Climate Change and Labor in sub-Saharan Africa

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Working Group "Climate Change, Livelihoods, Natrural Ressource Managment / Changement Climatique, Moyen de Subsistance, Gestion des Ressources Naturelles "

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Executive Summary

Climate change is directly and indirectly imposing adverse effects on labor productivity, employment, and labor mobility worldwide. It directly affects labor productivity through heat-stress, expansion of malaria and other weather-sensitive diseases. Indirectly, it impinges on employment through its effects on viability of economic activities (e.g., agricultural yield changes, food shortages), destruction of infrastructures (e.g., roads through floods,), and disruption of ecosystem functions (e.g., forest fires). The magnitude of such effects on labor are non-linear across the world. In particular, sub-Saharan Africa (SSA) stands out in terms of both direct and indirect effects of climate change on labor due to various reasons. First, tropical latitudes are at higher risk of heat stress. Second, agricultural systems in the region are mostly subsistence and based on smallholder systems, which already suffer from low productivity and are highly dependent on weather. Particularly, the rural livelihood in SSA is inextricably linked to agricultural production. By implication, labor productivity, wages, and propensity to migrate in SSA are highly influenced by climate-related shocks to agriculture. Those who will be affected the most, are those who are already on the margins of society (e.g., with low land ownership) and have a lower adaptive capacity (e.g., with low literacy level). However, not only climate change impacts on labor but the contributions of climate policy responses (adaptation, mitigation, climate finance) to labor are also development policy and planning issues. In other words, for better informed policy responses, the contribution of climate adaptation and mitigation measures shall be considered, as they can offset some of the adverse consequences of climate change on labor. Both aspects call for scientific studies to underpin the policy- and decision-making process.

That is what this brief report primarily aims to contribute. It reviews the interlinkages between climate change and labor with a special focus on the SSA region. The first objective is to synthesize how climate change would impact labor productivity, employment and migration both directly and indirectly. The second objective is to highlight how policy responses (mitigation and adaptation) would contribute to maintain labor productivity/employment in the face of climate change and/or offset its expected adverse effects on labor productivity/employment. We illustrated this through selected projects being implemented by GIZ in SSA.

1. Introduction

Sub-Sahara Africa (SSA hereafter) is one of the most vulnerable regions regarding the biophysical and socio-economic impacts of climate change (Niang et al., 2014). Impacts are already being observed and are expected to rise due to the region's heavy dependence on weather-based economic activities (e.g., agriculture, hydropower and biomass based energy) (Niang et al., 2014). Accordingly, the projected impacts of climate change on agriculture, water, labor, and human health are expected to be negative in SSA, with differing degrees of intensity for sub-regions (see, for example Müller et al., 2014; Caminade et al., 2014; ILO, 2019) The repercussions for macroeconomic growth and trade deficits are expected to be wide-reaching throughout (Jones and Olken, 2010; Dell et al., 2012; Alagidede et al., 2016; Yalew et al., 2018).

Therefore, adaptation to climate change in SSA is urgently needed (Müller et al., 2014). Seen from both the impact and the policy response perspectives, development planning in SSA will hardly be successful without considering climate change impacts which in turn calls for more scientific evidence.

This report particularly focuses on two main issues pertaining to climate change and labor. First, it presents the expected impacts of climate change on labor in terms of productivity, employment, and migration. Accordingly, we demonstrate that the impacts of climate change on labor can either be direct through heat-stress and health and/or indirect through its effects on returns of economic activities, infrastructures, and ecosystem functions. Then, it discusses the contribution of adaptation and mitigation measures to labor productivity, employment, and migration. Here we highlight the role of specific GIZ projects in SSA which directly or indirectly support labor productivity and employment. This should help to demonstrate the synergies between development interventions and climate change adaptation to create or prevent widespread losses of jobs in SSA.

The remainder of the report is organized as follows. Section 2 presents the context in the SSA region and conceptual framework of the study, which serve as background to the sections to follow. Section 3 discusses the potential impacts of climate change on labor (productivity, employment, and migration), followed by the contribution of policy response measures (mitigation and adaptation) in Section 4. Section 5 presents the conclusion along with their policy implications.

2. Demography, Labor, and Employment in SSA

In this section, we give an overview of demography and labor statistics in SSA. This should demonstrate why the climate change-labor topic matters.

SSA is one of the fastest growing regions in terms of population. On average, the population in SSA grows 2.5% per annum (WPP, 2019). Although it is declining, the growth rate in SSA will remain as the highest in the world (WPP, 2019). The region is also characterized by its high share of youth population. According to WPP (2019), excluding high-income countries, 42% and 62% of the population in SSA in 2020 is below 14 and 24 years old, respectively. SSA has the lowest median age (19 years) among the world developing regions (WPP, 2019). The combined effect, among others, would lead to a high child dependency ratio per 100 active labor force. For example, for the year 2020, the child dependency ratio (the ratio of population aged 0-14 per 100 population aged 15-64) in SSA is 76; which is much higher than the case in Middle East and North Africa (49), and South Asia (42) (WPP, 2019). Another outcome of this is an increasing need for employment opportunities as youths in the millions will join the labor market every year. For instance, currently, about 10-12 million youth in Africa enter the workforce compared with only 3.1 million new formal jobs being created every year (AfDB, 2016).

Due to the nature of formality versus informality, the creation of formal jobs is more easily measured than that of informal employment.

