Introduction

In 2015, world leaders came together and made a historic promise to the planet's future when they adopted the 20230 Agenda for Sustainable Development and its 17 Sustainable Development Goals (SDGs). Less than a decade remains for countries to meet these ambitious goals and the 2023 SDG progress report states that "Progress on more than 50 per cent of targets of the SDGs is weak and insufficient; on 30 per cent, it has stalled or gone into reverse." [1]

The SDGs reflect an understanding that sustainable development requires simultaneous consideration of economic growth, social well-being and environmental protection. This report was developed specifically to contribute to understanding and bringing greater attention to the issues of population dynamics and voluntary family planning and reproductive health (FP/RH) in the context of climate change and achieving sustainable development in Sub-Saharan Africa (SSA). The report also includes a summary of the distinct constellation of population, environment and climate change issues facing three particular countries in SSA: Malawi, Kenya, and Cote d'Ivoire.

Study Methods

To examine the interconnectedness of population dynamics, climate change and sustainable development, we searched for recent quantitative measures and indicators/datasets available across all or most of the countries in the SSA region. Specifically, for population dynamics, we collected data on current and projected population sizes. Since fertility is a central driver of population growth, we also collected data on current total fertility rates and unmet need for FP. For climate change indicators, we selected the Notre Dame Global Adaptation Initiative (ND-GAIN) index scores and global ranking as well as the index scores for its two primary components: vulnerability to climate change and readiness to adapt to climate change. For other sustainable development indicators, we selected measures of deforestation, urbanization, urban poverty, food security and water scarcity.

We compiled identified data points into spreadsheets and examined their distributions and any missing data across SSA countries. For each type of indicator, we calculated or selected indicator thresholds and visualized the indicators and their relationship to one another on a series of figures and maps. We drew on recent literature as available to determine appropriate indicator thresholds supported by the evidence or considered by experts as constituting levels above or below which would be considered problematic or to place populations at particular risk of the phenomenon in question. For those indicators in which the literature does not indicate any thresholds we divided the range of values for that indicator into terciles and present high, medium and low terciles so as to bring attention to countries in SSA with the lowest measures relative to other countries in SSA. Additional detail about the source of data for each indicator is provided in a table in Appendix 1 and additional detail on each indicator's definition, measurement and threshold is provided within each section of the report.

# Population Dynamics and Family Planning in Sub-Saharan Africa

Population Growth

Human population growth impacts how development occurs and has an impact on the climate in a variety of ways. For instance, as human populations grow, forests and other habitats are disturbed or destroyed for the building of homes, businesses, and roads to accommodate growing populations. Additionally, as populations increase, more land is needed for agricultural activities to grow crops and support livestock. This, in turn, can decrease biodiversity and change the interaction patterns of other organisms. Growing human populations also require more resources, including but not limited to fossil fuels and fresh water and the extraction of resources from the earth, often release pollutants and waste that reduce air and water quality and harm the health of humans and other species. The health of humans is also threatened as population density increases by diseases that can spread more rapidly within and among populations.

Africa's population is estimated at 1.2 billion people and is expected to continue to grow over the next few decades, nearly doubling to reach 2.1 billion people by 2050.[2] According to the World Population Prospects (2022), 5 out of the World's top 8 most populous countries by 2050, will be from Africa. These include the Democratic Republic of Congo, Ethiopia, Tanzania, Egypt, and Nigeria. Most countries in SSA are expected to continue growing through 2100 and will translate into contributing to half of the global population by this time. These population increases will change the geopolitical weight and the socioeconomic prospects of the African region in the world.[2]

SSA, in particular, is according to the Median variant of the *World Population Prospects 2022*, the only region in the world where the population is projected to continue to increase throughout the 21st century.[2] As shown in Figure 1, these increases in population numbers are expected despite the slowing of the population growth rate.

Figure 1. SSA's Projected Population Growth: Regional Growth Rates and Population Projections in Selected Countries
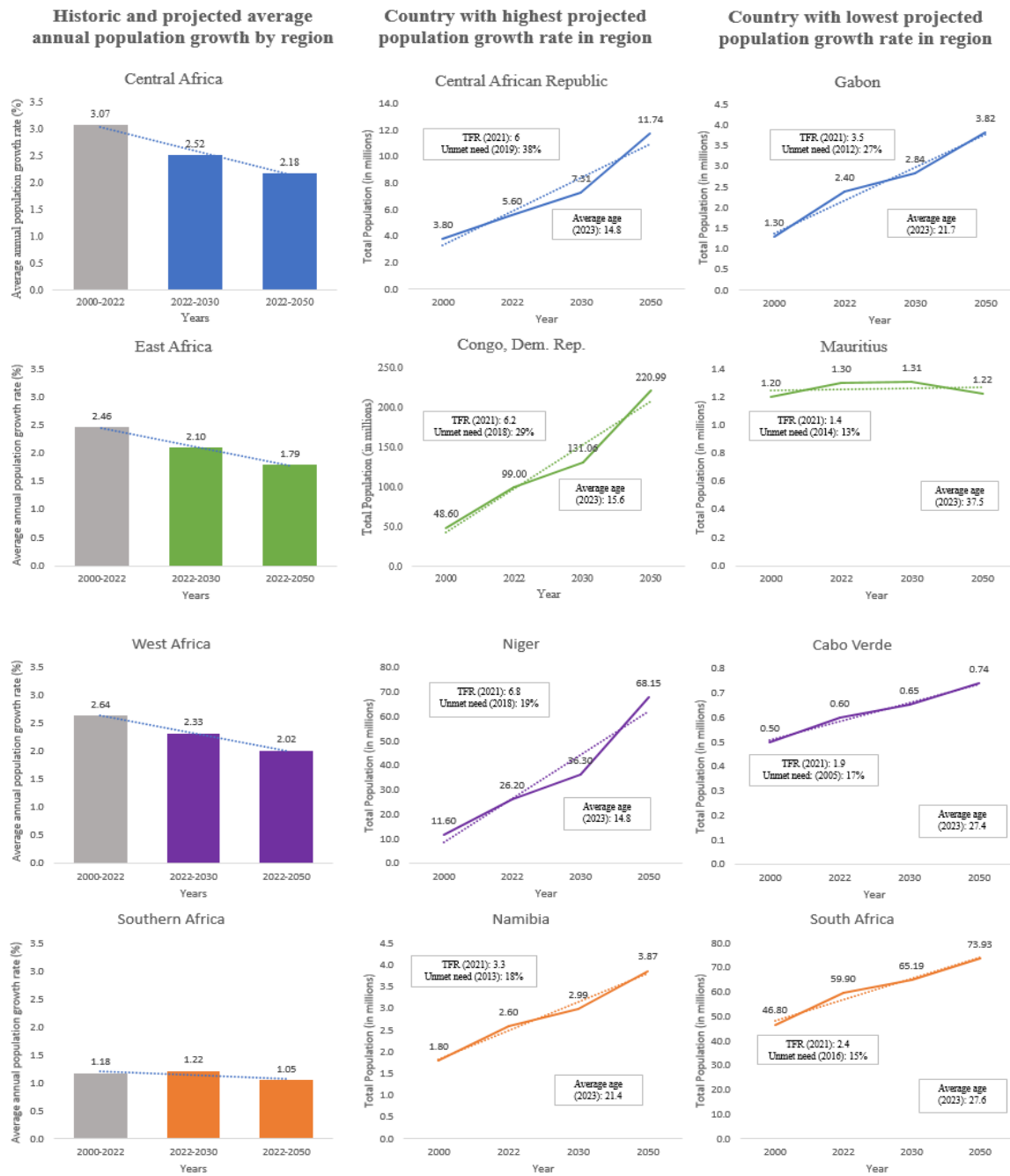
Data Sources: Average annual population growth rate and Total population: United National Population Division. World Population Prospects: 2022 Revision; TFR & Unmet Need: World Bank (2021); Median life expectancy at birth: United Nations Population Division

