percentage of conflict events occur in such a comparatively small area indicates a strong relationship between land degradation and violence, likely due to increased competition for arable lands.

This strong link between soils with decreased productive capacity and violence concerns some areas more than others. Locations especially affected by both declining land and violence are mostly located in the Sahel and Tillabéri regions. They include in particular the Djibo, Markoye, Sebba, and Mansila areas in Burkina Faso, as well as the Libiri and Makalondi areas in Niger. ACLED data shows that all of these locations mostly see violent events involving VEOs and state armed forces. Intercommunal violence only represents a small portion of related incidents.



### 4.3 VIOLENT EVENTS AND PRECIPITATION

When comparing ACLED incidents with rainfall data (Figure 9), however, only 33 of the ACLED incidents are located in areas with less precipitation than the average of previous 4-year periods. Conversely, there does not seem to be a significant correlation between the areas where precipitation most increased, and those that witnessed the most ACLED incidents.

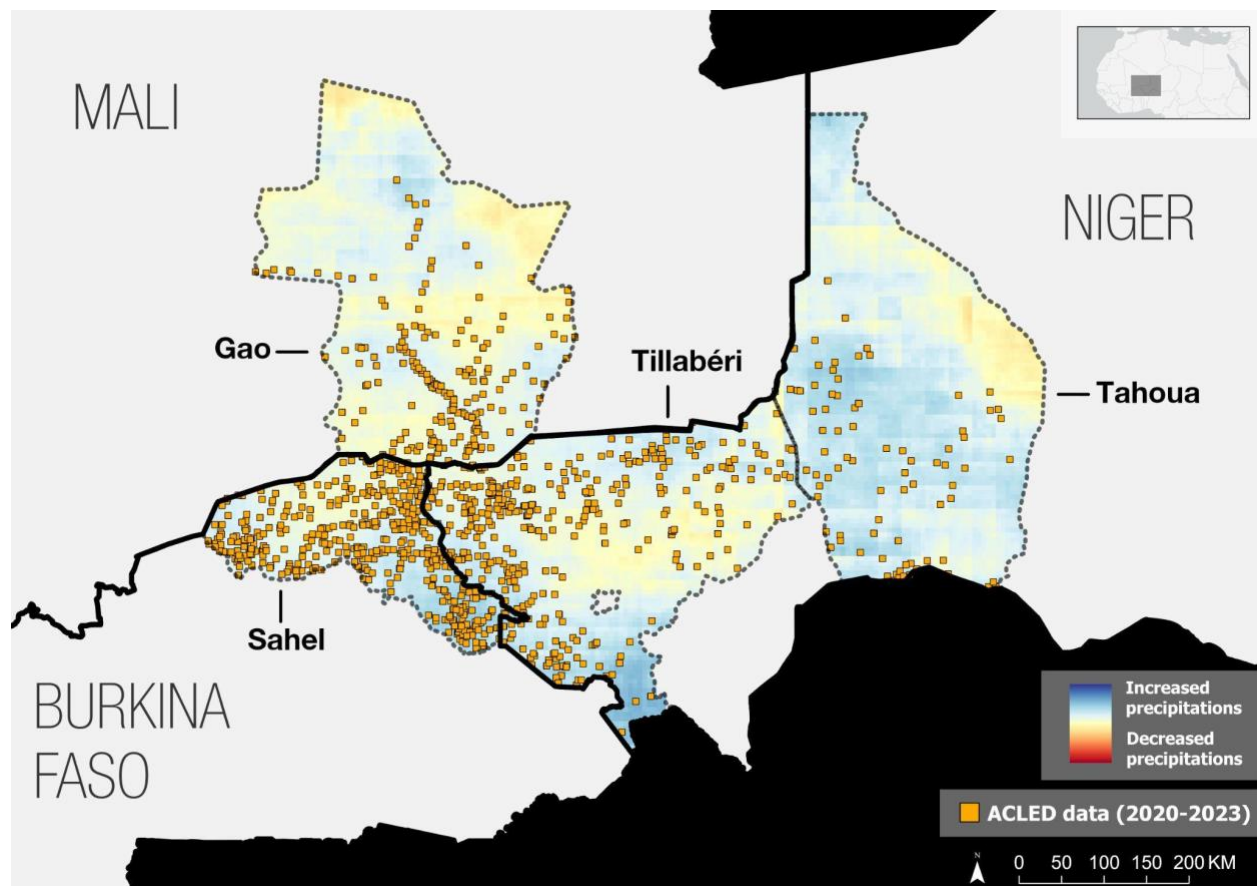


Figure 9: Map overlapping 2020-2023 ACLED data and SPI-48 precipitation data

### 4.4 VIOLENT EVENTS AND FIRE

As mentioned earlier, fires in the area of interest have seen a very significant increase in the last few years. In general, areas affected by fire in 2020-2023 tend to correspond well with areas affected by violence in the past 4 years (Figure 10).

In particular, the following areas in Burkina Faso are significant hotspots for both: Djibo, Arbinda, Markoye, Dori, Sebba, and Mansila. These locations were particularly affected by violence between VEOs and state armed forces rather than

intercommunal conflicts. As stated before, all of these locations also saw a very stark contrast in fire count between 2020-2023 and previous years.

