

## Ethiopia 2050: Population Growth and Development

By Aynalem Adugna<sup>1</sup>

Citation: Aynalem Adugna (2019). Ethiopia 2050: Population Growth and Development. Paper submitted to the Ethiopia:2050 Conference, Skylight Hotel, Addis Ababa, December 19 and 20. Posted to [www.EthioDemographyAndhealth.org](http://www.EthioDemographyAndhealth.org)

### ABSTRACT

This paper focuses on the links between Ethiopia's population size and growth dynamics, and the country's ability to meet ten areas of developmental challenges identified for discussions at the Ethiopia: 2050 conference. The ten conference themes are – access to clean water, large-scale urbanization, food security, sustainability, and environment, energy demand, advanced manufacturing, transportation, ICT infrastructure, access to health care, and STEM education – all of whom have a two-way interaction with vital demographic events including births, deaths, and migrations. Baseline data are gathered for all ten developmental variables using online literature search engines and from four rounds of Ethiopia's Demographic and Health Surveys (DHS). Comparisons are made with the neighboring country of Kenya and the nation of Vietnam - a country that has already achieved "Ethiopia's dream" of becoming a Middle-Income country. Analysis of DHS data and literature survey showed impressive but inequitable economic gains in Ethiopia in the last two and half decades as well as sharp declines in mortality and morbidity. It appears, however, that these gains have not fully caught up with the surge in the country's population size marked by its doubling over the same period. This is, in part, due to anemic reductions in birth rates as shown by the declining but still high total fertility rate (TFR) – a measure of the number of children likely to be born if the prevailing age-specific fertility rate (ASFR) were to hold constant until women currently in their reproductive years reach age 50. Ethiopia's TFR decreased by less than one child during a 16-year period (2000 – 2016) from 5.5 to 4.6. Meanwhile, the built-in population momentum has meant that the cohort of Ethiopian women now in their reproductive years has more than doubled over the last quarter century. Our conclusion based on the review of the literature is that Ethiopia's socioeconomic deliverables of the last 25 years have not caught up with demands brought on by the doubling of its population. This does not mean, however, that the country will not meet the ten developmental challenges slated for discussions at the Ethiopia: 2050 conference. It can, but only if serious measures are put in place to drastically alter the course of its demographic future. The word drastic does not imply forcible control measures as these have been known not to be effective, and to have untended consequences. We recommend that the growth rate of the country's population be reduced below its current level of 2.5 percent to approximate the rate in our model country of Vietnam through, among other measures, increases in Ethiopian women's and girls' completion rates of secondary and higher education to over 70 percent.

---

<sup>1</sup> Research Scientist, State of California [AynalemAdugna@aol.com](mailto:AynalemAdugna@aol.com) or [AynalemA2012@gmail.com](mailto:AynalemA2012@gmail.com)  
Adjunct faculty, Sonoma State University  
Adjunct faculty, Addis Ababa University  
Adjunct faculty, Addis Continental Institute of Public Health

## INTRODUCTION

This study addresses the developmental challenges - social, economic, environmental, etc. - that Ethiopia is likely to face over the next three decades due to its large population size and growth dynamics. The first half of the paper focuses on ten development variables identified for the Ethiopia: 2050 conference. The ten conference themes are – access to clean water, large-scale urbanization, food security, sustainability, and environment, energy demand, advanced manufacturing, transportation, ICT infrastructure, access to health care, and STEM education – all of whom have a two-way interaction with vital demographic events including births, deaths, and migrations. The second part compares the demography of Ethiopia to its neighbor Kenya and another country that was among the poorest of the poor less than 40 years ago but has already achieved “Ethiopia’s dream” of becoming a Middle-Income country by 2025 – the country of Vietnam. The last section presents discussions of observations made in sections one and two.

Whether Ethiopia has already achieved a demographic transition or not – a case where both fertility and mortality are low [1] - could significantly impact the level of socioeconomic development it can attain during the three decades ending in 2050. In countries where fewer births are taking place year after year, the size of the young-age population which is dependent for survival on the working-age population declines. With fewer people to support, this creates a window of opportunity for working adults to be more productive, thereby leading to rapid economic growth. This, of course, depends on provisions of the right social and economic policies in addition to investments in education, infrastructure, and health [2]. A term used to describe a pre-transition stage where there is a larger fall in mortality than in fertility is the “demographic dividend” (DD) [3]. This refers to accelerated economic growth that countries will be able to achieve due to a high number of young people entering the labor force. It is a case where the number of the working-age population is comparatively large enough to support the population that does not work, i.e. children and the elderly [3]. Harnessing the demographic dividend is best achieved through increased education and empowerment of women and girls. However, this is being misunderstood by leaders in Ethiopia and elsewhere in Africa [3,4] who only see positive prospects for it despite dismal records in women’s girl’s secondary school completion – only 17 percent in Ethiopia. Worse still, leaders often pay very little or no attention to improving the health, well-being, and human capital potentials of women and girls by providing them with better employment opportunities and greater decision-making powers at home and in society at large. Governments, including Ethiopia’s, have in fact downplayed both the extent and consequences of population growth, [5] risking the possibility that the fruits of a fast-paced development would be eaten away by a population that is growing even faster.

This study will investigate population growth of the past and forthcoming decades which the author considers less than ideal, if not problematic, for establishing favorable demographic grounds upon which optimistic development forecasts could be based. It will also highlight the uneven march toward a demographic transition among the nine regional governments and the two city administrations where birth rates range from less than two per woman in Addis Ababa to more than seven in Somali [9]. Special focus is placed on socioeconomic variables that are circularly linked to population growth, some of which are among the ten variables identified for discussion in the December 2019 conference. For example, the level of agricultural productivity and yield can both be the cause and consequence of high or low population growth. This means that population growth trends can impede or hasten development and development can in turn lead to reductions in both fertility and mortality. A third example is that of

population growth leading to rapid urbanization which can in turn lead to greater access to contraceptive use and a decrease in birth rates. The population-food production nexus would be the fourth example if expressed in terms of a high population growth rate leading to local and national strife and security challenges that may disrupt agricultural production, thereby leading to food shortages and internal displacements such as those observed repeatedly in Eastern African [10].

## **OBJECTIVES**

This study seeks to investigate demographic trends in Ethiopia spanning several decades in the past and future which it considers to be less than ideal, if not problematic. It does so in order to establish baseline population facts upon which discussions of the ten challenges identified for the Ethiopia: 2050 conference could be based. It will also show the links between regional differences in population growth resulting from uneven transitions toward low fertility and mortality in Ethiopia, and the potential impacts these might have on the ten areas of development identified for discussion. These objectives are partly achieved through comparisons of Ethiopia's demographic trends with that of a neighboring nation – Kenya- and the new “Asian Tiger” – Vietnam.

## **DATA AND METHODS**

Online literature reviews of the links between population and the subject areas of development identified for discussion in the Ethiopia: 2050 conference are conducted with a special focus on the implication for their two-way relationship with Ethiopia's population size and growth dynamics. Data from four national demographic and health surveys [5,6,7,8] are used when possible to provide objective analyses of those links. Standard demographic indicators including fertility and child mortality measures are used together with descriptive statistical measures. Data are also obtained from the United Nations' World Population Prospects 2019 website. A link is provided to previously published Geographic Information Systems (GIS) interactive web maps created by this author. These feature *Wereda* population size and densities and sixteen-year regional demographic trends in fertility, mortality, the proportion of reproductive women with access to contraception, etc.

### **Baseline Facts Regarding the 10 Variables Identified for the Ethiopia: 2050 Conference**

#### **I. Access to Clean Water:**

According to the 2005 DHS results [7], nearly 90 percent of urban households were said to have access to piped water (45 percent within compounds and 42.6 percent outside of compounds). The proportion for rural households was much lower - 13 percent. The major source of improved drinking water in rural areas was a protected spring (39 percent). The survey asked about persons who usually collect drinking water. The responses showed significant gender inequities, with adult females having a disproportionate share; they fetch water 74 percent of the time [6]. Similarly, female children under 15 years of age are over three times more likely than male children in the same age group to fetch water. The 2011 DHS results showed 95 percent of urban and 42 percent of rural residents as having improved sources of drinking water for a national average of 54 percent [8]. A common source of improved drinking water for urban households was piped water (87 percent). In contrast, only 19 percent of rural households had access to piped water; 11 percent had access to protected springs, and 8 percent to protected wells. The majority (53 percent) traveled 30 minutes or longer to get to the source (19 percent in urban areas and 62 percent in rural areas)

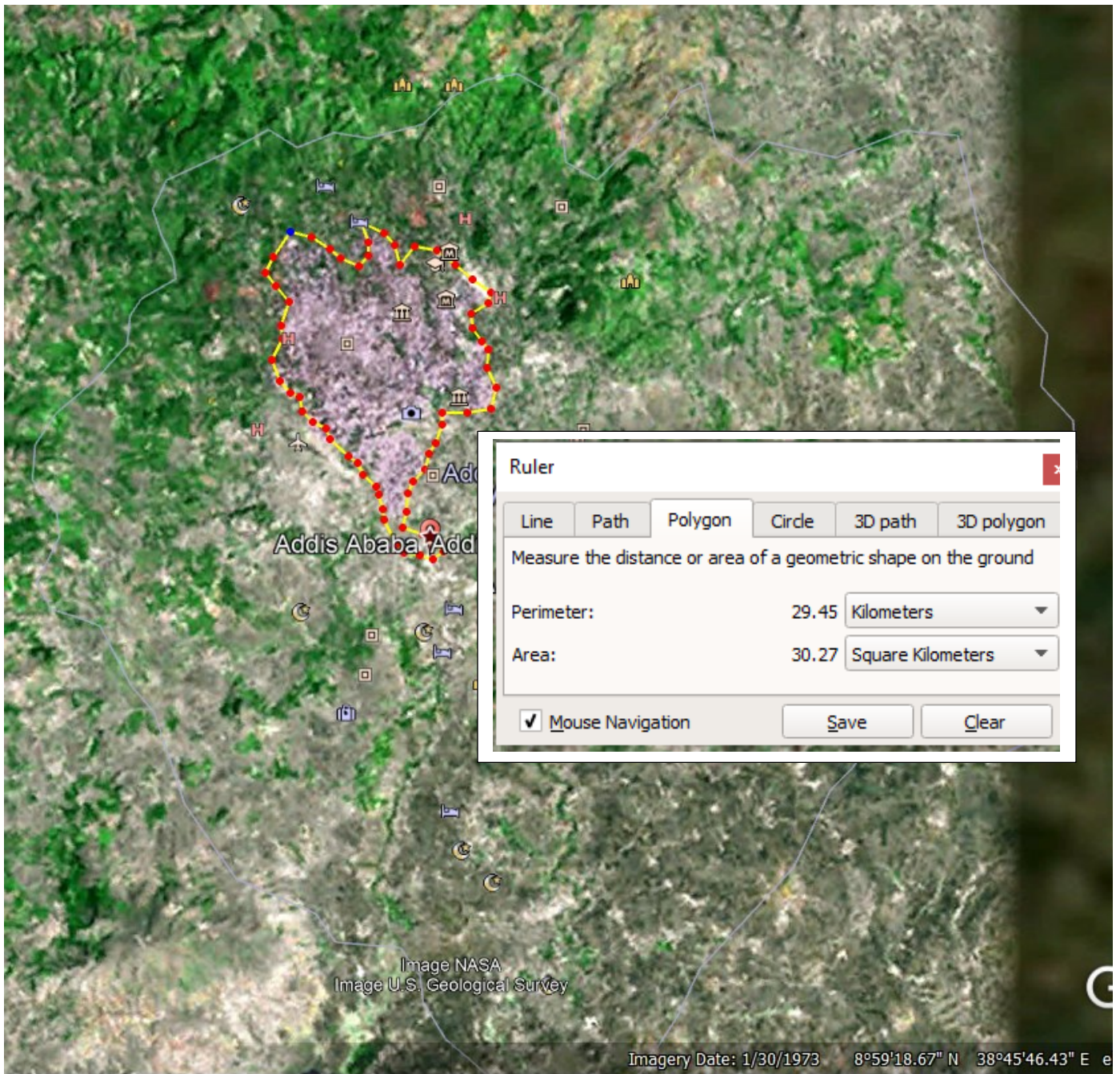
[8]. By the latest (2016) DHS, the proportion of urban households with access to improved sources of drinking water had risen to 97 percent, and for rural households, to 57 percent. The word “improved” covers piped water, public taps, standpipes, tube wells, boreholes, protected dug wells and springs, as well as rainwater [9]. The most common sources in urban areas are water piped into household dwellings, yards, or plots (63 percent); water piped into a public tap/standpipe (13 percent); and water piped into a neighbor’s yard (12 percent). The sources in rural areas are mainly public taps/standpipes (19 percent), protected springs (14 percent), and tube wells or boreholes (13 percent).

## II. Urbanization

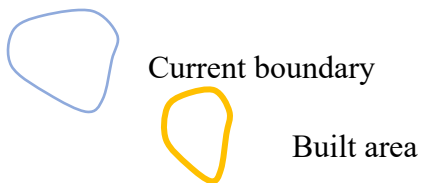
At roughly 17 percent in 2012, the percentage of the urban population in Ethiopia is one of the lowest in the world and well below Sub-Saharan Africa’s average of 37 percent [10]. However, dramatic changes are in the making with the county’s urban population projected to nearly triple from 15.2 million in 2012 to 42.3 million in 2034 due to the urban growth rate forecast of 5.4 percent per year [10]. The rapid increase is already being felt in peri-urban areas immediately surrounding a town or city where the transition from countryside to city is taking place at a higher clip than within formal boundaries of urban centers [11], often with undeveloped infrastructure for health and sanitation services, and with the natural environment at significant risk of degradation. Addis Ababa’s expansion over the years is shown below as an example (Figures 1 to 4).

Addis Ababa’s area size increased nearly tenfold from 30 square kilometers in 1973 (Figure 1) to 296 square kilometers in 2016 (Figure 4). The increase was more than six-fold for Adama (8.8 sq. km. to 50.6 sq. km.) and Hawassa (6.1 sq. km. to 39.1 sq. km.) [12]. This signifies the triple pressures of the proliferation of urban areas, expansion of those areas to gable-up surrounding land (urban sprawl), and high population sizes and densities, none of which have garnered significant government attention for remediation. The current responses in the form of industrial parks (IPs) are no match in scale to the cumulative urban unemployment that has been building up over the years. A solution currently being tested is known as “urbanization without rural depopulation” with a plan to build 8,000 cities and city-like settlements [14]. The project was initiated by Professor Franz Oswald and sociologist Dieter Läßle – supervisor to an Ethiopian Ph.D. student at Hafencity University in Hamburg [13]. Although it has government backing with plans to build thousands of cities like that, there is lukewarm support and mounting skepticism as potential resident farmers shun the required fees (estimated at 40 Euros) for joining the cooperative. Moreover, an urban life with electricity and toilets still seemed a little foreign to would-be residents who remained unconvinced [14].