SSA is also a region where the vast majority (ca. 60%) of the total population lives in rural areas (WDI, 2019). The implication of a fast growing and youth dominated population is a rising demand for food, resources (e.g., agricultural land, infrastructure), and opportunities (e.g., employment, access to education and health facilities) overtime. By implication, in societies with fast growing populations and where the vast majority of the population lives in rural areas, the growth of infrastructure, and employment opportunities should outpace the population growth. Otherwise, the existing development problems of food insecurity, underemployment, poverty, inequality and migration will perpetuate. This demonstrates the gravity of additional exogenous shocks such as climate change on labor in SSA.

In relative terms, it can be said that unemployment is not a big problem in SSA. The unemployment rate in the region in the last three decades remained hovering around 7% (ILO, 2016; Bhorat et al., 2017; WDI, 2019). Nonetheless, underemployment and seasonal unemployment are crucial problems in some regions in SSA. For instance, on average, about 70% of the total employment in the last two decades has worked under 'vulnerable' conditions, which refers to own account workers and unpaid family workers in total employment (Bhorat et al., 2017). About 50-55% of labor in SSA is employed in agriculture (WDI, 2019; Bhorat et al., 2017) on the one hand. On the other hand, because of the economic structure in SSA, the informal sector which contributes 50 to 80 % of GDP in the region contributes to 60-80 % of employment, and 90 % of new jobs in the region (Bhorat et al., 2017). The combined effects of underemployment, high share of own account and unpaid family workers, employment in agriculture and the informal sector results in a low level and slow growth of labor productivity in SSA (Bhorat et al., 2017). These defining characteristics of employment and productivity in SSA may increase the propensity of labor migration in the region.

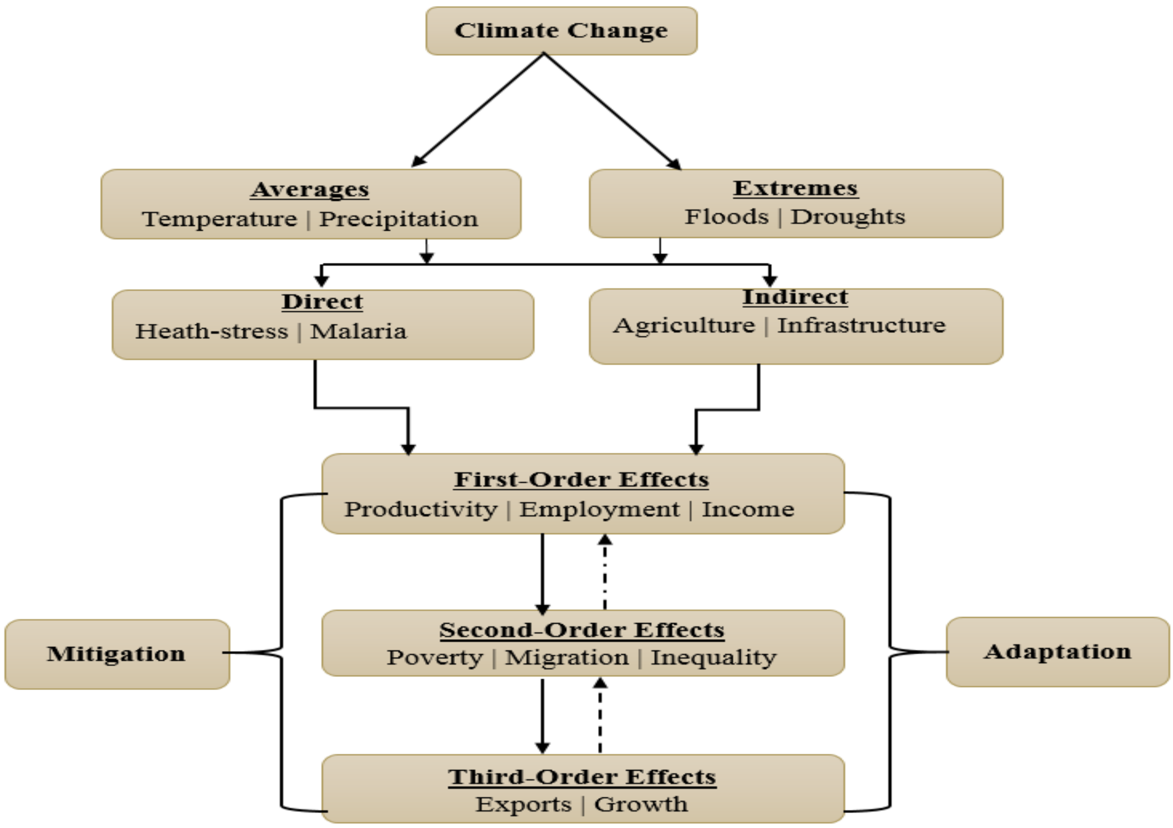

__Figure 1.__ Climate Change and Labor - A Conceptual Framework. The dashed lines show feedback effects. Source: Authors' own illustration.

The foregoing discussion on the demographic and employment structure in the SSA region implies that labor productivity, employment, and mobility in the region are highly susceptible to exogenous shocks such as climate change. Because of the fragmented nature of the labor market, the labor market needs to be supported with proper institutions and policy planning. Therefore, both scientific and policy studies on climate change should put labor into the center of their analysis. In Fig. 1, we conceptualize how climate change (and hence policy responses to it) could be related with the labor market in the SSA context. It further serves as our conceptual framework for the remaining sections in this report.

3. Climate Change and Labor in SSA

Climate change impacts will be particularly pronounced in SSA, where a large share of the population relies on agriculture to generate income and provide employment. Due to its geographic location and already hotter climate, rising temperatures will increasingly cause heat stress, which will have wide-reaching repercussions for workers´ health and productivity.