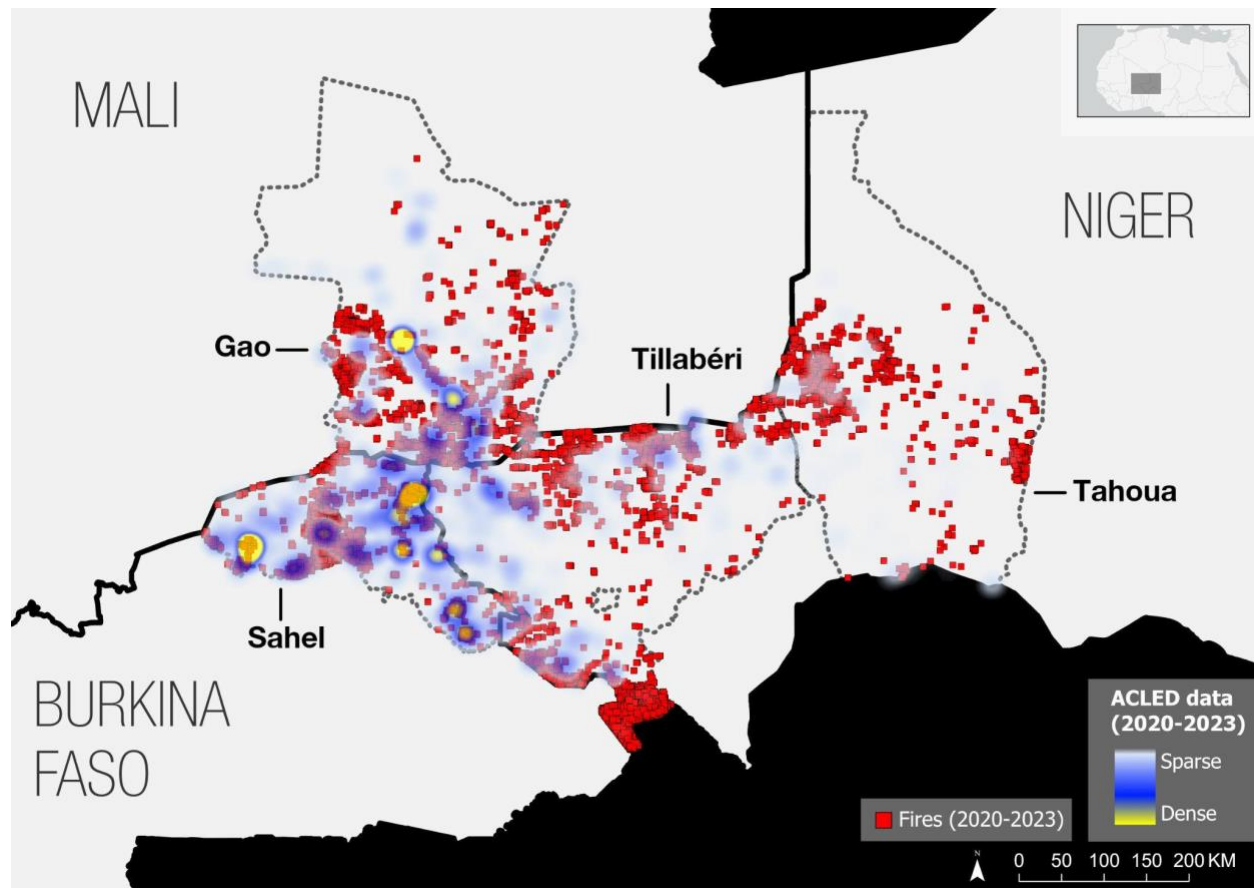


Figure 10: Map overlapping 2020-2023 FIRMS (MODIS) fire data and a heatmap of 2020-2023 ACLED data

In some areas, the causal relationship between fire and violence may involve a decrease in land productivity due to burnt lands, which would in turn heighten conflicts as a result of resource scarcity. However, the data does not provide direct evidence of such patterns. Conversely, in some cases, violence itself leads to an increased number of fires. Attackers may burn an area to damage structures, and agricultural resources, or even kill people. For instance, CIR suspects that this most likely happened as part of a large campaign of violence between 8 and 13 December 2023 in the area northwest of Djibo.<sup>14</sup> On this occasion, Burkinabe armed forces and Volontaires pour la défense de la patrie (VDPs) killed 220-300 civilians during an

<sup>14</sup> See CIR's September-December 2023 report on human rights violations for additional details on this analysis.

operation to “retake” areas under VEO control, according to (GRAPHIC) [local sources on X](#).

Satellite imagery analysis of 206 settlements in the area showed that between 7/8 December and 13/14 December 2023, 41 showed new burn scars affecting some of their structures. These fires generally had different points of origin. However, they were not randomly scattered. They were located along a line that extends from east to west, mostly along a road that crosses Baraboulé and Pétégoli (Figure 11). Both localities were also cited by [online reports from generally reliable sources](#) as targets of the operation and did show fire damage (see inset of Figure 11 for an overview of the newly scorched earth in Baraboulé). The general characteristics and overall configuration of the new fires suggest that they were closely linked to the military operation targeting VEOs.

