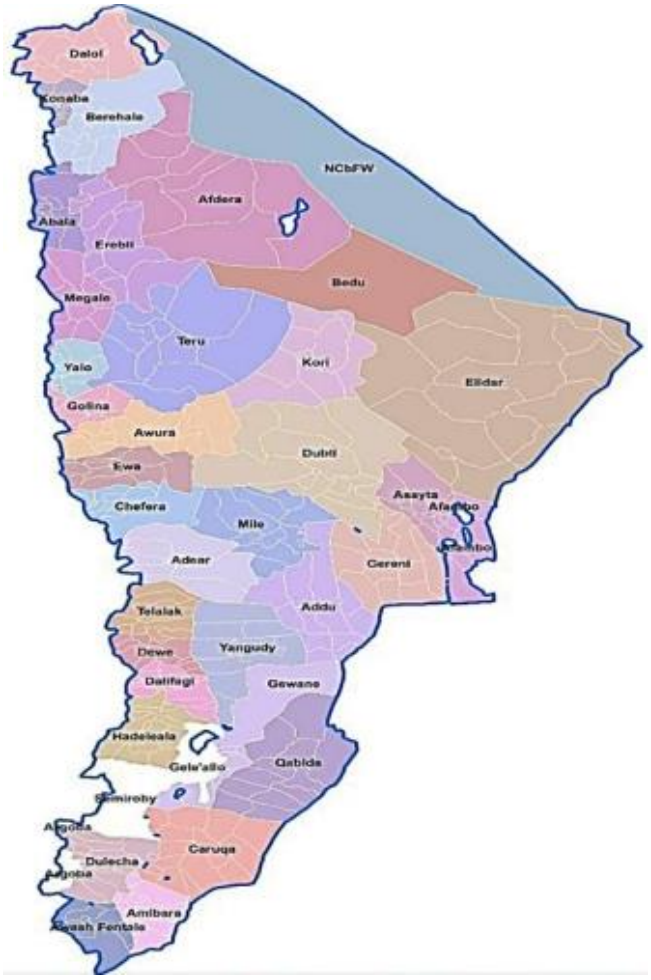
Socioeconomic Development in Afar Region

Achievements, Gaps, and Priorities



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Ethiopian Economics Association

Ethiopian Economic Policy Research Institute (EEPRI)
Socioeconomic Development in Afar Region
Achievements, Gaps, and Priorities

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Foreword

The Ethiopian Economics Association (EEA) is a non-profit, non-partisan and independent professional association established in 1991 with the primary aim of promoting development of the economics profession, contributing to policy formulation and implementation process of Ethiopia through research, training and capacity strengthening, public dialogue forums and publications, and publicity activities. The EEA has been actively involved in economic research and training, organizing international and national conferences, and round table discussions, and disseminating knowledge through various publications.

Ethiopia is committed to realize the Sustainable Development Goals (SDGs) to end extreme poverty and hunger in all its forms by 2030. It has also set targets and other related commitments of attaining the Low-middle-income status by 2025 and to realize the 2063 agenda of the African Union. However, the country is lagging behind in terms of some key socioeconomic and development indicators.

Our population has grown steadily, with significantly increasing urbanization and proportion of people now living in urban areas. Our economy is becoming increasingly interconnected and globalized. However, Ethiopia and its regional states have not witnessed sustained socioeconomic growth and development as part of the new globalized economy. Regardless of the various opportunities arising from globalization and technological advancement, Ethiopia is rather challenged by multiple constraints and obstacles in its effort to realize economic welfare and development.

Development is multidimensional covering multiple dimensions measured by different indicators such as income and consumption expenditure, economic growth, education, livelihoods, health, access to basic facilities, equity, freedom, gender equality, good governance, peace, justice and human rights, participation, self-determination, and sustainability, to mention a few. This research report investigates and measures some of the most important socioeconomic development indicators, evaluates their achievement levels, and identifies gaps and priorities for designing evidence-based policy-making and implementation in Afar National Regional State.

For various reasons investigated in this study, Ethiopia in general, and Afar regional state, in particular, is not ensuring growth, development, and welfare as much as expected. The country and its regional states are repeatedly shocked by recurrent droughts, and have recently experienced increasing and

intractable conflicts and instability, leading to greater population displacement. Agricultural productivity, food production, and natural resources have been adversely affected by climate change and variability with significant impact on food systems and rural livelihoods. Human, natural and financial resource constraints coupled with leadership capacity and governance problems have diluted effects of development efforts designed to achieve multidimensional welfare in Afar region.

To curve such development challenges and to realize multidimensional welfare and equity to the population, the Region has designed and implemented several and consecutive development policies and strategies in the last couple of decades. However, development planning presumes identifications of available resource bases, capacities, constraints, opportunities, and gaps in the context of available regional, national and global shocks and trends. In line with this, the Ethiopian Economic Policy Research Institute (EEPRI) of the Ethiopian Economics Association (EEA) has undertaken different studies aiming at supporting regional states and federal institutions in their effort to design and implement policy interventions requiring scientific evidence suitable to policy-making and implementation.

This research report is expected to help the Region in designing and implementing a vibrant and evidence-based socioeconomic development policies and short-term and long-term development plans for realization of the overriding development needs. It particularly enables to realize targeted and effective policy interventions in all aspects of socioeconomic development, including agricultural and pastoral development, health and education, industrial development, good governance, and access to basic facilities in the Region. The report will also serve as a benchmark for undertaking other research activities and designing socioeconomic development interventions in other regional states and institutions in Ethiopia.

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A number of institutions and people have played key roles throughout the development of this study. The Ethiopian Economics Association (EEA) would particularly like to acknowledge the Bureau of Finance and Economic Development (BoFED) of the Afar Regional State for its unreserved effort to successful completion of this study. The EEA is also grateful to Mr. Mohammed Hassen (Head of the BoFED) and Mr. Sualih Seid for their unreserved effort to initiate and design this study. The EEA acknowledges the support form facilitators of the study in various sectors of the Region (Mr. Ousman Ebrahim and Mussa Dersa) for their substantial contribution in supporting data collection required for the study.

Respondents from different administrative zones, woredas, and representatives of various social groups (religious, youth and women, civic societies, etc.) are also much appreciated by the EEA for their contribution in giving real and relevant data. The EEA is also grateful to the research team undertaking this study and devoting their scientific and professional expertise to successfully complete the study with the required quality standards. The EEA would also like to extend its gratitude to other staff members actively involved in supporting effectiveness of this study project.

Acronyms and Abbreviations

AF	Alkire-Foster
CAHWS	Community Animal Health Workers
CSA	Central Statistical Agency
DAP	Di-Ammonium Phosphate
Das	Development Agents
DASP	Distributive Analysis Stata package
DFID	British Department for International Development
DHS	Demographic and Health Survey
EEPRI	Ethiopian Economic Policy Research Institute
EVI	Enhanced Vegetation Index
FAO	Food and Agricultural Organization
FGDs	Focus Group Discussions
FTCs	Farmers Training Centers
GDP	Gross Domestic Product
GTP	Growth and Transformation Plan
KIIs	Key Informant Interviews
LSMS	Living Standards Measurement Study
LVI	Livelihood Vulnerability Index
MII	Multidimensional Inequality Index
MoARD	Ministry of Agriculture and Rural Development
MPI	Multidimensional Poverty Index
OPHI	Oxford Poverty and Human Development Initiative
PASDEP	Plan for Accelerated and Sustained Development to End Poverty
PCA	Principal Component Analysis
PIPs	Policies, Institutions and Processes
RBoFED	Regional Bureau of Finance and Economic Development
SDGs	Sustainable Development Goals
SDPRP	Sustainable Development and Poverty Reduction Program
SLA	Sustainable Livelihood Approach
SLF	Sustainable Livelihood Framework
UNDP	United Nations Development Program
USAID	United State Agency for International Development
USD	United States Dollar

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Executive Summary

Background

Since 2002, the Federal Democratic Republic of Ethiopia has embarked on implementation of successive development plans that have focused on addressing macroeconomic developmental concerns in multidimensional perspectives. Despite its remarkable and fast economic growth and development overall, the country's development effort has also been adversely affected by social, cultural, economic and environmental constraints.

Policies and development strategies designed at national level are expected to be adopted across all regional states within the country with the existing socioeconomic contexts. The Afar Regional State has been playing its role in terms of implementing these development policies, strategies, and programs in the context of the pastoral and agro-pastoral societies predominant in the region. It has been working on improving the livelihoods of pastoralists and agro-pastoralists throughout the region covering key sectors including education, health, infrastructure, revenue, and women and youth affairs. It has also been trying to build up institutional capacities at different administrative levels of the region.

The major objective of this study is to assess the achievements of the region and the gaps in its socio-economic development efforts as well as identify development priority areas for future strategic planning and policy interventions. Despite its huge natural, physical and human capital resources, the region has remained one of the least developed, food insecure, and impoverished regions of the country. There has been little investigation of this paradox, making it necessary to begin by undertaking an assessment of the resource base, livelihoods and strategies, major achievements, development priorities, and trends and gaps at different levels. These can help the region to draw lessons for the formulation of regional strategies to improve the livelihoods of pastoralists and agro-pastoralists for future planning. It will also help to identify priority areas for the Federal Government's support and generate new and reliable empirical evidence on the intervention options required to establish durable and sustainable socio-economic development in the region.

Methodology

Based on the nature of the study area, this study has employed two basic and relevant conceptual frameworks: The Sustainable Livelihood Framework (SLF) and the Multidimensional Welfare Analytical Framework. Both primary and secondary data were obtained from various sources. Primary data was collected using five Focus Group Discussions (FGDs) and 90 Key Informant Interviews (KIIs), selected across all zones in the regional state. In addition, field surveys and observations were undertaken to understand current livelihood patterns and distributions, and socio-economic development achievements. The secondary data required for the study were gathered from published and unpublished official sources including the third wave of Living Standards Measurement Study (LSMS) on Ethiopia. Using the SLF, various methods of data analysis, including valuation of livelihood capitals and resource base, and asset indices were computed. In measuring multidimensional welfare, the Alkire-Foster (AF) methodological analysis was used; to estimate multidimensional inequality (MI) and identify its possible sources of inequality, the Araar MI index was utilized.

Key Findings

The major findings of this study are summarized here under separate categories.

Regional status

1. Because of its hot climatic conditions, the density of the population is relatively sparse; 69% of the land area has a population density of less than 50 persons per square kilometer, compared to a national average of 19.1%.
2. Only 42.3% of the population are literate, 13.6% lower than the country as a whole. Households in the Afar region have relatively larger size than elsewhere.
3. There are only three agro-ecological zones in the Afar region and the majority of households reside in the arid (48%) and semi-arid (49%) zones where pastoralism is the only livelihood option; only 3.3% live in the warm semiarid zone where there is sufficient irrigation water from Awash River to boost crop production to ensure food supply in the Region and in the country at large.

4. The mean annual temperature is far higher (27 degree Celsius) and annual precipitation very low compared to the national average. Overall elevation (628.8 m above sea level) and climate means the annual mean rainfall (423.6 mm) less than half the national average (858 mm).
5. Land cover or vegetation in Afar region is either non-existent or very low compared to the national average. Wide areas are primarily covered by shrubs (36%) or open or close to open land where pastoralism is widely practiced in search of pasture for livestock.
6. Topography of the areas where households reside is dominated by mid-altitude plains (52%), with limited high-altitude plains (19%), or low plateau (15%). These plains are suitable for irrigated agriculture if access to irrigation water is secured.
7. The Afar region is dominated by vertisol, characterized by dominant soil-forming processes including cracking and mass movement of materials due to shrinkage and swelling of clay during dry/wet cycles, causing expansion and contraction. Its poor water retention capacity, coupled with recurrent droughts and erratic rainfall are a major constraint for the 63% of households which reside in these areas.
8. If there is sufficient irrigation water, the soil quality in Afar region is predominantly good (as validated by 68.5% of the households) compared to national average soil quality (50% fair). Irrigation agriculture is the primary option for crop production in such areas.
9. Evaluation of the major soil constraints (related nutrient availability, nutrient retention capacity, rooting condition of plants, oxygen availability to plants, excess salts, soil toxicity, and workability of soils) indicate the prevalence of many soil constraints for crop and livestock production in the region. Crop production with or without irrigation water requires measures of soil treatment and improved soil management practices.
10. Cattle, shoats and camel are the major livestock holdings. There are about 1.5 million cattle and 0.11 million camels owned by 160 and 78 thousand households, respectively. These are the largest in the country next to those of South Omo area and Somali region. On average, livestock holding per household in the Afar region is 6.8 cattle, 15 goats, nine sheep, and 2.2 camel, far higher than the national averages (3.6 cattle, 3 goats, 2.3 sheep and 0.3 camels).