3.1 Overview of Climate Change Projections

Average climatic conditions are changing in Africa over time (Fig. 2). During the last 50 to 100 years, near-surface temperatures (TAS) have increased by at least 0.5°C across most parts of Africa, with minimum temperatures rising more rapidly than maximum temperatures which will continue to rise (Niang et al., 2014 and references within).

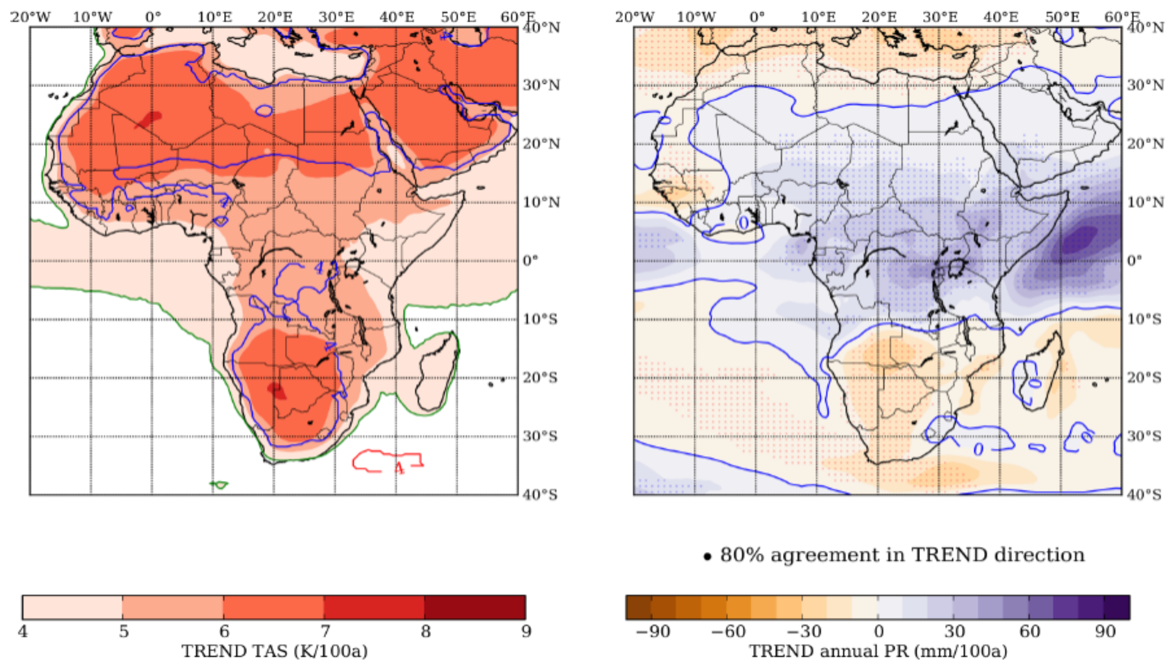

__Figure 2:__ Projected mean temperature above surface (TAS, left) and precipitation (PR, right) changes (2006-2100) in Africa under Representative Concentration Pathway (RCP) 8.5 scenario. The trends are ensemble mean of five Global Climate Models (GCMs). Source: PIK, 2019

Not only this, temperatures in Africa are projected to rise faster than the global average increase during the 21st century (Niang et al., 2014 and references within). Accordingly, the ensemble mean changes in mean annual temperature and will "exceed 2°C above the late 20th-century baseline over most land areas of the continent in the mid-21st century for RCP8.5[1], and exceed 4°C over most land areas in the late 21st century" under the same CO2 Concentration Pathway scenario (Niang et al., 2014). Unlike the case of temperature, observed and projected trends of precipitation changes in Africa come with greater uncertainty as there is a lack of sufficient observational data. Yet, for RCP8.5, projections show that annual precipitation likely to decrease in northern and southern Africa but to increase in eastern Africa beginning in the mid-21st century (Niang et al., 2014). In addition consistent with general climate trends, the frequencies of extreme heats (e.g., in northern & southern), heavy precipitations (e.g. West Africa), and droughts (e.g., East Africa) have increased in the past three to five decades.

These observed and projected trends of mean climatic conditions and extreme events (e.g. droughts, floods, storms) easily translate into socio-economic impacts in the region. This can mainly be attributed to the region's dependence on climate-sensitive sectors such as agriculture and water, and is due to the fact that the vast majority of the population lives in rural areas.

We will eschew from going into the details of the expected impacts as they are beyond the scope of this brief report. We will instead focus on labor related impacts here. As we pointed out earlier, these defining features of the population and labor markets in SSA makes the labor sector in SSA to be highly susceptible to climate change and other exogenous shocks. Climate change could impact the labor market in Africa in many ways which we discussed in the subsequent sections.

3.2. Climate Change, Heat-Stress, and Labor

The most direct and wide-spread impacts of climate change on the labor sector can be expected through heat-stress. This is because SSA features "a combination of both extreme temperatures and a high share of agriculture in total employment, a sector particularly exposed to heat stress" (ILO, 2019). Heat-stress in turn reduces the labor work capacity, hence working hours per period and increases the risk of accidental workplace injuries. Exposure to excessive heat levels can lead to heatstroke and is worsening of existing health conditions such as chronic pulmonary conditions, cardiac conditions, and kidney disorders. In order to alleviate heat stress induced symptoms, workers are inclined to take more rest while on the job, drink more water, take bathroom breaks more frequently, and work more slowly. While this behavioral change negatively impacts productivity, it is the body´s natural and healthy defense mechanism in order to fight heat exhaustion (Kjellstrom et al., 2016). According to ILO (2019) 2.3 % of the total number of working hours in Africa will be lost to heat stress in 2030, which are equivalent to more than 14 million full-time jobs (Fig. 3a, 3b). This pertains to both, the formal as well as informal sector, when workers are exposed to the outdoors. However, jobs in agriculture are widespread in SSA and tend to be informal. Thus, the informal sector is particularly vulnerable to heat stress. Besides, heat stress could widen existing gender gaps. Heat exposure during work adds to the health and productivity risks faced by pregnant women especially working in subsistence agriculture.