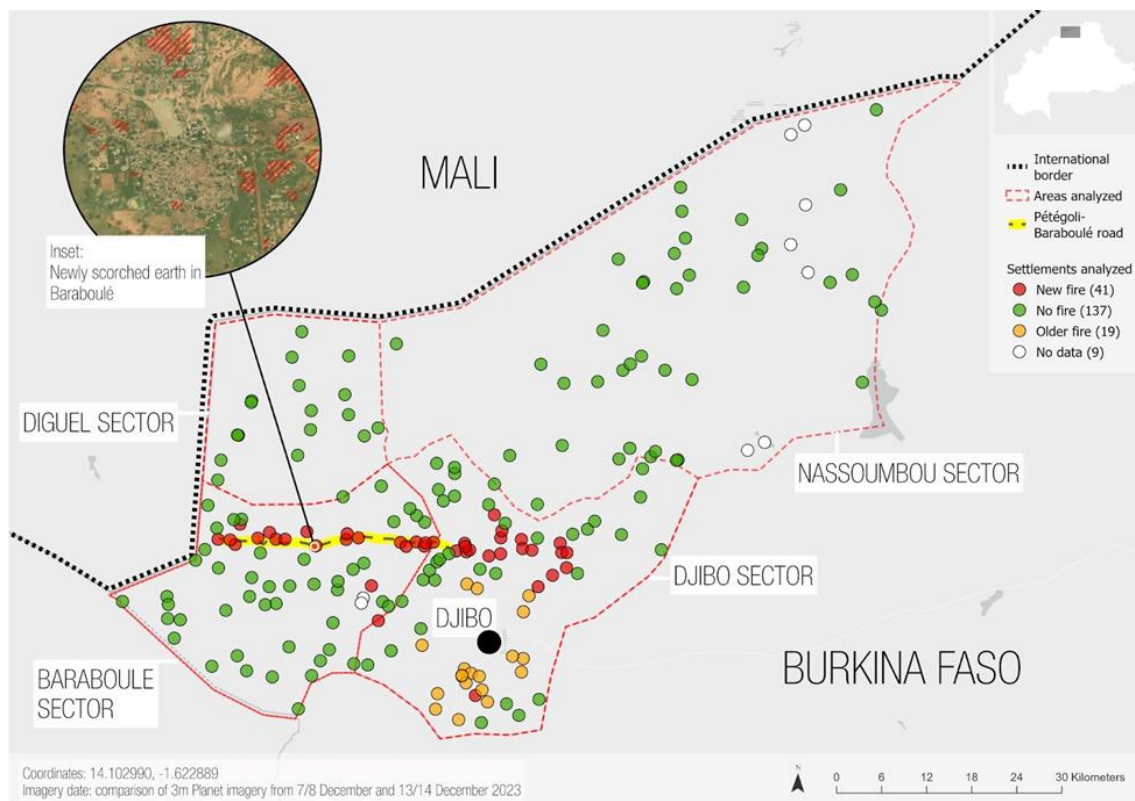


Figure 11: Map of settlements affected by fire in western Djibo department (7/8 - 13/14 December 2023)

The hypothesis that the increased fire count is also partly an effect of violence is backed by the evolution of violent events in recent years. As mentioned in the Violent Events Trends subsection, 2016-2019 ACLED data is composed of 1,759 incidents, while the 2020-2023 period saw 6,748 of them. ACLED incidents have thus been multiplied

by 3.8 between 2016-2019 and 2020-2023, while loosely fitting general fire patterns in the later period.

Other elements, such as the evolution of agricultural practices may also play a part in the additional number of fires in recent years, but land degradation and most importantly increased violence are very likely among the key explanatory factors.

Two areas in Niger clearly show no correlation between fire count and violence: the W National Park (NE) and the eastern area of the Tahoua region (NE). Both show significant fire activity but little violence.

This is not a new phenomenon in the W National Park. Fire data from the 2000s and the 2010s show a similar pattern. Based on information from a report of the [European Commission's Joint Research Centre](#), it is likely due in large part to slash and burn practices in dense vegetation areas, either to manage the park or to cultivate it, sometimes with the blessing of VEO groups (in particular Katiba Ansarul Islam and Katiba Serma) who have established themselves in the area according to the [Crisis Group](#).

In contrast, the occurrence of a large number of fires in the eastern area of the Tahoua region is a new reality. It is mostly linked to the exceptionally large bushfires that took place in [September and October 2021](#), during a period of especially strong heat and winds. It reportedly burnt more than 1,000 sq km of fodder in a mostly pastoral area but did not spark violent events, possibly because, as shown by data from the [National Network of Agriculture Chambers in Niger](#) (Réseau National des Chambres d'Agriculture du Niger), there is reportedly little agricultural activity in the area, and thus fewer instances of intercommunal violence.

In summary, although recent changes in precipitation do not seem to have affected violence patterns, land degradation does appear to be closely linked to violence. Additionally, the multiplication of fires is also most likely linked to violence, although mostly as an effect of it. Tillabéri, and most importantly the Sahel region are strong examples of a conjunction of such factors.