11. The physical appearance of the land is an important natural factor determining relevance of agricultural production. Croplands in the Afar region, largely, are flat (91%) compared to the whole country (56%). The proportion of irrigated cropland is about 50.5%.
12. Use of chemical fertilizer by farm households is 14%, which is four times lower than the national estimate. The use of other inputs for crop production is also very low.
13. There are multiple causes of crop damage most related to agro-climatic conditions. The level of crop damage in the Afar region is about 73.7% of the potential output, far higher than national estimates (48%). Crops in Afar region can also be damaged by shortage of rain with incidences of drought (88.4%), significantly higher than incidence at the national level (61%).

Livelihoods

14. Results of livelihood analysis show that all the five livelihood assets are relevant in the Region. Human capital is relatively most important followed by natural and physical capita. Financial capital was the least important in the region.
15. All livelihood capitals have moderate importance (index below 0.4-0.6) and with the exception of physical capital, there was no significant difference in the importance of livelihoods among the different zones of the region.
16. There are limited livelihood assets and capabilities evaluated for their role and importance in contributing to the livelihood of the population. These include camels, shoats, information, communal land, cattle, education, and use rights to land. Others have low or very low importance in forming the livelihood of the population, indicating the region has a very limited range of livelihoods, making it difficult to establish sustainable and resilient livelihoods.
17. The importance of livelihood assets in the region shows the overall role of livelihood capitals is 0.52, suggesting that the overall importance of livelihood capitals is below moderate (0.60). As the least important livelihood capital is financial capital, it indicates that financial income and related sources of livelihoods are limited.

Sustainability and vulnerability of livelihoods

18. Sustainability of livelihood capitals aggregated from all livelihood assets, capabilities and activities do not significantly vary across administrative zones. Almost all livelihood capitals are not sustainable (below 0.5 index), with human and financial capitals being the most unsuitable livelihood capitals for the region.
19. About 27 potential sources of vulnerability of livelihood assets were evaluated by respondents, indicating the intensity of prevalence of all sources of livelihood vulnerability occurred often (index above 0.67). The top five important sources of vulnerability in the region were price/inflation, drought, increasing temperature, scarcity of water, and human disease. All the five livelihood capitals were found to be vulnerable or moderately vulnerable to various trends, shocks and seasonal changes (LVI > 0.5), physical capital being the first (LVI=0.61). The overall vulnerability of livelihoods in the region was about 0.56, with the level of vulnerability of physical capitals being relatively higher, followed by natural and human capitals. The top six vulnerable assets in the region were camels, cattle, and shoats, transport and health services, and food.

Livelihood and coping strategies

20. The most widely adopted coping strategy for securing livelihoods in Afar region is local conflict resolution mechanism (index=0.77=high). Coping strategies with a moderate role include local institutions, collective action and water harvesting. Due to the harsh agro-ecology, the adoption of irrigation farming, livelihood diversification, and suitable marketing strategies for livestock and crop products, could have particular importance to secure livelihoods in the region.
21. Pastoralism and goat production are relatively the most widely adopted livelihood strategies while camel and sheep production are the other preferred options. Other means of livelihood including nonfarm activities, sedentary farming, trade business and wage from employment, are rarely practiced. The region needs to give due focus to create nonfarm employment opportunities, decide on the optimal choice between sedentary/mixed farming and pastoralism, and the creation of other business activities.
22. There are no wider options or strong linkages of livelihood strategies pursued in the region. Complementary strategies include pastoralism for

livestock production including camels (0.48), goats (0.34), and sheep (weak). There is a strong case to widen livelihood options by enhancing nonfarm activities, trade, business, and employment opportunities.

Livelihood outcomes

23. Evaluation of 17 suggested positive livelihood outcomes of socio-economic development interventions in the last five years show dissatisfaction with their negligible livelihood impacts. A majority of respondents did not agree on any positive impact from interventions related to housing, equity, or natural resource utilization, though those relating to good governance, road and communication infrastructure, health, employment, peace and order, and education, were perceived to have had a positive livelihood impact.
24. The top five indicators evaluated for their improved livelihood outcomes were income, financial services, equity (distribution), public services, and housing. With the exception of peace and order, socio-economic development interventions were evaluated to have a low level of livelihood outcomes on all indicators. The results generally suggest that socio-economic development interventions in the region produced low or unsatisfactory livelihood outcomes in many aspects.

Performance of sectors

25. Except for peace and security (with high performance), all the sectors produced low and/or very low performance (index below 0.6) over the last five years. The top five sectors with moderate performance (index between 0.4 and 0.6) were peace and security, education, health, agricultural and pastoral development, and women and children. Investment and development of natural resources had exceptionally low performance (index below 0.4).
26. The top five challenges and constraints adversely affecting the success of socio-economic development in the region were corruption (high), shortage of appropriate technology, budget constraints, shortage of capital, inflation, and drought.

Living condition

27. The population in the Afar region had relatively low access to major services and facilities. They were particularly and relatively poorer in accessing urban centers, safe drinking water, sanitation facilities, and human and veterinary health/medical services.
28. Ethiopia is very poor in housing and related facilities, but the Afar region is particularly poor in terms of quality of housing. About 73% of the population lived in private housing of very poor quality. The greatest proportion lived in houses made of poor materials (91%) like wood and mud (32.5%), wood and thatch (27.6%), and other materials (30.7%). These were far higher than the national averages. Only a small proportion of the population (2.4%) lived in houses made of stone and cement (1.5%) or blocks (0.9%).
29. Floors of houses in Ethiopia are generally of very poor materials like mud and/or dung, but nearly all house floors in the region were of exceptionally poor materials. Only a very small proportion of the population lived in houses with floors of quality materials (like cement).
30. A very low proportion of the regional population lived in roofs of houses made of corrugated iron sheets (46%), far below the national average (67%). The majority lived under roofs of thatch (7.5%), wood and mud (18.5%), plastic canvas (9.3%), or other poor materials (18.9%).
31. On average, about 66.6% of the population lived in a single room, regardless of the relatively higher average household size (6.3 in Afar; 5.9 In Ethiopia), compared to 42% for the country as a whole. About 33.1% of the population lived in houses with two rooms. Housing poverty in the region was relatively serious, requiring particular focus and policy intervention designed to improve housing and related living conditions to enable the population to tolerate the harsh climate and weather conditions.
32. The Afar region is better off in terms of energy sources for lighting. About 90% of the population had access to standard sources of lighting including electric meters, solar power, or generators. Access to energy sources for cooking was relatively higher (about 89%) than the national access rate (78%).

Nutrition and child growth

33. Children's access to food and their growth situation in Afar Region was analyzed and compared with the national average in Ethiopia. The average weight of children under five in Afar Region was relatively lower (14.1 kg) than the national average (14.9 kg), though they were nearly similar in height (97.7 cm).
34. The prevalence of stunting of children under five, due to lack of access to nutrition was higher (38.1%) than the national average (32.8%), suggesting that significant proportion of children under the age of five were too short for their age.
35. The percentage of children under five who are underweight in the region was also higher (39.2 %) than the national average (24.7%), indicating that large proportion of children under the age of five were small for their age.

Economic wellbeing

36. Poverty was relatively more prevalent in semi-urban areas of the region. This was different from the poverty situation elsewhere in Ethiopia where semi-urban areas are expected to be relatively better-off compared to their rural counterparts. This clearly suggests the need to design policy interventions to reduce poverty in the small towns of the region where poverty was worse than in rural areas.
37. Poverty incidence in Gabi Rasu of Afar region was far higher than the situation in Awsi Rasu. Indeed, there was substantial difference in the poverty situation across administrative zones of the region. This calls for the need to reduce the spatial poverty differential using relevant policy interventions to ensure equitable growth and redistribution in the region.
38. Both the incidence and depth of monetary poverty were far lower in the Afar region (5.4% and 1.5%) compared to the national average (22.1% and 6%). The spatial distribution of poverty by place of residence was nearly similar across the region, compared to the situation elsewhere in Ethiopia where rural poverty was twice as high as in urban areas.
39. Elasticity of total poverty with respect to average expenditure growth was very high. A unit percentage growth in real consumption expenditure reduces poverty incidence by 4.6% and 10.2% in the rural and semi-urban areas of the region, respectively. This level of elasticity is relatively very high compared to poverty elasticity in Ethiopia (2.45 and 1.5%). The total

regional growth elasticity of poverty is also higher (-5.1%) compared to the national average (-2.2%). This level of poverty elasticity suggests the responsiveness of potential poverty reduction interventions to alleviate poverty in the region.

40. Elasticity of poverty with respect to consumption inequality was also relatively high compared to the national average. A unit percentage growth in inequality increases the total incidence of poverty by about 5.4% and 1.9%, respectively, in rural and urban areas of the region. The elasticity of poverty due to inequality was exceptionally low (1.9%) in urban area of the region, but, overall, poverty was more elastic due to inequality (5.9%) compared to a national average of 4.7%.

Multidimensional deprivation

41. The incidence of deprivation for the 10 indicators of multidimensional deprivation was significantly different. Living conditions of the population related to access to standard sources of cooking fuel (98.5%) and clean floors of housing (96.1%) were the highest levels of deprivation in the Afar region. Deprivation in education (shown by child school attendance and years of schooling) and health (captured by health care and food security) were relatively lower in the region.
42. The mean index of deprivation in schooling was 42%. As expected, deprivation in years of schooling decreased with increasing urbanization from 58.9% in rural areas to 49.4% in urban areas.
43. The mean index of deprivation in school attendance of school-aged children was about 36.8%, suggesting that the great majority of children were not attending school. Deprivation in school attendance unexpectedly increased with increasing urbanization from 30.2% in rural areas to 50.5% in urban centers.
44. The mean index of deprivation in health care of the population was 64.6% suggesting that majority of the population did not consult any medical practitioner within the last year.
45. The mean index of deprivation in food was 29.4% where a significant proportion of the population had faced difficulty in satisfying their food needs, suggesting that their health was adversely affected by food shortage and poor nutrition. Food insecurity significantly increased with increasing

urbanization from rural (24.7%) to urban centers (41.9%). Unlike rural areas, urban centers in Afar region are characterize by food shortage.

46. Absolute poverty, determined by using annual real consumption expenditure per capita, was ETB 14758. The percentage of individuals falling below this absolute poverty line was 5.4% (considered income poor).
47. About 52.4% of the population was deprived of electric light from standard sources where the greatest majority was rural residents (72.2%). There was no deprivation in electricity for the urban population of the region.
48. About 20.1% of the population was deprived of private telephone services; 27.2% was the deprivation rate among rural residents.
49. About 38.2% of the entire population and over half of the rural population (52.7%) were deprived of safe drinking water. There was no deprivation of the urban population for safe drinking water.
50. Proportion of the population living in a house with dirt floor was very high (95.0%). The great majority of the population in the region were house poor, living in houses with unclean floor, rising to 98.5% for the rural population.
51. About 97.7% of the population were poor in terms of sources of cooking fuel. All rural residents (100%) and 91.6% of urban population used poor sources of coking fuel, dung, wood and/or charcoal.

Multidimensional poverty

52. The incidence of multidimensional derivation in the region was 83.4%, but rural residents were relatively highly deprived (96.6%) compared to their urban counterparts (56.3%).
53. About 96% of the population was multidimensionally deprived of the 10 weighted poverty indicators, but the prevalence of multidimensional poverty is increasing with increasing urban growth. Rural areas relatively contributed 72% to the incidence of multidimensional poverty in the region. Because they were on average deprived in terms of 96% of the weighted indicators, the population in the region were deprived in 55% of the total potential deprivations they could experience overall. Like the incidence of multidimensional deprivation, the Multidimensional Poverty Index (MPI) increased with increasing level of urban growth from 52% in rural areas to 63% in urban areas.

54. The incidence of non-monetary poverty, estimated with three non-monetary dimensions of wellbeing (education, health and living condition), was 81.9%, 14% lower than the overall MPI (98%). Similarly, the non-monetary MPI was 55%, which was 16% lower than the overall MPI. Non-monetary MPI was higher in urban areas compared to counterparts in rural areas, indicating that non-monetary poverty was increasing with urban growth. Incidence of monetary poverty was low (5.4%), far lower than the other two multidimensional measures. The results generally suggest that income poverty in Afar region was significantly reduced and relatively lower than other forms of poverty.
55. The contribution of the four dimensions to the total MPI, in order of importance, are income, health, education and living condition with significant and comparable contributions. Education contributed 14.3% and 14.8% to total head count ratio in absolute and relative terms, respectively. This was the third largest contribution (next to health) to incidence of total MPI. Similarly, the relative contribution of education to the total MPI was 16.2%. Compared to child school attendance, years of schooling contributed more to education poverty.
56. Health ranked second in its contribution to total MPI in both absolute and relative terms. It relatively contributed 19.8% to total MP incidence. Similarly, the relative contribution of health to the total MPI was 22.1%. Compared to health care, food insecurity contributed more to health poverty.
57. Over half of the total multidimensional poverty in the Afar region is attributable to consumption poverty. It contributed 52.4% and 46.2% to the incidence and the MPI, respectively.
58. In relative terms, living condition contributed 13% to incidence of MD deprivation and 15.5% to MPI. Access to telephone and safe drinking water had relatively larger contributions to the total MPI, with cooking fuel and flooring contributing relatively lower to poverty.