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[1] For more information on RCP scenarios please refer to http://www.climatechange2013.org/images/report/WG1AR5_SPM_FINAL.pdf

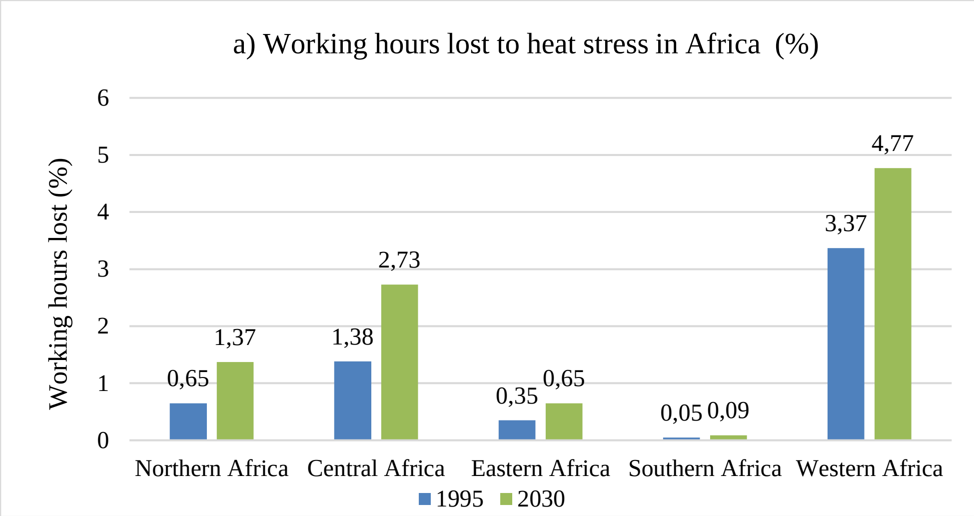

Figure 3 a: *Working hours lost to heat stress in Africa. Working hours lost to heat stress includes also working hours lost as a consequence of associated health, well-being and productivity effects. The values are calculated based on RCP2.6 HadGEM2 and GFDL-ESM2M climate models. Source: Authors' illustration based on data from ILO (2019).*

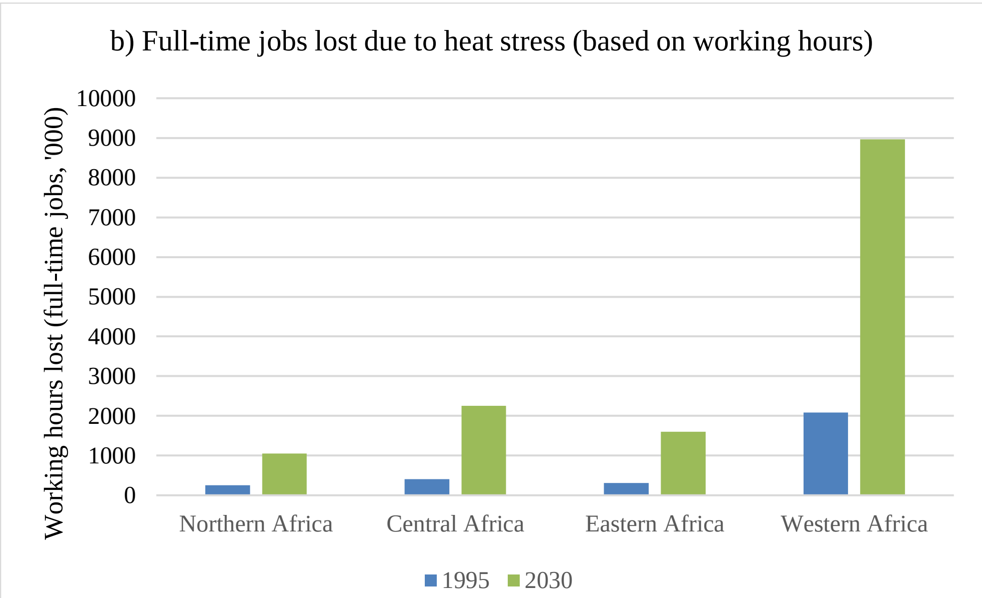

Figure 3 b: *Working hours lost to heat stress in Africa. Working hours lost to heat stress includes also working hours lost as a consequence of health, well-being and productivity effects. The values are calculated based on RCP2.6 HadGEM2 and GFDL-ESM2M climate models. Source: Authors' illustration based on data from ILO (2019).*

As is evident from figures 3a and 3b, Western Africa followed by Central Africa are projected to suffer the greatest losses due to heat-stress (ILO, 2019). Likewise, a recent study finds that those countries located closest to the equator are expected to see a decrease in productivity of 20-25% and 10-15% in the agricultural and non-agricultural sectors, respectively (Burzynski et al, 2019).

Box 1: The case of petroleum plant workers near the Algerian city of Ouargla

In July of 2018 the thermometer hit 51.3°C in Ouargla, Algeria, which to date is the highest reliable temperature measured on the continent of Africa. In the aftermath, laborer Abdelmalek Ibek Ag Sahli was interviewed. He and his co-workers realized the temperature would be higher than usual that day. They started work at 7 a.m., and were to work a 12-hour shift, as they usually do.