Reading the figure from top to bottom, the rows in this figure are organized to provide a snapshot of the historic and projected population growth in each of the four regions within SSA: Central, Eastern, Western and Southern. The bar graphs in the first column show the regional population growth rates from 2000 to 2022 as well as projections of those growth rates to 2030 (i.e., the deadline for the SDGs) and 2050. Notably,

with the exception of the South Africa region whose growth rate is projected to remain approximately the same, the growth rates in other three regions of SSA are projected to decline continuously and significantly between 2022 and 2050.

Reading across the rows, the line graphs show the projected population growth in millions from 2000 to 2050 for the countries within each region that have the highest and then the lowest projected growth rates. While the y axis population figures differ across these country graphs, what is striking here are the increases in the slopes of all of these graphs despite projected declines in the growth rate. With the exception of Mauritius, the populations in all countries in these regions, including those with the lowest projected growth rate are projected to steadily and appreciably increase between 2022 and 2050.

Population growth is determined by four main factors: fertility rates, mortality rates (life expectancy), the initial age profile of the population (whether it is relatively old or relatively young to begin with) and migration. Much of SSA's rapid population growth stems from persistent high fertility combined with the young age structure of the populations of most of its countries. The 2021 total fertility rate (TFR)s and 2023 median ages for each of these countries are included on each of the country line graphs and paint a clear picture of the population growth in these countries and differences in the rates of population increase. The countries with the highest projected population growth in each region (Central African Republic (CAR), Democratic Republic of Congo (DRC), Niger and Namibia) have a combination of high TFRs and relatively young age structures indicating they currently have a large percentage of their populations who are currently or not yet of reproductive age and reproducing at a rate substantially above the replacement rate (2.1 births per woman). For the purposes of the additional analyses in this report, we calculated the estimated/projected population growth rate from 2022 – 2050. We focused on high population growth which we defined following McNicoll (1984)[3] as an annual growth rate of 2% or higher.

By 2050, this demographic boom currently unfolding in most sub-Saharan African countries will likely have transformed many of the region's economies into the largest in the world. Rapid population growth however is a challenge to sustainable development as it results in population outpacing efforts to meet the social needs of citizens.

Fertility and Family Planning

According to recent projections in World Population Prospects,[4] fertility rates--the number of children per woman over her lifetime--have been declining steadily in SSA since 1990 when they averaged 6.3 children per woman and will continue to fall, and by 2050, in some SSA countries will decline to the levels close or even below the replacement rate (2.1 births per woman).[5] A critical component to reductions in birth rates is that women have access to FP methods. Unmet need for FP is the measure most commonly tracked to determine the percent of women who have not had been able to plan, space or delay pregnancies. Unmet need for FP is specifically defined using survey data as the percentage of women of reproductive age, either married or in a union, who do not want to become pregnant but are not using contraception.[6]

The unmet need indicator ranges from 0 (no unmet need) to 100 (no needs met). However, since in the general population of women at any one time, some women wish to become pregnant and others are not at risk of pregnancy, values approaching 100 per cent do not occur.[6] As shown in Figure 1, the most recent measures of unmet need for these countries varies substantially but is largely in keeping with a countries TFR such that the countries with the higher TFRs are also the countries with the higher rate of unmet needs (i.e., Central African Republic - TFR of 6 and unmet need of 38% and DRC - TFR of 6.2 and unmet need of 29%).

Notably, measurement of unmet need for FP at the country/national level requires nationally-representative survey samples and is determined using responses from more than 15 different survey questions. Given the large sample sizes and numerous survey questions needed to accurately measure unmet need for FP, unmet need measures require a national-level DHS or Multiple Indicator Cluster Surveys (MICS) to be conducted. These surveys are conducted in different countries at different intervals. As a result, comparison across countries of the unmet need measures shown here should keep in mind that some of the variation has to do with how long ago the last DHS was conducted in different countries. The most recent year measures of unmet need for FP that we are using for this analysis vary from 1998 to 2021.
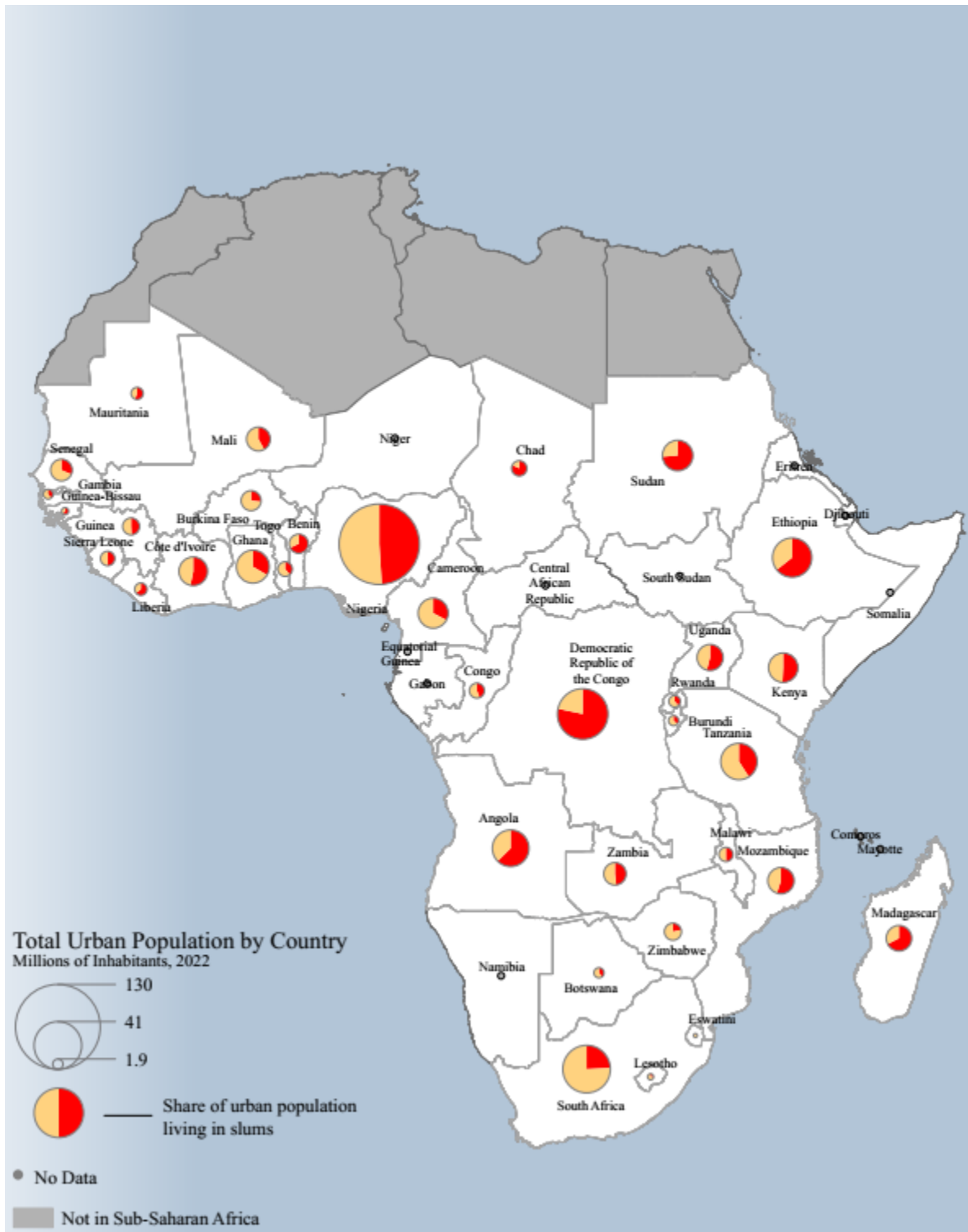
Urbanization