## 5 OTHER FACTORS INCREASING VIOLENT COMPETITION FOR NATURAL RESOURCES

The idea that climate change generates violence is widespread. There are two major schools of thought on the relationship between resources, conflict, and security. The eco-violence movement ([Robert Kaplan 1994](#), [Homer-Dixon 1999](#), [Turner 1999](#)) defends the link between resource scarcity and violent conflict, chiefly that resource scarcity drives conflict. However, even though CIR analysis tends to support this

interpretation for the tri-border area (see section 2), it remains difficult to prove the existence of a direct and significant causality with factual and measurable elements.

As a result, several researchers ([Holst, 1999](#), [Benjaminsen and Ba 2009](#), [Deligiannis 2012](#), [Witsenburg and Adano 2009](#)) have challenged eco-violence, proposing instead that it is a combination of several factors, including but not limited to climate change, that may put a stress on resource availability, leading to violence. In the Sahel region, this analysis helps better explain observed trends. Over the last twenty years, competition for natural resources has been intertwined and inextricably linked with regional conflict dynamics in the context of notable environmental shifts.

## 5.1 DEMOGRAPHIC GROWTH AND LAND CONFLICTS

Population growth in the countries of central Sahel and, more generally, population growth in West Africa are major factors increasing the pressure for access to and exploitation of natural resources. The populations of Mali, Niger, Mauritania, and Chad rose from 12.3 million in 1960 to 65.5 million in [2020](#), with more than half of the population living in rural areas. Furthermore, [projections](#) for the future indicate that the Sahel countries (Mali, Niger, Burkina Faso, Mauritania, and Chad) will grow from 83.7 million inhabitants in 2019 to 196 million in 2050, with around 50% under the age of 15. This enormous demographic pressure is likely to lead to even more conflict, migration, and competition for resources.

This increase particularly [concerns](#) sedentary farming populations (Bambara, Zarma, Dogon, Mosi, etc.) as opposed to nomadic herding populations (Foulani, Touareg, etc.). This has had two major consequences: the need to produce more and the need for more land for both agriculture and livestock farming. The consequence is increased competition for available land and the areas where these resources are located. The Sahelian [livestock movement areas](#), occupied on a seasonal basis, have therefore become [contested areas](#). The data produced in Figure 6 of this report shows a real juxtaposition between these contested areas between communities and the dynamics of conflict, whether linked to conflict between armed groups and the state, between communities themselves, or between armed groups and community-based self-defence movements.

The dynamics of land conflicts can also be observed outside the strict boundaries of the conflict in Central Sahel. [Land conflicts](#) linked to the occupation of arable land by sedentary farming communities and nomadic livestock breeders can be found throughout the sub-region, in Benin, Togo, Ghana, Côte d'Ivoire, and elsewhere as shown in a [recent UNOWAS report](#).

These land conflicts play a role in [aggravating armed conflicts](#) and in driving recruitment for armed groups of all kinds. Communities are looking for "sponsors" and "protectors" when rival communities use armed conflict to try to gain advantage and advantageous positions (land, grazing land, water points, other resources).

For instance, this dynamic was evident in the commune of Mondoro (Cercle of Douentza) on the Mali-Burkina border, near the centre of the Liptako-Gourma area. Foulani communities quickly came under the protection of the Movement for Oneness and Jihad in West Africa (MUJAO) in 2012-2014, enabling them to take control of land belonging to the Dogon, before the Dogon later took revenge through the FAMA<sup>15</sup>. Since then, the armed conflict has been superimposed on the land dispute.

## 5.2 INCREASED PASTORAL PRESSURE

Since the end of droughts in the late 1980s, the pastoral sector has grown considerably due to the explosion in demand for meat. This demand has more than doubled since 1990 in West Africa, rising from 1.81 million tonnes in 1990 to 4.09 million tonnes in 2021, according to the [FAO](#). For example, meat consumption in Nigeria [has risen](#) from 204,000 tonnes in 1990 to 412,000 tonnes in 2023. Despite a large national herd (nearly 20 million cattle, 40 million sheep and 60 million goats), nearly 30% of the animals slaughtered in Nigeria come from Mali, Niger, Chad, Burkina Faso, and Cameroon according to the [Agence France-Presse \(AFP\)](#). The [United Nations Food and Agriculture Organisation \(FAO\)](#) predicts that beef and pork consumption in Africa will rise by 200% between 2015 and 2050, and poultry consumption by 211%. This increased demand for beef has been combined with a general improvement in climatic conditions (since the end of the drought of the 1970s and 1980s) and in people's overall living conditions.