> *"We couldn't keep up," he recalled. "It was impossible to do the work. It was hell." By 11 a.m., he and his colleagues walked off the job. But when they got back to the workers' dorms, things weren't much better. The power had gone out. There was no air conditioning, no fans. He dunked his blue cotton scarf in water, wrung it out, and wrapped it around his head. He drank water. He bathed 5 times. "At the end of the day I had a headache," he said by phone. "I was tired."* (Sengupta, May, and Ur-Rehman, 2018)

While this one Algerian story illustrates clearly how work hours will be cut short by extreme heat, it even more urgently elucidates the toll it already does and will increasingly take on human health in the not too far future.

3.3. Climate Change, Vector- and Water-borne diseases, and Labor

Besides heat stress, another direct impact of climate change on labor are malaria and other vector-and water-borne diseases. Malaria is one of the climate-sensitive health problems whose prevalence is expected to pose a major problem for labor productivity (Caminade et al., 2014; Ermert et al., 2013). Even assuming a constant population in regards to the year 2000, about 427 to 461 million people in Africa may be exposed to malaria (Ermert et al., 2013). In tropical Africa only, person-months exposure (PME) of malaria may increase by about 3-4% and 6% in 2020s and 2040s, respectively (Ermert et al., 2013). For the whole of Africa, Tanser et al. (2003) estimated an overall increase of PME for Africa of about 16–28% by 2100. Climatic conditions suitable for malaria reproduction may particularly lead to expansion of malaria disease into the Eastern and Southern regions of Africa. Therefore, climate change may at least reverse some of the progress made to reduce the incidence of malaria in Africa. The malaria disease burden in turn affects labor productivity in the region.

In addition, climate change-induced flooding and droughts can affect household access to water and sanitation infrastructure resulting in related health risks. For instance, flooding can disperse faecal contaminants, increasing risks of outbreaks of waterborne diseases such as cholera (WHO, 2018). Water shortages due to drought can increase risks of diarrhoeal disease. Time required to seek health care or provide in-house care for family members or oneself also negatively affects working hours/ productivity.

3.4. Climate Change, Economy, and Labor

In addition to direct impacts such as heat stress and diseases which affect labor, indirect impacts accrue from the impacts of climate change on other sectors which employ labor and in turn affect the factor income for labor. For instance, as we pointed out earlier, agriculture which is directly susceptible to climate change (Adams et al., 1998; Antle and Capalbo, 2010) employs about 50% of the total labor force in the region

Climate change impacts on crop and livestock productivity affect expected agricultural income from cultivating crops and/or rearing livestock in Africa. For instance, Knox et al. (2012), based on a review of studies, find mean yield changes of -17% (wheat), -5% (maize), -15% (sorghum) and -10% (millet) across Africa. Similarly, Schlenker and Lobell (2010) find estimated changes of mean production changes in SSA to be -22%, -17%, -17%, -18%, and -8% for maize, sorghum, millet, groundnut, and cassava, respectively. Moreover, because of the nature of the production system (rain-fed pastureland based system), climate change imposes serious threats to the livestock sector in SSA (Nardone et al., 2010). As a result, income from livestock farms is expected to drop substantially by 15 to 20% by 2020 (Seo and Mendelsohn, 2008). The ultimate consequence of such impacts of climate change on the crop and livestock activities in Africa will be less factor return to laborers engaged with such activities.

Likewise, the impacts of climate extremes such as floods would disrupt, for example, road networks which eventually influence economic activities (and hence labor wages). This is especially true if we consider roads are the main mode of transport (carrying at least 80% of goods and 90% of passengers) in Africa and only less than half of the continent's rural population has access to all-season roads (AfDB, 2014).

3.5. Climate Change and Migration

As aforementioned, rural livelihoods are inextricably linked to agricultural performance in SSA. Therefore, climate change-induced risks on agricultural production may trigger migration from agricultural to non-agricultural sectors and from rural to urban. According to economic theories, expected wage differences between rural and urban sectors mobilize labor from the agricultural sector to non-agricultural sectors (see, for example, Harris and Todaro, 1970). In addition, with increasing risks due to climate change, rural livelihood may become unpredictable and unreliable which may force agricultural (rural) households' to consider migration as a risk management or coping strategy (Abreu, 2010; de Haas, 2010).

Fifteen out of 38 cases of environmental migration events in recent years occurred in Africa (Naude, 2010 citing Reuveny, 2007). In Tanzania, Kubik and Maurel (2016) find that weather-shock-induced decline in agricultural income by 1% increases the probability of migration, on average, by 13 % within the following year. Likewise, Gray and Mueller (2012) find men's labor migration increases following droughts in Ethiopia.

In fact, the literature acknowledges that it is hard to disentangle the marginal impacts of climate change on migration as there are many economic, social, cultural, political, and institutional reasons to trigger migration. As such, in regions such as the SSA, the demographic structure (implying more resource demand) and poverty (implying lack of options) alone have the potential to displace populations. Yet, climate change and variability will act as a multiplier and interacts with already underlying socio-economic factors (Scheffran, 2018). For instance, in 2018, worldwide there were 17.2 million people newly displaced by natural disaster of which 16.1 million were weather related (IDMC, 2019). In Nigeria, a country already rattled by conflict, floods affected 80 % of the country which resulted in 600,000 additional displacements (IDMC, 2019). Where already harsh rural working conditions worsen because of climate change, population pressure and scarcity of fertile land, internal and regional migration can be a viable adaptation measure to improve one´s economic standing (Vinke 2019).