Nearly two-thirds of population growth in Africa is expected to occur in urban areas[7,8] and it is predicted that by 2100 the majority of the largest cities in the world will be in Africa.[9] The number of large cities with populations between five and ten million in Africa is expected to increase, from five in 2018 to thirteen in 2030.[10] Two new megacities (defined as urban areas with more than ten million inhabitants) are expected to emerge in SSA in Dar es Salaam and Luanda by 2030.[10]

SDG #11 is focused on making cities inclusive, safe, resilient and sustainable.[11] The UN stresses the importance of cities, as the proportion of the population living in urban areas globally is more than half and rising quickly. SSA, in particular, is the least urbanized but fastest urbanizing region in the world.[12] Many environments are not prepared for rapid and sprawling urbanization, as housing, infrastructure, and services do not keep pace.[13] Rapidly developed, unplanned and unregulated urban areas face challenges such as overcrowding, poor sanitation, and limited access to basic services that in turn, contribute to poor health and well-being for residents of those areas.[14] Environments contending with these challenges and characterized by temporary housing structures and/or informal settlements are often referred to as slums.

As can be seen on Map 1, half or more of residents in SSA urban areas live in what are commonly referred to as slums. The specific statistic is that about 62% of urban populations in SSA currently live in slums, the highest number globally.[15] Some cities that have experienced the most significant urban growth in the past 20 years, such as Accra, Ghana, Lagos, Nigeria, and Nairobi Kenya have some of the world's largest slums. In 2018, SSA had two megacities: Kinshasa and Lagos (megacities are defined as urban areas with more than ten million inhabitants).

In terms of development, the GDP of many SSA countries relies on their urban areas. There are 143 cities in SSA, which generate a combined $0.5 trillion, or 50% of the regions GDP.[12] Yet, rapid population growth and rapid urbanization without corresponding growth and improvements in infrastructure and services will leave urban residents, particularly slum residents particularly vulnerable to the impacts of climate change. As temperatures and sea levels continue to rise and concomitant extreme weather patterns such as flooding and heatwaves become more common, these climate changes will further exacerbate pre-existing challenges in urban areas such as air quality and access to clean drinking water and sanitation.[12]

Total Urban Population by Country
Millions of Inhabitants, 2022

130
41
1.9

Share of urban population living in slums

● No Data

Not in Sub-Saharan Africa

MAP 1. URBANIZATION IN SSA

Climate Change Vulnerability and Readiness

SDG #13 is to take urgent action to combat climate change and its impacts.[11] According to the most recent 2023 SDG report, "The world is on the brink of a climate catastrophe and current actions and plans to address the crisis are insufficient.[11]" Notably and undeservedly, the African continent, which has contributed the least to global warming[16] is also thought to be the most vulnerable continent to climate change impacts.[17] As such, whereas climate action in developed nations calls for rapid and dramatic efforts to lower emissions and reduce global warming in Africa the concern about climate change is about developing resilience and readiness for the risks that climate change poses to its population, ecosystem and to its recent development gains.

With the goal of assessing where the greatest needs and opportunities for improving resilience to climate change exist, researchers at the Notre Dame Global Adaptation Initiative (ND- GAIN) developed and ranked 185 of the total 195 countries globally on the ND-GAIN index. As shown in Map 1, all but three of the countries in SSA are globally ranked in the lowest tercile of the ND- GAIN index. Notable, albeit not visible on the map, Chad in East Africa is the country with the lowest ranking on the ND-GAIN index followed in order by Central African Republic, Eritrea, DRC, Guinea-Bissau and Sudan.