Multidimensional inequality

59. The relative multidimensional inequality index (MII) in the region is 0.282. MII in the region did not significantly vary by areas of residence (rural-urban). The non-monetary MII, estimated by excluding the income dimension of wellbeing, was 0.152, significantly lower than the overall MII

(0.282). On the other hand, the monetary inequality was 0.248 with little variation by place of residence.

60. The total MII, decomposed to the welfare dimensions, indicate that the primary source of inequality was identified to be income (or real consumption expenditure) with 60.2% contribution to the regional MII. The other three dimensions (education, health and living condition) had nearly comparable contributions to the total MII, respectively, with 14.8%, 14.7% and 10.3% relative contributions. The population of the region is more likely to face equity problems mainly arising from the difference in income or consumption expenditure.
61. The highest source of non-monetary inequality in the region was education (37.8%) followed by health (36.9%) and living condition (25.4%). Non-monetary inequality due to education and health generally decreases with increasing level of urbanization. However, the contribution of living condition to non-monetary MII rather increased with increasing urbanization, suggesting that urbanization in the region was not accompanied by improved basic urban facilities and services.

Agricultural and pastoral development

62. The region is expected to expand animal health facilities together with necessary utilities required for effective functioning of these physical facilities. In terms of distribution of veterinary clinics and health posts, Chifra woreda took the lead followed by Dalol, Dubti, Amibara, Dalifag, and Uwa woredas in that order. Argoba woreda was the least in terms of number of veterinary clinics and animal health posts followed by Bidu woreda.
63. The region needs to work on equitable distribution of animal health-related facilities among its woredas on the basis of available livestock resources, proximity to markets, etc. Furthermore, focus group discussion participants reported that many of the available veterinary clinics and animal health posts were not providing the required functions owing to absence of the required utilities like electricity, water, medical supplies, and the like. It is, therefore, necessary to work on fulfilment of necessary utilities (water, electricity, medical supplies, etc.) required to run the clinics and health posts.

64. Awsi Rasu has relatively a greater number of veterinary clinics and animal health posts followed by Kilbet Rasu and Hari Rasu in that order. Given the fact that the Region in general is known for its livestock population, the available number of veterinary clinics and animal health posts are inadequate.
65. Though the Region is known for its livestock production, crop production is also practiced in some parts of the region. Use of irrigation facilities has been expanding and currently about 10,000 hectares of land are under irrigation. The region is suitable for crop production with irrigation and 22.4% of the total area of the region could be devoted to crop production activity. However, use of improved agricultural inputs such as chemical fertilizer, pesticides, and fungicides remain minimal compared to the national average.
66. In terms of area allocated to crop production, Aba'ala woreda took the lead followed by Aysaita, Afambo, and Argoba woredas. In terms of land allocated to crop production, total production, and number of households using agrochemicals, Awsi Rasu leads, followed by Kilbet Rasu, Gabi Rasu, Hari Rasu and Fantena Rasu in that order.
67. Dubti woreda had the highest number of development agents (Das) followed by Amibara woreda while Chifra took the lead in terms of Community Animal Health Workers (CAHWS) followed by Amibara and Aba'ala woredas. Amibara woreda was in a better position both in terms of the number of CAHWS and of DAs. Woredas like Aba'ala which are reported to have more land allocated to crops, had a smaller number of development agents. This is an indication that revision of the placement of CAHWS and development agents based on livestock and crop coverage may be required. The number of farmers/pastoralists training centers has been increasing over the last decade in the region. However, the number of veterinary clinics has been nearly constant over years.

Education sector development

68. In the last 20 years, expansion of education in the Afar region played a significant role in terms of improving the welfare of the community. Responses from Focus Group Discussions (FGD) revealed that education was the most important sector contributing to better development performance in the region. In connection to education sector development

plans, distribution of primary schools by woreda revealed good progress though more focus was required to assure equity and quality problems.

69. Success in the education sector was underlined by the expansion and distribution of public and private primary schools in the region which also showed improvement in terms of secondary school student enrolment.

70. One caveat was the number of female teachers with first degree qualification - far less than that of male teachers. Another was that the number of preparatory schools in Afar region was much lower than the targets set for the end of the First Growth and Transformation Plan (GTP I) period, though there were, however, subsequent improvements. This was an indication that the regional government had given some attention to expanding preparatory schools.

71. Though overall student enrolment is increasing at primary level, the share of female students' enrolment remains very low with some variation among different woredas and zones. Some show a shortage of primary schools.

Health sector development

72. The top 10 diseases in the region in 2019/20 were acute fever illness (AFI), malaria, pneumonia, diarrhea, acute upper respiratory infection, malaria without laboratory confirmed, typhoid, urinary tract infection, malaria confirmed by lab, and dyspepsia (or indigestion) in that order.

73. In the last 20 years, there has been notable achievement and attention to the health sector by the regional and the federal government. The number of hospitals and health posts have been relatively fairly distributed among the five administrative zones; however, the absence of health professionals, especially for midwifery, is still a serious problem. Other challenges include health facility infrastructure such as beds, access to roads, and shortages of medical supplies, drugs, and equipment.

74. About 24.1% of the health facilities in the region are currently non-functional for various reasons, basically related to the absence of the basic utilities including electricity, water, latrine service, laboratory facilities, etc. More focus is required to fulfil the required facilities for effective functioning of the available health facilities and for expanding new facilities into inaccessible areas.

Budget and expenditure

75. The regional budget has been continuously increasing year to year. When budget allocation among woredas is considered, the highest budget per capita was 3,335 Birr for Awash and the smallest was 614 Birr for Chifra woreda. The per capita budget distribution appears uneven with some woredas better off than others.
76. While no equal budget to population ratio is expected, it is advisable to revisit the formula for budget distribution among the different woredas taking into account population size, relative proximity to basic infrastructure, and available resources. Overall, recurrent and capital expenditures have been increasing from year to year, but expenditures on roads, education, health, and agricultural and rural services have shown little improvement for the past decade.
77. The region should now make significant increases in poverty-targeted expenditures (on health, education, roads, and agriculture) give due focus to developing roads (especially rural roads), agriculture, health, and education infrastructure.

Revenue

78. The region's development is expected to be financed mainly by tax revenue collected from the people. However, the performance of non-tax revenue collected from tourism and hospitality for the period 2010 to 2018 was found to be insignificant; in 2010, for example, amounting to less than 200 million.
79. There has been gradual improvement in revenue generation. In 2018, total revenue reached about 911 million ETB, a significant improvement, but still minimal in comparison with regional expenditure.

1. Introduction

Improving food security and eradicating poverty are among the main elements of the development agenda of Ethiopia, the second most populous country in Africa. The Sustainable Development and Poverty Reduction Program (SDPRP) which extended from 2002/2003 to 2004/2005, the Plan for Accelerated and Sustained Development to End Poverty (PASDEP) from 2005/2006 to 2009/2010, the First Growth and Transformation Plan (GTP I) (2011-2015), and the Second Growth and Transformation Plan (GTP II) (2015-2020) are some of the country's previous development programs and plans centered around improving food security and reducing poverty. Equally, however, the country's development efforts have been confronted with a number of challenges including chronic malnutrition, extreme poverty, rapidly growing and young unemployed urban populations, civil and political conflict, and intensifying droughts (Feed the Future, 2018). While drought and other disasters, such as floods, are significant triggers for shocks, more important are the factors which create and/or increase vulnerability to these shocks and which undermine livelihoods, including land degradation, limited household assets, low levels of technology, lack of employment opportunities and population pressure (MoARD, 2009).

It is important to recognize that amid rapid population growth, climatic and land pressures, commodity price spikes and other challenges, significant progress has been made. There have been improvements in responding to extreme food insecurity (Cochrane and Tamiru, 2016), and aggregate yields have increased substantially (CSA, 2016b). Over the past twenty years or so, Ethiopia has also made significant progress in improving health, nutrition, education, and other human development indicators. Life expectancy has risen dramatically, while the percentage of population living in poverty and hunger has fallen by a third in the decade before 2015 alone (Anderson and Farmer, 2015; Hickel, 2016). The overall incidence of poverty declined from 45.5% in 2000 to 23.5% in 2016, but while the urban headcount poverty declined from 36.9% in 2000 to 14.8% in 2016, rural poverty alone declined from 45.4% to 25.6% in the same period (UNDP, 2018). This provided a clear indication that poverty is predominantly a rural phenomenon in Ethiopia. Equally, though there have been gradual reductions in poverty levels, food shortages are still high. In 2016, 10.36% of households suffered food shortages (CSA, 2016a). Income inequality as measured by the Gini coefficient remained low and stable over the past two

decades at around 30% (UNDP, 2017). Access to universal primary education reached 100%, health coverage 98%, access to potable water 65%, and life expectancy 64.6 years (UNDP, 2018).

Prevalence of undernourishment declined from an average of 39.7% for the years 2004-2006 to 20.6% for years 2016-2018 (FAO et al., 2019) though this still means one person in five is undernourished, an alarming statistic. About 11.4% of the population had access to safely managed drinking water, 41.1% had at least basic drinking water services, and 7.3% basic sanitation services in 2017. The general trend over time showed gradual improvements.

The national literacy rate was 53.32% in 2016. In terms of access to basic services, 32.83%, 14.23%, 52.41, 16.4%, 40.17% of the population were at less than one-kilometer distance from telephone service, post office, drinking water, food market, and all-weather roads respectively in 2016. Likewise, about 11.22%, 10.16%, 17.53%, and 12.30% of the population could access agricultural extension services, veterinary services, a police station, and microfinance services at less than one kilometer in 2016 (CSA, 2016b). In terms of GDP per capita, the value at constant 2011 international price (purchasing power parity) was USD 1617.3 in 2016, USD 1724.5 in 2017, and USD 1794.3 in 2018. Again, the trend showed good improvement.

Levels of the wellbeing of the community are linked with the resource base and asset portfolio at the disposal of households, the community, regions, and the country at large. Because of differences in the resource base, livelihood capabilities, assets, and levels of implementation of strategies set at federal level, aggregate improvements of welfare at national levels might not have trickled down to the regions.

Following the remarkable achievements of the first Growth and Transformation Plan (GTP I) in terms of real GDP growth, infrastructural development, social development and capacity building at all levels, the government of Ethiopia formulated the second GTP (GTP II) covering the period from 2015/16 to 2019/20. GTP II had the aim of serving as a springboard towards realizing the national vision of becoming a low middle-income country by 2025, through sustaining a rapid, broad-based and inclusive economic growth; and to accelerate economic transformation and the journey towards the country's renaissance. Under the auspices of this national plan, regional governments were expected to customize and contextualize the strategies outlined in the GTPII to contribute to regional and national targets. Afar Regional State played its part in

terms of implementing these policies, strategies, and programs in the context of pastoral and agro-pastoral societies that predominate in the region.

The Afar regional state covers about 8.4% of the total geographical area of the country but has less than 2% of the population underlining how sparsely populated it is. However, the region contains about 63.5% of Ethiopia's camel population, 2.9% of the cattle, 13.6% of sheep, 25.6% of goats, and 4.6% of donkeys in 2019 (CSA, 2019b). It is basically pastoral and agro-pastoral, and only contributed 0.07% of the total grain production of the country in 2019 (CSA, 2019a).

The regional government has been working on improving the livelihoods of pastoralists and agro-pastoralists through implementation of various policies, strategies, and programs across all its administrative zones and woredas, covering various areas of intervention including education, health, infrastructure, revenue, and women and youth affairs. It also tried to build up the institutional capacities of the relevant offices at regional, zonal, woreda, and kebele levels. In implementing these and related activities, the region committed resources through the Regional Bureau of Finance and Economic Development with the expectation that livelihoods would ultimately be improved and socio-economic development goals achieved.