Workers in the agricultural and construction sectors are particularly exposed to heat stress, due to the physical nature of the work, low levels of mechanization and prolonged exposure to the outdoors. Indirectly, workers in the agriculture sector are further affected through crop failures and thus food insecurity. While the impact nexus of climate change-agriculture-migration is still comparatively novel, the relevant science and policy community has concerned itself with the matter for some time (IOM 2008, 2009; Kelley et al, 2016; Scheffran 2018; Vinke 2019). While internal migration can be voluntary, viable and valuable, the motivations and outcomes can also differ. Internal migration may also be involuntary in the sense that migrants feel they are left with no choice other than to migrate in order to provide better living conditions for themselves and their families. Climate variability is by far not the only determining factor for migration decisions, but can contribute to making rural livelihoods less attractive by exacerbating working conditions for outdoor workers directly through heat stress. In addition, droughts and floods in particular can diminish economic prospects in the agriculture sector, indirectly impacting workers through crop failure. While cities often provide improved economic opportunities in comparison to rural areas, large-scale migratory movements from rural to urban areas may also lead to population pressure and a decrease in living standards in those urban centers, when the capacity to absorb migrants and workers is strained. The availability of employment, as well as the city's capacity to provide transport, social and healthcare services, housing, and other crucial infrastructure, is key in determining whether migration is a viable adaptation option or contributes to urban challenges. These challenges may range from the worsening of living conditions such as a decrease in hygienic standards, to a rise in crime rates and even providing fertile grounds for intercommunal conflict. This is particularly true for fragile states, where governments lack capacities and economies are weak. Within states which are already suffering from violent conflict, extreme weather events can further threaten human security and become an added driver of conflict (Scheffran, 2018). See, for example, the case with Syria in Box 2.

<u>Box 2: Climate change, Migration and Conflicts – The Syrian case</u>

It is clear the immediate case for the Syrian crisis is related to the Arab Spring which brought the opportunity to air grievances regarding social, political and religious factors. Yet, environmental factors such as increased weather variability can provide a fertile ground for migration as well as conflict outbreak (Schleussner et al, 2016). Preceding the advent of what remains an ongoing violent conflict 9 years later, was the worst drought on instrumental record. Livelihoods were lost, affecting an estimated 800.000 people in Syria´s eastern region. Livestock populations were diminished. Wheat production had plummeted to 47% and barley to 67% of the average yield during the three consecutive drought years. Another drought during the rainy season of early 2011 hit an already fragile Syrian food security situation (Gleick, 2014). Three subsequent drought years were among the chief motivations for 1.5 million rural Syrians to move to urban centers and their outskirts (Kelley, et al., 2015).

4. Policy Responses to Climate Change and Labor in SSA

The policy responses to climate change, i.e., mitigation and adaptation, have further implications for labor markets. In this section, we briefly discuss how adaptation and mitigation policies could contribute to the labor market, and how GIZ projects in the region could directly or indirectly contribute to the same.

4.1. Adaptation and Labor

The IPCC (2014) defines adaptation as "the process of adjustment to actual or expected climate and its effects" which seeks "to moderate or avoid harm or exploit beneficial opportunities". Adaptation measures can, therefore, contribute to the labor sector either directly by adjusting the labor sector to the impacts of climate change and/or indirectly by fostering structural transformation into economic sectors (e.g. more indoor labor activities and less-climate sensitive labor). Direct adaptation measures to labor productivity may include air conditioning and cooling facilities, and shades (e.g., for heat-stress related impacts) and insect protection (e.g., for malaria related impacts). Not only this, the capacity of local institutions to provide information for the general public during heat-waves is important (WHO, 2011). We refer an interested reader to WHO (2011) for detailed suggestions on responding to heat-waves for multiple stakeholders (e.g. health authorities, health professionals, care home managers and employers).[2]

On the other hand, adaptation measures to maintain agricultural production and resilience of infrastructure also buttress labor productivity and employment, and curb migration in the face of climate change. Besides, adaptation policies may in general promote structural change (or transformation) in low-income countries in SSA which is also regarded as a generic adaptation measure (Fankhauser and Burton, 2011). Structural change would involve deployment of labor from agriculture (as most climate sensitive sector) to manufacturing and then services (which are relatively less climate sensitive).

According to ILO (2018), the following are some examples through which adaptation can contribute to the labor sector. Adaptation measures can directly create employment and prevent job losses. For instance, according to the EU Adaptation Strategy, about 500,000 additional jobs (ca. 0.2% of working population) can be created in the EU by 2050 through respective measures. Adaptation investment in climate-resilient infrastructure has a positive impact on employment. For example, construction of irrigation facilities can create additional jobs while it prevents job losses due to the impacts of climate change on agriculture. Training and skills development (e.g., regarding agricultural extensions, climate services, and public health) as adaptation measures also contribute to employment. Additionally, social protection policies are also seen as adaptation measures as such measures facilitate the adaptation of individuals and families to environmental degradation and climate change (ILO, 2018). Cash transfers and public employment programs are two specific types of social protection instruments that can be used to help families adapt to extreme climate events (ILO, 2018). The Hunger Safety Net Programme (HSNP) in Kenya is one of such examples. The HSNP in Kenya is an unconditional cash transfer program that aims to build resilience and reduce extreme poverty in four arid counties located in the northern part of the country (ILO, 2018). Such transfers enable the beneficiaries (usually the poorer) to attain a better standard of living, increase their resilience to weather-related shocks, and make modest investment in agricultural capital which complements labor productivity and employment.