The ND-GAIN index is itself a compilation of 45 climate indicators that are organized into two primary components of climate change resilience: vulnerability to climate change and readiness to adapt to climate changes. ND-GAIN assesses the vulnerability of a country by considering six life-supporting sectors: food, water, health, ecosystem services, human habitat and infrastructure. Each sector is in turn represented by six indicators that represent three cross-cutting components: the exposure of the sector to climate-related or climate-exacerbated hazards; the sensitivity of that sector to the impacts of the hazard and the adaptive capacity of the sector to cope or adapt to these impacts. Readiness is defined as "Readiness to make effective use of investments for adaptation actions thanks to a safe and efficient business environment."[18] ND-GAIN measures readiness by considering a country's ability to leverage investments to adaptation actions. ND-GAIN measures overall readiness by considering three components: economic readiness, governance readiness and social readiness.
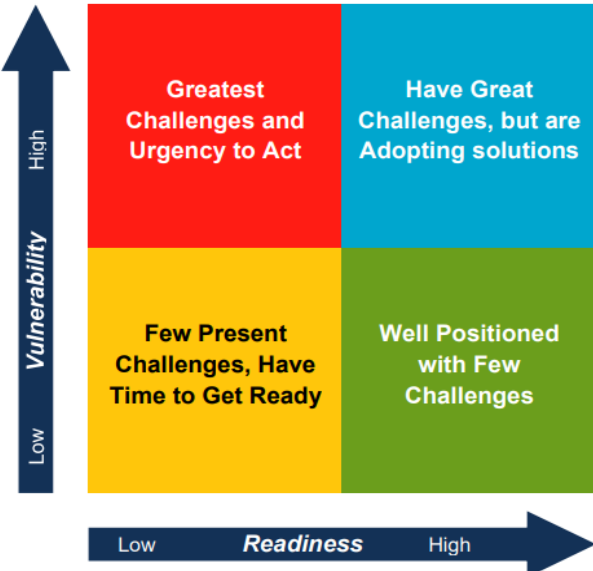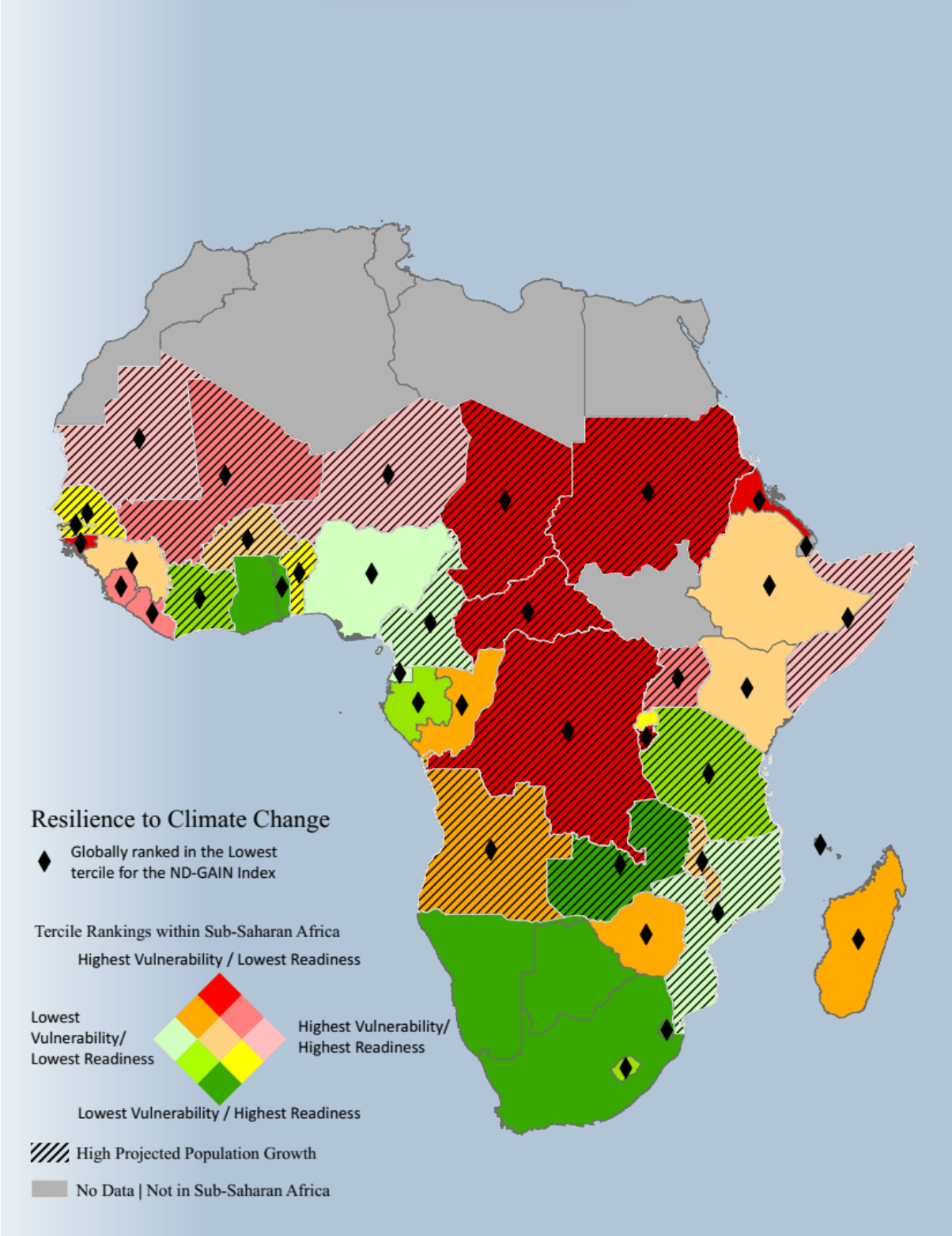

FIGURE 1: ND-GAIN INDEX MATRIX

Figure 2 shows the ND-GAIN Matrix, which is used to plot and compare how countries scored on vulnerability and readiness. The matrix divides countries into four quadrants or the combinations of readiness and vulnerability to climate change. According to the ND Gain Country Index Technical Report approximately half of all countries fall to the left and half to the right of the readiness line, while half fall above the vulnerability line and half below.[18] The countries within SSA all fall below the vulnerability line and to the left of the readiness line. Therefore, to bring attention to the SSA countries with highest vulnerability and lowest readiness, we ranked SSA countries

readiness and vulnerability scores and divided them into terciles. The gradation of color on Map 2 goes from green being those that are relatively least vulnerable and most ready to red being those that are relatively most vulnerable and least ready to adapt to climate change. Countries shown in red on Map 2 include Chad, Central African Republic, Eritrea, DRC, Guinnea-Bissau and Sudan, which also happen to be in inverse order the countries with the lowest ranking ND-GAIN index scores globally. Notable, also is the fact that all of the countries in the lowest global tercile of the ND-GAIN index will also be experiencing high population growth (i.e., above 2%) between now and 2050.

Resilience to Climate Change

♦ Globally ranked in the Lowest
  tercile for the ND-GAIN Index

Tercile Rankings within Sub-Saharan Africa

Highest Vulnerability / Lowest Readiness

Lowest
Vulnerability/
Lowest Readiness

Highest Vulnerability/
Highest Readiness

Lowest Vulnerability / Highest Readiness

///// High Projected Population Growth

▨ No Data | Not in Sub-Saharan Africa

MAP 2. PROJECTED HIGH POPULATION GROWTH AND CLIMATE RESILIENCE

Population Growth, Climate Change and the SDGs in SSA

In the context of these dual challenges of rapid population growth and climate change, there is an increasing need to understand the implications for SSA of these simultaneous changes as it strives to achieve sustainable development and within the next decade the Sustainable Development Goals (SDGs). While population and climate changes are likely to have an impact on attainment of all the SDGs, we have selected three to focus on for the purposes of this report: forest loss (SDG #15), food insecurity (SDG #2) and water scarcity or stress (SDG #6).[11]

Deforestation

SDG #15 is focused on life on land and the worded as "Sustainably manage forests, combat desertification, halt and reverse land degradation, halt biodiversity loss."[13] The United Nations (UN) notes that the combination of climate change, pollution and biodiversity life all threaten earth's ecosystems, and that the expansion of agriculture causes nearly 90% of deforestation.[13] Forests continue to decrease as the population grows due to increased demand for food and land, leading to forest land being converted for agricultural and other land uses.

According to FAO, almost 4 million hectares of forests are cut down annually in Africa, almost twice as quickly as the global average of deforestation. Despite deforestation rates decreasing globally, deforestation in Africa has increased steadily since 1990. Some of the main causes of deforestation in Africa include agricultural expansion, commercial logging, mineral extraction and, charcoal and biofuel production.[19] Additionally, the fast growing population is one of the major drivers of deforestation due to creation of new settlements as well as the need for raw materials for houses and infrastructure.[20,21]

Map 3 below shows levels of forest area cover lost by country in SSA between 2000 and 2021. It should be noted that forest cover loss is difficult to accurately quantify as expansions and losses in forests occur simultaneously and are challenging to track.[22] We use here observational data from the Global Forest Watch, which is derived from continuously analyzing satellite imagery back to the year 2000 and is reported as "area of forest loss per year". We limited our definition of what a forest was to areas with at least 30% canopy cover (this is the threshold Global Forest Watch uses to report all of their data). We calculated the rates of total forest loss per country by comparing the country's starting (year 2000) forest extent and the final reported year's (2021) forest extent to determine the net change in forest coverage by area.

Map 3 also shows the overlay of forest cover loss with high population growth. As shown in red, Burkina Faso has among the highest level for forest area cover loss (99.2%) as well as a high population growth rate. Contrastingly, South Sudan has among the lowest rate of deforestation (1.1%) and does not have a projected high population growth rate. Of the 46 countries in SSA with data, 6 have levels of deforestation above 30%. The map shows that the highest levels of deforestation in SSA are concentrated in Southern and West Africa.