Figure 1. Addis Ababa, Satellite Picture of Built-up Areas: 1973

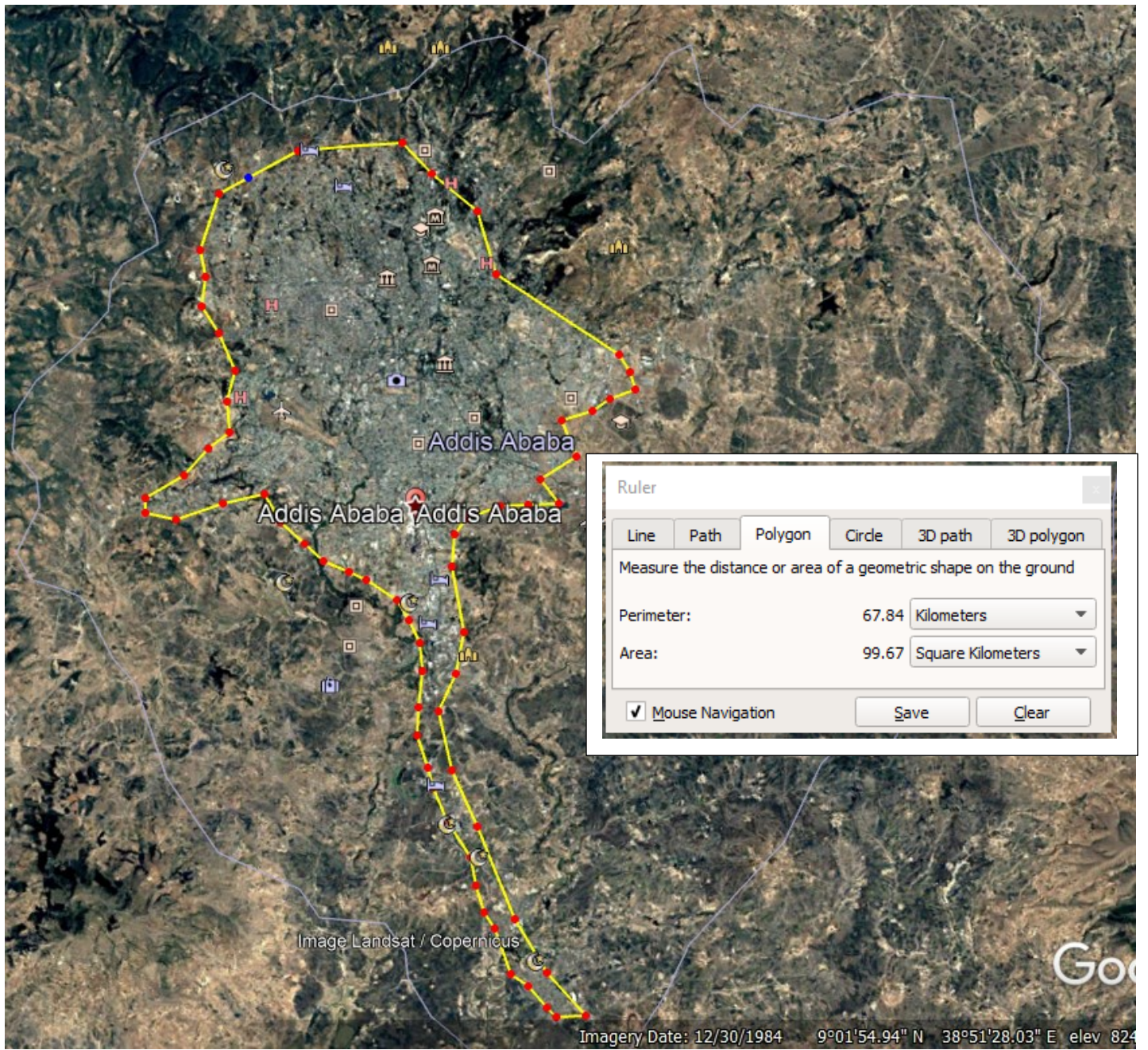


Source: Google Earth, retrieved September 9, 2019

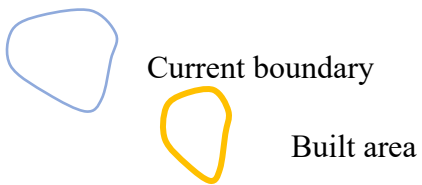




**Figure 2.** Addis Ababa, Satellite Picture of Built-up Areas: 1984

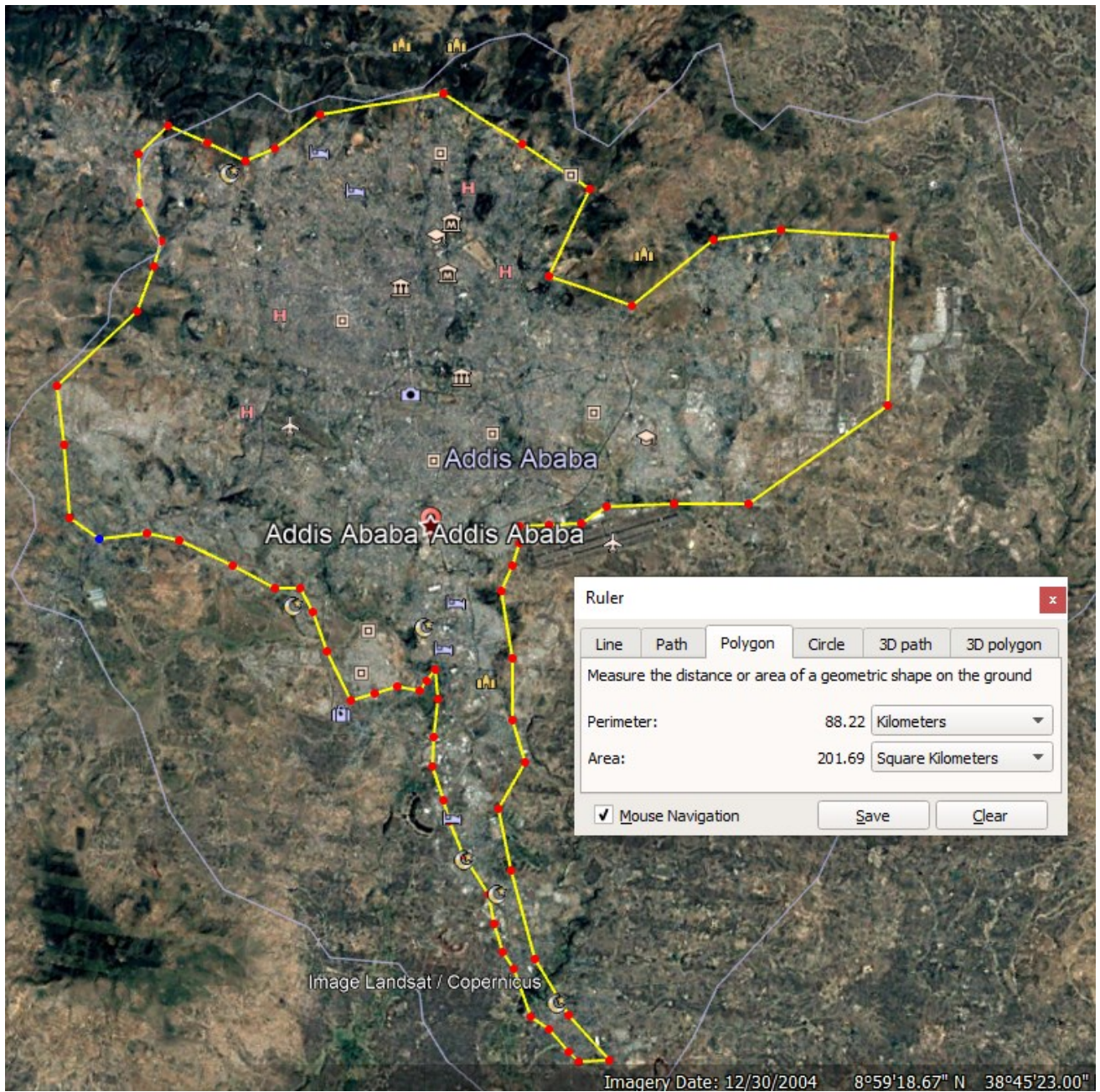


Source: Google Earth, retrieved September 9, 2019





**Figure 3.** Addis Ababa, Satellite Picture of Built up Areas: 2004



Source: Google Earth, retrieved September 9, 2019

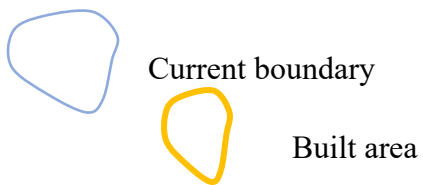
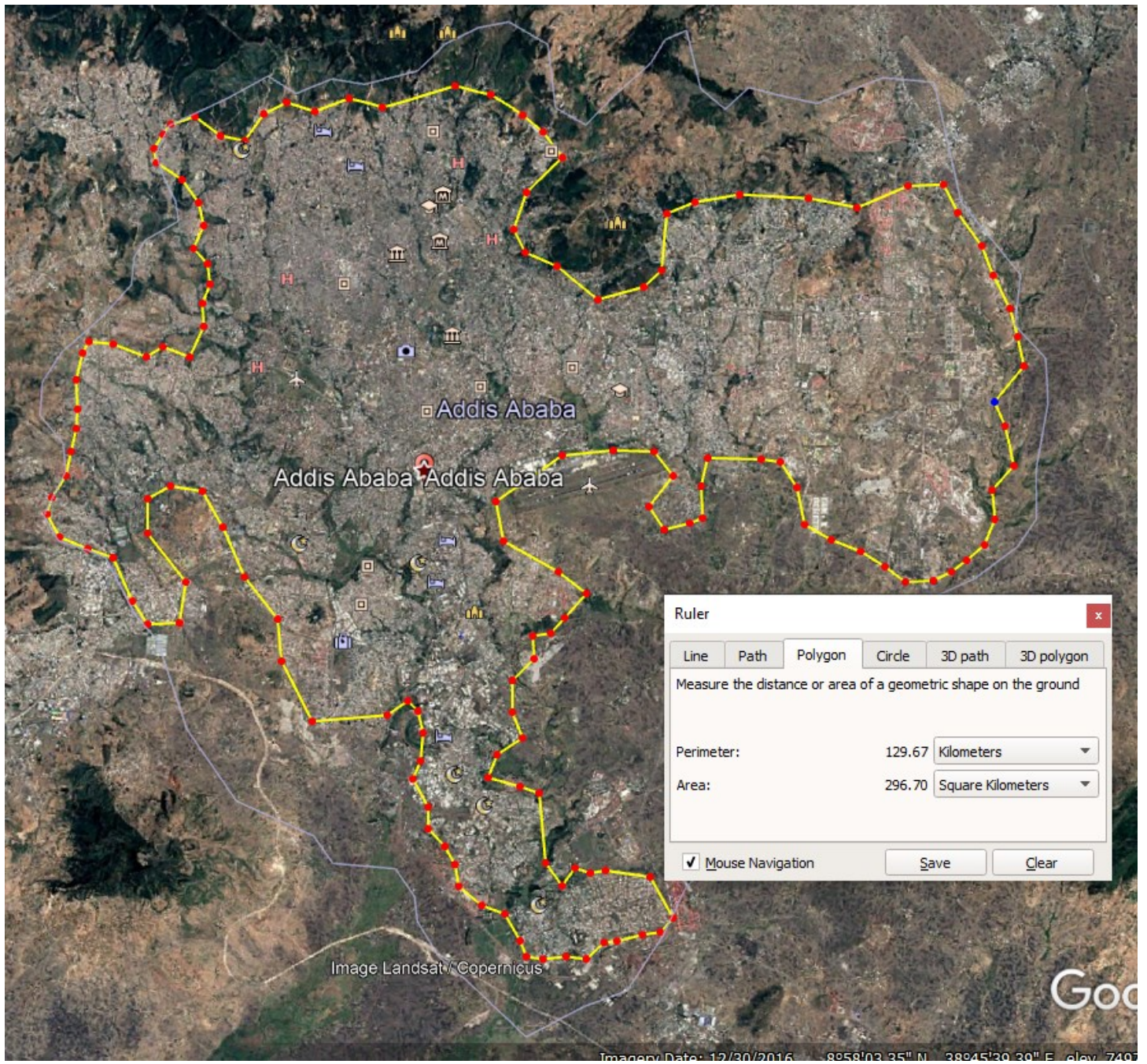
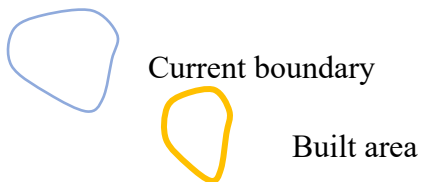




Figure 4. Addis Ababa, Satellite Picture of Built up Areas: 2016



Source: Google Earth, retrieved September 9, 2019





A city administration report on Addis Ababa by the World Bank Group [15] provided ample lessons that other cities and towns can use. In particular, the major cities of Mekele, Dire Dawa, Bahir Dar, Adama, etc. can benefit from its focus on urban management issues including municipal challenges and the need for policymakers to link growth plans to a range of critical urban development choices that define urbanization in the context of the country's socioeconomic and demographic change. This, the report says, is best achieved through what it called city strength diagnostics capable of identifying shocks and stressors that have the potential to hinder a city's ability to accomplish its development goals. The potential shocks for Addis Ababa and other cities and towns included slums (often referred to euphemistically as sub-standard housing), unemployment, urban sprawl, flooding, fire, earthquakes, water scarcity, social vulnerability, and infrastructure demands including power, water, information, and transportation. These, the report adds, must be delivered in competitive, socially and economically inclusive, climate resilient, and environmentally efficient ways [15]. Selected indicators for Addis Ababa are as follows:

**Table 1.** Addis Ababa: Development Indicators, 2015

<b>Indicator</b>	<b>Value</b>	<b>Indicator</b>	<b>Value</b>
Population, 2013 (millions)	3.8	Access to safe water supply (%)	44
Population, 2037 (millions)	9.8	Access to piped sewerage (%)	10
Population growth rate (%)	3.8	Solid waste collected (%)	63
Per capita daily water consumption (liter)	40.0	Access to electricity (%)	100.0
Annual GDP growth	14.0	Poverty rate (%)	22.0
Increase in mean annual rainfall by 2050 (%)	35-50	Unemployment rate (%)	23.5
Increase in mean annual temp. by 2050 (°c)	1.5	Employment in the informal sector	30.0
Land underused or vacant (%)	46	Total housing stock comprised of low-quality housing (%)	70-80
Land allocated to streets (%)	20	Urban land expansion rate (%/yr.)	3.2
Maximum density (persons per km. sq.)	30,000		

Source: Based on [15]

### **III. Food Security**

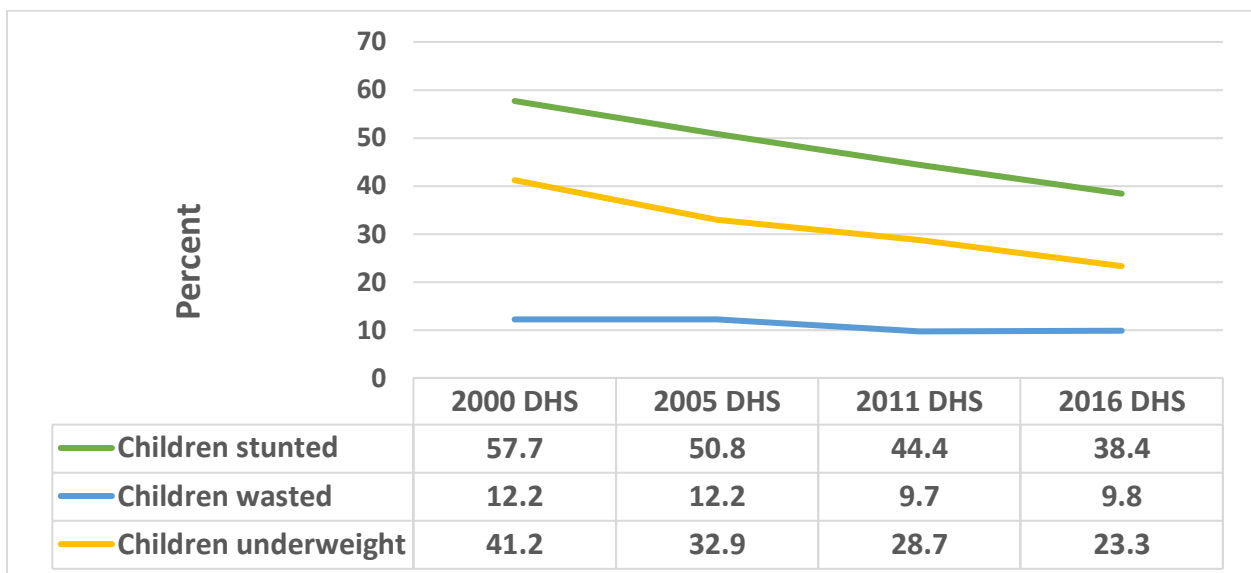
Smallholder farming lots by 12 million Ethiopian households are said to be providing 85 percent of all employment in the country [16] with a typical family farm consisting of a five-person household predominantly headed by males [17]. The rapid increase in population size meant that farm sizes are becoming smaller, making it difficult to sustain age-old practices even at subsistence levels [17]. The average farm size is less than a hectare and diminishing further with a generational of parents (typically fathers) outnumbered by offspring (typically sons) inheriting land use rights. Complete dependency on rain-fed agriculture, low rate of fertilizer use, and nonuse of improved seeds, as well as land degradation and deforestation, are negatively impacting agricultural productivity [17]. Moreover, only 2 percent of

small-holder arable land is irrigated, and only 3.7 percent of farm households have access to agricultural machinery.

The government has launched a series of programs to promote agriculture and achieve food and nutrition security while building resilience. This included the second Growth and Transformation Plan (GTP II) covering the 2016-2020 period [16]. The main objective of GTP II was the implementation of the country's vision of becoming a Middle-Income country by 2025 with agriculture as the main driver of growth. This is said to be accomplished through improvements in agricultural productivity and reductions in the degradation of natural resources as well as reductions in vulnerability to catastrophes through capacity building and disaster mitigation.

A 2014 visit by seven US Congressional Chiefs of Staff and the poverty-fighting organization CARE, led to a report showing that 10 percent of Ethiopia's citizens (over 10 million people) are chronically food insecure; a figure that rises to more than 15 percent (over 15 million people) in drought years. The consequence is more severe for Ethiopia's children, more than two-fifths of whom are stunted (Figure 5). The report mentions Ethiopia's answer to food security dubbed the Productive Safety Net Program (PSNP) which is said to be one of the largest safety net programs in the world with more than seven million beneficiaries and a reputation for working with vulnerable households through cash- or food-for-work programs. The main objective is the prevention of families' descent into poverty and depletion of household assets in times of shortages while stimulating markets by improving access to services through Ethiopia's Household Asset Building Program (HABP) which focuses on families at a lesser risk of depleting their assets in times of scarcities [18].