[2] http://www.euro.who.int/__data/assets/pdf_file/0007/147265/Heat_information_sheet.pdf

Likewise, in Ethiopia, structural change leading to increased labor skills and reduced transaction costs in commodity markets could offset about 30% of macroeconomic losses due to climate change (Yalew et al., 2018).

4.2. Mitigation and Labor

Mitigation activities can also contribute to enhance labor productivity, and employment. Mitigation to climate change refers to "a human intervention to reduce the sources or enhance the sinks of greenhouse gases (GHGs)" (IPCC, 2014). As burning fossil fuels is the major cause of GHG emissions worldwide, energy transition (from fossil fuels to renewables) is regarded as the main mitigation strategy. As such, a renewable energy project in SSA for mitigation of climate change (as outlined in the Nationally Determined Contributions – NDCs of African states) has implications for labor productivity and employment. For instance, mini-grid and off-grid renewable energies in rural SSA will help to reduce the indoor air pollution (and hence improves the health and productivity of labor, especially, that of women) and time spent to collect firewood (and hence helps to allocate labor into most productive sectors). In the SSA, air pollution causes about half a million deaths each year and is ranked as the fourth death risk factor in the region (Ritchie and Roser, 2020). Evidence shows that indoor air pollution is caused by burning solid fuel sources (e.g. firewood, crop waste, and dung) for cooking and heating (Fig. 4, Ritchie and Roser, 2020).

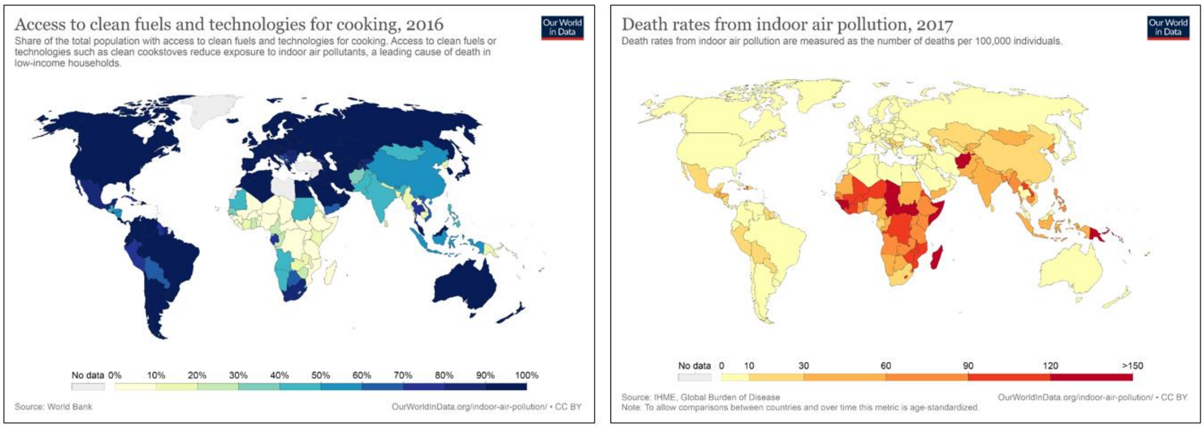

Figure 4: Death rates from indoor air pollution are inversely related to access to clean cooking fuels. Source: Our World in Data (https://ourworldindata.org/indoor-air-pollution).

Therefore, mini-grid and off-grid renewable energy projects aimed at either to support rural development and/or mitigation to climate change in SSA, bear co-benefits to human health, gender equity, and labor productivity.

4.3. Examples of GIZ Projects

Neither climate change adaptation nor mitigation measures are new to development planners and practitioners. They are incremental measures to specifically address climate related problems. Therefore, not only specific adaptation/mitigation projects but also conventional development projects meant to address poverty, gender or income inequality will have positive spillovers on labor productivity and employment in SSA. As such, both climate-specific and generic development projects by the GIZ and its partners will contribute to reduce impacts of labor or to compensate labor productivity and employment that might have been lost due to climate change. In 2018, the volume of climate-related orders of GIZ in SSA amounted to over EUR 0.6 billion (GIZ, 2019: Klimaportfolioanalyse). Among them are both GHG-mitigation projects (e.g. for the promotion of renewable energy) as well as adaptation projects (e.g. in the sector of agriculture). In this section, we provide some examples of GIZ projects implemented in SSA which directly or indirectly contribute to labor productivity and employment in the face of climate change.

A. Sustainable and climate-friendly basic energy services (ProENERGIE) in Togo

This climate change mitigation project, running from 2017 to 2020, aims to establish norms on product quality through investment and training in renewable energies in Togo. This approach can contribute to employment directly through training technicians and indirectly releasing some labor time and services which otherwise would have been used to collect firewood. The project includes capacity building for maintenance of solar panel installations, which is expected to create additional steady jobs. For example, for that purpose, 3000 solar technicians (electricians, engineers, developers and resellers of solar products) received additional training for solar technology.

The improved competencies ensure sustainability for rural electrification in general, and solar-powered electrification in particular. Specific attention was paid to spatial dispersion of candidates, so that a country-wide coverage of capable solar technicians is ensured. Furthermore, the target group was generally people who have previously undertaken apprenticeships, not just electrical engineers who have studied at university. Trainees were contacted through newspaper and radio advertisement. This initiative makes great strides towards assuring investors that there is local capacity and know-how to maintain these electrical installations. However, the challenge may arise after the hardware will have been installed, as it is not envisioned to match the former trainees with potential job opportunities directly. This may be something to consider in order to truly harness the potential of the human capital, which has been fostered through previous training. In addition to the creation of solar-energy clusters in rural areas, the Togolese private sector has been prompted to engage in the sale of individual solar-powered kits such as lamps, pumps and fridges, in order to extend the reach of the project. This component of the project is supported through a result based financing fund, which subsidizes these local businesses for every sale that is made, in an effort to provide evidence-based financing.