Forests play a crucial role in combatting climate change and in sustaining human populations – they produce oxygen and simultaneously absorb and store carbon dioxide, removing greenhouse gases from the atmosphere. It is estimated that one large tree can provide a day's supply of oxygen for up to four people[23] Loss of forest cover accounts for approximately 20% of global greenhouse gas emissions and contributes to loss of biodiversity and further disruption of the ecosystem, further exacerbating climate change.[24-26]

MAP 3. PROJECTED HIGH POPULATION GROWTH AND DEFORESTATION

Food Insecurity

The official wording of SDG #2 is: "End hunger, achieve food security and improved nutrition and promote sustainable agriculture".[27] Globally during the past 50 years, there have been rapid and continuous improvements in agricultural productivity that have resulted in significant improvements in food security in many regions of the world.[28] However, in SSA, food insecurity (i.e., lack of food security) has been on the rise and increased significantly since 2015 due to a combination of factors including but not limited to the COVID-19 pandemic and the Ukraine conflict.[28] According to Action against hunger, 264 million people in SSA currently face hunger and 24.1% of the SSA population are undernourished.[29]

Various definitions of food insecurity exist. The prevalence of moderate to severe food insecurity found in SSA countries as recently as 2021 is shown in Map 4. We use here the Food Insecurity Experience Scale (FIES) developed by FAO. The prevalence of moderate or severe food insecurity in the population, based on the FIES is one of the metrics used to track progress on SDG #2. It is an estimate of the percentage of a country's population that faces difficulties in accessing enough safe and nutritious food for normal growth and development and an active and healthy life. [30]

The FIES is a series of 8 questions asking respondents about their experiences during the past 12 months of facing any constraints to access to food. The questions range from ran out of food or skipped a meal (moderate) to went without eating for a whole day or experienced hunger because of insufficient money or resources for food (severe). The FIES captures deprivations in diet quality and quantity and in addition one of the unique contributions of the FIES is that it also captures the psychosocial aspects associated with anxiety or uncertainty regarding the ability to procure enough food. This is important as it has been shown that even in the absence of measurable negative effects on nutritional status, food insecurity can have potentially negative consequences for mental and social health and well-being.[30]

There was a total of 33 countries (shown in red on Map 4) in SSA in 2021 whose results on nationally-representative surveys found that 50% or more of their populations reported moderate to severe food insecurity (Map 4). Six of these countries, reported rates of 80% or higher of moderate to severe food insecurity in their populations in 2021; these countries included Malawi, Central African Republic, Sierra Leone, Democratic Republic of Congo, South Sudan and Liberia. Only one country in SSA, South Africa reported rates of moderate to severe food insecurity in 2021 below 30%.

In SSA, food insecurity is already a dire situation, and the simultaneous and compounding effects of population growth and climate change are likely to make it worse. Rapid population growth puts pressure on the food supply system and limited food resources. Simultaneously, climate change is exacerbating and likely to further contribute to food insecurity in a variety of ways, including most directly by reducing crop yields, altering ecosystems, and interrupting transport conduits all of which, in turn, will disrupt food availability, reduce access to food, and affect food quality.

The authors of a 2022 literature review of food insecurity in SSA note an obvious but critical fact, "it will be difficult for Africa to have sustainable economic development if its people are malnourished and unwell." The review found and summarized a number of key problems related to sustaining food security in SSA, notable among which were: weak infrastructural development, low investment in irrigated agriculture and research, poor policy frameworks and climate change and high population growth.[28] Similarly, a 2022 paper published by the International Monetary Fund wrote that, "addressing the lack of resilience to climate change—that critically underlies food insecurity in SSA—will require careful policy

prioritization against a backdrop of financing and capacity constraints".[31] Both papers concluded that there was a need for financing and policies to improve agricultural resilience and household's food-purchasing power as essential to addressing food insecurity in SSA.

Prevalence of Moderate to Severe Food Insecurity

- 20 - 30%
- > 30 - 50%
- Over 50%
- High Projected Population Growth Rate
- No Data
- Not in Sub-Saharan Africa

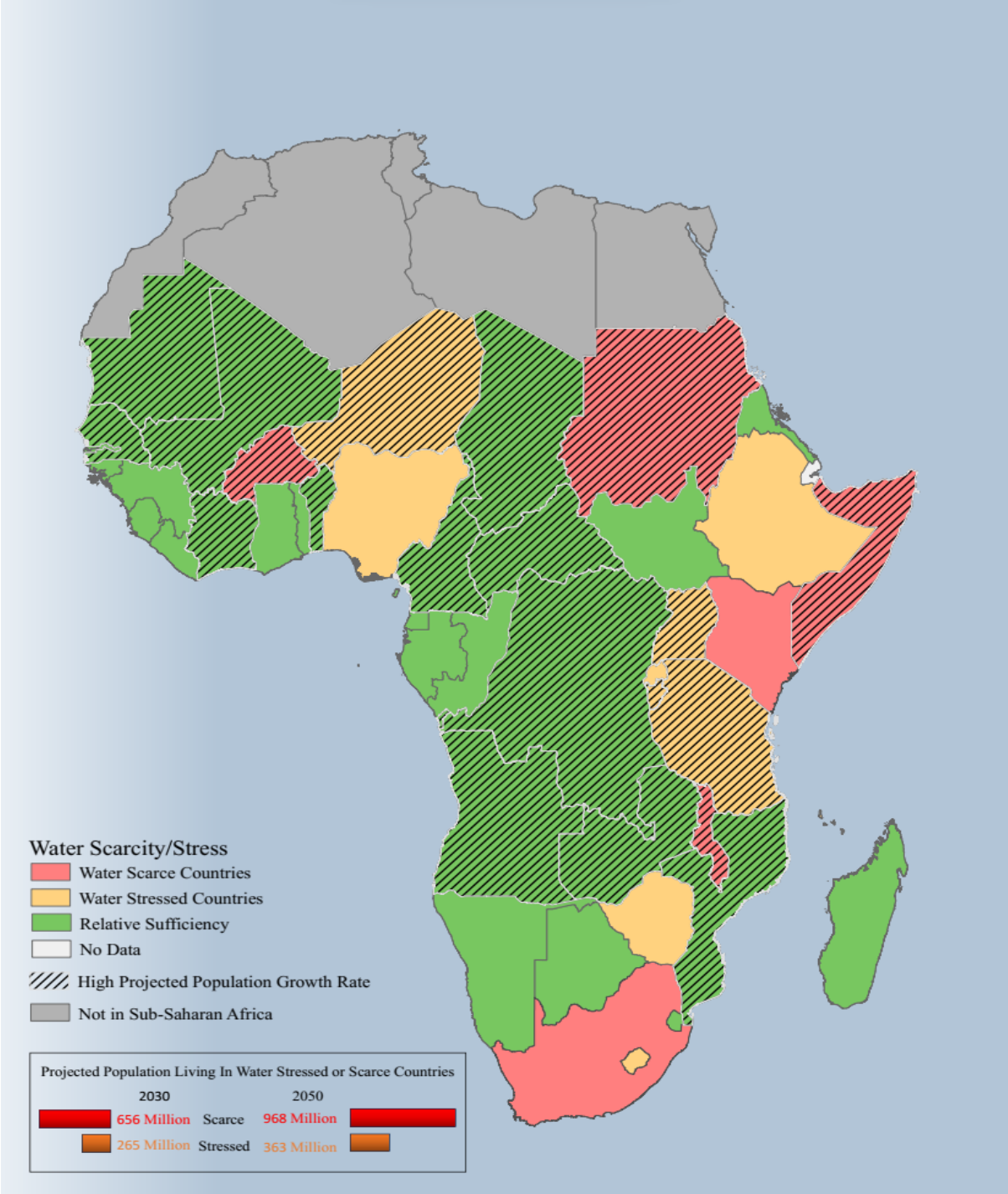MAP 4. PROJECTED HIGH POPULATION GROWTH AND FOOD INSECURITY IN SSA.