**Figure 5. Ethiopia: Childhood Stunting, Wasting, and Underweight Trends, 2000 – 2016**



Source: Based on [6,7,8,9]



#### IV. Sustainability and Environment

An online publication entitled “Environmental Policy of Ethiopia” [19] lists the two main policy objectives of the country’s environmental protection programs: 1) enhancement of the health and quality of life of all Ethiopians, and 2) promotion of sustainable social and economic development through the sound management and use of natural, human-made, and cultural resources and the environment. This is said to assist in meeting the needs of the current generation without jeopardizing the ability of future generations to meet their needs. It is difficult to disagree with the United States Agency for International Development’s (USAID) description of Ethiopia as a “... classic example of how severe degradation of ecosystems and productive agricultural lands and poor utilization of water resources increases poverty, food insecurity, loss of biodiversity, and even conflict” [20]. Item #7 of the United Nation’s Millennium Development Goals is the safeguarding of environmental sustainability which entails guaranteeing environmental stewardship to meet the needs of both the present and future generations by ensuring improved quality of life for everyone whether they are currently living or not yet born. A UN report [21] details Ethiopia’s recent political and legislative actions including the establishment of the environmental protection agency at the federal level, regional state agencies, as well as proclamations on pollution control, industrial waste handling, and implementation of carbon neutral and climate resilient developmental practices [21]. A 2015 research titled “Environmental Issues in Ethiopia and Links to the Ethiopian Economy” [22] lists the four major areas of past and ongoing environmental damages. These are discussed below:

- A. Soil Erosion:* The combined effects of population growth and intensive agriculture and pastoral use in Ethiopia’s highlands, cultivation of marginal lands, commercial timber-cutting, perilous environmental conditions, and lack of soil conservation measures, have meant that land degradation has been particularly prolonged and severe with estimated soil loss of around 100 tons per hectare [23]. In the mid-1980s 27 million hectares or almost 50% of the highland Ethiopia was said to have been significantly eroded, 14 million hectares seriously eroded, and over 2 million hectares beyond reclamation [24]. Although estimates vary widely, direct losses of productivity from land degradation are estimated to be at least 3 percent of national agricultural GDP [24]; a very important figure given the country’s population growth rate of 2.5 percent.
- B. Deforestation:* It is estimated that forest cover in Ethiopia has been reduced from 40 percent to around 3 percent over the course of the last century made worse by uneven patterns of forest depletion in some parts of the country including complete deforestation in the Ethiopian highlands. The south-central Rift Valley’s forest cover is said to have declined from 16 percent in 1972 to 2.8 percent in 2000, corresponding to an annual forest loss of around 1,440 hectares. The consequences include disruptions in the provision of fresh water, food, and fuel, which in turn impacts the health, livelihoods, income, and well-being of the population. With the majority of Ethiopians engaged in subsistence farming, livelihoods are directly dependent on healthy ecosystem services including fuelwood provision and flood protection as well as freshwater supplies.
- C. Biodiversity Loss:* Ethiopia is said to possess an estimated 6,000 species of higher plants, of which 10% are endemic, 284 species of wild mammals, and 861 species of birds [25]. The country has ten ecosystems as well as 18 major and 49 minor agroecological zones. It also hosts two of the biodiversity hotspots of

the world, namely: the Eastern Afromontane and the Horn of Africa hotspots [25]. Biodiversity loss which is intimately linked to deforestation is a critical, if sometimes overlooked, aspect of ecosystem and biosphere integrity underpinning all aspects of social, political, economic, and cultural life [22]. Loss of biodiversity” is defined as a reduction in genetic (species and ecosystem) diversity, and encompasses both wild and domesticated animal and plant species. This is now occurring in Ethiopia at an unprecedented rate due, among other reasons, to the conversion of natural forests, woodlands, grazing lands, and wetlands into agriculture, settlements, or charcoal-making operations. Fish species including Labeobarbus (Lake Tana), harvestable timber (for example Hagenia abyssinica), and medicinal plant species such as Taverniera abyssinica are notable examples of species that have been threatened by over-utilization. Excessive pumping or drainage of water from lakes and wetlands has resulted in loss of habitats and species as is the case with Lake Haramaya [25]. There is a direct link between biodiversity loss and poverty with the poorest of the poor often taking the brunt of its disproportionate impacts.

**D. Pollution:** The term pollution encompasses a broad range of air, water, soil, and contaminants caused by anthropogenic substances [22]. Air pollution includes emissions of volatile organic compounds, lead, black carbon (soot), aerosols, sulfur oxides, nitrogen oxides, and other forms of particulate matter, as well as acid deposition. These emissions are disproportionately sourced in urban refuse, industrial operations, and transportation sources [22]. However, important rural air pollution sources also exist in the form of particulate matter released from biomass burning and methane from cattle dung. These and other pollutants are responsible for significant human mortality and morbidity as well as impaired plant growth and reduced agricultural productivity. Citing the Ethiopian Environmental Protection Authority, the World Health Organization has reported that about two million cubic meters of hazardous liquid waste and 19,000 tons of solid hazardous wastes were generated from industrial sectors in 2006 [26]. The number of deaths associated with outdoor and indoor air pollution in 2004 was estimated to be 2,500 and 72,400, respectively [26]. The major causes of aquatic and wetland ecosystem pollution are small- and large-scale industries including brewery, textile, chemical, tobacco, garment, and paint factories. These lack proper waste disposal systems, the only option being to dump industrial waste directly into nearby aquatic and wetland ecosystems. Major damages to the biodiversity of the ecosystems through the deposition of heavy metals have occurred over the decades as is the case with the Akaki River, and Abasamuel and Koka reservoirs [25].

**V. Energy Demand:** In its GTP II, which envisions Ethiopia’s escape from poverty and from a developing country to a Middle-Income country (this was supposed to be accomplished by 2025), the Ethiopian government foresees significant expansions in the energy sector to power what it hopes to be revolutionary transformations in agriculture and industry [27]. However, significant challenges remain because, although the country is endowed with plentiful renewable energy resources and has the potential to generate over 60,000 megawatts (MW) of electric power from hydroelectric, wind, solar, and geothermal sources, it is said to currently possess only 2,300 MW of installed generation capacity [27].

“The targets for increasing generation capacity to 10,000 MW established under the first iteration of the GTP will be met by the completion of two major hydropower plants in 2017 and 2018. The current GTP has a new target to increase generation capacity to over 17,000 MW by 2020, with an overall potential of 35,000 MW by 2037, which would help sustain



Ethiopia’s continued economic growth and enable it to become a regional renewable energy hub in East Africa.” [27].

A presentation to the Energy Foundation in June of 2016 showed a per capita electricity consumption of less than 100 kWh per year, geographic access to an electricity grid of 55 percent, connectivity of about 30 percent with electrified towns numbering approximately 6,000 [28]. The rural electrification plan in GTP II included the distribution of 3.6 million solar lanterns and 400,000 Solar Home Systems (SHS) by 2020 another 40,000 SHS installations based on a 7-year loan, and a further 60,000 by Non-governmental Organizations (NGOs) and private companies. An additional one million lanterns are to be sold by private companies [28].

Table 2. Power Sources, Exploited Reserve, and Exploited amount.

Resource	Unit	Exploitable Reserve	Exploited	
			Amount	Percent
Hydropower	MW	45,000	~2100	< 5%
Solar/day	kWh/m <sup>2</sup>	4--6		< 1%
Wind: power	GW	1350	171 MW	< 1%
: speed	m/s	>7	Under construction	< 1%
Geothermal	MW	7000	7.3 MW	< 1%
Wood	Million tons	1120	560	50%
Agricultural waste	Million tons	15 - 20	~6	30%
Natural gas	Billion M <sup>3</sup>	113	-	0%
Coal	Million tons	>300	-	0%
Oil shale	Million tons	253	-	0%

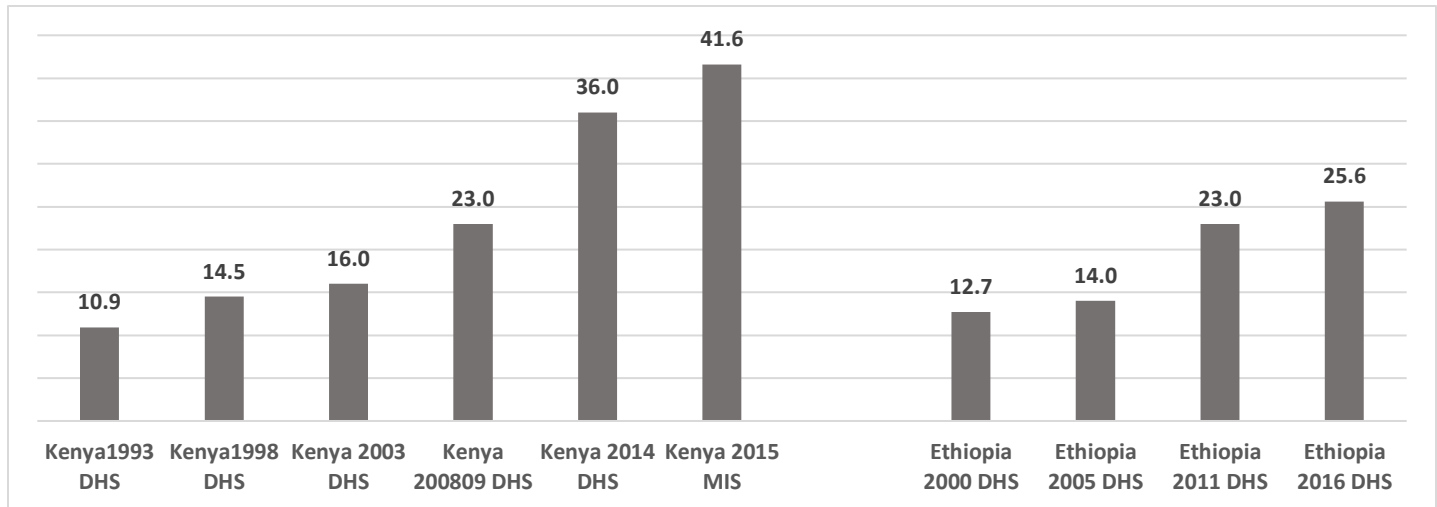
Source: Own reconstruction based on [28]

Power plants under construction include the Grand Ethiopian Renaissance Dam (6,000MW), Gibe III (1,870 MW - has already started power production), Genale Dawa III (54MW), Aluto Langanu geothermal expansion (75 MW), and the Repi Waste-to-Energy power (50MW). Wind farms include Shegoda with an installed capacity (MW) of 120 and average energy (GWh/yr.) of 450, as well as Adama II with a capacity (MW) of 153 and average energy (GWh/yr.) of 479 [28]. There is also a landfill area with a 50 MW installed capacity and municipal solid waste (Addis Ababa) with the first waste-to-electricity (W to E), plant in Africa which is 68 percent completed [28].

Figure 6 shows the rapid rise in access to electricity in Kenya and the comparatively slow change in Ethiopia. Kenya’s coverage rose nearly threefold between 1998 and 2015 compared to Ethiopia’s which saw a mere doubling of the rate between 2000 and 2016. Kenya’s government, together with the World

Bank, recently presented a roadmap to achieve universal energy access by 2022. The plan, which bets on off-grid solar, is referred to as the Kenya National Electrification Strategy (KNES) [29]. The Ethiopian government has also launched a similar plan which aims to achieve universal electrification for the country by 2025 [30].

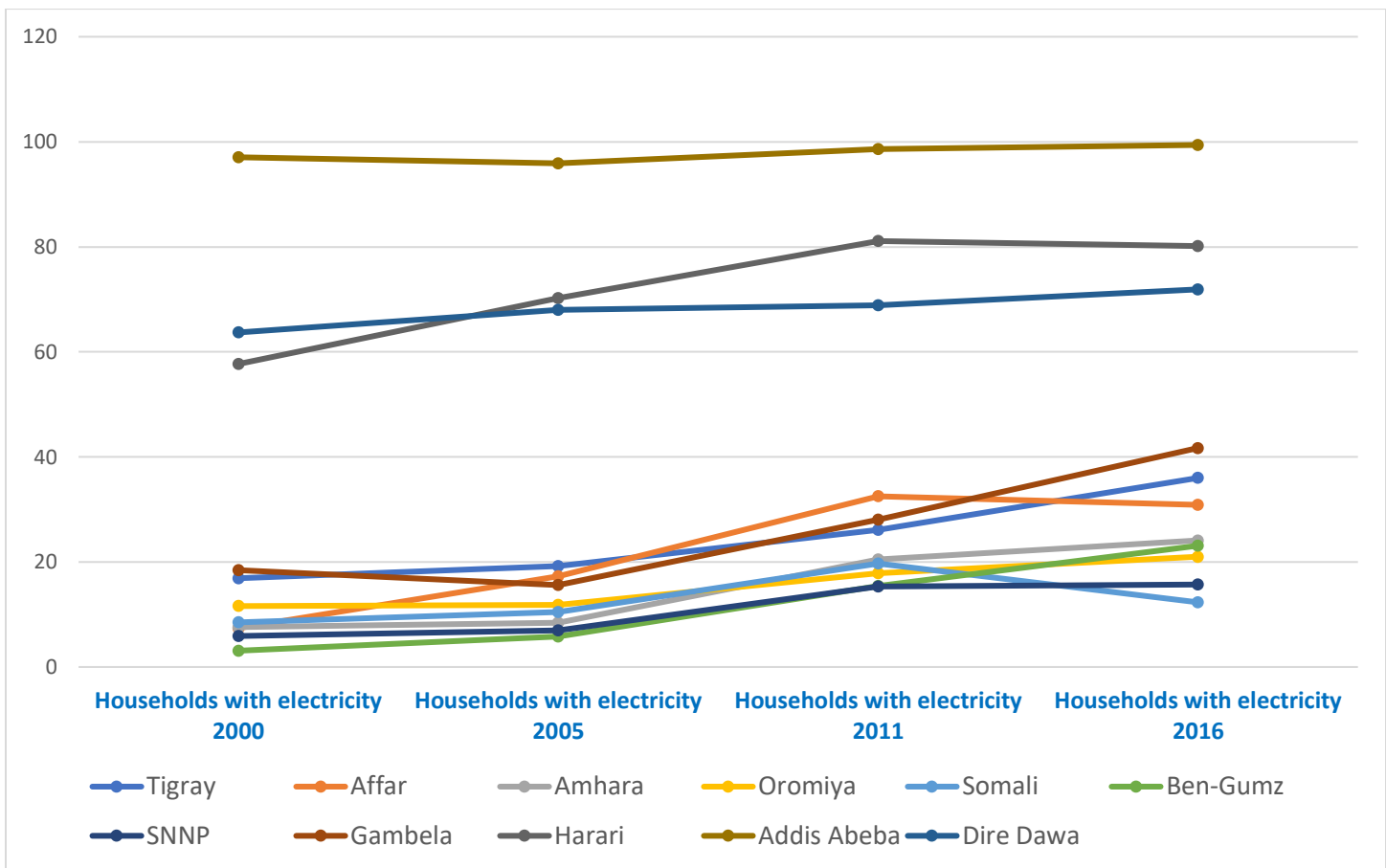
**Figure 6.** Percentage of Households with Electricity in Ethiopia and Kenya at Various Demographic and Health Surveys



Source: DHS <https://www.statcompiler.com/en/>

Figure 7 shows percentages of households with access to electricity during Ethiopia's four demographic and health surveys. Two noteworthy trends catching the eye are the impressive rise in percentages of households with access to electricity in Tigray and Gambella Regions, and the unexplained but rather disappointing decline in the Somali Region from nearly 20 percent in 2011 to just over 12 percent in 2016. A three-fold increase in the Afar Region from around 10 percent in 2000 to just over 30 percent in 2016 is also impressive. It is clear, however, that Ethiopia's national average masks the significant difference in accessibility between the major cities of Addis Ababa, Dire Dawa, Mekele, Bahir Dar, etc., and the rest of the country.



**Figure 7.** Percentage of Households with Electricity at Four National Demographic Surveys

Source: Based on [6,7,8,9]

- VI. **Advanced Manufacturing:** A website dedicated to engineering ([www.engineering.com](http://www.engineering.com)) mentions the textile manufacturing base of Hawasa Industrial Park [31] and asks if Ethiopia could become Africa's manufacturing hub. It then offers two reasons for why it thinks the answer is a yes: 1) the country has no minimum wage and the minimum age for labor is 14, and 2) the cost of electricity is about \$0.06 per kWh, less than half the African average of \$0.14. Reason number 1 is disconcerting due to its child labor implications and the dangers of exploitation of workers lacking the basic protections of a minimum wage. However, the organizers of the Ethiopia: 2050 conference likely view advanced manufacturing to be much more than textile production, even if done with cutting-edge technologies of garment-making. They, most likely, view it in manners reported by the US National Center for the Middle Market and the National Association of Manufacturers [32] who see advanced manufacturing as new technological frontiers that include information technologies, automation, process technologies, and computer technologies, as well as "... control systems, custom manufacturing, high precision technologies, sustainability technologies, high-performance computing, and advanced robotics". These have the potential to significantly enhance production outputs and profitability for manufacturers in Ethiopia, and serve as catalysts for accelerated

economic growth. However, this begs the question of whether Ethiopia can weather the consequences of advanced manufacturing and avoid its pitfalls. In particular, the replacement of the human worker by machines on most assembly line operations, and the resulting shrinkage of the industrial workforce, especially given the burgeoning size of the labor force which is said to have grown from 20 million in 1990 to 51.9 million in 2018 [33]. The percentage of the industrial labor force in Ethiopia which includes mining, manufacturing, energy production, and construction was only 8.6 of the total in 2013 [32]. Agriculture, which comprised farming, fishing, and forestry accounted for 71.0 percent, and the service sector - government activities, communications, transportation, finance, wholesale, retail, and all other economic activities that do not produce material goods - accounted for 20.1 percent [32].