Realization of all these expectations requires an assessment of the resource base, livelihoods and strategies, major achievements, development priorities, trends, and gaps at different levels. It is particularly important to help the region draw lessons for the formulation of regional strategies for improving the livelihoods of pastoralists and agro-pastoralists in the future. It would also help to pinpoint focus areas for the federal government to support the region where necessary. In this regard, this study generated new and reliable empirical evidence on the intervention options required to establish durable and sustainable socio-economic development in the region.

The general objective of this study was therefore to assess the major achievements and gaps in socio-economic development endeavors and to identify development priority areas for the region's future strategic plan and policy interventions.

Specific objectives of the study were to:

1. evaluate the resource base and livelihood capabilities, assets, activities and living conditions in the region for possible design and implementation of homegrown economic reform of the country;
2. construct asset indices and identify the priority livelihood assets and asset indicators required to estimate the necessary resource base and asset accumulation;
3. establish sustainable and resilient livelihood strategies for durable socio-economic growth by integrating the four pillars of development (economic, social, institutional and environmental) and provide clear perspectives to conduct sustainable livelihood analysis of the region;
4. identify factors constraining the adaptation of sustainable livelihood strategies and outcomes/ achievements and to recognize the factors that reduce vulnerability of the target population by aligning the resource base, policy focus, and sustainable livelihoods relevant to design appropriate policy interventions; and
5. assess and measure the multidimensional welfare situation in the region.

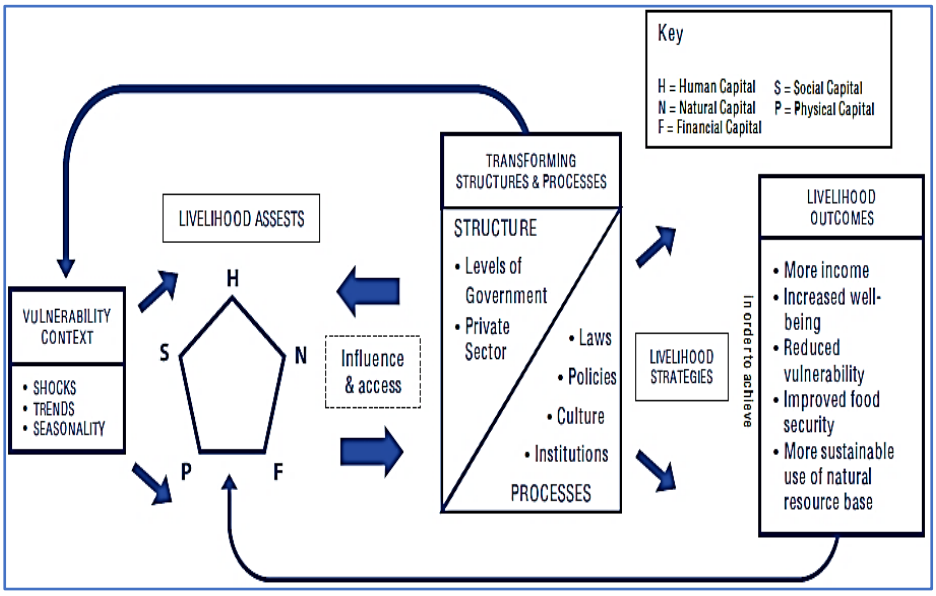
2. Conceptual Frameworks

Afar regional state is one of the merging, major pastoralist regions in Ethiopia. Its 96.7 thousand km2 area is characterized by an arid and semi-arid climate. It has a population of 1.8 million of which 81% are rural residents depending on pastoral and agro-pastoral livelihood systems. Based on the nature of the study area, this study employed two basic frameworks with greatest relevance for socio-economic development analysis: The Sustainable Livelihood Framework (SLF) and the framework of Multidimensional Welfare Analysis.

2.1. Sustainable Livelihood Framework

The British Department for International Development (DFID) defines livelihood as a concept comprising the capabilities, assets and activities required for a means of living. A livelihood is said to be "sustainable when it can cope with and recover from stresses and shocks and maintain or enhance its capabilities and assets both now and in the future, while not undermining the natural resource base" (DFID, 2000). The SLF is presented in Figure 1 below.

Figure 1: Sustainable Livelihood Framework (SLF)



Source: DFID (2000).

Though the DFID sustainable livelihood approach (SLA) is mainly designed to eliminate poverty in poor countries, there are ways of adapting this framework to the specific contexts of countries and objectives based on six core principles: people-centered, holistic, dynamic, building on strengths, macro-micro links, and sustainability.

The first step in the SLA is to investigate the living conditions of the target population through a livelihood analysis and to understand the livelihood options. These will provide the basis for planning, prioritizing, monitoring and evaluation. The second step is to identify any limiting factors which hinder the adaptation of sustainable livelihood strategies and the outcomes or achievements and to recognize the factors that reduce vulnerability.

Though there have been no specific sequence or methods of livelihood analysis developed, the SLF frames the tools or provides checklists to understand and conduct livelihood analysis. It specifies the five main elements of the framework:

1. Vulnerability context framing the external environment in which people exist;
2. Livelihood assets (or strengths/capitals/capabilities/activities) on which livelihoods are built;
3. Policies, institutions, and processes determining access to assets, terms of exchange between assets, and returns to livelihood strategies;
4. Livelihood strategies; and
5. Livelihood outcomes (achievements or outputs of livelihood strategies).

The SLA is a good way of integrating the four pillars of development (economic, social, institutional and environmental) and provides a clear perspective to conduct Sustainable Livelihood Analysis before and after development interventions. However, because the SLA is a holistic approach, it requires a huge amount of primary and secondary data covering different segments of the target population for differentiated livelihood analysis. If some groups of the target population are omitted from the analysis, improvement in the livelihoods of a specific group may result in a negative effect on the livelihoods of others, leading to a dilemma of prioritization.

Generally, the application of SLF to this study has enabled us to generate empirical evidence on, but not limited to, the following development issues in the region:

- Evaluation of the regional resource base and establishment of sustainable and resilient livelihoods;
- Identification of priority capital assets and livelihood strategies to be optimally pursued;
- Identification of types and intensity of vulnerability of resources;
- Alignment of priority assets and a policy focus for sustainable and durable socio-economic development; and
- Assessment of gaps in the resource base and identification of appropriate policy design to account for differentials in such socio-economic development.

2.2. Multidimensional Welfare Measurement

The basic challenge in welfare analysis is the approach adopted and the methods of measuring welfare. Poverty with its multiple dimensions and approaches has been one of the primary research areas of development economics. There are different theories on poverty analysis, of which the dominant ones are the welfarist school, the basic-needs school, and the capability school. Appropriate development intervention and targeting requires concrete and reliable empirical evidence on the prevalence, intensity and sources of the welfare measures.

In the last decade, the multidimensional concept of welfare analysis has undergone substantial progress in terms of explaining and measuring poverty. One significant factor has been the development of the global Multidimensional Poverty Index (MPI) by Oxford Poverty and Human Development Initiative (OPHI) since 2010. The global MPI uses 3 dimensions and 10 indicators of poverty drawing on the Demographic and Health Survey (DHS) dataset. Unlike the global MPI, this study employed a multidimensional method of poverty and inequality analysis adapted to the context in Afar Regional State, using a dataset collected from its residents.

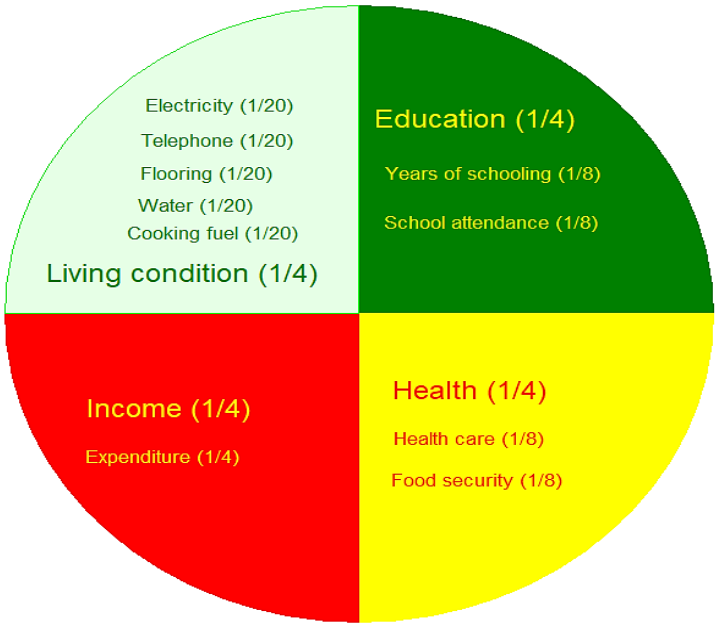
The most important task in the construction of a regional MPI is the selection of welfare dimensions and indicators relevant to the real contexts in the region. Unlike the global MPI with three dimensions (education, health and standard of living) and 10 indicators, the Afar regional MPI considers four dimensions (education, health, income/expenditure, and living conditions) and a different set of 10 indicators. It uses equal weight for dimensions and the same

cut-off point used by the global MPI (33.3%). Accordingly, a person is considered MPI poor if s/he is deprived in at least a one-third of the weighted indicators.

To account for the limitations arising from the data constraints experienced in the global MPI and to adapt to national and regional contexts, this study utilized the Living Standards Measurement Survey (LSMS) dataset and identified four dimensions (education, health, income and living conditions) and 10 indicators relevant to the regional context (Figure 2). All dimensions and all indicators within a dimension are given equal weight.

The study includes income as one welfare dimension for the regional MPI for Afar, captured by real consumption expenditure per capita. Income is becoming an important part of designing a national MPI for countries. It has so far been included as a dimension in three national MPIs (Armenia, Ecuador and Mexico) and in the Latin American region as proposed by Santos and Villatoro (2016). To avoid overlapping measurements, other indicators used to capture income-related indicators (like assets included in the global MPI) were excluded in this study.

Figure 2: Dimensions and indicators of the MPI for Afar Region



Source: Authors'' design (2019).

The other new dimension included in the regional MPI is living condition with five indicators. This dimension mainly includes basic services (electricity, telephone, water, flooring/housing, and cooking fuel) and their inclusion in the regional MPI has so far been applied by all countries and regions constructing their national/regional MPIs (Santos, 2019; Santos and Villatoro, 2019). Depending on the extent of provision of basic services in the regional development programs, these basic utilities were validated for their relevance in explaining the MPI.

Generally, the application of an MPI framework to this study enables us to generate relevant empirical evidence on, but not limited to, the following development issues:

- Preparation of socio-economic development achievements;
- Documentation of welfare profiles;
- Identification and definition of income/expenditure patterns;
- Measurement of monetary and non-monetary multidimensional welfare and its distribution, prevalence and intensity by population subgroups;
- Measurement of multidimensional inequality (monetary and non-monetary) and its distribution, prevalence and intensity by population subgroups;
- Identification of sources of multidimensional poverty for possible policy interventions; and
- Identification of major socio-economic development achievements, gaps and intervention points for designing relevant development measures.

3. Dataset and Methods

3.1. Dataset

This socio-economic development study required investigation of both primary and secondary data obtained from various sources in the region and beyond.

3.1.1. Primary data

Primary data were collected by using focus group discussions (FGDs) and key informant interviews (KII) with adequate and representative coverage of livelihood zones across the region. The regional distributions of primary data were based on the number of administrative zones and woredas (Table 1). Overall, 90 key informants from 39 woredas in five administrative zones and major social groups (community leaders and civic societies) were selected. Five FGDs were conducted at zonal level to identify and rank livelihoods. Selected key informants were trained for one day on the concept of the study and livelihoods in the region.

Table 1: Distribution of respondents by zones and woredas in the Afar region

Administrative level	Number of woredas	Number of KIIs	Number of FGDs
Awsi Rasu	12	42	1
Kilbet Rasu	9	20	1
Gabi Rasu	8	13	1
Fantena Rasu	5	8	1
Hari Rasu	5	5	1
Total	**39**	**90**	**5**

The research team also conducted preliminary field surveys and observations in the five administrative zones and the selected woredas. These enabled us to understand the real livelihood patterns and distributions and socio-economic development achievements in the region. Cases observed during field observation also served to narrate the existing welfare situation and to link them to results of the entire study. The list of administrative zones and woredas is indicated in Table 2.