Water Scarcity or Stress

SDG #6 is to ensure access to water and sanitation for all.[11] UN recognizes access to clean, affordable and safe drinking water as a fundamental human right.[13] Water scarcity results when water demand exceeds water availability, combined with lack of access to safe water and supplies.[16] According to the WHO, one in three people in the Africa region face water scarcity, a situation which is worsening due to factors including population growth, urbanization and climate change.[32]

Rapid population growth, urbanization, and increasing needs from agriculture, industry and energy sectors result in increasing demand for and worsening access to water. As a result, demand for water is growing faster than the population.[13] Additionally, climate change has exacerbated water insecurity in SSA. For example, increased floods and droughts and increased global temperatures have worsened water availability and access.[16]

Current water scarcity in SSA countries is shown in Map 5. Countries are classified as water scarce or water stressed according to widely used measures established by hydrologist Malin Falkenmark (1992).[33] Countries are classified as water scarce if there are fewer than 1,000 cubic meters of renewable fresh water available per person per year, and as water stressed if there are fewer than 1,667 cubic meters available per person per year. Total renewable freshwater includes the amount of both internal and external renewable water available to a country. We use data on the amount of total renewable freshwater available in each country from the Food and Agriculture Organization of the United Nations which provides an annual per capita rate measure during the time period 2018-2021.

Fifteen countries in SSA face water scarcity or water stress as of 2020 (Map 5). Among these, Kenya, Burkina Faso, and South Africa are the most affected by water scarcity, with less than 900 cubic meters of water available per person per year. More than half of the countries in SSA facing water stress or scarcity are also experiencing the highest population growth rates (i.e., > 2% per year). Given the high population growth in many of these countries by 2030 the number of people projected to be living in water stressed or scarce countries in SSA is projected to be 921 million and this number is projected to increase to 1.331 billion by 2050 (Map 5). Population growth increases demand and competition for water resources and compounds water scarcity.[34] Combined with anticipated changes in climate, water shortages are likely to become even more severe in SSA, especially in areas where economic and political problems impede access to fresh water.
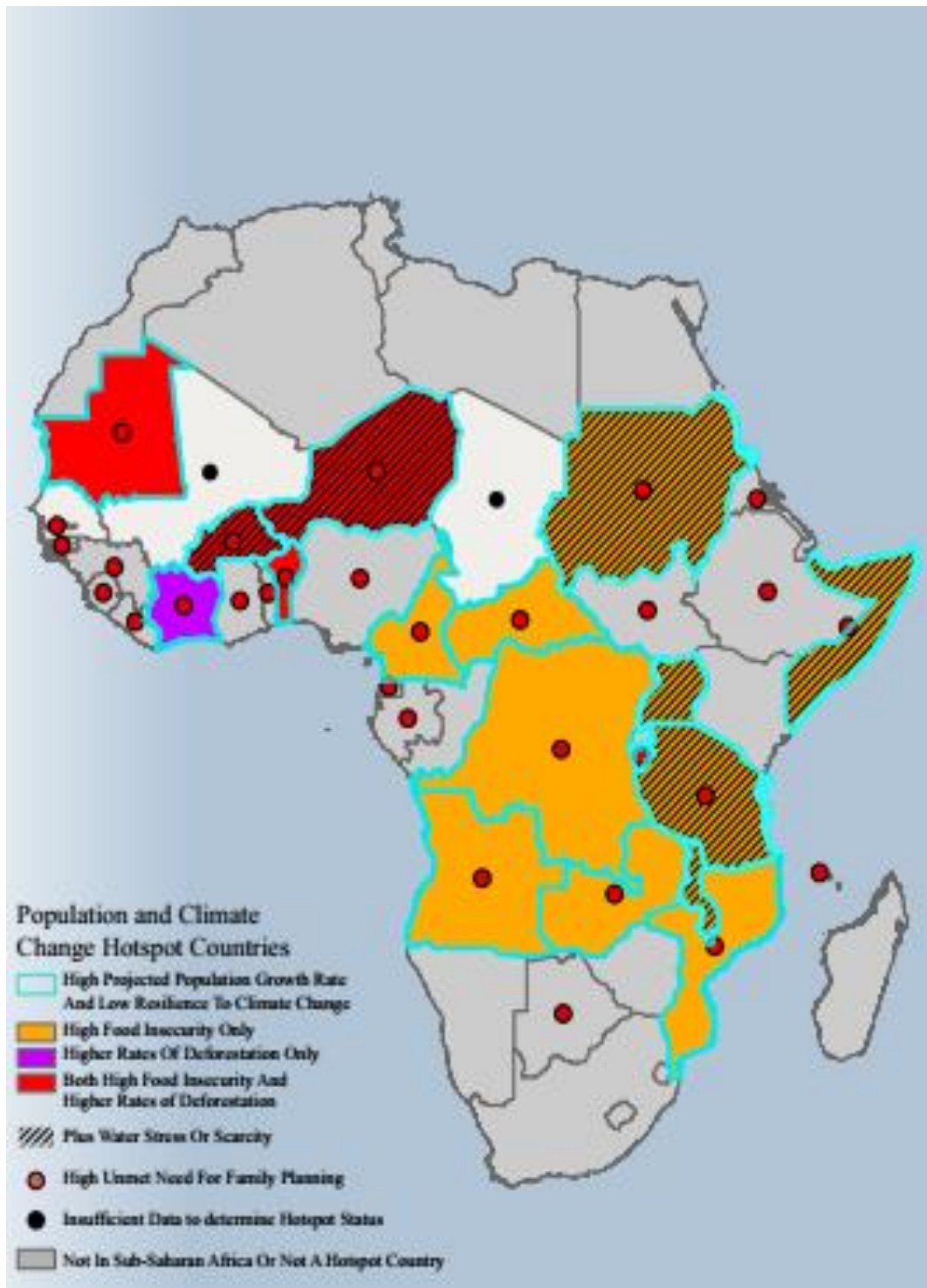
Map 5: Projected High Population Growth and Water Scarcity and Stress in SSA

Population and Climate Change Hotspots

For the purposes of this final map, we defined population and climate change "hotspot" countries as those in SSA experiencing both high population growth rates and low resilience to climate change (defined by the GAIN-ND index) and limitations in terms of at least one of the three sustainable development goals highlighted in this report (i.e., deforestation, food insecurity and water scarcity or stress). There are 17 of these "hotspot" countries in SSA (Map 5). To see the full constellation of issues discussed in this report that the hotspot countries are contending with we then overlaid are other indicators of high food insecurity, high rates of deforestation, and water stress or scarcity on to these hotspot countries. We also created an indicator of high unmet need for FP. The median rate of unmet need for FP on survey measures between 1997 and 2010 was 18.4 percent.[6] We therefore defined high unmet need as a rate above this median rate (i.e., > 18.4%).[35]

Of the 17 "hotspot" SSA countries shown on this map, two (Niger and Burkina Faso) also experience both high food insecurity and high rates of deforestation, water stress or scarcity, and high unmet need for FP. Other hotspot countries face various combinations of these challenges. The majority face high unmet need for family planning and high food insecurity. Many also face water stress or scarcity. Population growth is a key driver of these challenges, which are further compounded by climate change. As the population grows and resources are stretched, vulnerability to climate change and limited capacity to meet the SDGs may increase. Investments in voluntary FP/RH can contribute to reducing the unmet need and allow families to plan for and achieve their optimal family sizes, slowing population growth and increasing climate change resilience.