## VII. **Transportation:**

According to the Federal Negarit Gazeta, 12<sup>th</sup> Year, Number 1 [34], the powers and duties of Ethiopia's Ministry of Transportation and Communication include the promotion and expansion of transport and communication services, ensuring that provisions of transport and communication services meet the country's development strategy, and planning for equitable regional distribution including safeguarding of the integrated provision of transport and communication services. It also includes ensuring provisions of safe and reliable transportation and communication services, monitoring activities pertaining to the Ethio-Djibouti Railway line, and regulating maritime and transit services [34].

An online publication maintains that closing the existing gaps in infrastructure quality and quantity in Africa relative to those found in the best-performing economies in the world could increase the growth of the continent's GDP per capita by 2.6 percent per year with the biggest growth benefits coming from closing the gap in the transportation sector [35]. China has made substantial investments across all of Africa to improve infrastructure as well as fulfill its own needs for resources thereby becoming a major financier of key transport projects. A minimum of five countries - Kenya, Ethiopia, Angola, Djibouti, and Nigeria - have had their railway systems funded by China. [35]. The main objectives of Ethiopia's first GTP included enhancements in the resource capacities of the transportation sub-sector to render the system more efficient [36]. The country's growth strategy has relied on massive public investment programs amounting to almost a quarter of the country's GDP in 2014 [37], or nearly half of all growth in the economy since 2011. The country's spending on roads has been averaging about 4 percent of GDP every year over many years, and the Addis Ababa-Djibouti Railway is said to have cost about USD\$3.4 billion [37]. The Ethiopia-Djibouti corridor provides land-locked Ethiopia its main commercial access to the sea. Without this investment in infrastructure, capacities for improving logistics would be limited and the manufacturing sector would not be price-competitive in international markets.

The total distance covered by bus services increased from 70,000 kilometers in 2009/10 to 102,000 kilometers by 2014/15 [36]. Consequently, the number of passengers increased from 148 million to 394 million. There was also a decline in the number of passenger fatalities which decreased from 70 deaths per 10,000 vehicles to 60 deaths despite the significant increase in passenger volume [36]. However, it is reported that more needs to be done to improve the quality and safety of services by implementing modern transport and traffic management information systems based on studies and data-driven policies [37]. Meanwhile, the number of Ethiopian Air Line's international passengers' flight destinations increased



from 58 to 90 and the number of domestic flight destinations rose from 16 to 19. The country has also purchased new cargo ships. However, as the government report [36] indicates, there have been shortfalls in satisfying demands for a wide range of transportation services despite efforts made in this sub-sector due, in part, to limited project management know-how and insufficient capital outlays.

An online publication of the Ethiopian Road Authority [38] lists four phases of the government's Road Sector Development Programs (RSDP) that have been sequentially completed during the 1997 to 2015 implementation period and a fifth phase that is currently underway. By the report's publication date of October 2016, RSDP's cost totaled Ethiopian Birr (ETB) 266.2 billion (115 percent of the planned disbursement) [38]. As a result, the total length of the country's road network increased from 26,550 kilometers in 1997 to 113,066 kilometers in 2016 (an increase of 326 percent). The road density per 1000 square kilometers increased more than four-fold from 24 in 1997 to 103 in 2016. Substantial improvements have also been registered in the proportion of road networks deemed to be in good condition; it increased from 22 percent in 1997 to 72 percent in 2016. The average distance from a paved road has decreased from 21 kilometers in 1997 to 4.9 kilometers in 2016. Additionally, the proportion of areas beyond 5 kilometers of an all-weather road, which was 79 percent in 1997, has decreased to just under 36 percent in 2016 [38]. The Rural Access Index, RAI (percent), which measures the proportion of rural residents who live within two kilometers of an all-season road (equivalent to 20-25 minutes' walk) also increased from 13 in 1997 to 57 in 2016. Last but not least, express toll roads are being built to address traffic congestion on existing roads and improve travel times. The Addis Ababa – Adama expressway is already operating as a toll road. Two more alternative express toll ways - Modjo to Hawassa and Adama to Awash are expected to follow suit [38]

**VIII. Information and Communication Technologies (ICT) Infrastructure:** We are in an information age. The last millennium gave rise to feudal societies marked by strict hierarchical systems of power centered around land ownership [39]. This system was ended by the Industrial Revolution three centuries ago which is itself being supplanted by the information age that is based on the creation of information and services and driven primarily by knowledge, with greater powers in the hands of those storing and distributing information.

Ethiopia's 2016 national ICT policy and strategy draft [40] shows the development of this sector to be one of the country's top strategic priorities, with significant roles for infrastructure development as set out in GTP II. The government's vision is to transform Ethiopia, a country once synonymous with poverty, into a Middle-Income economy and society using next-generation ICT. More importantly, the policy and strategy draft views e-government as an effective way of improving public service delivery and accelerating the ease of doing business for enterprises. It was in recognition of this fact that the government developed and implemented an e-Government Strategy during the 2011 – 2015 plan period. Entries in the below paragraphs are all based on the above-mentioned policy and strategy draft [40].

Ethiopia established the Ministry of Communication and Information Technology (MCIT) in 2010 in recognition of the critical role ICT has in national development, and along with it, Proclamation No. 916/2015 which gave the MCIT a mandate to promote ICT as a key component in achieving the 17 UN

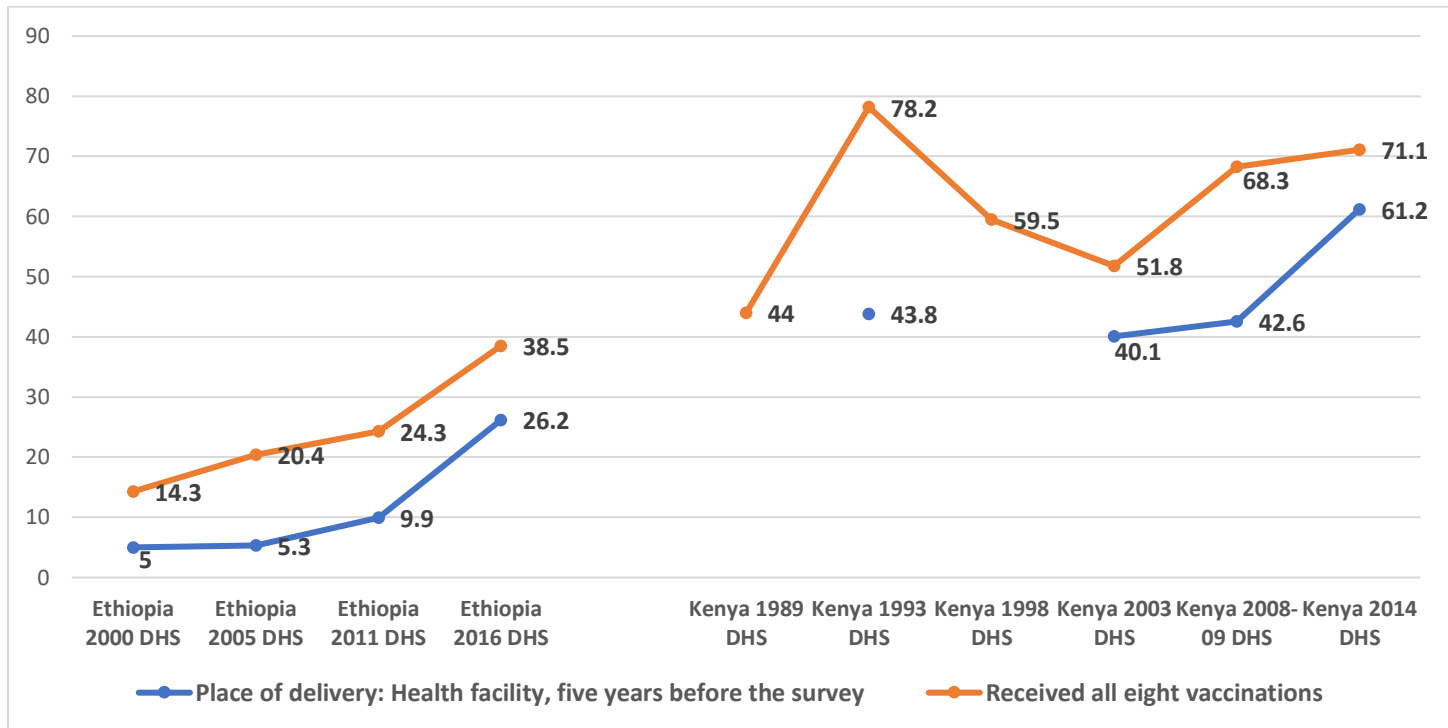
Sustainable Development Goals (SDGs). Specifically, goal #9 places emphasis on technological progress and the bridging of digital divides to find lasting solutions for the country’s economic and environmental woes. In particular, item 9c sets 2020 as the target for realizing the goal of affordable broadband access for all Ethiopians. Ensuring that ICT is an integral part of the national education system by achieving a critical mass of computer literate teachers, and expanding quality ICT education to make it accessible to all is another lofty goal. Ethiopia’s ICT infrastructure has seen significant expansion in the past few years with mobile telecommunications growing from a mere 1 million subscribers in 2007 to 39 million in 2014/15. Similarly, the proportion of the rural population living within a 5-kilometer radius of mobile telephone services increased from 62 percent to 96 percent, and the number of internet users increased from fewer than a million to more than four million. Nevertheless, the diffusion of ICT in Ethiopia remains sluggish in comparison to regional and global peers.

The major hurdles preventing Ethiopia from realizing its full digital potential include lags in the formulation of regulations for dealing with new technological advances to catch up with infrastructure growth and achieve full monitoring of service affordability and quality. The need to expand broadband service throughout the country is also paramount. The challenges of accelerating the take-up rate of ICT services in rural areas by citizens, businesses, health, educational institutions, etc. due to lack of digital literacy is noteworthy. One hopes that the provision of affordable ICT devices and services at low cost for a segment of the population that cannot afford to buy them at full price takes center stage as an important and honorable cause.

**IX. Access to Health Care:** The World Health Organization’s (WHO) 1946 constitution envisages “...the highest attainable standard of health as a fundamental right of every human being.” [41]

WHO’s constitution places a legal obligation on all countries, including Ethiopia, to ensure access to timely and affordable health care to all individuals and families while addressing the underlying determinants of health including clean water, sanitation, food, housing, health-related information and education, and gender equality. The key phrase here is “all individuals and families”. There is, however, a widespread shortage of medical care and services in Ethiopia [6,7,8,9] whose health impacts are compounded by significant geographical inequities. Two examples of the inadequacy of care would be the prenatal and delivery services offered to pregnant women and the full immunization coverage of children (Figure 8). Just over a quarter of Ethiopian women have access to delivery care even though the country improved access to delivery care five-fold between 2000 and 2016. In comparison, over three-fifths of Kenyan women have access to such care [Figure 8]. Similarly, just over a third of Ethiopia’s children have had all eight vaccinations; nearly three-quarters of Kenya’s children have.

**Figure 8.** Ethiopia and Kenya: Percentage of Women with Access to Health Facilities Deliveries and Children who have Achieved Full Immunization During National Demographic and Health Surveys.



Source: DHS <https://www.statcompiler.com/en/>

The lower national averages for Ethiopia than Kenya would, in fact, be significantly lower if it weren't for the much higher coverage in Addis Ababa. For example, in the year 2000, the percentage of women delivering at healthcare facilities which was 5 percent nationally (Figure 8), was nevertheless a high of 66 percent in Addis Ababa [6]. Similarly, the percentage of live births in the 5 years before the 2016 survey that were delivered in a health facility was 26.2 percent nationally and 97 percent in Addis Ababa [9]. The percentage of children who achieved full vaccination in 2000 (14.3 percent nationally) was also much higher in Addis Ababa - 88 percent. The corresponding numbers for the 5 years before the 2016 survey were 38.5 percent nationally (Figure 8) and 89 percent in Addis Ababa. Geographically, although the worst performing regions are Afar (15 percent in vaccination coverage) and Somali (22 percent coverage), the population giant – Oromiya (25 percent in vaccination coverage) – is not faring much better. Given the much higher population size in Oromiya than in Afar or Somali, it is not difficult to reach the conclusion that Oromiya has the largest absolute number of persons not reached by adequate health care as exemplified by the selective focus on the two variables graphed in Figure 8. At 15, 18, and 19 percent respectively, Afar, Somali, and Oromiya are at the bottom of regional rankings for the percentages of live births in the 5 years before the 2016 survey that were delivered in a health facility [9].

The executive summary of Ethiopia's Health Transformation Plan [EHTP] [42] lists the achievements of the past two decades through what it called, heavy investments in health system strengthening. This was said to have been guided by its pro-poor policies and strategies which, it says, have resulted in significant



gains in health improvements for all Ethiopians, and have led to the achievement of most of the Millennium Development Goals (MDG) targets. Among the listed gains is the accomplishment of MDG-4 with a two-thirds drop in under-five mortality rate from 1990 levels. This, the report said, contributed to an increase in average life expectancy at birth from 45 in 1990 to 64 in 2014. The below paragraph on gains of the 20-year planning period (1995 and 2015) is based on this report [42]:

A total of 16,440 health posts, 3,547 health centers, and 311 hospitals were constructed as part of the EHTP. Over 38,000 Health Extension Workers (HEWs) have been trained and deployed to all regions - two HEWs per Kebele. HEWs are tasked with the transfer of knowledge and skills to families they serve so that households can take ownership of their health into their own hands (close to 3 million families trained). A 69 percent decrease in maternal mortality from a high estimated base of 1,400 per 100,000 live births was achieved. The rise in contraceptive prevalence from 3 percent to 42 percent has led to a drop in the total fertility rate from 7.7 in the 1990s to 4.6 in 2016. Significant mortality and morbidity reductions in the top infectious causes - HIV/AIDS and tuberculosis – have been registered. Generalized malaria outbreaks have not been observed over the last decade and new HIV infection has dropped by 90 percent and mortality from it cut by more than 50 percent among adults. Moreover, Ethiopia stands out for the “rapid decline” in mother-to-child transmission of HIV, which was reduced by 50 percent between 2009 and 2012. Significant decrease in hospital admissions of children under five (down by 81 percent) and deaths in this age group (down by 73 percent) have been achieved. The accomplishments included the target for tuberculosis prevention and control, which saw a decline of more than 50 percent in incidence rates and significant decreases in mortality from 2005 onwards, due in part, to the launch of a program known as the TB/HIV collaborative, and the scaling up of free ART services.