Table 2: Checklist of administrative zones and woredas for primary data collection

Zone/*Woreda*	Zone/*Woreda*
Awsi Rasu	**Gabi Rasu**
1. Asaita	1. Awash-Fentale
2. Dubti	2. Amibara
3. Afambo	3. Dulecha
4. Elida'ar	4. Gawane
5. Mille	5. Hanruka
6. Chifra	6. Galealu
7. Ada'ar	7. Argoba special woreda
8. Garani	8. Awash city administration
9. Kuri	**Fantena Rasu**
10. Asaita city administration	1. Golina
11. Dubti city administration	2. Ewa
12. Semera-Logia city administration	3. Awra
Kilbet Rasu	4. Yallo
1. Aba'ala	5. Teru
2. Dalol	**Hari Rasu**
3. Barahle	1. Dawe
4. Erebti	2. Telalak
5. Magale	3. Dalifage
6. Afdera	4. Samurobi
7. Konaba	5. Hadele'ela
8. Bidu	
9. Aba'ala city administration	

The trained key informants were asked to evaluate the livelihoods prevalent in their respective woredas. The livelihoods, including crop production (maize, sorghum, cotton, vegetable, fruits, etc.), livestock production (camels, cattle, shoats) and non-farm activities particularly in towns and cities of the region, were ranked by key informants in order to construct sustainable livelihoods. Focus group discussions were conducted in each zone to identify the major livelihoods in their respective zones and ranked for prioritization of resources.

3.1.2. Secondary data

The secondary data regarding the socio-economic development indicators over time required for alignment of the regional development goals and objectives with national goals and the Sustainable Development Goals (SDGs) of the United Nations (UN) are of primary importance. The data was collected from published and unpublished official sources.

In addition to above secondary data, the third wave of Living Standards Measurement Survey (LSMS) (2015/16) for Ethiopia was widely utilized. The LSMS is the country representative, multi-topic dataset of different levels (individual, households, farm plots, etc.) collected by Central Statistical Agency (CSA) of Ethiopia in collaboration with the World Bank. It covers nine regional states and two administrative towns with 4954 households and over 23,000 individuals across the country in 290 rural and 143 urban (43 small towns[1] and 100 large towns) enumeration areas (CSA, 2017).

The sample in LSMS for the Afar Region covers a total of 659 individuals (86.3% rural residents) distributed across two administrative zones, nine woredas, and four towns (Table 3). These samples provided useful insights about trends, prevalence, intensity, distribution, gaps, sources of development, and the welfare situation in the region.

Table 3: Distribution of the LSMS samples across zones and areas of residence in Afar Region

Areas of residence	Administrative zones		Total	Share (%)
	Awsi Rasu	Gabi Rasu		
Number of sample woredas	5	4	9	23.1
Number of sample towns	2	2	4	-
Rural samples	392	177	569	86.3
Samples from small towns	24	29	53	8.0
Samples from large towns	37	0	37	5.6
Total samples, Region	453	206	659	100.0

Source: Compiled from data in LSMS (2016).

[1] A small town (termed as semi-urban in this study) is defined by CSA as a town with the population of less than 10,000. Large towns include all other urban areas with the population of above 10,000 (CSA, 2017).

The LSMS dataset was used here for investigation of the following issues:

- Household and individual characteristics (demography, health, education, food security, access to water and sanitation, employment and occupation, mobility, access to financial services, consumption and expenditure patterns, asset holdings, shocks, housing, etc.).
- Community level analysis (housing, clothing, community services, social network, mobility, religious practices, land use, access to road and transport facilities, employment opportunities, farm and off-farm practices, shocks, development interventions, business activities, etc.);
- Geo-variables (land cover, agro-ecological zones, rainfall, elevation, wetness index, terrain, nutrient availability, plot characteristics, etc.);
- Livestock production (livestock type and holding, marketing of livestock, livestock rearing practices, water access for livestock, animal disease, veterinary services, use of animal products, etc.);
- Crop production (inputs, outputs, farm technologies, etc.); and
- Post-harvest analysis and post-planning (farm type, crops produced, crop yield, cultivated land, crop damage, crop sales, etc.).

In addition to this secondary data at household, individual and community levels, different sets of socio-economic data were also collected at woreda, zonal and regional levels. This secondary data included time series and cross-sectional data on different sectors and subsectors of agriculture, manufacturing and services. Some of these data requirements included, but were not limited to:

- Socio-economic data for the most recent years (education, health, access to basic services, agriculture, infrastructure, construction);
- Budget expenditure by sectors and subsectors;
- Revenue generation and distribution by source; and
- Socio-economic development achievements for most recent years.

3.2. Valuation of Livelihood Capitals

The importance of access, or entitlement to assets, and the factors determining this, is generally dealt with by Sustainable Livelihood Framework (SLF`) models through analysis of Policies, Institutions and Processes (PIPs)

(Farrington et al., 2002). It can also be analyzed in the wider context within which livelihood strategies are pursued. Institutions, policies and legislation within the livelihood framework shape livelihoods. They operate at all levels and effectively determine access (to capital, to livelihood strategies and to decision-making bodies and sources of influence); the terms of exchange between different types of capital; and returns (economic and non-economic) to any given livelihood strategy (DFID, 2000).

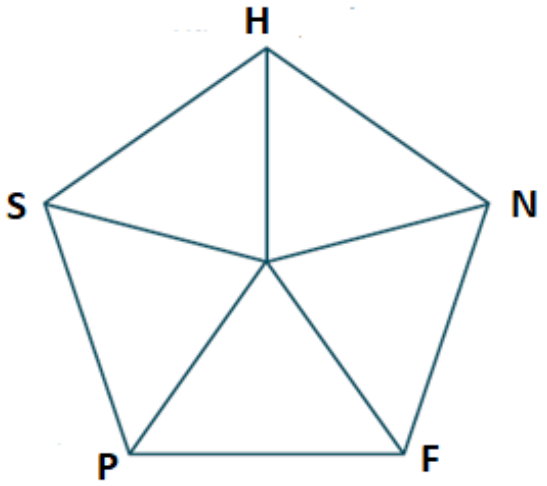
Identification of the relative importance of the livelihood capitals in the region and indictors determining access to such capitals are important information for the formation of sustainable livelihoods for durable socio-economic development in the region. The relative importance of capitals in this study was evaluated by key informants at different administrative levels of the region using the UNDP's tool developed with modifications on the scale of valuation (UNDP, 2017). Unlike the three ordinal scores used by the UNDP, scores with five ordinal scales were used in this study. Key informants from different sectors and levels in the target population were asked to value the five livelihood assets qualitatively. Informants ranked each livelihood asset (human, financial, physical, social/political, and natural) according to their perception of relevance to the formation of sustainable livelihoods in the region or zone in which they were working. They attached ordinal values: 1 if not sustainable, 2 if less sustainable, 3 if sustainable, 4 if more sustainable, or 5 if most sustainable (the largest rank indicating the more desirable alternative or greater importance).

The greater the range of the scores among the different groups of key informants, the more sensitive the scoring is to changes over time and to the effects of development interventions (UNDP, 2017). Little difference in the ranges of rankings made by respondents in different groups is an indication of the stability of assets in the formation of sustainable livelihoods over time.

Accordingly, the most important livelihood capitals or welfare dimensions relevant to the formation of sustainable and resilient livelihoods in the region were identified and livelihood profiles compiled. Based on the asset valuation results, livelihood profiles were documented from which asset pentagons could also be constructed. The asset valuation results served as a baseline for comparison of the changes in livelihood assets and the associated outcomes in the target population after implementation of development interventions. These findings can serve as the bases for designing relevant development interventions in the region.

The pentagon of capital assets serves as a visual presentation of information on assets. The pentagon grid can be used as a schematic demonstration of existing variations in regarding capital access. Because the availability of different assets changes constantly, the shape of the pentagon changes accordingly (Figure 3). If the triangle tip of a shape within the pentagon moves towards or away from the external line labelled H (Human capital), for instance, it is an indication of weaker emphasis given to this capital. However, if the internal shape forms a regular pentagon, it shows that a development intervention gives equal weighting to all forms of capital.

Figure 3: Pentagon of assets for visualizing changes in asset status



Source: UNDP (2017).

Note: F=Financial, H=Human, N=Natural, P=Physical, S=Social/Political.

Livelihood assets

Livelihood assets refer to the resource base of the community and of different categories of households. In Figure 3, we have a pentagon that stands for different types of assets available to the local people - human, natural, financial, physical and social. These assets are interlinked. The livelihoods approach is concerned with people. It seeks to gain an accurate and realistic understanding of people's strengths (assets or capital endowments) and how they endeavor to convert these into positive livelihood outcomes. The approach is founded on a belief that people require a range of assets to achieve positive livelihood outcomes; no single category of assets on its own is sufficient to yield

all the many and varied livelihood outcomes that people seek. This is particularly true for poor people whose access to any given category of assets tends to be very limited. As a result, they have to seek ways of nurturing and combining what assets they do have in innovative ways to ensure survival.

Human capital: Human capital represents the skills, knowledge, ability to work and good health that together enable people to pursue different livelihood strategies and achieve their livelihood objectives.

Social capital: In the context of the sustainable livelihood framework, social capital is taken to mean the social resources upon which people draw in pursuit of their livelihood objectives. Social resources are developed through networks and connectedness that increase people's trust and ability to work together and expand their access to wider institutions; through membership of more formalized groups which often entails adherence to mutually-agreed or commonly accepted rules, norms and sanctions; and through relationships of trust, reciprocity and exchanges that facilitate cooperation, reduce transaction costs and may provide the basis for informal safety nets amongst the poor.

Natural capital: Natural capital is the term used for the natural resource stocks from which resource flows and services useful for livelihoods (e.g. nutrient cycling, erosion protection) are derived. There is a wide variation in the resources that make up natural capital, from intangible public goods such as the atmosphere and biodiversity to divisible assets used directly for production (trees, land, etc.). Within the sustainable livelihood framework, the relationship between natural capital and the Vulnerability Context is particularly close. Many of the shocks that devastate the livelihoods of the poor are themselves natural processes that destroy natural capital (e.g. fires that destroy forests, floods and earthquakes that destroy agricultural land) and seasonality is largely due to changes in the value or productivity of natural capital over the years.

Physical capital: Physical capital comprises the basic infrastructure and producer goods needed to support livelihoods. Infrastructure consists of changes to the physical environment that help people meet their basic needs and be more productive. Producer goods are the tools and equipment that people use to function more productively. Among the components of infrastructure usually seen as essential for sustainable livelihoods are: affordable transport; secure shelter and buildings; adequate water supply and sanitation; clean, affordable energy; and access to information (communications).

Financial capital: Financial capital denotes the financial resources that people use to achieve their livelihood objectives. There are two main sources of financial capital:

- **Available stocks:** Savings are the preferred type of financial capital because they do not have liabilities attached and usually do not entail reliance on others. They can be held in several forms: cash, bank deposits or liquid assets such as livestock and jewelry. Financial resources can also be obtained through credit-providing institutions.
- **Regular inflows of money:** Excluding earned income, the most common types of inflows are pensions, or other transfers from the state, and remittances. In order to make a positive contribution to financial capital, these inflows must be reliable. While complete reliability can never be guaranteed, there is a difference between a one-off payment and a regular transfer on the basis of which people can plan investments.

3.3. Resource Base and Asset Indices

Asset and poverty indices are two approaches to measuring two faces of welfare. The asset index is a measure of intensity of asset accumulation based on asset endowment data (or access to resources), whereas the poverty index is a measure of poverty based on intensity of asset deprivation. In order to understand the basis for asset distribution in the region, the various types and levels of structures (public, private, civic) and processes (policy, legislation, institutions, culture) that affect access to livelihood assets were analyzed. For possible development interventions, access to major livelihood assets, strategies and decision-making bodies, and sources of influence were investigated.

The asset index is used to measure the level of asset accumulation based on people's access to assets. Construction of asset indices requires proper identification and measurement of reference indicators for each livelihood asset. Since it was hardly possible to get an exhaustive list of assets in the region to conduct livelihood analysis, it was important to identify components of the livelihood dimensions that were of particular importance to livelihoods in the region. Depending on the level of asset endowments, different sets of indicators were identified to conduct livelihood analysis among differentiated social groups.

To estimate asset indices in this study, a set of 36 livelihood asset/capabilities/activities deemed relevant to Afar Region were proposed (Table 4). The table describes the livelihood assets/capabilities/activities identified as indicators of livelihood in the region. Respondents were asked to attach binary values as 1 if the indicator was easily accessible/ available, 0 otherwise.