Co-benefits include that villagers no longer need to rely on batteries for energy consumption, which eliminates waste and may save them money in the long-run. It further eliminates the usage of oil lamps, which is also a health risk when used indoors.

While the construction and maintenance of these electrical installations create jobs already, the established access to electricity in rural areas provides much potential for upgrading value chains, particularly in but not limited to the agriculture sector. Additionally, those who can invest in solar appliances such as refrigerators, have the opportunity to generate additional income by renting out space therein to provide cooling for vegetables and fruits and hence, reducing post-harvest loss. That way the technology is shared and benefits multiple households within one village.

(For further information on this project go to https://www.giz.de/en/worldwide/71064.html)

B. Supporting the national program for sustainable small-scale irrigation in Mali

This project, running from 2008 till 2019, helps to foster agricultural and rural development in Mali. Irrigation allows multiple cropping cycles and reduces the dependency on rain-fed agriculture. This allows farmers to continue growing throughout the year thereby reducing seasonal (or disguised unemployment). Therefore, as an adaptation measure, the irrigation project can also be regarded as no-regret measure as it contributes to the alleviation of poverty and food insecurity regardless of the expected impacts of climate change. This is especially true for rural Mali as agriculture is generally rain-fed and rainy seasons are short and increasingly unpredictable. Both men and women will benefit from the jobs that are created within the agricultural sector, both in training and on the field, as well as the expanding irrigation industry. There are three pillars to it: sensitization of the public concerning the causes and impacts of climate change, practical trainings on adaptation strategies and implementation of preemptive measures regarding soil erosion. The potential lies in an increase in yield leading to a surplus for smallholder farmers. This surplus could potentially be used to sell additional produce and foster value chains. The combination with increased post-harvest management would be ideal and might be a way to extend the already successful program. Although addressing heat stress and measures to prevent it is not currently part of the strategy, it would be valuable and convenient to add this to adaptation trainings that are already undertaken, since workers in agriculture are particularly vulnerable to adverse health impacts. The project strengthens the technical as well as operative capacities of farmers.

(For further information on this project go to https://www.giz.de/en/worldwide/30245.html)

C. Rural employment with a focus on youth

This project focuses globally on areas where small-scale farming is the main source of income. The expected duration of the project is 2018 till 2022. About 90% of the people living there earn their income from the agricultural sector and food processing industry. But, rural areas are often lacking attractive employment opportunities and prospects for the future. Women and young people are disproportionately affected by underemployment, unemployment, precarious job situations and informal employment conditions. Their situations are often plagued by insecurity, poor working conditions, high workload, low productivity and low pay. Agricultural production in Africa will need to double by 2050 in order to be able to feed the rapidly growing population. Increases in productivity, innovative technologies and sustainable farming methods are prerequisites for this. Young people in particular are key players who can drive future change and development processes.

Thus far, climate change adaptation and mitigation are not explicitly addressed in this project. Specific country packages are still being rolled out, and the stated goal is to consider and implement aspects of the climate change agenda at that point. The agricultural sector, which the project aims at, is particularly vulnerable to climate change impacts such as drought, floods and resulting land degradation. Hence, finding synergies from an early stage of the project planning phase would make great strides in ensuring long-term sustainability of employment creation.

(For further information on this project go to https://www.giz.de/en/worldwide/67975.html)

5. Conclusions and Policy Implications

Climate change affects labor productivity and employment directly and indirectly. The direct impacts include loss in working capacity and working hours due to heat-stress, and vector- and water-borne diseases such as malaria and diarrhea. Climate change also affects productivity of agriculture while climate extremes (such as floods) may affect road qualities and functions thereby reducing overall economic production and revenue and hence return to labor in the economy.

On the other hand, adaptation and mitigation measures can lead to employment gains and prevent job losses. Adaptation and mitigation policies and measures contribute to directly reduce climate change-induced impacts on labor or expanding employment opportunities. This could help to maintain labor productivity/employment in the face of climate change and/or to compensate productivity/employment losses due to climate change.

In this report, for example, we have highlighted how GIZ projects being implemented in SSA can complement job creations or offset job losses due to climate change impacts. These include direct contributions such as irrigation (adaptation) projects and indirect contributions such as renewable energy (mitigation) projects. GIZ projects should therefore incorporate considerations of climate change impacts at the early planning stage, in order to harness the full potential of mitigation and adaptation options and counteract net negative impacts on productivity and income.

Furthermore, the national and regional governments in addition to international development partners in SSA should consider the implications of climate change on labor productivity, employment, and mobility. The technical capacity of local institutions to provide early warning and real-time information during heat-waves for the general public shall be consolidated. Multi-stakeholder guideline (such as WHO, 2011) shall be prepared to guide stakeholders (authorities, medical professionals, home caretakers, general public) responses to heat-stress. Development initiatives in highly sensitive sectors such as agriculture and infrastructure should especially scrutinize heat-related implications as part of their environmental and social safeguards policies.

That being said, however, this report notes that there exists little research on the contributions of specific adaptation measures to labor productivity and employment in SSA. Therefore, more research is needed on how the synergies between adaptation measures and development efforts could foster sustainable employment creation in the region.

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