X. **Stem Education:** The developed world has long recognized science, technology, engineering, and math - disciplines collectively known as STEM - as critical tools to equip a nation’s youth with advanced knowledge and skills necessary to solve problems, make use of information, and know how to collect and evaluate data to make decisions and meet the demands of an advancing economy. [43]. By the same token, the vision of Ethiopia’s science, technology, and innovation (STI) policy is to see the country undertaking STI initiatives that will eventually lead to the export of its own technologies by the year 2025 [44]. All of the information included in the below paragraph comes from this report [44]:

The STI mission is to create the science and technology foundation for the country, as well as coordinate the national technological capacity-building efforts to achieve the enhancement of economic competitiveness and reduce technological dependencies. The critical policy issues for Ethiopia are 1) development of national and regional innovation systems; 2) technology transfer; 3) human resource development; 4) business enterprises research; 5) financing and incentives; 6) national quality infrastructure; 7) university-linked government research institutes [GRI]; 8) industry linkage; 9) intellectual property rights; 10) science and technology information; 11) environmental technologies; and 12) international cooperation. The STI strategies include placing the initiative under top government leadership, encouraging the support and establishment and/or strengthening of balanced regional innovation systems, establishing regional centers of excellence to undertake research focused on technology adaptation, and ensuring strong linkage between federal and regional STI actions. These strategies are to be implemented through, the establishment of specialized science and technology institutions that focus on the production of the finest scientists and engineers for the economy, as well as maintenance of the 70:30 university intake ratios in favor of science and technologies for the coming 10

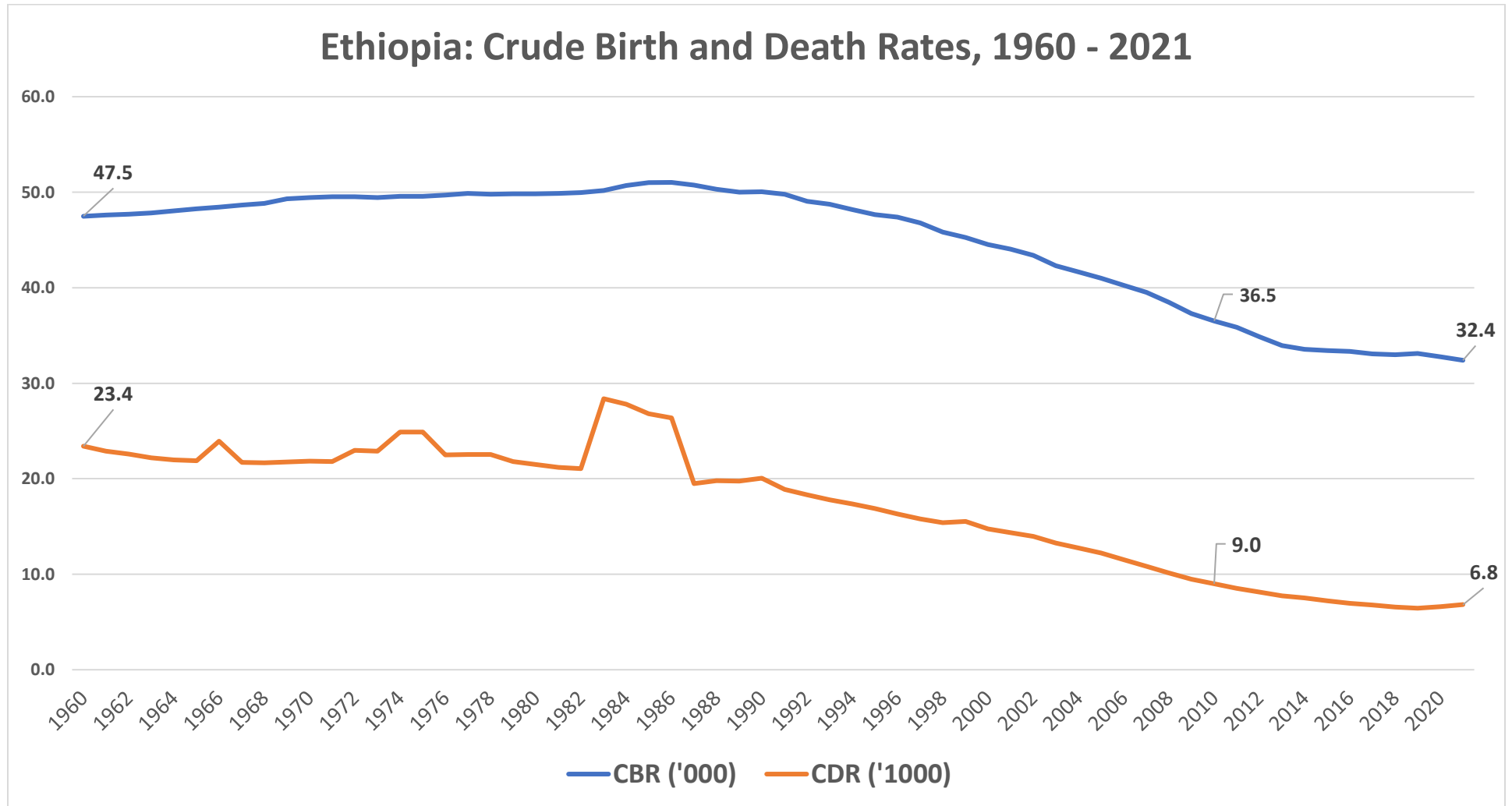
years. The promotion of positive attitudes towards technical and vocational education and training (TVET) and, the creation of quality assurance centers for TVET teachers and subject matter expert (SME) workers, as well as owners is also critical. The introduction of high-quality, dynamic, practical, interactive science and mathematics curricula at teachers' training institutes beginning with primary and secondary schools is considered an urgent area of need. In addition, the promotion of productive scientific tours, and participation of Ethiopia's scientists and technologists in conferences, symposia, workshops, and seminars both at national and international levels is of paramount importance. Training a critical mass of scientists, engineers, and technicians at national and foreign institutes, labs, and schools, providing incentives for science, engineering, technology, and mathematics teachers, increasing the proportion of female students who enroll in science and engineering as well as in technical fields of TVET Schools is of supreme importance [44].

### **Population: The Elephant in the Room**

In this day of sociopolitical developments with debates about the future of Ethiopia among 100 or so parties vying for political power, there is an eerie silence about what this author called “the elephant in the room” during a recent phone conversation with Selome Tadesse, of Fan TV's The Selome Show. The neglected elephant in the room is, of course, the country's unprecedented population size and its growth rates. The country now has an estimated population of over 120 million (Figure 9). What is more, the underlying dynamics in fertility and mortality are likely to fuel more explosive growth in the decades to come. Clearly, whether or not Ethiopia will be able to address all of the ten development challenges identified for the December 2019 Ethiopia: 2050 conference will be determined by the weight of its response to the population factor. The above-stated silence on population growth and dynamics in Ethiopia, and unwillingness to confront its impacts as the main spoiler of development plans and prospects for a better future - whether social, economic, technological, environmental, etc. - is very concerning, especially given its implications for the welfare of today's children, and that of those not yet born.

### **The Demographic Transition: Has Ethiopia Achieved it yet?**

The classic demographic transition theory pegs onsets of its various phases or stages to trends in crude birth and death rates. According to the below figure, the crude birth rate (CBR) fell below 40 in 2006 and the crude death rate (CDR) fell to single digits in 2009. The gap between the two is still high (25.6, or a natural increase of 2.6 percent in 2021) making one wonder if a transition has taken place in Ethiopia at all. But still, if one must choose a reasonable start date for demographic transition in the country, it would be roughly a decade and a half ago around 2008 when the above-stated (estimated) rates in CBR and CDR were documented. The word “estimated” was used to emphasize that CBR and CDR calculations are based on census intercensal data, but that Ethiopia's last census was in 2007. Notice the CDR rise in the early to mid-1980s; a mortality history of a nation linked to drought and famine which killed over a million citizens. The famine engendered resettlement from northern Ethiopia to the western part of the country setting a stage for ethnic-based forcible relocations, especially out of the former Wellega *Kiflchager*, four decades later.

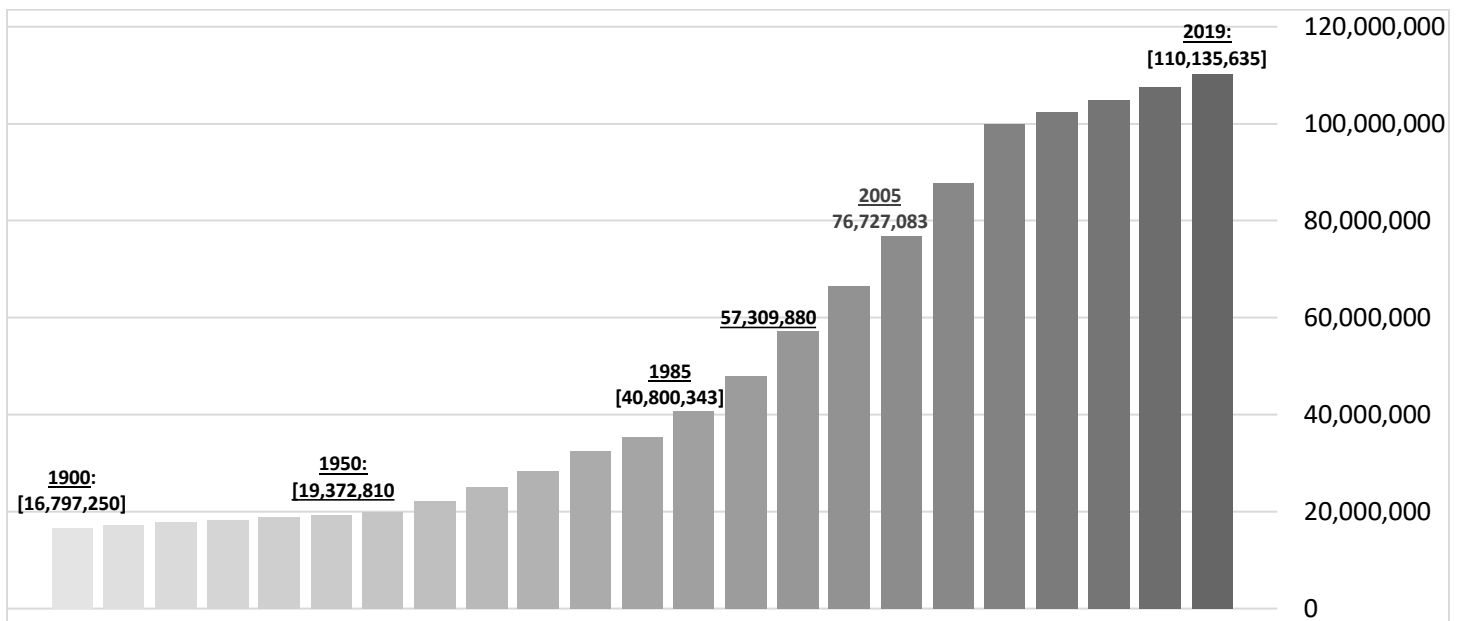


Data source for crude birth rates (CBR): <https://data.worldbank.org/indicator/SP.DYN.CBRT.IN?locations=ET>

Data source for crude death rate data(CDR): <https://data.un.org/Data.aspx?d=PopDiv&f=variableID%3A65>



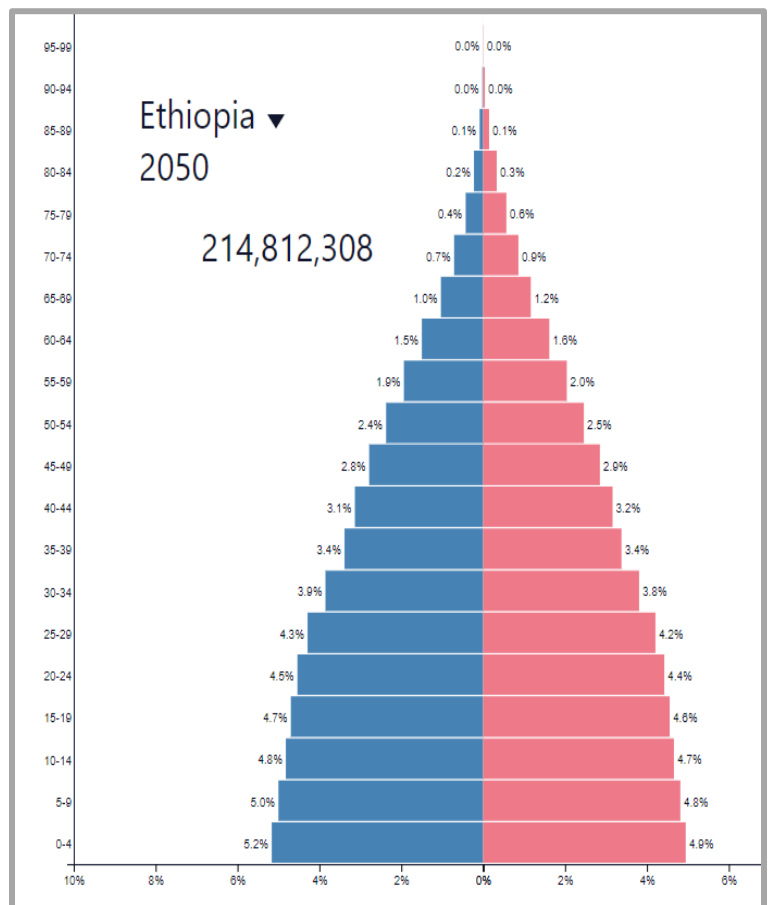
**Figure 9A:** Ethiopia’s Population Growth: 1900 to 2019



**Source:** Based on [45] and reverse projection by the author to the year 1900 based on the 1950 population

**Figure 9B:** Ethiopia’s Population by Age in 2050

Age	Male	Female
0-4	11,091,526	10,627,754
5--9	10,739,992	10,345,861
10--14	10,351,907	10,008,628
15-19	10,088,435	9,786,667
20-24	9,742,623	9,504,317
25-29	9,210,591	9,039,521
30-34	8,271,733	8,181,435
35-39	7,271,576	7,258,311
40-44	6,728,733	6,789,934
45-49	5,980,062	6,123,600
50-54	5,091,235	5,283,380
55-59	4,157,136	4,388,446
60-64	3,215,563	3,470,985
65-69	2,215,242	2,498,458
70-74	1,522,665	1,849,610
75-79	915,839	1,218,282
80-84	481,162	713,565
85-89	182,365	311,025
90-94	41,276	90,536
95-99	4,946	15,661
100+	303	1,414
<b>Total</b>	<b>107,304,910</b>	<b>107,507,390</b>
<b>Grand total</b>	<b>214,812,300</b>	

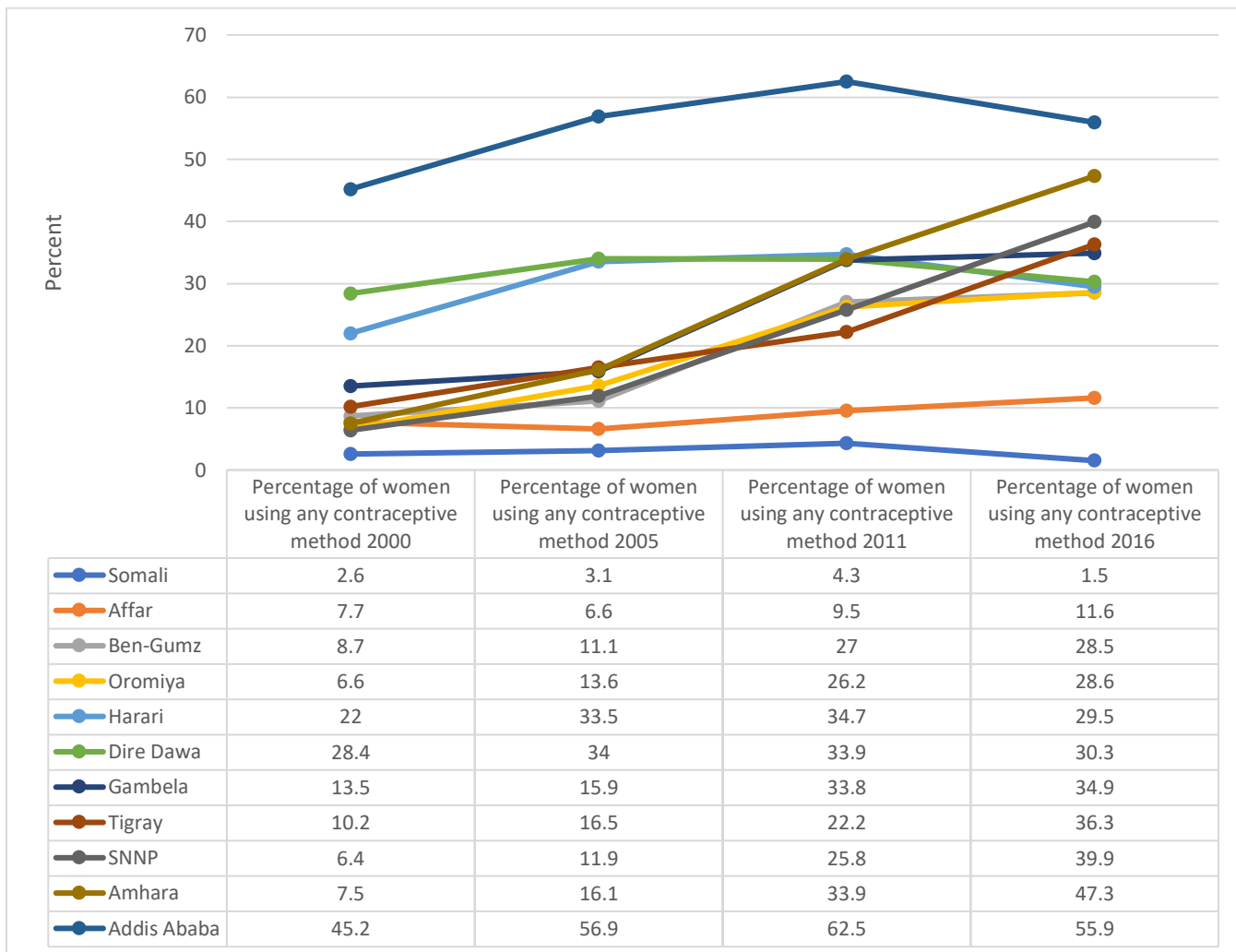


Source: [https://www.populationpyramid.net/ethiopia/2050/#google\\_vignette](https://www.populationpyramid.net/ethiopia/2050/#google_vignette)

A reverse projection by this author for the year 1900 from United Nation's 1950 estimate [45] gave a population size of 16.7 million for the start year of the 20<sup>th</sup> century. A century and two decades later the country's population has increased to over 120 million – a phenomenal growth indeed. It took nearly seven decades (1900 – 1968) to gain a population of 10 million, but just over a decade (1968 – 1980) to gain the next 10 million. The 100-year estimates shown in Figure 9 appear to be reasonable for all decades as the numbers match up closely with population totals from the first national census of 1984 which gave a total of 42.6 million [46] and the 1994 national census count of nearly 52 million [47]. To the extent that there is a wider gap between the 2005 estimate and the results of the 2007 national census, the explanation is to be found partly in the two-year gap but mainly in the widespread consensus that the 2007 census results represented a serious undercount of Ethiopia's population, especially in Amhara Region and in Addis Ababa. A post-census analysis conducted by this author as the principal investigator [48] has findings suggestive of such an occurrence.