This has had several consequences: a considerable increase in herds and in related crimes such as cattle rustling according to the [Global Initiative against Transnational Organized Crime](#), and related land disputes as reported by the [Centre for Humanitarian Dialogue](#). Indeed, the combined expansion of agricultural land and the increase in transhumance herds (70 to 90% of [pastoralism is transhumant](#) in the Sahel region) have multiplied the areas of friction between these two worlds, with animals destroying the fields that extend over the herds' transit and transhumance areas. This situation becomes particularly critical during transhumance periods. Violent conflicts between farmers and herders have erupted, linked to [more than](#)

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<sup>15</sup> Sahel: Pourquoi prendre les armes? Une revue de littérature, Papiers de Recherche, Zanoletti, 2020

[15,000 deaths](#) since 2010 in West and Central Africa, more than half of which have occurred since 2018.

### 5.3 LAND PRESSURE LINKED TO THE GOLD RUSH

A third phenomenon has intensified competition for land in the central Sahel: gold mining. The [International Crisis Group](#) estimated in 2019 that gold mining brings in around 4.5 billion dollars a year for the Central Sahel countries alone (Mali, Niger, Burkina Faso) and that 2 million people are directly involved in artisanal gold panning, which accounts for 50% of production.

The Sahel region is a gold zone stretching from Senegal to Sudan. The kingdom of Gao (Mali) was thus one of the main producers of gold in pre-colonial and colonial Africa. In the mid-14th century, a large portion of the gold shipped to the West came from what had become the Mali Empire according to [Northwestern University](#). Emperor Kankan Moussa's pilgrimage to Egypt [in 1324](#) struck contemporaries with the [profusion of gold distributed](#). Forgotten for a while because of the fall in the price of gold on the international markets, the Gold Rush has come back with a vengeance from Sudan where it [re-emerged in 2012](#), then gradually spread westwards via Chad and Niger until it reached Mali and Burkina Faso in the middle of the 2010s.

Gold panning is practised both industrially by large international groups (Canadian, Australian, Russian, Brazilian, etc.) and artisanally by local and migrant populations according to the United Nations Office on Drugs and Crime. The lodes that can be mined are often located on stony land of little agricultural value, which the communities had allocated to new arrivals and economic migrants from neighbouring countries. The communities that owned the land and the economic agents with influence sought to recover this land and exploit it.

The result was a new competition for land between communities, which fuelled new conflicts over control of new resources. Some of these disputed areas also correspond to areas of friction between other factors. Artisanal gold mines are also becoming targets in their own right, attracting covetousness and conflict, like the Intillit mine in Mali. Opened in 2019, it came under the control of armed jihadist groups, then the CMA, and recently the Wagner group (CIR report - FAMa, Wagner take control of Intahaka gold mine in Gao Region; 22 February 2024).

This combination of factors has led to intense competition in the central Sahelian area where exploitable resources are concentrated in known and identified zones. Along with climate change, these factors both help explain and fuel the ongoing political conflict. They also provide a favourable context for recruitment by armed jihadists, independence groups, militias, or national armed forces.

Either through their direct effects or indirectly through their link to violence, environmental changes also have a significant influence on another aspect of the worsening humanitarian situation: forced displacements.

## 6 CLIMATE CHANGE AND DISPLACEMENT

According to reporting from the [ICCT](#) and the [International Monetary Fund](#), environmental events and climate variability have driven significant numbers of displacements across the broader Sahel region. Shifting climate patterns have decimated livelihoods, created food and water scarcities as well as defined patterns of protracted conflict.

One should note that quantitative and spatial data is not always available for population displacements. They cannot always be precisely associated with detailed counts and locations. For this reason, they are not systematically displayed in map format.

### 6.1 ENVIRONMENTAL DRIVERS OF DISPLACEMENT

The chief environmental drivers of displacement in the Gao, Tillaberi, Tahoua, and Sahel regions are extreme weather events, such as droughts and floods which have contributed to widespread resource insecurity<sup>16</sup> according to reporting from the [ICCT](#) and the [International Monetary Fund](#).

#### Droughts and Floods

Over the past half-century, several periods of severe drought have been recorded across the Sahel, forcing large-scale displacements. According to the [Geophysical Fluid Dynamics Lab](#), the most severe periods of drought occurred between 1969 and the mid-1980s. More recently, drought decimated crops in 2005 in Niger resulting in 47,000 deaths and lower than average rainfall in Burkina Faso and Niger in 2017 similarly destroyed livelihoods killing thousands as reported in [Preventable famines: Response and coordination failures in twenty-first-century famines](#).

However, as mentioned earlier, with more intense and irregular precipitation in recent years, flooding is becoming a more frequent and pervasive threat. According to the [Journal of Hydrology](#), floods, in particular, flash flooding, have become more severe and frequent. This mirrors CIR's findings, shown by rainfall data displayed in

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<sup>16</sup> This chiefly refers to food and water scarcity, but also extends to other key natural resources essential to agro-pastoral livelihoods such as cattle, grazing lands, etc.



Figure 3: much of the geographic area of focus has seen increased rainfall between 2020-2023 when compared against previous decades.

Excess rainfall has caused severe flooding and crop destruction forcing displacements. In 2023, flooding, which began in June 2023, forced over 150 thousand civilians from their homes across Niger according to the [DTM flood displacement dataset](#). As of September 2023, [UNICEF](#) reported flooding had impacted an estimated 27,717 people in the Tillaberi region, and 20,488 people in Tahoua. Rainfall in Niger, Burkina Faso, and Mali typically occurs between June and September, but in 2023, above-average rainfall began in May. However, 2023 was not an exceptional year, but rather reflective of a pattern of increasing precipitation. In 2022, the rainy season in Niger resulted in 195 casualties and affected 400,000 people, including 256,000 people whose livelihoods were destroyed.