Table 4: Capital dimensions and asset indicators

Livelihood Assets/Capabilities/Activities	Livelihood Assets/Capabilities/Activities
Natural capital (N)	Physical capital (P)
Access to land for crop production	Camel stock
Access to land for grazing	Cattle stock
Security of property rights to land	Shoat stock
Versatility of resources	Crop/grain stock
Natural forests	Clean and affordable energy
Clean rivers/waters	Private telephone services
Minerals for mining	Adequate and safe drinking water and sanitation
Resources for tourist attraction	Clean and secure housing
Human capital (H)	Affordable health services
Educational level	Affordable public/private transport
School attendance (enrolment)	Access to irrigation water
Adequate and nutritious food	Financial capital (F)
Access to information	Wage from employment
Public awareness on their public rights, policies and regulations impacting their livelihoods	Income from trade business
Social/Political capital (S)	Credit access
Membership in organizations	Saving in banks
Membership in committees or collectives	Saving in livestock
Membership in local administration councils	Presence of formal financial services
Existence of influential public organizations	Remittances
Existence of influential rules, norms or laws impacting community development	Liquidity of savings

Source: Proposed by authors (2019).

A Principal Component Analysis (PCA) was employed to construct asset indices and identify principal components of the livelihood assets available to the region (Jolliffe, 2002; Al-Kandari, et al., 2012). The first component accounting for the highest variance with the highest eigenvalue was considered as the asset index for that category. Once the principal assets under different livelihood dimensions were identified, the optimal mix of such livelihood assets in the formation of sustainable livelihoods could be identified using parametric and nonparametric analytical techniques.

The PCA is a statistical technique used for data reduction. The leading eigenvectors from the eigen decomposition of the correlation or covariance matrix of the variables describe a series of uncorrelated linear combinations of the variables that contain most of the variance. In addition to data reduction, the eigenvectors from a PCA are often inspected to learn more about the underlying structure of the data.

Let C be the $p \times p$ correlation or covariance matrix to be analyzed. The spectral or eigen decomposition of C is

$$C = V\Lambda V' = \sum_{i=1}^{p} \lambda_i v_i v_i'$$

$$v_i v_i' = \delta_{ij}, \qquad (orthogonalty)$$

$$\lambda_1 \geq \lambda_2 \geq \cdots \lambda_p \geq 0.$$

where the eigenvectors (vi) are also known as the principal components; and the direction (sign) of principal components is not defined.

In addition to valuation of livelihood assets for establishment of sustainable livelihoods ensuring durable economic growth, the sources and intensity of vulnerability of resources were evaluated. This offers the possibilities of defining policy measures required to ensure implementation of relevant policies of resource utilization in the region.

3.4. Optimizing and Aligning Livelihood Strategies

Development policy interventions generally focus on addressing prioritized challenges for improving the welfare of a society. Concentration of available resources for the proposed development programs requires prioritization of development challenges and the associated interventions. The primary task in livelihood analysis is to identify the alternative livelihood strategies pursued by households in different groups of the target population; so, the alternative livelihood strategies employed by different groups of the regional residents were identified by KIIs and FGDs. Livelihood options in rural areas are relatively less diversified and can easily be identified without in-depth analysis of such strategies at household level. KIIs and FGDs were therefore utilized to

identify the dominant livelihood strategies pursued by the different social groups within sub-populations.

In the SLF, the choices of livelihood strategies adopted by households are determined by a number of factors related to assets, policies, institutions and processes (DFID, 2000). Because resources are limited, the choice of one livelihood strategy is not independent of the choice of another. In order to optimize their utility generated from the choice of alternative livelihood strategies, households, given their resource constraints, are likely to jointly choose a combination of livelihood strategies. The choice of one livelihood strategy simultaneously affects (positively or negatively) the choice of another. This leads to simultaneity of household decisions from the available alternative livelihood strategies. Access to one kind of livelihood asset, access to grazing land for livestock, for instance, can reinforce households' access to another kind of livelihood asset (e.g. physical capital or financial capital through livestock production).

In this study, the alternative livelihood strategies pursued in each district, social group or household, and their interdependence were identified to optimize the mix of livelihood strategies and development interventions. Estimation of tetrachoric correlations between pairs of livelihood strategies chosen by social groups assists to identify complementary and competitive strategies to be pursued in the region. Significantly correlated livelihood strategies clearly suggest pathways for constructing an optimal mix of livelihood strategies relevant to improve the livelihoods of residents. Complementary and competitive livelihood strategies can be indicated, respectively, by significant positive and negative nonlinear correlations. The results permit us to identify the positive and negative effects of alterative livelihood strategies to be pursued before development interventions.

3.5. Measuring Poverty and Equity

3.5.1. Economic welfare

The Foster-Greer-Thorbecke (FGT) poverty measures are used to measure economic poverty. Real consumption expenditure is considered as an indicator of economic wellbeing in this study and the FGT index of poverty was used to analyze the incidence, depth and severity of consumption poverty. As one of the measures proposed by Foster et al. (1984), it is defined as

$$P_a = \frac{1}{N}\sum_{i=1}^{N}\left(\frac{G_i}{z}\right)^a, \; a \geq 0$$

where α is a measure of the sensitivity of the index to poverty and the poverty line. When parameter α = 0, P_0 is simply the headcount index. When α = 1, the index is the poverty gap index P_1, and when α = 2, P_2 is the poverty severity index. For all α > 0, the measure is strictly decreasing in the living standard of the poor.

The FGT poverty index (P) can be decomposed by population subgroups as follows (Araar and Duclos, 2013):

$$\hat{P}(z,\alpha) = \sum_{g=1}^{G}\hat{\phi}(g)\hat{P}(z;\, a \;\, g)$$

where G is the number of population subgroups, $\hat{P}(z,\alpha,g)$ is the estimated FGT index of subgroup g, $\hat{\phi}(g)$ is the estimated population share of subgroup g, $\sum_{g=1}^{G}\hat{\phi}(g)\hat{P}(z;\, a \;\, g)$ is the estimated absolute contribution of subgroup g to total poverty, and $\sum_{g=1}^{G}\hat{\phi}(g)\hat{P}(z;\, a \;\, g)$ is the estimated relative contribution of subgroup g to total poverty.

To decompose total poverty, assume that there exist K income/expenditure sources and that sk denotes source k. Accordingly, the FGT index is defined as (Araar and Duclos, 2013):

$$\hat{P}\left(z;\, a \;\, y = \sum_{k=1}^{K} s_k\right) = \frac{\sum_{i=1}^{n}\left(1 - y/z\right)_+^a}{\sum_{i=1}^{n} w_i}$$

where wi is the weight assigned to individual i and n is sample size.

This estimates the share in total consumption expenditure of each source k and the absolute and relative contributions of each source k to the value of $\left(\hat{P}-1\right)$.

Growth Elasticity of Poverty (GEP) is the percentage reduction in poverty rates associated with a percentage change in mean income or expenditure. The information on the responsiveness or sensitivity of poverty measures to changes in income or expenditure is relevant to evaluate the likely impacts of poverty reduction measures. The overall GEP, when growth comes exclusively from growth within a group k (within that group, inequality neutral), is estimated by (Araar & Duclos, 2007; Araar, 2012):

$$GEP = \begin{cases} -\dfrac{zf(k,\ z)}{F(z)} \ if\ \ \alpha = 0 \\ \alpha \dfrac{\overline{P}(k,z;\alpha) - \overline{P}(k,z;\alpha-1)}{\overline{P}(z,\alpha)} \ if\ \ \alpha \geq 1 \end{cases}$$

where z is the poverty line, k is the population subgroup in which growth takes place, f(k, z) is the density function at level of income or expenditure z of group k, and F(z) is the headcount.

3.5.2. Multidimensional poverty

The definition and measurement of the four dimensions and 10 indicators included in the regional MPI framework are defined in Table 5. To decide on the unit of identification, choosing the method of aggregation of dimensions or indicators is essential. One option is to aggregate all attributes across individuals to a global measure of wellbeing. This is the aggregation of dimensions across individuals to form a dimension-specific measure across all the individuals and to combine all the one-dimensional indices yielding an MPI measure. The other option is aggregation of individuals focusing either only on those that are poor according to all attributes or on all those who are poor in at least one attribute. This second option is the combination of the multiple indicators of deprivation for each individual and then to aggregate them across the individuals. In this study, the aggregation of welfare dimensions/indicators across individuals was used to estimate the MPI measure.

Table 5: Definition and measurement of welfare dimensions and indicators for regional MPI

Dimensions/ Indicators	Poverty line	Definition of deprivation
Education (1/4)	**1/12**	**Deprived if intensity of deprivation in education is at or above 1/12**
Years of schooling (1/8)	1/24	Deprived if no household member has completed six years of schooling
Child school attendance (1/8)	1/24	Deprived if any school-aged child is not attending school up to class 8
Health (1/4)	1/12	**Deprived if intensity of deprivation in** health is at or above 1/12
Health care (1/8)	1/24	Deprived if individuals in the households did not consult any medical practitioner in the last 12 months
Food security (1/8)	1/24	Deprived if the household faced difficulty satisfying food needs in the last 12 months
Income (1/4)	**1/12**	**Deprived if intensity of deprivation in income is at or above 1/12**
Consumption expenditure (1/4)	1/12	Deprived if individuals living in the households below the absolute poverty line (ETB 14758)
Living condition (1/4)	**1/12**	**Deprived if intensity of deprivation** in living condition is at or above 1/12
Electricity (1/20)	1/60	Deprived if the household has no electric source of lighting
Telephone (1/20)	1/60	Deprived if the household had no private telephone services
Water (1/20)	1/60	Deprived if the household had no access to safe drinking water
Flooring (1/20)	1/60	Deprived if the household had a dirt, sand or dung floo
Cooking fuel (1/20)	1/60	Deprived if the household cooks with dung, wood or charcoal
MPI (1.00)	**1/3**	**MPI poor if intensity of deprivation** is at or above 1/3

Source: Authors' compilation (2020).

To estimate the MPIs in this study, the Alkire-Foster (AF) methodology was employed. The construction of an MPI that uses the AF is based on the M0 (adjusted head count ratio) measure, proposed by Alkire and Foster (2011). The LSMS data were exposed to rigorous analysis using the Distributive Analysis Stata package (DASP) developed by Araar and Duclos (2013).

To specify the method, consider a population of individuals, $i = 1, \ldots, n,$ with income y_i, and sampling weight w_i. Let $f_i = \frac{w_i}{N}$, where $N = \sum_{i=}^{i=n} w_i$. Suppose that $j = 1, \ldots, K,$ denotes the j_i^{th} dimension of poverty and z_i denotes the poverty line for dimension j. A general form for additive multidimensional poverty indices can be written as (Araar and Duclos, 2013):

$$P(x,\ z) = \frac{1}{n} \sum_{i=1}^{i=n} f_i\, p(x_i,\ z)$$

where $p(x_i,\ z)$ is the individual poverty function that determines the contribution of individual i to total poverty p.
The Alkire and Foster MPI is estimated as (Alkire and Foster, 2011)

$$p(\alpha,\ x_i,\ z) = \frac{1}{N} \sum_{i=1}^{N} \frac{1}{J} \sum_{j=1}^{J} w_j \left(\frac{z_j - x_{i,j}}{z_j} \right)_+^{\alpha} I(d_i \geq d_c)$$

where I (i is poor) = 1 if $\sum_{j}^{J} w_j I(z_j > x_{i,j}) \geq d_c$, zero otherwise; N is the total sample size; J is the number of poverty dimensions/indicators; z_j is the poverty line for indicator j; $x_{i,j}$ is the intensity of poverty of individual i in indicator j; and d_c is the dimensional cut-off point to identify the poverty status.

Following the algorithm for computing the Shapley value developed by Araar and Duclos (2009), the total MPI poverty indices were decomposed into their constituent components or dimensions (education, health, income, and living condition).

3.5.3. Multidimensional inequality

Estimation of multidimensional inequality index (MII) and identification of its possible sources is imperative for designing and implementing policy interventions related to equity. The MII in this study was estimated by using the

Araar MI index. The Araar MII index for the K dimensions of wellbeing takes the following form (Araar, 2009):

$$MI = \sum_{i=1}^{i=K} \phi_k \left[\lambda_k I_k + (1 - \lambda k) C_k \right]$$

where ϕ_k is the weight attributed to the dimension k (may take the same value across the dimensions or can depend on the averages of the wellbeing dimensions). I_k and C_k, respectively, are the relative–absolute-Gini and concentration indices of component k. The normative parameter λ_k controls the sensitivity of the index to the inter-correlation between dimensions.

The total multidimensional inequality measured by the Gini coefficient was also decomposed into the four dimensions based on the method of decomposition developed by Araar (2006).

4. Description of the Region

4.1. Location

The Afar National Regional State is located in the northeast of the country and is one of the nine regional states of Ethiopia. It is the homeland of the Afar people. Samara-Logia city administration is the capital city of the region, located at 605 kms northeast of Addis Ababa with geographic coordinates between 8.83^0 to 14.46^0 East and 39.73^0 to 42.41^0 North.