Meanwhile, family planning has been part of the government lexicon for decades. In their 2005 article on the timeline of the origins of family planning in Ethiopia, Assefa H.M (et.al) [49] report the lack of information about activities for the period preceding the mid-1960s. However, it appears that things had started to change following the formation of the Family Guidance Association of Ethiopia (FGAE) in 1966 by a few individuals concerned about high rates of morbidity and mortality among mothers resulting from complications of childbirth. FGAE became an associate member of the International Planned Parenthood Federation (IPPF) in 1970 and a full member in 1975 following which delivery of family planning services began in earnest. Much of the initial push to spread the message of the need for population control came from concerned AAU academics including Ato Kebebew Daka and Professor Andargachew Tesfaye (personal knowledge - no reference citations) whose efforts were constrained by a lack of overt policy commitments and political support on the part of governments. It was not until the 1980s that family planning was starting to be perceived as necessary and good. Fast forward to 1994, family planning was enshrined in the country's constitution, under Article 35 which read: "Women shall have the right of access to education and information on [family planning] and capability to benefit thereby so as to protect their good health and prevent the health hazards resulting from childbirth" [49].

**Figure 10.** Ethiopia: Percentage of Women with Access to any Contraceptive Method at Four Demographic and Health Surveys by Region



Source: [6,7,8,9]

Figure 10 Shows regional percentages of women with access to any contraceptive method during Ethiopia’s four demographic and health surveys. With rates hovering around two to four percent in Somali Region, nearly 50 percent in the Amhara Region, and over 56 percent in Addis Ababa, access to family planning shows a wide geographic inequity in Ethiopia. This alone can be a determining factor and a potential predictor that regions such as Amhara will be better equipped to address the ten development challenges identified for the December 2019 Ethiopia: 2050 conference than Somali or Afar regions. Interesting comparisons can also be made for the two population giants – the Oromiya and Amhara Regions. With just over a quarter of women having access to any contraceptive method in the Oromiya Region (Figure 1), it is evident that this region’s demography is less amenable than Amhara’s to addressing the ten development challenges identified for the Ethiopia: 2050 conference.

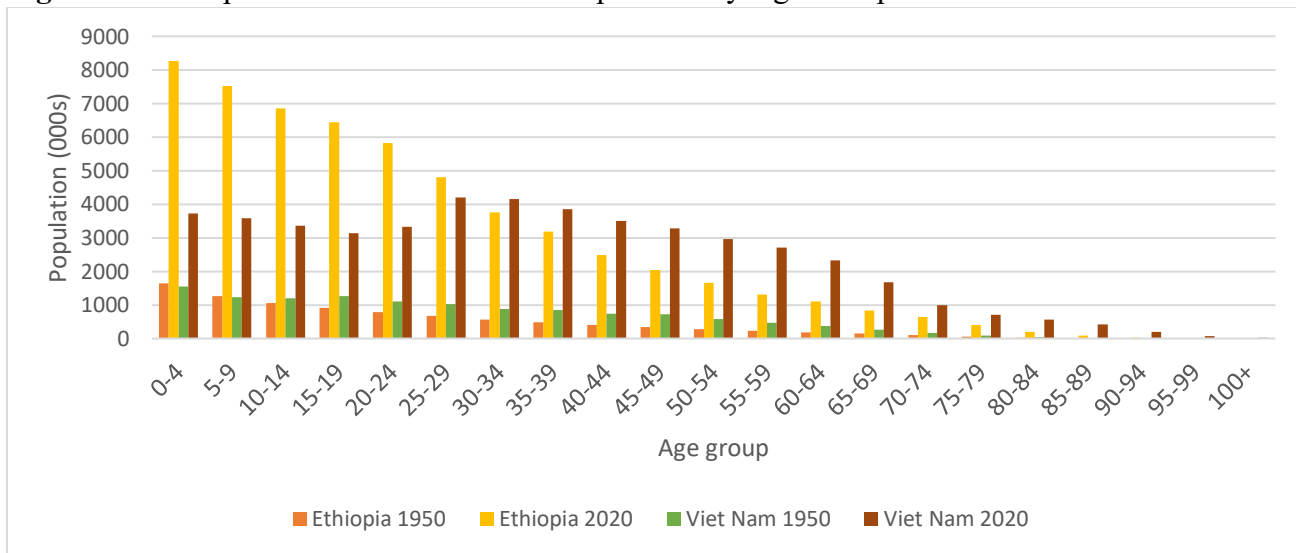
In Figure 11, and Tables 3 through 5, we provide summary findings that are the basis of the statistics reported in the abstract of this paper by comparing the demography of Ethiopia and Vietnam. Figure 11 is a very powerful representation of the demographic forces at play in constraining Ethiopia’s declared goal of becoming a Middle-Income country by 2025. Conversely, the bar graphs for Vietnam are a representation of how demography can lay the necessary grounds for a country’s march out of poverty to a Middle-Income status, or even a developed



country status. The bar graphs exclusively focus on female populations in the two countries at two point-in-time snapshots (1950 and 2020).

Vietnam was chosen for comparison due to its achievement [50] of “Ethiopia’s dream” of becoming a middle-income country [36]. Figure 10 explains why Vietnam is now a Middle-Income country [49], and why Ethiopia’s master plan to become one by 2025 [36] might have to remain un realized for a decade or longer beyond 2025. The female population is singled out for its role in determining the size of future generations; only females give birth. The Ethiopia of 1950 looked pretty much like the Vietnam of 1950 except that Vietnam’s estimated female population total (12,560,000) was greater than Ethiopia’s (9,130,000); a difference of over 3 million in Vietnam’s favor. The two countries had more or less identical female populations in the 0-4 age group (approximately 1.5 million each) in 1950. Another similarity is the 2020 estimate of females in the 30-34 age group (approximately 4 million each) in the two countries. There were roughly equal numbers of females below age 15 in Ethiopia (3.96 million) and in Vietnam (3.98 million) – a 1:1 ratio – in 1950. Fast forward to 2020, the estimate of the female population in Ethiopia is larger by 8.7 million. The 2020 estimate for the population of females below age 15 is 22.7 million in Ethiopia and 10.7 million in Vietnam – a 2.1:1 ratio. Disregarding the differential impacts of mortality and migration, this ratio suggests more than twice as many females in the 20 to 34-year age group (prime years of female reproductivity) in Ethiopia than in Vietnam two decades from now with each Ethiopian woman bearing more children average than her Vietnamese counterpart. This fact alone will call into question statements about the future socioeconomic potentials of Ethiopia as anything but one challenged by its current population size and growth rates with minimal likelihood of replicating the experience of Vietnam unless drastic measures are put in place to change its demographic course over the next decades.

**Figure 11.** Ethiopia and Vietnam: Female Population by Age Group



Source: [45]

Table 3 shows a 3.1: 1 ratio of females aged 25+ to the population (both sexes) below age 25 in Ethiopia. The ratio in Vietnam is roughly 1:1. These ratios and the numbers in the percentage of women with secondary or higher education shown in the last column of Table 4, can be cited among reasons for why Vietnam is already a middle-income county fully capable of addressing and turning into opportunities the challenges identified for the December 2019 Ethiopia: 2050 conference. It is also an indication of why Ethiopia might have a hard time of it if measures are not put in place now with a prime focus on the education and empowerment of Ethiopian women

and girls to elevate the status of women and girls in society, reduce their fertility levels and decrease the woman-child ratios shown in Table 3.

**Table 3.** Ethiopia and Vietnam: The Ratio of Population Under 25 to the Population of Females Aged 25+

Age group	Population under 25 (both sexes) (1)	Age 25+ (females only) (2)	Ratio (3) (3) = (1)/(2)
<b>Ethiopia, 2020</b>	70,613,400	22,547,120	3.13
<b>Vietnam, 2020</b>	35,897,820	31,611,180	1.13

**Table 4.** Ethiopia and Vietnam: Married Women currently Using any Method of Contraception, Percentage of Women in Secondary or Higher Education, and median Age at First Marriage

Country/survey	Total fertility rate 15-49	Married women currently using any method of contraception	Median age at first marriage [Women]: 25-49	Women with secondary or higher education
Ethiopia 2016 DHS	4.6	35.9	17.1	17.2
Ethiopia 2011 DHS	4.8	28.6	16.5	11.2
Ethiopia 2005 DHS	5.4	14.7	16.1	11.9
Ethiopia 2000 DHS	5.5	8.1	16	9.1
Vietnam 2005 AIS			21.2	72.8
Vietnam 2002 DHS	1.9	78.5	21.1	66.9
Vietnam 1997 DHS	2.3	75.3	21.3	65.9

Source: DHS <https://www.statcompiler.com/en/>

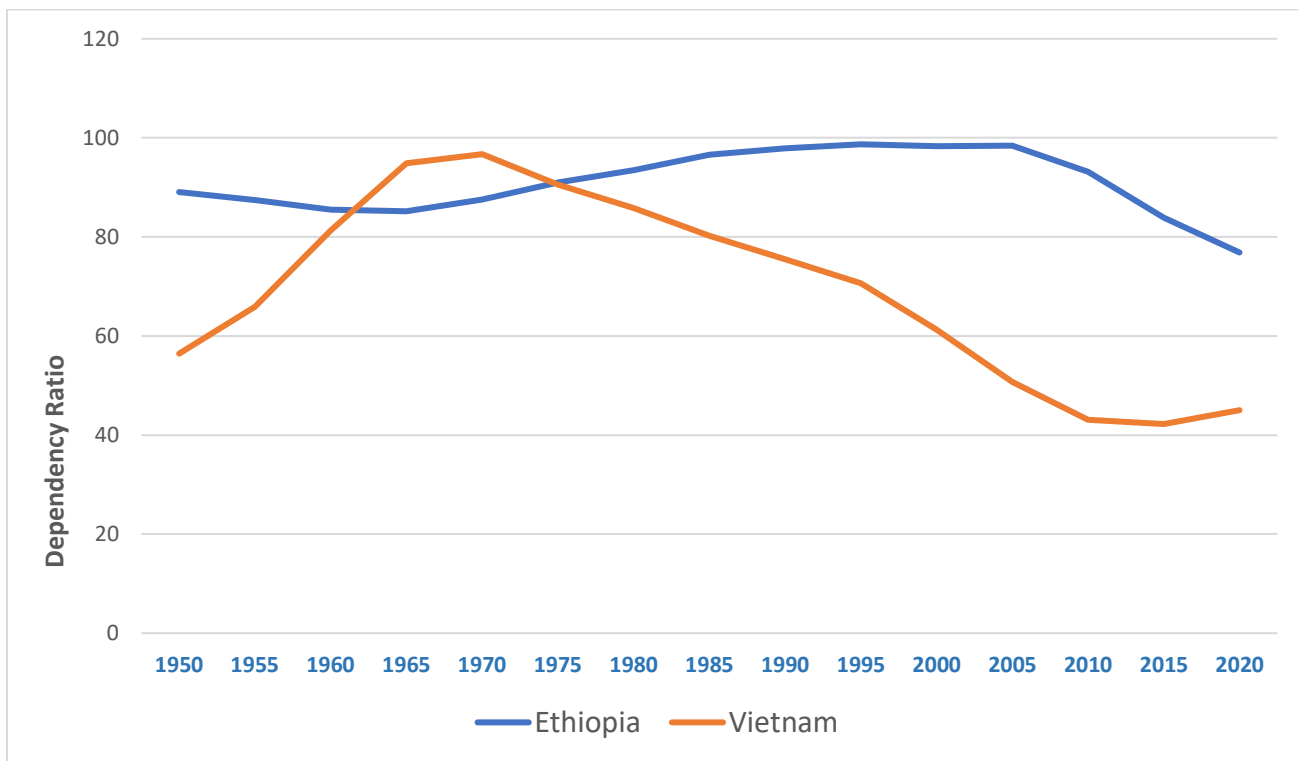
Table 4 shows fertility rates, average percentages of women with access to any contraceptive method, age at first marriage, and educational levels in Ethiopia and Vietnam during the United States Agency for International Development's (USAID) national demographic and health surveys in the two countries. The contrast between the two is very clear as more than two-thirds of Vietnamese women have access to contraceptive services; just over a third of Ethiopian women do. Nearly three-fourths of Vietnamese women have a secondary or higher education, and their TFR is only 1.9 (below replacement fertility level).

Finally, there is the all-important measure of dependency of the non-working segment of the population in the 0-14 age group (child dependents) and those in the 65+ age group (aged dependents) (Table 5 and Figure 12). Those in the 15-64 age group are considered the working-age population. A comparison of dependency ratios where working-age adults in Vietnam support half as many youths below the age of 15 than in Ethiopia (Table 5) provides one of the more powerful clues as to why Vietnam was able to become a middle-income country in just over 30 years, and why Ethiopia will find it hard to do so even a decade past its planned year of 2025.

**Table 5.** Ethiopia and Vietnam: Child- and Old-age and Total Dependency Ratios

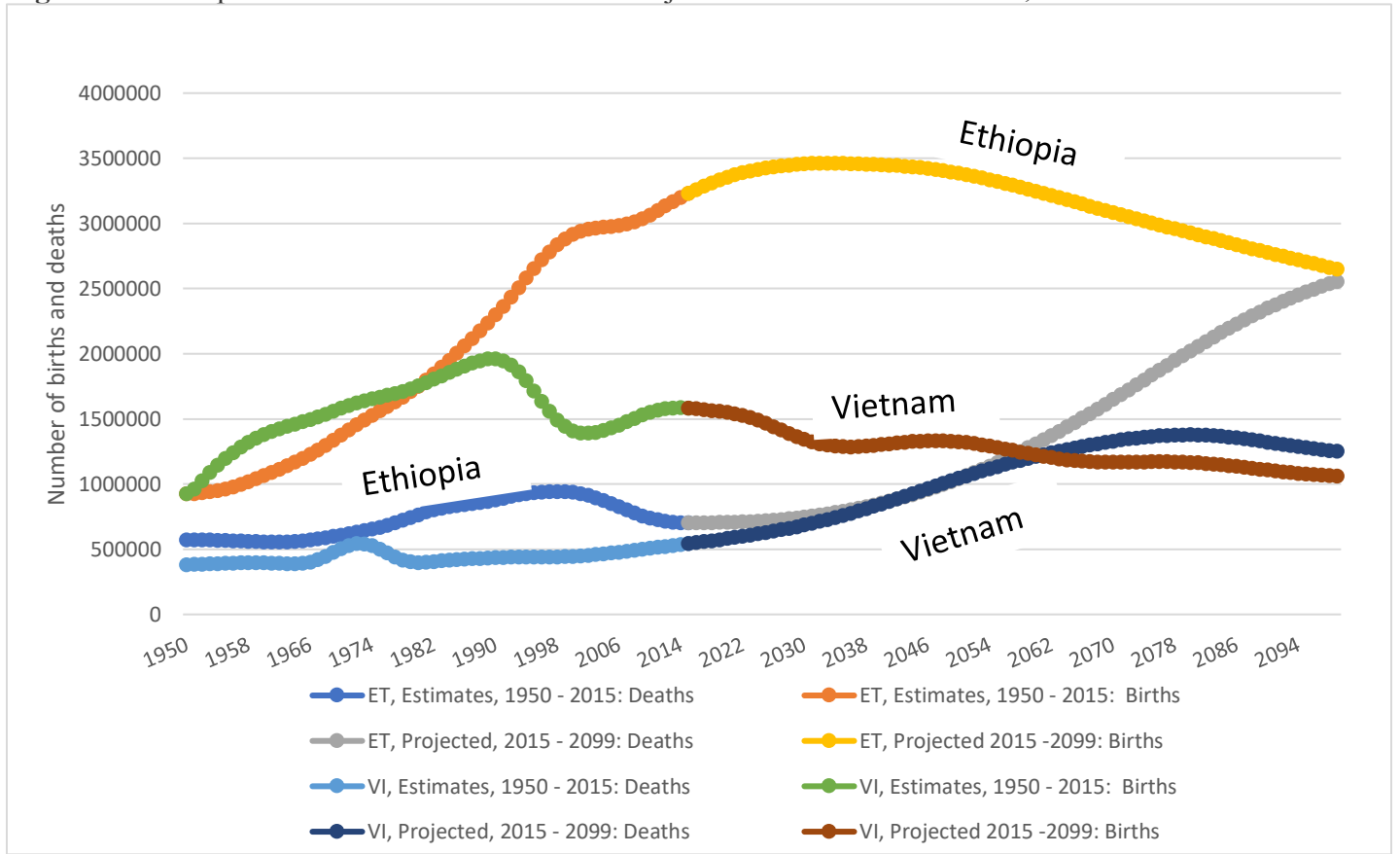
Age group, Population size, Dependency Ratios						
Country/ year	Population 0-14	Population 15-64	Population 65+	Child-dependency ratio	Old-age dependency ratio	Total dependency ratio
Ethiopia 2020	45,890,747	65,006,701	4,066,135	70.6	6.3	76.8
Vietnam, 2020	22,576,746	67,105,173	7,656,664	33.6	11.4	45.1

Source: [45]