[ACAPS](#) data from 2020, 2021, and 2022 shows that the rainy season negatively impacts an average of 250,000 people a year in Niger and similar portions of the populations in Burkina Faso and Mali.<sup>17</sup> While all those affected by the flooding are not displaced annually, large numbers of civilians have been forced to leave their homes due to extreme rainfall across Gao, Tillaberi, Tahoua, and the Sahel regions according to the [UN Refugee Agency \(UNHCR\)](#).

#### Resource Insecurity

The [Organisation for Economic Co-operation and Development](#) and the [World Food Programme](#) (WFP) have reported that environmental shifts - particularly higher temperatures and more frequent extreme weather events - have contributed to an increase in food insecurity across the Sahel. According to [WFP](#), the regions of focus - Gao, Tillaberi, Tahoua, and the Northern regions of Burkina Faso - are among those most impacted by malnutrition and food insecurity. This alone has driven displacement with individuals leaving their homes in search of more secure access to food.

Moreover, the [International Monetary Fund](#) has reported that agricultural practices in the Sahel rely largely on rain feeding the crops. This means that populations in the Gao, Tillaberi, Tahoua, and Sahel regions are extremely vulnerable to shifts in precipitation. Rainfall studies<sup>18</sup> show substantial changes in rainfall periods, which are shorter, more intense, and more irregular. These changes can destroy crops, exacerbating food and economic insecurity. According to the [European Civil Protection and Humanitarian Aid Operations](#), food insecurity in part caused by low

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<sup>17</sup> Equivalent data has not been collected in [Mali](#) or [Burkina Faso](#), but data from ACAPS suggest the scale of the impact is similar.

<sup>18</sup> Rainfall Trends in the African Sahel: Characteristics, Processes, and Causes, Biasutti, 2019

crop yields has driven widespread displacements, particularly in the Liptako-Gourma region.

This vulnerability to climate shifts similarly affects pastoralists, who rely on access to grazing lands for their cattle across the broader Sahel region. Critical swathes of land have been decimated or become inaccessible due to flooding and widespread fires (see Figures 3 and 4) according to [The New Humanitarian](#) reporting. This has both altered transhumance mobility patterns as well as forced many pastoralists to move to urban areas to seek alternative sources of income according to the [IOM](#) and the World Bank's [Global Programme on Forced Displacement](#).

## 6.2 ENVIRONMENT-RELATED CONFLICT AND DISPLACEMENT

As shown previously, climate change has most likely triggered increased violence in some parts of the area of interest, especially in the Sahel and Tillabéri regions. In turn, this violence logically tends to force civilians to flee their homes (see CIR report - Satellite Imagery Analysis of Malian Population Displacement Dynamics).

Moreover, some VEO groups have developed a practice of preventing civilians from accessing key natural resources, particularly water, further adding to resource scarcity, and strengthening climate-related population displacement patterns as reported by the [Inter Press Service](#).

Rural populations often travel long distances across dangerous terrain, exposed to attacks by armed groups to reach water access points. According to [ICRC](#), between 2022 and 2023, the number of attacks on water access points by VEO and criminal actors rose in Burkina Faso. These attacks included sabotaging water access by threatening women on their way to and from collecting water, massacring civilians at wells, or poisoning water supplies with fuel or animal carcasses according to [UNICEF](#) (CIR - Human Rights Violations Summary Report Sep-Dec 2023).

While previously this trend was primarily observed in northern Burkina Faso, and across the border into Mali and Niger, that is, within our area of interest, VEOs have since begun replicating this targeting technique across more southern areas of Burkina Faso. [ICRC](#) reported that in 2022, 58 water points in Burkina Faso were attacked. This left 830,000 people without access to water. Many of these individuals were forced to leave their homes to seek reliable water access elsewhere (Figure 12).