The region has about 99,646.54 km^2 area which accounts for 8.4% of the national land area (ADSWE, 2018). The Afar Region, the original home of human beings, is divided into five administrative zones and 39 woredas (districts) with 358 rural and 32 urban kebeles. About 23 of the woredas are categorized as severely affected districts. Afdera and Elidare are the biggest woredas covering a quarter of the Region, while Koneba and Dewe are the smallest.

Samara-logia city administration serves as the capital of the Region and of Awsi Rasu. Kilbet Rasu encompasses various tourist attractions especially for those interested in geo-tourism and shares a 328 km-long international boundary with Eritrea and Djibouti Republic. Gabi Rasu is well known for large-scale modern irrigation schemes owned by different companies. Fantena Rasu shares a 109 km-long regional boundary with both Amhara and Tigray regions; and Hari Rasu shares a 225 km-long regional boundary with Amhara (USAID, 2010).

The Afar Depression, Erta Ale active volcano, Awash National Park, Yangudi-Rassa National Park and the Aramis archeological site, as well as cultural games and traditions of the community are the major tourist attractions of the Region. In addition, it boasts abundant reserves of various major and significant minerals (Franzson et al., 2015; Mindat, 2017). The region has good geothermal sources and potential solar energy (Katarzyna et al., 2014).

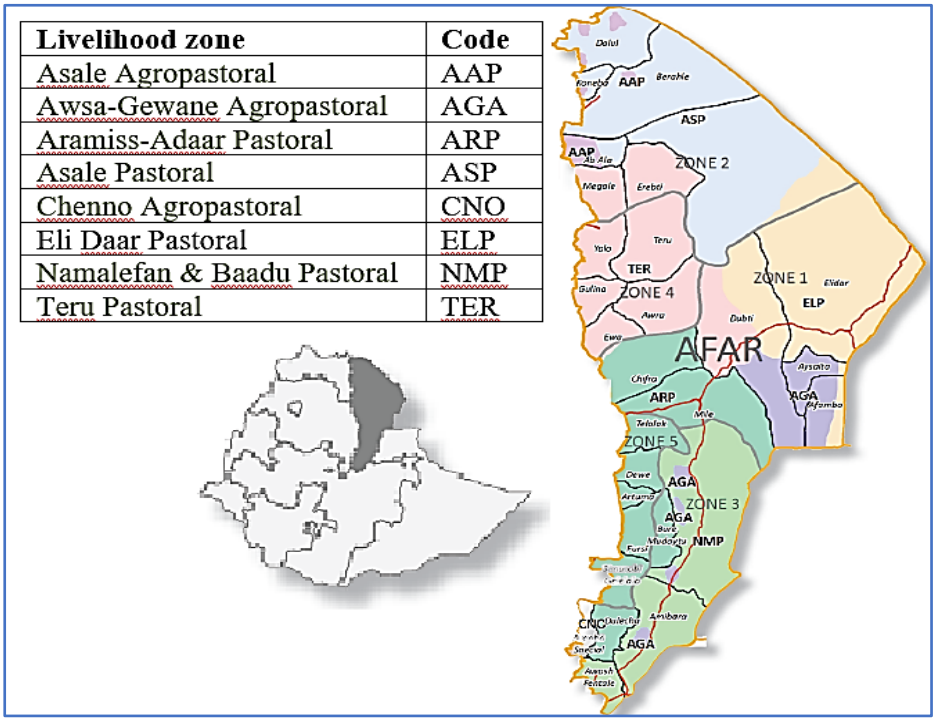
4.2. Livelihood Zones

Afar Region is dominated by two major livelihood zones (pastoral and agropastoral), and further categorized into eight sub-livelihood categories, including Livelihood zone 8, also known as Awash pastoral/agricultural system or the Afar Depression, and Livelihood zone 10, termed as Northeastern pastoral livelihood system (USAID, 2010) (Figure 4). About 85% of the rural population is dependent on pastoral livelihoods and the remaining 15% on agropastoral

livelihood (Afar Atlas, 2014). Pastoralists in this area rely on livestock production as their main livelihood. All major species of livestock including camel, cattle, sheep and goats are kept.

Figure 4: Livelihood zones in Afar Region

Livelihood zone	Code
Asale Agropastoral	AAP
Awsa-Gewane Agropastoral	AGA
Aramiss-Adaar Pastoral	ARP
Asale Pastoral	ASP
Chenno Agropastoral	CNO
Eli Daar Pastoral	ELP
Namalefan & Baadu Pastoral	NMP
Teru Pastoral	TER



Source: USAID (2010)

4.3. Demography

According to (ADSWE (2018)) the Afar Regional State covers a land area of 99,646.54 square kilometers. The total population is 1,812,002, of which 80.9% are pastoralists and 19.1% urban residents Because of its hot climate conditions, population density is relatively sparse and the greatest proportion of the land area (69%) has a population density below 50 persons per square kilometer (Table 6), which is far above the national average (19.1%).

Table 6: Population density in Afar and Ethiopia

Population density (persons per km2)	Proportion (%)	
	Regional (Afar)	National
0-50	69.0	19.1
50-100	10.6	12.3
100-200	9.2	21.4
200-300	-	8.4
300-400	-	5.1
400-500	-	3.5
1000-2000	-	3.5
500-1000	0.7	5.3
2000-5000	4.2	5.7
5000-10000	0.7	5.3
10000-20000	5.6	7.2
>20000	-	3.2

Source: Authors' computation from LSMS-2016 data.

Values of other demographic variables describing the region are also far below or above the national average (Table 7). Only 42.3% of the entire population and 22% of the household heads are literate, which is 13.6 percentage points lower than the literacy condition of the population as a whole. Households in the Afar region have relatively more family members, particularly for larger households which underlines the need to implement relevant family planning policy interventions in the region. The main religion followed by the population in the region is Islam (80%) followed by Orthodox Christianity (20%). The marital status experienced in the region is not significantly different from the case in Ethiopia where most of the households are either single or married.

Table 7: Comparison of demographic features of households between Afar region and Ethiopia

Variables	Proportion (%)	
	Regional	National
Household characteristics		
Age (year)	21.80	23.5
Age of household heads (year)	43.66	46.5
Literacy status of household heads (%)	16.4	13.8
Educational level (grades completed)	5.10	8.1
Household Size (counts)	6.31	5.91
Rural	6.56	6.2
Small towns	5.15	5.5
Urban centers	4.03	5.00
Number of household members		
1	2.0	2.0
2	5.0	5.0
3	7.0	9.0
4	8.0	14.0
5	11.0	16.0
6	17.0	17.0
7	21.0	14.0
8	12.0	11.0
8+ members	16.0	12.0
Main religion		
Orthodox	19.9	49.9
Muslim	80.1	27.1
Protestant	0.3	20.7
Catholic	-	1.2
Other (pagan, Wakefeta, etc.)	-	0.7
Marital status		
Single	42.3	48.1
Married-monogamy	43.6	42.0
Married-polygamy	2.4	1.0
Divorced	3.6	3.2
Other (widowed, separated, etc.)	8.1	5.0

Source: Authors' computation from LSMS-2016 data.

4.4. Agroecology

Agroecology is the study of ecological processes applied to agricultural production systems (Wezel et al., 2009). It is a science, a set of practices and a social movement dealing with the interaction of different components of the agroecosystem and seeking to establish sustainable farming systems that optimize and stabilize yields and pursue multifunctional roles for agriculture; promote social justice; nurture and identity culture; and strengthen the economic viability of rural areas (FAO, 2019).

For countries to transform their food and agricultural systems, mainstream sustainable agriculture on a large scale, and achieve 'zero hunger' and other UN Sustainable Development Goals (SDGs), the following 10 interdependent and interlinked elements are important (FAO, 2020): Diversity; synergies; efficiency; resilience; recycling; co-creation and sharing of knowledge; human and social values; culture and food traditions; responsible governance; circular and solidarity economy.

4.4.1. Agro-ecological zones

An agro-ecological zone is a land resource mapping unit, defined in terms of climate, landform and soils, and/or land cover, and having a specific range of potentials and constraints for land use.

There are only three agro-ecological zones in which the population in Afar region live. A majority of the households reside in arid (48%) and semi-arid (49%) zones followed by a much smaller number in semiarid zones (3.3%) (Table 8). These agro-ecological zones are not suitable for crop production where pastoralism is pursued as the only livelihood option. However, the region is also endowed with irrigation water from the Awash River. Many areas in the region are irrigable and crop production can be boosted to ensure food supplies in the region, and in the country at large. The current example of this is the policy direction to produce lowland wheat on a substantial scale using irrigation water.

Table 8: Comparison of households' agro-ecology between Afar and Ethiopia

Agro-ecological zones	Proportion (%)	
	Regional	National
Tropic-warm/arid	47.7	0.8
Tropic-warm/semiarid	49.0	3.7
Tropic-warm/sub-humid	-	0.7
Tropic-warm/humid	-	0.1
Tropic-cool/arid	-	0.1
Tropic-cool/semiarid	3.3	24.3
Tropic-cool/ sub-humid	-	56.5
Tropic-cool/humid	-	13.9

Source: Authors' computation from LSMS-2016 data.

4.4.2. Weather and climate

Weather is a condition of the atmosphere over a short period of time and affected by temperature, pressure, humidity, cloudiness, wind, precipitation, rain, flooding, ice storms, etc. Climate, however, is the long-term observation of the overall atmospheric conditions at any location though also affected by humidity, temperature, the sunshine, wind, etc. Precipitation, on the other hand, is any product of the condensation of atmospheric water vapor that falls under gravity from clouds. Its main forms include drizzle, rain, sleet, snow, ice pellets, and hail. Plants use the moisture in the soil to replenish the water lost through transpiration. If there is no water in the soil, leaves will wilt. Rainwater builds up the moisture levels in the soil and assures a healthy plant.

The mean annual temperature in the Afar Region is by far higher (27 degree Celsius) and annual precipitation much lower than the national averages, underlining that the harsh weather conditions are not suitable for crop production or rain-fed agriculture (Table 9). Because of the overall elevation (628.8 m above sea level), the annual mean rainfall is twofold lower (423.6 mm) than the national average (858 mm).

Table 9: Comparison of some household geo-variables between Afar and Ethiopia

Variable	Proportion (%)	
	Regional	National
Annual mean temperature (degree C)	27.0	19.3
Mean temperature of wettest quarter (degree C)	29.0	19.1
Annual precipitation (mm)	371.3	1064.2
Precipitation of wettest month (mm)	89.5	224.6
Precipitation of wettest quarter (mm)	189.5	562.5
Elevation (m)	628.8	1872.7
Average 12-month total rainfall (for January to December, mm)	423.6	858.0
Total rainfall in wettest quarter (of 2015) (mm)	221.2	497.0

Source: Authors' computation from LSMS-2016 data.

4.4.3. Land cover

Land cover, or earth cover, is the physical material on the surface of the earth. Land covers include grass, asphalt, trees, bare ground, water, etc. Earth cover is the expression used as a synonym to vegetation. Land cover in Afar region is also nonexistent or very low compared to the national average (Table 10). About 36% of the households reside in wider land areas of the region primarily covered by shrubs or open or close to open land. The lands in the region are less vegetated and bare areas where pastoralism is widely practiced for search of pasture for livestock.

Table 10: Major land cover class within approximately 1 km buffer

Land cover	Mean (%)	
	Regional	National
Rainfed croplands	-	2.5
Mosaic cropland (50-70%)/vegetation	5.4	47.0
Mosaic vegetation (50-70%)/cropland	-	18.1
Open (15-40%) broadleaved deciduous forest	-	1.0
Mosaic forest or shrub land (50-70%)/ grass	11.7	15.3
Mosaic grassland (50-70%)/forest or shrub	-	0.0
Closed to open (>15%) (broad-leaved)	0.6	10.5
Closed to open (>15%) herbaceous vegetation	35.7	0.4
Sparse (<15%) vegetation	-	1.0
Closed to open (>15%) grassland-fresh	12.5	0.1
Artificial surfaces and associated area	-	3.3
Bare areas	34.1	0.8

Source: Authors' computation from LSMS-2016 data.

4.4.4. Topographical features

Topography is the arrangement of the natural and artificial physical features of an area. These include mountains, hills, valleys, lakes, oceans, rivers, cities, dams, and roads. Household residences in Afar region are primarily found on mid-altitude plains (52%), high-altitude plains (19%), and low plateaus (15%) (Table 11). These plains are suitable for irrigation agriculture - if access to irrigation water is secured.

Table 11: Comparison of terrain roughness between Afar and Ethiopia

Terrain Roughness	Proportion (%)	
	Regional	National
Plains	-	0.1
Mid-altitude plains	52.0	1.2
High-altitude plains	18.6	11.3
Platform (very low plateaus)	10.8	0.2
Low Plateaus	15.3	0.8
Mid-altitude mountains	3.3	20.5
High plateaus	-	43.7
Low mountains	-	0.1
Mid-altitude mountains	-	16.3
High mountains	-	5.9

Source: Authors' computation from LSMS-2016 data.