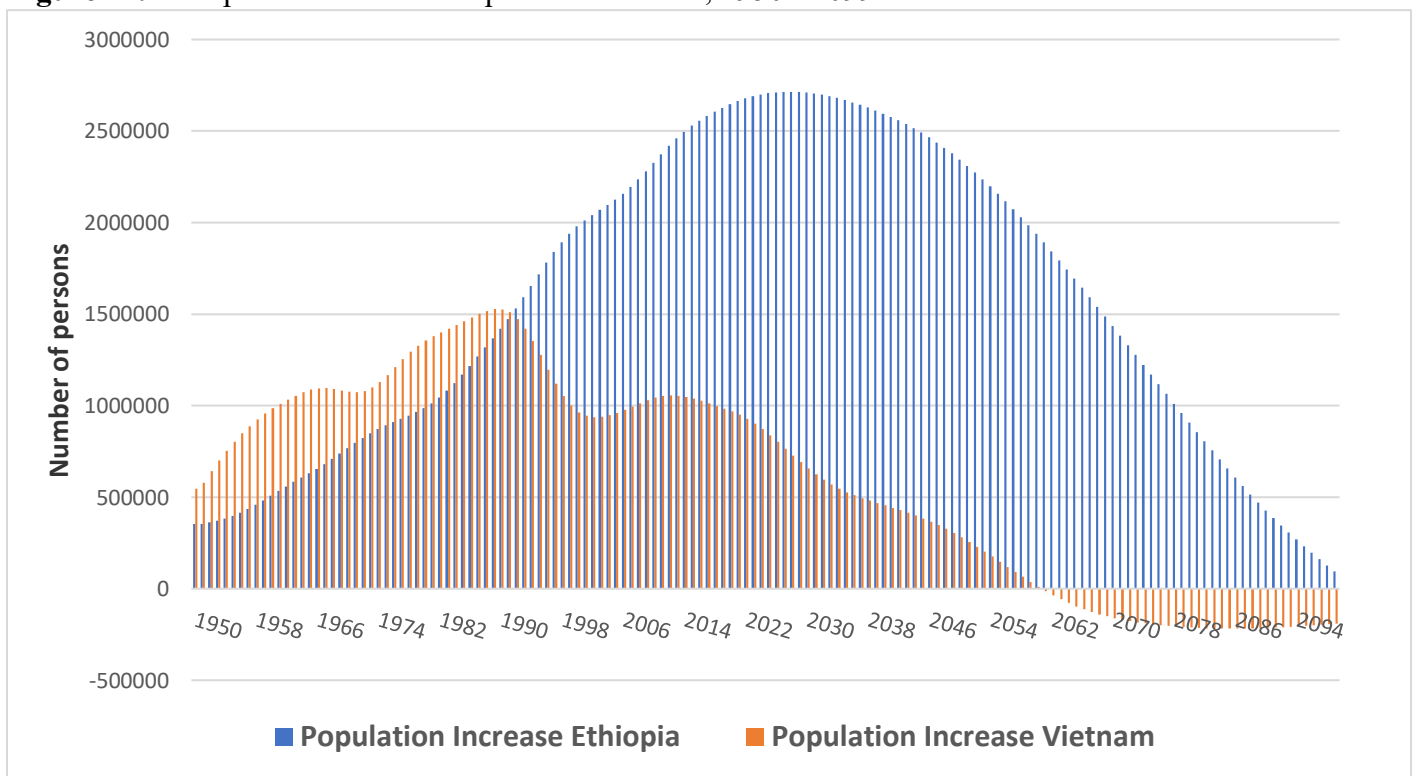
**Figure 12.** Trends in Dependency Ratios in Ethiopia and Vietnam

Figures, 13 and 14 are additional exhibits of the immense challenges Ethiopia's massive population increase will bring to bear on its development efforts over the next three decades while the taming of population growth and in Vietnam through effective control measures lasting over three decades will serve as a welcome growth catalyst for favorable socioeconomic change the foreseeable future. For Ethiopia, the two line graphs in Figure 13 come together in the shape of a leaf suggesting an explosive population growth yet to come five to six decades down the road. The two curves for Vietnam represent the case of a declining trend in net population increases. This difference is put in sharp focus in Figure 14.

**Figure 13.** Ethiopia and Vietnam: Estimated and Projected Birth and Death Rates, 1950 - 2099



**Figure 14.** Ethiopia and Vietnam: Population Increase, 1950 - 2099





## DISCUSSION

The high proportion of urban households with access to improved sources of drinking water at 97 percent in urban areas at the time of the 2016 survey [9] and the much lower access among rural residents (only 57 percent) is a reflection of the enormity of the challenges of providing such services to a large and growing agrarian population. Most households in both urban places (88 percent) and rural neighborhoods (92 percent) report that they do not treat water prior to drinking it [9]. One policy recommendation for Ethiopia: 2050 is the increase the percentage of families with access to improved water sources in rural areas to attain parity with that of urban areas. A second policy objective could be the redefinition of the word “improved” to only include drinking water that is piped directly into homes which would significantly reduce the current reported percentages in both urban and rural areas and provide a sound basis for more realistic policy formulations and planning. None of the objectives will be met, however, if population growth continues to outpace the growth in the provision of these services.

Not all socioeconomic statistics show urban Ethiopia in a more favorable light than rural Ethiopia. For instance, although less than a fifth of the country’s population lives in towns and cities compared to Sub-Saharan Africa’s average of 37 percent [10], the predominantly substandard urban housing that many call home does not offer bright prospects for current and future occupants of the available housing stock. Malnourished street dwellers including children are crowding sidewalks and public places by the tens of thousands [51]. At the same time, the creation of new cities and towns with ever-growing urban spaces is being recommended [14] to alleviate growing land fragmentation in rural areas resulting from an ever-increasing generation of families living off of the sustenance provided by increasingly shrinking plots of land [17]. Policies fostering closer relationships between urbanization, manufacturing, and agro-industrialization can help by strengthening rural–urban linkages [13]. The four issues raised above – urbanization, food, water, and shelter – are among the topics to be discussed at the Ethiopia: 2050 conference in the hope of charting alternative paths leading to universal access to all four by the year 2050. The role of population size and growth dynamics in hampering progress in all four areas is patently obvious unless the country changes course by implementing aggressive control policies based non-controversially on the increase of the rate of secondary and higher education completion by Ethiopia’s women and girls to 70 percent or higher; a formula that worked effectively for Vietnam.

Both urban and rural development challenges are compounded by environmental damage in the form of pollution in cities and deforestation and soil loss in the countryside [20,21]. The current size of Ethiopia’s population and its momentum - defined as pent-up growth potential resulting from a large and growing youthful population, especially those under the age of 15 [52] - will put significant strains on efforts to promote health care [42] and raise the stature of advanced manufacturing in Ethiopia not to mention the industrial sector which will face significant challenges in growing the size of its labor force far above its current single-digit percentage [32]. Additionally, the fulfillment of GTP II’s plans for increasing road access [16], will be in jeopardy if the above-discussed momentum of Ethiopia’s population growth (also referred to above as the elephant in the room) is not tackled. The population’s growth momentum could also jeopardize declared growth plans for health care, food security, universal access to health care, and STEM education, as well as the 2016 national information and communication technology (ICT) policy objectives [40] of transforming Ethiopia, into to a Middle-Income economy.

Ethiopia’s ICT sector is government-run with limited private-sector involvement. The challenges of boosting home-grown and locally relevant applications and services as well as scaling up innovations to benefit a wider class of ICT entrepreneurs and customers are very real. Low levels of internet penetration compared to the take-

up rate of mobile services, and of fixed broadband coverage in comparison to that of mobile broadband, are also noteworthy. Last, but not least, it has been reported that the connectivity of government institutions in education and health networks, and the monitoring, mitigating, and adapting to the impacts of climate change, have been improved so that ICT can have a bigger role in disaster relief and emergency communications. Developing special ICT training programs for women and for persons with disabilities has also been made an essential part of the plan in order to address gender and social inequalities.

Ethiopian politicians do not seem to be aware that the upheavals of the last 60 or so months are a powerful reminder of what demographers call “population potential” expressed in ways that governments would find it difficult to reign in or contain. Moreover, no one in the media will ever tell a story of the recent leadership change that brought Prime Minister Abiy Ahmed to power, as evidence that “the elephant in the room” moved in unpredicted ways. In this regard, the lesson from Vietnam is that of family planning as a saving grace and a political windfall that governments can take advantage of pending successful implementations of population control measures while, at the same time, meeting the demands of every citizen with no one left behind. It is, therefore, the ardent hope of this author that participants of the Ethiopia: 2050 conference will advocate successful implementations of planned population control measures based (non-controversially) on increases in the rate of secondary and higher education completion by Ethiopia’s women and girls to 70 percent or higher. To this end, the author has created interactive Geographic Information System (GIS) web maps of the distribution and density of the country’s population by *Wereda* [53] and its demographic dynamics by Region [54]. These can be used among others, to update the 1993 population policy of Ethiopia [55] which hardly saw the daylight as a road map for the future course of Ethiopia’s demographic dynamics.

Finally, to those intrigued by the specifics of how Vietnam managed to catapult itself from one of the world’s poorest nations to a Middle-Income country in a span of just 30 years, a World Bank report [50] has an explanation that begins with the economic and political reforms under *Đổi Mới*, launched in 1986. In particular, the report talks about massive investments that have been made in raising the social (including empowerment), economic, and educational status of women [50]. Unlike Ethiopia, female-headed households in Vietnam are less likely to be poor than male-headed households. In addition, the primary and junior secondary school net enrolment rates are practically equal for boys and girls. What is more, there are more females attending the upper secondary and tertiary education levels in Vietnam than males. The report further details the maternal mortality reduction in Vietnam which fell from 233 to 58.3 deaths per 100,000 live births. Infant mortality dropped from 44 deaths per 1000 live births to 15 between 1990 to 2015. Moreover, women’s labor force engagement is within 10 percent of men. In addition, the share of women in wage work has been rising, mostly driven by increases in foreign-owned export-oriented factories. The overall developmental gains in Vietnam are such that 99 percent of the population had access to electricity in 2016, up from 14 percent in 1993, and rural access to clean water has gone up from 17 percent in 1993 to 70 percent during the same period. Access to clean water in urban areas stood at above 95 percent in 2015 [50].

Advancing the socioeconomic status and educational levels of Ethiopian women and girls, and the provision of easy access to family planning services is not something the reader of the country’s development plans of the last several decades would be able to find as a core objective. The country’s demographic history and its current population trajectory would be different than what was observed or is being experienced if women’s education and empowerment had been center-stage and formed the core of development plans. The combined effects of the four variables shown in Table 4, including differences in median age at marriage, could be considered a powerful determinant, and a predictor that Ethiopia will be less able than Vietnam to address all of the ten development challenges identified for the December 2019 Ethiopia: 2050 conference unless the prevailing human rights and educational status quo for Ethiopian women is disrupted in fundamental ways. Last but not least, a country where demographic and health surveys include the question of when it would be appropriate for a husband to beat his

wife, has by definition a long road to travel toward becoming a Middle-Income country. If 100 percent of women did not give an “under no circumstances” response, it would be a further confirmation that Ethiopia is indeed not close to being a middle-income country and that it will have a hard time meeting the ten challenges identified for the conference.

## CONCLUSIONS AND POPULATION-RELATED POLICY RECOMMENDATIONS

### 1. As in Vietnam, raise the percentage of girls finishing high school to 70%

#### Why is this important?

First thing first: it is a no brainer - a girl in school is not giving birth (although a tiny minority do). This means that up to three or four births can be averted in Ethiopia (per female) by simply keeping girls in school until the completion of high school. Moreover, education of girls and women serves as a powerful tool in combating child marriage. Girls in school are less likely to be married off or become mothers before they are ready.

Additionally, education of women and girls contributes to:

- i. *Population control*: The most powerful effect of educating women and girls is evident in the globally known fact of educated girls and women having fewer children and having them later in life - crucial ingredients of sustainable development. This will contribute to a healthy balance between Ethiopia’s resources and the population that depends on those resources, while at the same time improving the overall well-being of families and the whole nation.
- ii. *Global competitiveness and breaking the cycle of poverty*: Educating women and girls increases a country's global competitiveness while better equipping nations to ensure full-employment of working-age citizenry so that families can lift themselves out of poverty as well as bequeath sustainable development opportunities to future generations.
- iii. *Long-term societal benefits*: The societal benefits of educating women and girls extend beyond individual and families to societal structures, values, and norms, there by leading to a stable, more prosperous, and equitable society.
- iv. *Female empowerment*: Girls become knowledge, skillful, and confident in making informed decisions about their lives, the lives of their children, and of the community surrounding them.
- v. *Economic contributions*: Educating Ethiopian women and girls will help break the cycle of poverty and enhance the country’s overall economic development by millions of female citizens entering the workforce and contributing to the economy and society.
- vi. *Healthy choices and preventative care*: Educated girls are more likely to access healthcare services and make informed choices about their well-being and the well-being of their children, thereby contributing to healthier families and communities overall.

- vii. *Community development and social change:* Educated women and girls play active and far more positive roles in community development initiatives than boys or men. They are more likely to engage in civic activities, contribute to local governance, challenges harmful traditional practices and beliefs thereby fostering a culture of tolerance, respect, and acceptance while participating in efforts to improve the well-being of communities.

## 2. As in Vietnam, raise the prevalence of modern contraceptive use among married women to 70%.

### Why is this important?

Increased contraceptive use in Ethiopia will have a multifaceted benefit that positively influences maternal and child health, overall population dynamics, poverty and its attendant ills, women's empowerment, education, and environmental sustainability.

Additionally, raising contraceptive prevalence to 70% will have the effects of:

- i. *Sustainable population growth and environmental stewardship:* Limiting births through increased contraceptive prevalence will contribute to Ethiopia's overall societal well-being and its sustainable development. By reducing pressure on natural resources, it brings about alignments with Ethiopia's broader goals and efforts to achieve sustainable development, feed its people, address climate change, and fight environmental degradation.
- ii. *Improved maternal and child health through reduced unintended pregnancies:* Increased contraceptive prevalence (ideally to 70% as in Vietnam) will allow Ethiopian women to space and time their pregnancies, thereby reducing the risk of maternal and infant mortality. Adequate spacing between births contributes to healthier mothers and infants, as it allows women to achieve adequate bodily and mental recovery between pregnancies. Unintended pregnancies often lead to insurmountable challenges for individual women and girls and families as couples are unable to plan and space the arrival of their children. Contraception supports families in making informed decisions about their reproductive health.
- iii. *Poverty reduction:* Family planning helps fight poverty and end its vicious circle by breaking the cycle of high fertility leading to increased economic strain on families. Smaller families improve resource allocation as well as raise living standards resulting in increased per capita income.
- iv. *Gender equity and women's empowerment:* Ability to plan their pregnancies allows women to stay in school and pursue higher education thereby enhancing their economic opportunities and leading to greater financial stability for them, for their families, and, collectively, for the entire nation of Ethiopia. Moreover, increased contraceptive use is linked to greater gender equality because both men and women are jointly involved in family planning decisions; a situation which fosters a more equal distribution of responsibilities and decision-making power between husband and wife.
- v. *Healthcare system relief and improved quality of life:* By allowing Ethiopian women to make choices aligned with their aspirations and resources, family planning fosters a sense of control and well-being



while reducing the strain on healthcare systems by preventing unplanned pregnancies and demand for maternal and infant healthcare services.

### **3. Reduce infant mortality from Ethiopia’s current level of 47 per 1000 to Vietnam’s current rate of 15 per 1000.**

#### **Why is this important?**

Reductions in infant mortality are often associated with lower birth rates as parents become confident that their children are more likely to survive, and may choose to have fewer births, thereby contributing to better family planning and population control, limited population growth, and reduced developmental challenges. In this way, reduced infant mortality can become an important vehicle for achieving sustainable population control. It is also a humane thing for Ethiopia to do to the best of its capacity as it limits the deaths of precious infant and child lives.

Additionally, reduced infant mortality is associated with:

- i. *Enhanced social cohesion and improved maternal health:* Reduced infant mortality improves maternal healthcare by limiting a scenario called “replacement fertility” whereby families try to replace a deceased infant or child thereby exposing the once-again-pregnant mother to face the risks of complicated childbirth. Moreover, lower infant mortality is associated with improved social indicators, including increased literacy and gender equality. This means that families are more likely to invest in the education of their children when they see higher chances of survival. This, in turn, can positively impact Ethiopia’s social development. It is also worth noting that the emotional and psychological toll of losing an infant or child can lead to stress and unrest. Conversely, lower infant mortality fosters a sense of well-being and optimism for mothers, families, and communities.
- ii. *Increased life expectancy and a healthy workforce:* At the base of life expectancy calculations (formula) is the level of early age mortality, which strongly correlates with overall life expectancy. Low infant and child mortality and a longer life expectancy means that Ethiopians will be productive economically and socially for a more extended period and this can positively impact the country's human capital and overall development. Moreover, with reduced infant mortality, more children survive into adulthood ensuring a larger, healthier workforce in the future. A healthier population is generally more productive and can contribute more effectively to the country's economic and social development.