### 6.3 SCALE OF DISPLACEMENT

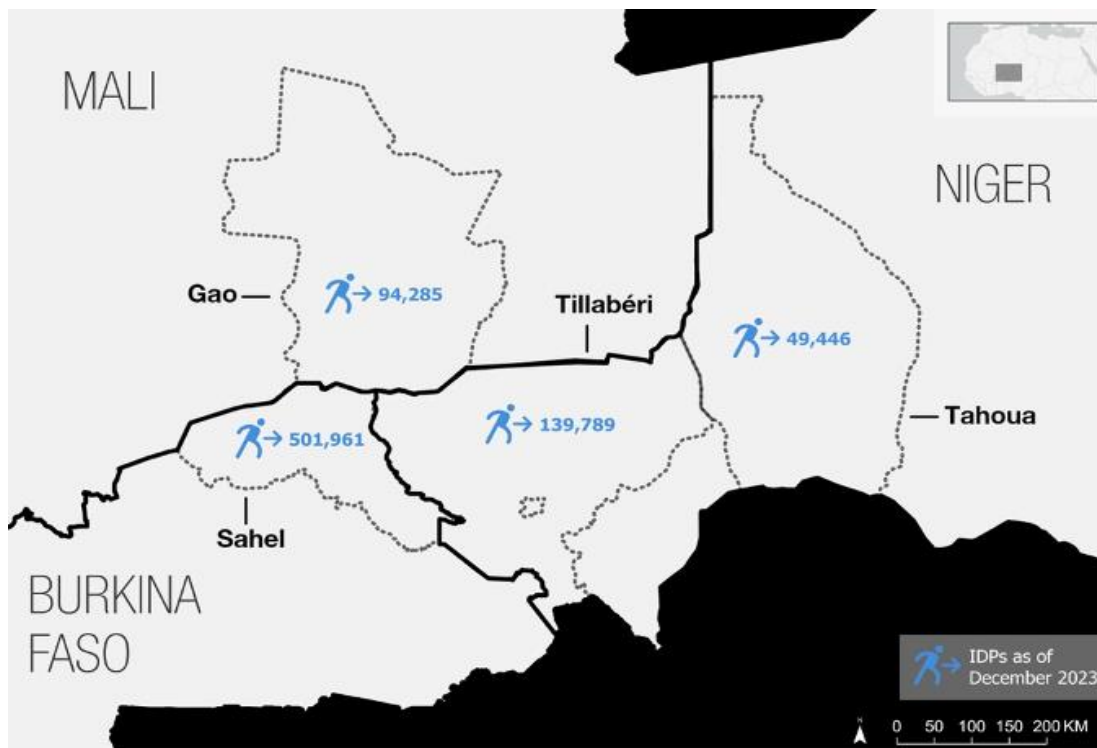


Figure 12: Map of IDP count per region

As of December 2023, there were approximately 501,961 internally displaced persons (IDPs) in the Sahel region, 49,446 IDPs in Tahoua, 139,789 IDPs in Tillabéri, and 94,285 IDPs in Gao according to the [Displacement Tracking Matrix](#). While it is impossible to extricate displacement driven by climate from displacement caused by violent conflict, given the degree to which these elements are interwoven, it is evident that a large portion of these IDPs were either directly displaced by climate events or by the impact of environmental factors on conflict trends.

One can see that the Sahel region has by far the highest number of IDPs, while only representing 11% of the territory and 12% of the population<sup>19</sup> of the area of interest. It also happens to correspond to the region that sees the most significant spatial combinations of important land degradation, strong increases in fire counts, and violent incidents.

According to [UNHCR](#), women tend to be especially affected by forced population displacements, begging the wider question of the gendered impact of climate change in the region.

<sup>19</sup> All population figures are extracted from [2020 Facebook data](#).

## 7 GENDERED VULNERABILITIES TO CLIMATE CHANGE

According to [UN Women](#), women and girls are disproportionately impacted by climate change as it exacerbates existing inequalities as well as threatens their livelihoods and security. Both in the Sahel and more broadly, women are reliant on natural resources given their dependence on agro pastoral livelihoods and responsibility for providing water and food for their families. This makes women and girls uniquely vulnerable to environmental events and climate variability.

### 7.1 AGRO-PASTORAL LIVELIHOODS

Agriculture is the most significant livelihood for women in the Sahel as reported by the [African Journal of Reproductive Health](#). According to [UNOCHA](#), women contribute to 40% of agricultural production, 80% of agricultural processing, and 70% of agricultural distribution labour regionally. This makes them acutely vulnerable to climate variability that decreases agricultural outputs.

Women are also heavily involved in pastoral livelihoods. According to [OECD reporting](#), approximately 250 million people in the Sahel region rely on pastoralism with approximately 175 million living in poverty. While historically seen as a male dominated livelihood, women make up two thirds of the world's livestock keepers according to the [Land Use Policy](#) journal. Women both manage livestock directly as well as support with milking and other tasks across the Sahel region as reported by the [OECD](#). Climate change has made pastoralist livelihoods more challenging as access to water and key resources such as grazing lands has been reduced by unpredictable rains, fires, and active conflict.

When climate events impede women's engagement in agriculture or pastoralism, alternative economic opportunities are scarce and often even less available to women than men. This livelihood vulnerability is compounded by ongoing active conflict. Men are often engaged in armed groups or killed in conflict, leaving women to support themselves and their dependents. With limited alternative pathways, women are less resilient to environmental shocks and more vulnerable to changes that impact their livelihoods.

Moreover, women often lack access to and control over land and other economic resources they require for these livelihoods. Even though women are often the most engaged in land use, they rarely have equal rights to land ownership. This means that they are even less secure in these livelihoods given their tenuous access to the resources they need.

## 7.2 TIME POVERTY AND RESOURCE ACCESS

Environmental variability has been seen to increase the time needed to access resources according to [UN Women](#). Women are often responsible for the acquisition of resources like timber and water. When climate variability makes these scarce, it often takes more time and energy to complete these tasks, ultimately limiting the resources women have to engage in economic activities.