Population and Climate Change Hotspot Countries

- High Projected Population Growth Rate And Low Resilience To Climate Change
- High Food Insecurity Only
- Higher Rates Of Deforestation Only
- Both High Food Insecurity And Higher Rates of Deforestation
- Plus Water Stress Or Scarcity
- High Unmet Need For Family Planning
- Insufficient Data to determine Hotspot Status
- Not In Sub-Saharan Africa Or Not A Hotspot Country

MAP 6. POPULATION CHANGE AND CLIMATE CHANGE HOTSPOTS IN SSA

Implications at the Country Level: The Cases of Malawi, Kenya, and Cote d'Ivoire

Malawi, Kenya and Cote d'Ivoire are focus countries for the BUILD project and examples of SSA countries whose sustainable development is put in jeopardy by the combined challenges caused by population and climate change. As outlined here, they have similar profiles of population and development indicators but have some notable distinctions in terms of which challenges pose the greatest problems for each.

Comparison of Population and Family Planning Indicators

TABLE 1: POPULATION AND FERTILITY INDICATORS

	Malawi	Kenya	Cote d'Ivoire
Annual population growth rate (%) (2000-2022)[1]	2.7	2.5	2.3
Total fertility rate 15-49 (2021)[2]	3.9	3.3	4.4
Median Age (2023)[3]	17.2	19.6	17.9
Contraceptive prevalence, any modern method (% of married women ages 15-49) (2020)[4]	65	61	20
Unmet need for contraception (% of married women ages 15-49) (2020)[5]	15	13	26
Total population (in millions) (2022)[6]	20.4	54.0	28.2
Population density (persons per square kilometer) (2021)[7]	211	93	86
Data Sources: 1. United Nations, Department of Economic and Social Affairs, Population Division (2022). World Population Prospects 2022: Data Sources. (UN DESA/POP/2022/DC/NO. 9). 2. Fertility rate, total (births per woman) | Data (worldbank.org) 3. Demographics - Worldometer (worldometers.info) 4. Contraceptive prevalence, any modern method (% of married women ages 15-49) | Data (worldbank.org) 5. Unmet need for contraception (% of married women ages 15-49) | Data (worldbank.org) 6. Population, total | Data (worldbank.org) 7. Population density (people per sq. km of land area) | Data (worldbank.org)			

As shown in Table 1, each of these countries experienced similarly high average annual **population growth** rates between 2000-2022 (i.e., between 2.3- 2,7%). Population growth in all three countries was driven in large part by high TFRs and young age population structures. As shown, as of 2021 each still had **TFR**s above 3 children per woman and as of 2023 each had a median age below 20. As a comparison, the global median age is 30.5 years.[36] Of the three, Cote d'Ivoire stands out as having a significantly lower recent **rate of modern contraceptive use** (20% of married women ages 15-49) than Malawi (65%) and Kenya (61%). Not surprisingly and in the same vein, Cote d'Ivoire also had the highest level of **unmet need for FP** (26% of married women ages 15-49). Low modern contraceptive prevalence and high unmet need are major drivers of unintended fertility which in turn drives high population growth. Population growth that outpaces the rate of growth in programs, policies and infrastructure to serve growing numbers of citizens hampers progress towards sustainable development.[37]

Kenya is the largest of the three countries, but Malawi is the most **dense** (Table 1). Notably, it is hard to compare population density across countries as the overall density level may mask wide variation within smaller urban and rural geographic areas within each country. Interpreting population density is also not straightforward and higher population density has both advantages and disadvantages. Population density has been shown to have a significant effect on economic growth and economic efficiency, but high population density also leads to increased competition for resources, environmental degradation and more rapid transmission of diseases.

Comparison of Climate Change and Development Indicators

TABLE 2: CLIMATE AND DEVELOPMENT INDICATORS

	Malawi	Kenya	Cote d'Ivoire
ND-GAIN index rank out of 185 countries ranked (2023)[1]	161	150	140
Forest Loss (%) (2002-2022)[2]	11	7.8	27
Total internal renewable water resources (meters[3] per capita) (2020)[64]	903.3 (water scarce)	570.94 (water scarce)	3,189.75 (relatively sufficient)
Prevalence of moderate or severe food insecurity in the total population (%) (3-year average) (2020-2022)[75]	82.4	72.3	44.2
HDI rank out of 191 countries ranked [6]	169	152	159
Urbanization rate (2020 – 2025)[47]	1.66	1.77	0.92
GDP per capita (current US$) (2022)[3]	645.2	2,099.3	2,486.4
Date Sources: 1. ND-GAIN Country Index rankings | ND-GAIN Index 2. Global Deforestation Rates & Statistics by Country | GFW (globalforestwatch.org) 3. FAO AQUASTAT Dissemination SystemUnited Nations, Department of Economic and Social Affairs, Population Division (2019). World Urbanization Prospects 2018: Highlights (ST/ESA/SER.A/421). 4. FAO Hunger Map: https://www.fao.org/interactive/state-of-food-security-nutrition/2-1-1/en/ 5. Human Development Index | Human Development Reports (undp.org) 6. United Nations, Department of Economic and Social Affairs, Population Division (2022). World Population Prospects 2022: Data Sources. (UN DESA/POP/2022/DC/NO. 9). 7. GDP per capita (current US$) | Data (worldbank.org)			

In terms of resilience to climate change, each of the three focus countries fall into the bottom quartile of the **ND-GAIN index,** indicating that **e**ach is highly vulnerable to the impacts of climate change (Table 2). Climate changes that are already being experienced throughout Africa include rising temperatures, increase in extreme weather events, and changes in precipitation extremes, including increased flooding and droughts.[38,39] Cote d'Ivoire also faces degradation of coastal areas, Malawi is contending with more extreme tropical storms and is still trying to recover from Tropical Cyclone Freddy in 2023[40] and Kenya faces high domestic and industrial pollution, exposing Kenyans to high levels of air and water pollution.[35,38,41,42] According to recent data compiled by the World Health Organization in their Global Health Observatory, Malawi experiences over 33,000 deaths per year attributable to the environment, Côte d'Ivoire over 55,000, and Kenya over 80,000.[43]

All three of these countries are highly reliant on their agricultural sectors, which contribute to nearly a third or more of the **GDP** in each of these countries (33% in Kenya, 42% in Malawi and 27% in Cote d'Ivoire). A large part of agricultural production in these countries as in elsewhere in Africa relies on subsistence or small-holder farming. Small-scale, rain-fed agriculture is particularly vulnerable to the effects of climate change.[44,45] Cote d'Ivoire is the world's largest producer of cocoa yet some predict that cocoa producers could see drastic losses in the next 30 years.[46] Approximately 85% of Kenya's pastoral land area is classified as a fragile arid and semi-arid ecosystem.[47] The country similarly faces environmental degradation and loss of natural resources.[41] The livelihoods of agricultural and fishery workers are most immediately impacted by the weather and environmental changes.[35,48]