### **4. Planned urbanization that matches Vietnam’s current urban population ratio of 50+ percent.**

#### **Why is this important?**

Planned urbanization can be utilized as a tool for population control, being mindful of ethical considerations and respect for individual rights in the application of population redistribution strategies. While rapid urbanization

can be associated with changes in demographic patterns including reductions in population growth rates from rural highs to urban lows, planned urbanization is not typically implemented as a direct population control measure.

Here are ways in which planned urbanization can influence population control:

- i. *Educational awareness and better access to family planning services:* Planned urbanization provides areas with better access to healthcare and family planning services, education, and contraceptives, thereby empowering Ethiopians to make informed decisions about family size and spacing. Moreover, urban educational infrastructures foster initiatives to raise awareness about the benefits of smaller family sizes, reproductive health, and responsible parenting. In this way, heightened educational awareness can empower individuals to make choices that align with personal goals and societal needs.
- ii. *Quality of life factors and community engagement:* Urban communities engaged in the planning and decision-making processes can achieve more effective population control through understanding of local values, beliefs, and preferences, and by tailoring those toward strategies that are culturally sensitive and acceptable. Individuals and communities may opt for smaller family sizes to maintain higher standards of living as Ethiopian towns and cities become more attractive places to live in with improved services, developed infrastructure, and enhanced quality of life.
- iii. *Better urban housing and employment opportunities:* Well-planned urbanization involving existing and new cities and towns will offer more diverse employment opportunities, particularly for Ethiopian women who will have increased access to educational opportunities helping them delay marriage and childbirth thereby contributing to lower birth rates.
- iv. *Incentives and Disincentives:* Planned urbanization involving Ethiopia's existing or new cities and towns could include incentives for smaller families or disincentives for larger ones in the form of tax credits, access to better education or healthcare, or other social and economic perks that encourage family planning.

## References

- 1: Cuning, David, The Causes and Consequences of the Demographic Transition, Population Studies, 65, No. 3, 353-361, 2011  
<https://dash.harvard.edu/bitstream/handle/1/33730183/6431162.pdf?sequence=1&isAllowed=y>
- 2: United states Bureau of the Census, Population Reference Bureau, <https://www.prb.org/demographic-dividend-factsheet/>
3. [http://www.demographicdividend.org/country\\_highlights/ethiopia/](http://www.demographicdividend.org/country_highlights/ethiopia/)
- 4: <https://www.prb.org/harnessing-the-demographic-dividend-in-ethiopia/>

- 4: Financial Times, Interview with Ethiopia's Prime Minister Meles Zenawi.  
<https://www.ft.com/content/bec150c2-738d-11dd-8a66-0000779fd18c>
- 6: Central statistical Authority and ORC Macro, Ethiopia Demographic and Health Survey, 2000, May 2001, Addis Ababa Ethiopia and Calverton Maryland, USA, <https://dhsprogram.com/publications/publication-FR118-DHS-Final-Reports.cfm>
- 7: Central statistical Authority and ORC Macro, Ethiopia Demographic and Health Survey, 2005, September 2006, Addis Ababa Ethiopia and Calverton Maryland, USA,  
<https://www.dhsprogram.com/publications/publication-FR179-DHS-Final-Reports.cfm>
- 8: Central statistical Authority and ORC Macro, Ethiopia Demographic and Health Survey, 2011, March 2012, Addis Ababa Ethiopia and Calverton Maryland, USA, <https://www.dhsprogram.com/publications/publication-fr255-dhs-final-reports.cfm>
- 9: Central Statistical Authority and ORC Macro, Ethiopia Demographic and Health Survey, 2016, May 2017, Addis Ababa Ethiopia and Calverton Maryland, USA, <https://www.dhsprogram.com/publications/publication-fr255-dhs-final-reports.cfm>
10. World Bank, Ethiopia: Urbanization Review. Urban Institutions for Middle Income Ethiopia.  
<https://openknowledge.worldbank.org/bitstream/handle/10986/22979/Ethiopia000Urb0ddle0income0Ethiopia.pdf?sequence=1&isAllowed=y>
11. The Open University. Urbanization in Ethiopia  
<https://www.open.edu/openlearncreate/mod/oucontent/view.php?id=79940&section=3.2>
12. Birhanu K.T. et.al., Urban Expansion in Ethiopia from 1987 to 2017: Characteristics, Spatial Patterns, and Driving Forces, MDPI, sustainability, 11, 2973; doi:10.3390/su11102973, 2019, <https://www.mdpi.com>
13. Tegegne G.E and Edlam A. Y., Urbanization and Industrial Development in Ethiopia, The Oxford Handbook of the Ethiopian Economy Edited by Fantu Cheru, Christopher Cramer, and Arkebe Oqubay. 2019.  
<https://www.oxfordhandbooks.com/view/10.1093/oxfordhb/9780198814986.001.0001/oxfordhb-9780198814986-e-40#oxfordhb-9780198814986-e-40-div1-296>
14. <https://www.spiegel.de/international/tomorrow/ethiopia-plans-to-build-8000-new-cities-in-countryside-a-1197153.html>
15. The World Bank Group, Addis Ababa, Ethiopia, Enhancing Urban Resilience. City Strength, Resilient Cities Program, 2015  
<http://documents.worldbank.org/curated/en/559781468196153638/pdf/Addis-Ababa-Enhancing-Urban-Resilience-city-strength-resilient-cities-program.pdf>
16. FAO., Ethiopia at a Glance: <http://www.fao.org/ethiopia/fao-in-ethiopia/ethiopia-at-a-glance/en/>
17. FAO, Small Family farms: Country Fact Sheet. <http://www.fao.org/3/i8911en/I8911EN.pdf>
18. CARE, Achieving Food and Nutrition Security in Ethiopia, Findings from the CARE Learning Tour to Ethiopia,  
[https://www.care.org/sites/default/files/documents/Ethiopia\\_Trip\\_reportv3.pdf](https://www.care.org/sites/default/files/documents/Ethiopia_Trip_reportv3.pdf)
19. Environmental Policy of Ethiopia. The Resource Base and the Need for a Policy.  
[https://thereddesk.org/sites/default/files/environment\\_policy\\_of\\_ethiopia\\_1.pdf](https://thereddesk.org/sites/default/files/environment_policy_of_ethiopia_1.pdf)
20. USAID, Ethiopia, Environment. <https://www.usaid.gov/ethiopia/environment>
21. United Nations, WHO, Africa Health Observatory,  
[http://www.aho.afro.who.int/profiles\\_information/index.php/Ethiopia:MDG\\_Goal\\_7:\\_Ensure\\_environmental\\_sustainability\\_-\\_Other\\_MDGs](http://www.aho.afro.who.int/profiles_information/index.php/Ethiopia:MDG_Goal_7:_Ensure_environmental_sustainability_-_Other_MDGs)
22. Ben Daley, Environmental Issues in Ethiopia and Links to the Ethiopian Economy. Report produced for produced for Evidence on Demand with the assistance of the UK Department for International Development (DFID), 2015  
<https://pdfs.semanticscholar.org/f0f1/b34af5334a3d4a2b6fdbba6422bf09c0cd29.pdf>

23. Esa, E., Assen, M. & Legass, A. Environ Syst Res, Implications of land use/cover dynamics on soil erosion potential of agricultural watershed, northwestern highlands of Ethiopia, Environmental Systems Research, volume 7, Article number: 21 (2018), <https://doi.org/10.1186/s40068-018-0122-0>
24. Land Degradation in Ethiopia: Its Extent and Impact. Commissioned by the GM with WB support, Unpublished report, 2003. [www.fao.org/agl/agll/ladadocs/ETHIOPIA\\_LD\\_CASE\\_STUDIES](http://www.fao.org/agl/agll/ladadocs/ETHIOPIA_LD_CASE_STUDIES)
25. Government of the Federal Democratic Republic Of Ethiopia: Ethiopia's Fifth National Report to the Convention on Biological Diversity Ethiopian Biodiversity Institute. Addis Ababa, Ethiopia, 2014. <https://www.cbd.int/doc/world/et/et-nr-05-en.pdf>
26. WHO, Africa Health Observatory. Ethiopia: Analytical summary - The physical environment. [http://www.who.int/profiles/information/index.php/Ethiopia:Analytical\\_summary\\_-\\_The\\_physical\\_environment](http://www.who.int/profiles/information/index.php/Ethiopia:Analytical_summary_-_The_physical_environment)
27. Power Africa in Ethiopia. Ethiopia Energy Sector Overview [https://www.usaid.gov/sites/default/files/documents/1860/EthiopiaCountryFactSheet\\_2016.09%20FINAL\\_0.pdf](https://www.usaid.gov/sites/default/files/documents/1860/EthiopiaCountryFactSheet_2016.09%20FINAL_0.pdf)
28. Samson Tsegaye, Highlights of the Ethiopian Energy Sector, Solar Energy Foundation, 2016. <https://sustainabledevelopment.un.org/content/documents/21986Ethiopia.pdf>
29. PV magazine. Kenya's 2022 universal electrification goal bets on off-grid solar. <https://www.pv-magazine.com/2018/12/07/kenyas-2022-universal-electrification-goal-bets-on-off-grid-solar/>
30. The World Bank. Ethiopia's Transformational Approach to Universal Electrification <https://www.worldbank.org/en/news/feature/2018/03/08/ethiopias-transformational-approach-to-universal-electrification>
31. Engineering.com, Could Ethiopia Become Africa's Manufacturing Hub? <https://www.engineering.com/AdvancedManufacturing/ArticleID/12842/Could-Ethiopia-Become-Africas-Manufacturing-Hub.aspx>
32. International Labor Organization, ILOSTAT [https://www.ilo.org/ilostat/faces/oracle/webcenter/portalapp/pagehierarchy/Page21.jspx;ILOSTATCOOKIE=iv9O7RqnQgLDLHPPsYrelS2MH03j-zECpwnn12fXHK6Pe--L57wA!-1162039553?\\_afLoop=245295733907072&\\_afWindowMode=0&\\_afWindowId=null#!%40%40%3F\\_afWindowId%3Dnull%26\\_afLoop%3D245295733907072%26\\_afWindowMode%3D0%26\\_adf.ctrl-state%3D82jlu8rjd\\_4](https://www.ilo.org/ilostat/faces/oracle/webcenter/portalapp/pagehierarchy/Page21.jspx;ILOSTATCOOKIE=iv9O7RqnQgLDLHPPsYrelS2MH03j-zECpwnn12fXHK6Pe--L57wA!-1162039553?_afLoop=245295733907072&_afWindowMode=0&_afWindowId=null#!%40%40%3F_afWindowId%3Dnull%26_afLoop%3D245295733907072%26_afWindowMode%3D0%26_adf.ctrl-state%3D82jlu8rjd_4)
33. Advanced Manufacturing Techniques Among U.S. Middle Market Manufacturers. A Report from the National Center for the Middle Market and the National Association of Manufacturers [https://www.middlemarketcenter.org/Media/Documents/advanced-manufacturing-techniques-among-us-middle-market-manufacturers\\_advanced\\_manufacturing\\_report.pdf](https://www.middlemarketcenter.org/Media/Documents/advanced-manufacturing-techniques-among-us-middle-market-manufacturers_advanced_manufacturing_report.pdf)
34. Federal Negarit Gazeta, of the Federal Democratic Republic of Ethiopia, 12<sup>th</sup> Year, Number 1, 2005. <https://www.refworld.org/pdfid/4ba7a4b62.pdf>
35. Research and Markets. African Transport Network Projects, 2019 - \$430.3Bn Investment Value, with Focus on Road, Railway and Bridges, 2019. <https://www.globenewswire.com/news-release/2019/07/09/1879924/0/en/African-Transport-Network-Projects-2019-430-3Bn-Investment-Value-with-Focus-on-Road-Railway-and-Bridges.html>
36. Federal Democratic Republic of Ethiopia, Growth and Transformation Plan II (GTP II), (2015/16-2019/20), Volume I: Main Text, National Planning Commission, 2016, Addis Ababa <https://europa.eu/capacity4dev/file/30510/download?token=efsF8UiP>
37. United Nations Conference on Trade and Development, UNECTAD, The Djibouti City – Addis Ababa, Transit and Transport Corridor, Turning Diagnostics, Into Action, 2018 [https://unctad.org/en/PublicationsLibrary/aldc2018d6\\_en.pdf](https://unctad.org/en/PublicationsLibrary/aldc2018d6_en.pdf)
38. The Federal Democratic Republic of Ethiopia, Ministry of Transport, Ethiopian Roads Authority. Road Sector Development Program 19 Years Performance Assessment. Addis Ababa, 2016.

<http://www.era.gov.et/documents/10157/37f7faf1-4614-4abb-8be4-2146ffadfe27>

39. Lumen. Introduction to Sociology.

<https://courses.lumenlearning.com/sociology/chapter/types-of-societies/>

40. EFDRE, The National Information and Communication Technology (ICT) Policy and Strategy, Final Draft, Addis Ababa, 2016

<http://www.mcit.gov.et/documents/20181/22562/The+National+Information+and++Communication+Technolo+gy++%28ICT%29+Policy+and+Strategy/45d74e1f-6eff-4607-bba9-342462a7be13>

41. World Health Organization. Human Rights and Health: Key Facts.

<https://www.who.int/news-room/fact-sheets/detail/human-rights-and-health>

42. Federal Democratic Republic of Ethiopia, Ministry of Health, Health Sector Transformation Plan (HSTP), 2015/16 - 2019/20, 2015.

[https://www.globalfinancingfacility.org/sites/gff\\_new/files/Ethiopia-health-system-transformation-plan.pdf](https://www.globalfinancingfacility.org/sites/gff_new/files/Ethiopia-health-system-transformation-plan.pdf)

43. US Department of Education, Science, Technology, Engineering, and Math.

<https://www.ed.gov/stem>

44. The Federal Democratic Republic of Ethiopia National Science, Technology and Innovation Policy: Building Competitiveness through Innovation, Addis Ababa, 2010

<https://chilot.me/wp-content/uploads/2011/08/national-science-technology-and-innovation-policy.pdf>

45. United Nations, World Population Prospects, 2019

<https://population.un.org/wpp/Download/Standard/Population/>

46. Transitional Government of Ethiopia, Office Of The Population And Housing Census, Commission The 1984 Population and Housing Census, of Ethiopia Analytical Report at National Level, Addis Ababa, 1991

[https://international.ipums.org/international/resources/enum\\_materials\\_pdf/source\\_doc\\_et1984a.pdf](https://international.ipums.org/international/resources/enum_materials_pdf/source_doc_et1984a.pdf)

47. Federal Democratic Republic of Ethiopia (FDRE). (1995). Central Statistical Authority (CSA), The 1994 Population and Housing Census of Ethiopia, Results for the Amhara Region, Volume II, Analytical Report

48. Aynalem Adugna and Helmut Kloos and Terefe Degefa. Evaluation of the 2007 Ethiopian Census Data, with an Emphasis on Coverage in the Amhara Region. Ethiopian Journal of Development Research, Vol. 36, Number 1, 2014

49. Assefa H.M. Tekleab M. and Misganaw F., Family Planning in Ethiopia, In Kloos, H, Berhane Y. and Hailemariam D (eds). The Ecology of Health and Diseases in Ethiopia. 2nd ed. Shama Publishers, Addis Ababa, ER 2005.

[https://www.researchgate.net/publication/272172840\\_Family\\_Planning\\_in\\_Ethiopia\\_In\\_Kloos\\_H\\_Berhane\\_Y\\_and\\_Hailemariam\\_D\\_eds\\_The\\_Ecology\\_of\\_Health\\_and\\_Diseases\\_in\\_Ethiopia\\_2nd\\_ed\\_Shama\\_Publishers\\_Ad dis\\_Ababa](https://www.researchgate.net/publication/272172840_Family_Planning_in_Ethiopia_In_Kloos_H_Berhane_Y_and_Hailemariam_D_eds_The_Ecology_of_Health_and_Diseases_in_Ethiopia_2nd_ed_Shama_Publishers_Ad dis_Ababa)

50. The World Bank. The World Bank in Vietnam

<https://www.worldbank.org/en/country/vietnam/overview>

51. The Guardian. Homeless children struggle to survive on the streets of Ethiopia's capital

<https://www.theguardian.com/global-development/2019/jan/07/homeless-children-struggle-to-survive-on-streets-of-ethiopia-capital-addis-ababa>

52. PopEd Blog. Population Potential Explained.

<https://populationeducation.org/population-momentum-explained/>

53. Aynalem A. Population Density Map of Weredas, 2007 Census, 2016

<http://www.arcgis.com/home/webmap/viewer.html?webmap=de8f5c12764b47cdbc6333aa93d79ad1>

54. Aynalem A. Map of Ethiopian Demography and Health, 2017

[http://www.ethiodemographyandhealth.org/Regional\\_Demography\\_AndHealth.pdf](http://www.ethiodemographyandhealth.org/Regional_Demography_AndHealth.pdf)

<http://www.arcgis.com/home/webmap/viewer.html?webmap=6f5f8f518efc48278fede7c31c3f43e6>

55. The National Population Policy of Ethiopia

[http://www.phe-ethiopia.org/pdf/Population\\_Policy\\_of\\_Ethiopia.pdf](http://www.phe-ethiopia.org/pdf/Population_Policy_of_Ethiopia.pdf)