Limited water access often necessitates women and girls to travel long distances to access points where they are at risk of attacks by VEO groups, criminality, and sexual assault according to [UNOCHA](#). Besides the risk of violence, carrying heavy loads such as water and firewood over long distances can result in health issues ranging from dehydration to back and spinal injuries which impede women's ability to engage in agro pastoral activities and provide for their dependents according to the [OECD](#).

Collecting these basic resources also detracts from the time women would otherwise spend engaged in remunerative activities. The [OECD](#), [Journal of Global Health](#), and others refer to this constraint as 'time poverty.' By and large, women experience less free time than their male counterparts. As they are required to complete time-intensive non-remunerative tasks in addition to the tasks required to economically support their families. According to [UN Women](#), to ensure all required household work is completed, many girls are kept home to help their female relatives manage the significant burden.

## 7.3 VULNERABILITY AND SURVIVAL STRATEGIES

In the face of lost livelihoods and violent conflict over resources, large numbers of women and their dependents have been displaced. In Mali and Niger, the [IOM](#) reported that displaced female-headed households frequently reported no income or an irregular source of income demonstrating the compounded and perpetual vulnerability many women endure.

In the face of providing for dependents amid limited access to goods and services, many women are forced to turn to illicit activities and economies. A series of reports by organisations such as the [World Food Programme](#) and [InterAction](#) have addressed the prevalence of women engaging in 'survival sex' or trading sex for aid across the Sahel region. This has been cited as one of the frequent survival strategies for women whose livelihoods have been destroyed by climate events or related violence by the [OECD](#).

## 8 ANNEX - METHODOLOGY

### 8.1 LAND DEGRADATION ANALYSIS

The assessment of land degradation in the Sahel, Gao, Tillabéri, and Tahoua regions was performed by CIR using the [Trends.Earth](#) methodology. It was created by Conservation International, Lund University, and NASA to help submit reports to organs of the United Nations Convention to Combat Desertification (UNCCD), which is the legal framework set up to address desertification and the effects of drought. Desertification is a combination of land degradation and relatively low precipitation.

Land degradation is calculated using a combination of three sub-indicators: vegetation productivity, land cover, and soil organic carbon. All three of them are calculated from remote sensing data, using a combination of techniques involving in particular automatic land classification, calculations based on the Normalized Difference Vegetation Index (NDVI), and [SoilGrids](#) data. Whenever one of the three sub-indicators shows degraded values, related land is considered as degraded for the purpose of the methodology.

The Trends.Earth methodology provides several advantages. It is widely recognized, respects [UNCCD's good practices](#), and allows for consistent data comparisons. It also aims to present results in a relatively intuitive and straightforward manner. On the other hand, the datasets used in the analysis process are limited to a specific period. At the time of writing, it may yield results for the 2001-2020 time frame only. This limitation is significant but still allows CIR to draw conclusions and detect general trends in land degradation over the past two decades or so. Since the focus of the current report is on climate (that is, not weather and yearly changes), such overarching patterns are sufficient and ideal to provide insights.

CIR performed the analysis in-house using the QGIS software.

### 8.2 PRECIPITATION ANALYSIS

The analysis of precipitation was computed by CIR using the [standard precipitation index \(SPI\) methodology](#) developed by the United Nations Platform for Space-based Information for Disaster Management and Emergency Response (UN-SPIDER). It makes use of [CHIRPS rainfall estimates](#) to calculate differences in rainfall between periods and identify droughts. This method standardised the cumulative precipitation distribution into a normal distribution with a mean of zero and a standard deviation of one, allowing for comparisons.

In this case, CIR compared 48-month periods (SPI-48) from 1984 to 2019 with the 2020-2023 time frame, to identify anomalies in the latter period. Google Earth Engine was used to produce the final results.

### 8.3 FIRE ANALYSIS

CIR also worked on fire data, using the Fire Information for Resource Management System ([FIRMS](#)) developed by NASA. FIRMS makes use of satellites detecting fires and thermal anomalies to compile fire data.

CIR specifically used the MODIS subset of fire data. The VIIRS data was excluded from the methodology because although it tends to be more precise due to its higher spatial resolution, its data only goes back to 2011, whereas MODIS data includes all years since 2002. This allows for data comparisons over longer periods, which is key for climate analysis.

### 8.4 ACLED DATA

Protests, riots, and strategic developments were subtracted from the ACLED data used by CIR in this report. Analysts chose to focus on incidents linked to battles, explosions, and violence against civilians, which are the most representative of the conflict-related violence of interest to this study.

ACLED data includes information on the perpetrator of the incidents, but not on their target. This allows an approximate estimation of the area of influence of various actors. However, in some areas, groups may mostly be targets and not perpetrators. Similarly, in some of their undisputed strongholds, armed groups may also rarely take part in violent operations. Only general tendencies can thus be drawn from the data in terms of areas of influence, not precise assessments. In addition, when the incident count is very high, such as is the case for the 2020-2023 period in our area of interest, data tends to overlap significantly, preventing detailed visual representations of perpetrator categories. For these reasons, this report does not distinguish between perpetrators when displaying ACLED data on maps. However, references to this element were still made in the text analysis when relevant.