All three countries are experiencing rapid **deforestation** but this is particularly an issue in Cote d'Ivoire, which according to Global Forest Watches observational data experienced a loss of 27% of its forest cover between 2002 and 2022. Cote d'Ivoire's rapid deforestation is being largely driven by agricultural expansion and illegal logging, the latter of which activity is driven in part by a dependency on wood as a

primary source of heat and cooking fuel. It has also been documented that unsustainable agricultural practices, including slash-and-burn techniques, have led to soil erosion and degradation in various parts of Cote d'Ivoire.[49] Forest cover loss and land degradation resulting from unsustainable farming practices such as overgrazing and overharvesting are also concerns in Malawi (World Bank 2019) and Kenya.[42] Forest cover loss is contributing to loss of biodiversity and threatening the ecosystems of these countries.[22]

Reported rates of moderate or severe **food insecurity** are alarmingly high in both Malawi (82.4%) and Kenya (72.3%). In Malawi, food insecurity has recently been exacerbated by impacts of climate change including droughts, flooding and inconsistent rainfall.[50] Since 2019, tropical cyclones have killed more than 1,000 Malawians and destroyed countless homes and crops. At the same time, droughts have reduced food production and threatened biodiversity and livelihoods in Malawi's lakes and rivers.[45] Rapid population growth in all focus countries also contributes to food insecurity as the food systems and resources are stressed.

Both Malawi and Kenya are also considered **water scarce** with total internal renewable water resources less than 1,000 meters[3] per capita. Flooding is also a concern in Kenya, particularly in urban areas, where poor drainage systems and inadequate infrastructure exacerbate the impact of heavy rains.[41] While Cote d'Ivoire has relative water sufficiency and lower rates of reported food insecurity, changes in rainfall patterns and increased demand for water and food due to population growth and economic development are of concern and have recently contributed to water scarcity in certain regions in Cote d'Ivoire. Additionally, water pollution from industrial and agricultural activities poses a threat to water quality in Cote d'Ivoire.[51]

In terms of development indicators, each of these three countries also fall into the bottom quartile of the **Human Development Index** (HDI), which is a summary measure of average achievement in key dimensions of human development: life expectancy, years of schooling and Gross National Income (GNI) per capita. Urbanization, which can contribute to economic development, if too rapid or unplanned can undermine sustainable development as it can result in increased waste generation, strain on infrastructure and development of urban slums.[52] Overcrowding, poor sanitation, and limited access to basic services in urban slums, in turn, contribute to poor health and well-being for residents of those areas. All three countries are experiencing rapid **urbanization**. Among them, Cote d'Ivoire is currently experiencing the slowest rate of urbanization. Yet, the percentage of the population living in urban areas in Cote d'Ivoire is already higher than the average urbanized population in the rest of West Africa. Conversely, Malawi and Kenya, which have been experiencing urbanization at a faster rate than Cote d'Ivoire still currently have lower proportions of urban populations than the average proportion of urban population in Eastern Africa.[4]

Comparison of Policy Gaps and Challenges

A landscape analysis report for the USAID BUILD Project included a systematic document review to understand the extent of population, health, environment, and development policies in target countries, including Malawi, Kenya and Cote d'Ivoire.[46] A total of 86 documents were reviewed using a policy extraction tool. Only documents that were publicly available were reviewed and included policies, guidelines, strategies, and legislation. This policy document review identified a number of policy gaps and challenges, most of which were common to all three countries. Notable among these were the following seven types of gaps and challenges:

- **Lack of integrated policies**: the analysis found a lack of fully integrated policies that comprehensively address the interactions between population dynamics, environmental sustainability, and climate change adaptation and mitigation in Malawi, Kenya, and Cote d'Ivoire.

- **Dearth of cross-sectoral coordination**: an analysis of government structures, coordination mechanisms, and collaborative frameworks found a lack of coordination among different sectors (e.g., agriculture, water resources, health) to address population, environment, and climate change challenges comprehensively in all three countries. Improved coordination between government agencies and stakeholders would help ensure that policies are implemented effectively.[53]
- **Population not addressed as part of sustainable development**: The landscape analysis also reported that a review of population-related policies and strategies from relevant agencies in Kenya and Cote d'Ivoire indicated that there are inadequate policies to address population growth and voluntary FP/RH within the context of sustainable development.
- **Need for urban planning**: The urban development plans and policies from relevant authorities in Kenya and Cote d'Ivoire show that there are insufficient urban planning policies to address the environmental impact of rapid urbanization, including issues like waste management and pollution.
- **Need to prepare for climate change and build resilience:** Community-based adaptation strategies and disaster risk reduction policies in Kenya and Cote d'Ivoire showed limited policies focusing on building resilience at the community level to cope with the impacts of climate change
- **Insufficient climate change adaptation and mitigation**: Insufficient measures for adapting to the impacts of climate change and mitigating greenhouse gas emissions were found in Malawi, Kenya and Cote d'Ivoire. Similarly, in Kenya, the "Climate Governance in Kenya" report notes a lack of coherence and coordination in Kenya's climate policies[54] and a need to improved preparedness and response to natural disasters to increase resilience to climate change. The World Bank's Climate Risk Country Profile for Kenya highlights the need for increased investment in renewable energy sources to reduce the country's reliance on fossil fuels.[55]
- **Weak Natural Resource Management:** In Malawi and Cote d'Ivoire, a review of forestry policies, land-use planning documents and conservation strategies revealed weak policies of sustainable natural resource management, leading to issues such as deforestation, land degradation, and biodiversity loss.

Two additional gaps found in the Malawian policies reviewed included inadequate funding for population interventions, which are addressed by the National Population Policy, and gaps in scientific research related to climate change. The review noted that the gaps in research stemmed from lacks in technical and financial capacity and that the research gaps make it difficult to inform management and policy decisions. In Cote d'Ivoire, there were weak mechanisms for monitoring and evaluating the effectiveness of policies related to population, environment, and climate change.[46] Finally, in Kenya, the review noted a need for a comprehensive climate hazard and vulnerability analysis to identify areas that are most vulnerable to climate change.[41]

Conclusion

In SSA, high fertility rates among an already large and young population are one of the main drivers of rapid population growth. Unmet need for family planning is high in SSA, leading to high rates of unintended pregnancies, high fertility, and unsafe abortions.[56] Voluntary family planning and reproductive health information and services can contribute to reducing unmet need, unintended pregnancies, and high fertility, and reaching the SDGs.[37]

Additionally, population dynamics both impact and are impacted by climate change. Rapid population growth contributes to climate change while also reducing societies' abilities to respond and adapt to it. However, as noted by Dodson et al. (2020)[57], policies designed to plan for and adapt to climate change often don't consider the potential of voluntary family planning programs to decrease fertility rates and slow population growth. The deadline for attainment of the SDGs is less than a decade away. For SSAs to continue to make progress towards those goals, strong plans of action are needed that both simultaneously support resilience and adaptations for climate change and include right-based policies designed to augment access to voluntary family planning and reproductive health.

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