4.5. Soil Conditions

Soil condition can be defined as the capacity of a soil to function, within land use and ecosystem boundaries, to sustain biological productivity, maintain environmental health, and promote plant, animal, and human health.

4.5.1. Soil type and quality

The predominant soil types and qualities in Afar region are compared to national soil conditions reported in Table 12. The Afar region, as well as the country, is dominated by vertisols, and 63% of the households reside in areas dominated by this type of soil, which is characterized by soil-forming processes that include cracking and movement of material due to shrinkage and swelling of clays during drying/wetting cycles, causing the clays to expand and contract.

Vertisols are typically formed from basic rocks (such as basalt) in climates that are seasonally humid or subject to erratic droughts and floods (like the Afar region), or impeded drainage. Recurrent drought and erratic rainfall, coupled with the soil's poor water retention capacity, is a major constraint for crop production. If there is sufficient irrigation water, the soil quality in Afar region is predominantly good (as validated by 68.5% of the respondents, compared to national average soil quality (51% good). Irrigation agriculture is the primary option recommended for crop production in such areas.

Table 12: Predominant soil types of land plots

Soil type and quality	Proportion (%)	
	Regional	National
Soil type[2]		
Leptosol	8.5	8.4
Cambisol	4.3	2.2
Vertisol	62.7	37.8
Luvisol	11.0	34.3
Mixed type	4.2	15.5
Other soil type	9.3	1.8
Soil quality		
Good	67.5	29.2
Fair	21.7	52.2
Poor	10.8	18.6

Source: Authors' computation from LSMS-2016 data.

4.5.2. Soil constraints

Problems related to soils can be characterized by seven variables: nutrient availability; nutrient retention capacity; rooting condition of plants; oxygen availability for plants; excess salts; soil toxicity; and the workability of soils.

The intensity of the problem arising from these constraints may be evaluated by households at four levels: (a) no or slight constraint, (b) moderate, (c) severe, or (d) very severe, with other constraints arising from non-soil and water shortage (Table 13). To undertake crop production with or without

[2] There are about 19 soil types in Ethiopia. The major soil types (in order of their area coverage) are Leptosol (14.7%), Nitosol (13.5%), Regosol (12.0%), Cambisol (11.1%), Vertisol (10.5%), Fluvisol (7.9%), Luvisol (5.8%), and other soil types (24.5%). However, the LSMS dataset didn't consider other soil types with relatively higher coverage of land in Ethiopia such as Nitosol, Regosol, and Fluvisol (FAO, 2016).

irrigation water, it is advisable to carry out measures of soil treatment and improved soil management practices.

Table 13: Soil constraints and intensity of the problem to crop production

Soil constraints	Intensity of constraint (%)				
	No/slight	Moderate	Severe	Very severe	Other (non-soil & water)
Nutrient availability	31.1	27.7	14.1	26.3	0.7
Nutrient retention capacity	58.2	0.7	38.3	1.1	0.7
Rooting conditions	12.4	8.2	29.2	36.6	12.9
Oxygen availability	54.6	4.3	39.3	1.1	0.7
Excess salts	37.9	20.4	11.2	25.6	4.3
Toxicity	58.2	0.7	39.3	1.1	0.7
Workability	5.9	35.9	44.6	12.9	0.7

Source: Authors' computation from LSMS-2016 data.

4.6. Agriculture

4.6.1. Livestock production

Cattle, shoats and camels are the major livestock holdings in Afar region. There are about 1.5 million cattle and 0.11 million camels, owned by 0.16 million people and 78,000 households in the region, respectively (Getachew Diriba, 2020). Households' cattle and camel holdings are the largest in Afar region next to cattle in South Omo of Southern region and camels in the Somali region. On average, livestock holding per household in Afar region is 6.8 cattle, 15 goats, nine sheep, and 2.2 camels, all of which are far higher than the national averages (3.6 cattle, 3 goats, 2.3 sheep and 0.3 camels, (Table 14).

The region, in fact, is endowed with a livestock population adapted to a harsh environment characterized by water shortage and pastoral and agro-pastoral systems. The sustainable and productive use of these physical capitals requires identification of suitable and relevant livelihood strategies enabling the population and the region to cope with the multiple vulnerabilities (shocks, trends, seasonality) prevalent in the region. This may include identification of alternative livelihood assets, sedentary farming, irrigation farming, and off-farm activities involving a significant proportion of the disadvantaged and marginalized groups of the population.

Table 14: Livestock holding and diversity in Afar region

Livestock type	Livestock holding (counts per household)	
	Regional	**National**
Cattle	6.82	3.57
Goats	15.35	2.99
Sheep	8.72	2.27
Camel	2.24	0.26
Chicken	0.8	4.04
Horses	0.00	0.10
Mules	0.01	0.03
Donkeys	0.47	0.40
Bee colony	0.02	0.32

Source: Authors' computation from LSMS-2016 data.

4.6.2. Crop production

The physical appearance of land is an important natural factor determining the relevance of agricultural production. Crop lands in Afar region, to a great extent, are flat (91%), compared with the overall figure in Ethiopia (56%) (Table 15). If this land resource endowment is maintained by an integrated agricultural input supply and facilities (including water for irrigation), the region could be a potential producer and supplier of agricultural products for agro-food manufacturing industries in the country and for other regions and countries. Currently, the proportion of households with access to irrigated crop lands is about 50.5%. This needs to be scaled up and there would have to be policy directions to bring idle land under irrigation as commercial farms with active participation of the private sector.

Currently, regardless of such potential opportunities, access to the use of improved agricultural inputs and availability of important facilities are minimal and incomparable with the national average. Use of chemical fertilizer is below 14%, 48 percentage points lower than that of the national estimate (56%). The application of inputs for crop production is very low, though due to recurrent crop pests, the use of pesticides is relatively higher in the region (67%). Agriculture inputs can be pre-planting or post-harvest; inputs are generally used to boost production and productivity, to reduce and control crop damage before and after harvest.

Table 15: Farm plots and input use

Variables	Proportion (%)	
	Regional	National
Field appearance (GPS)		
Flat	91.0	56.2
Sloppy – Moderate	6.6	33.1
Sloppy – Steep	2.5	10.7
Agricultural inputs and facilities		
Access to irrigation in the current season (%)	50.5	2.6
Use of chemical fertilizer (%)	13.6	55.8
Use of herbicide (%)	11.1	76.2
Use of pesticide (%)	66.8	17.6

Source: Authors' computation from LSMS-2016 data.

There are multiple causes of crop damage, most of which are related to the agro-climatic conditions of the region (Table 16). The level of crop damage is about 73.7% of the entire potential output, far higher than the national estimate (48.1%). About 88% of households in Afar region report that crops are damaged by shortage of rainfall, a significantly higher figure than the national incidence of 61%. This underlines the importance of a search for alternative livelihood options and strategies relevant to the context of the region. As mentioned above, sedentary farming with irrigation and the introduction of drought-tolerant crop varieties are the immediate options for the existing environment.

Table 16: Causes of crop damage

Causes of crop damage	Proportion (%)	
	Regional	National
0000000		3.6
Too little rain	88.4	61.0
Insects	-	5.2
Crop disease	-	13.9
Weeds	-	2.0
Hail	-	3.5
Frost	-	1.6
Floods	-	0.2
Wild animals	11.6	2.0
Locust	-	0.01
Birds	-	0.3
Shortage of seeds	-	0.1
Depletion of soil	-	2.6
Security problems	-	0.1
Bad seeds	-	0.7
Others	-	3.1

Source: Authors' analysis (2020).

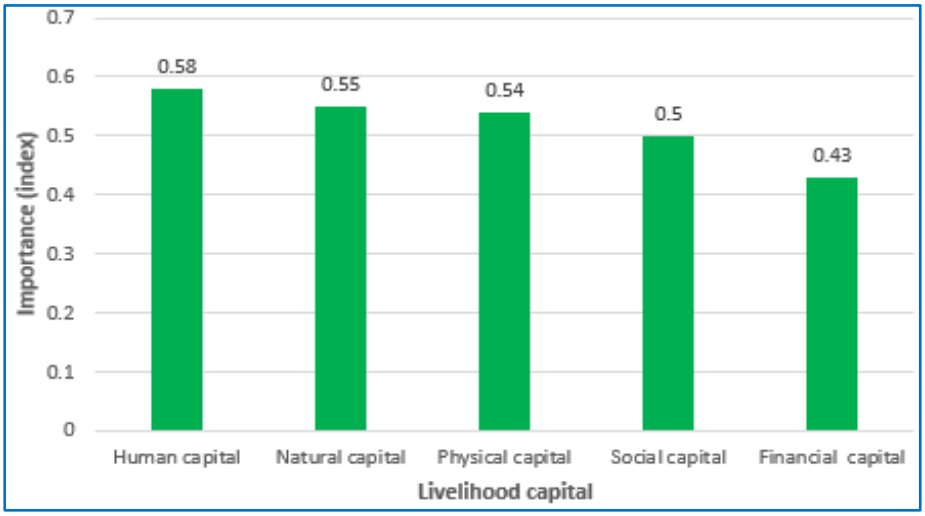
5. Livelihood Analysis

5.1. Livelihood Capitals

Respondents from different social groups and from all woredas and zones were asked to evaluate the relative importance of the 38 selected livelihood assets, capabilities and activities in the livelihoods of their respective woredas/zones. They were allowed to rank each livelihood asset as 5 if importance of the asset is very high, 4 if high, 3 if moderate, 2 if low, or 1 if the asset was unimportant/very low.

In order to identify the most relevant indicators, factor analysis of the correlation matrix was employed. Accordingly, uniqueness of all the indicators was below 0.5, suggesting that all the livelihood assets were relevant in the analysis. The intensity of importance of the five livelihood capitals was evaluated and reported as shown in Figure 5. Human capital was the first, followed by natural and physical capital. Financial capital was the least important capital for the livelihoods of the population in Afar region.

Figure 5: Relative importance of livelihood capitals in Afar region



Source: Authors' computation (2020).

The role of the five livelihood capitals in the livelihoods of the population was also evaluated across the five administrative zones (Table 17). On average, all the livelihood capitals had moderate importance (index below 0.4-0.6). Except physical capital, there was no significant difference in the importance of livelihoods among zones of the region.

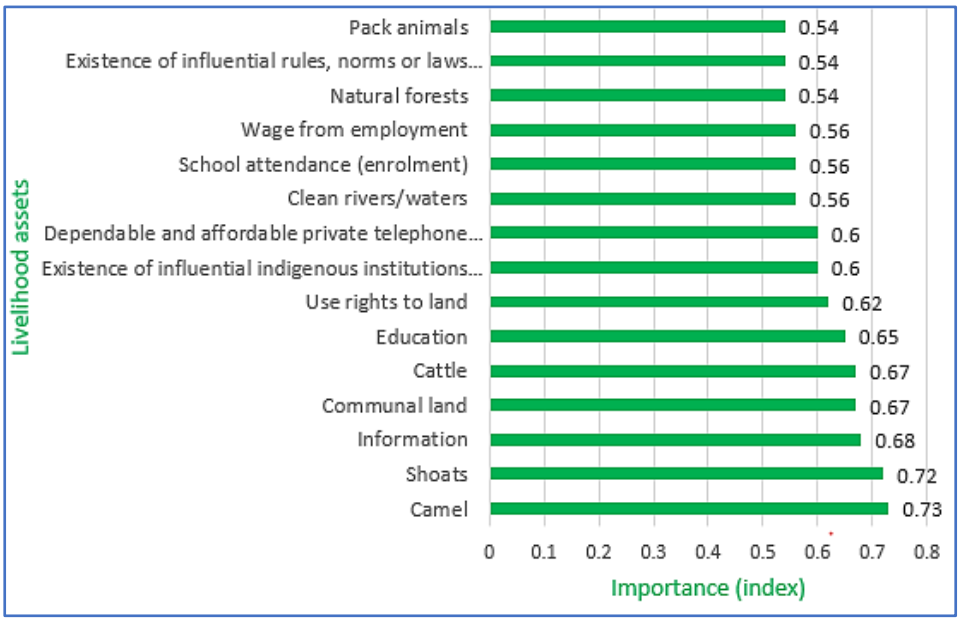
Table 17: Importance of livelihood capitals by administrative zones

Population subgroup	Livelihood capitals					All
	Natural	Human	Physical	Social	Financial	
Awsi Rasu	0.58	0.58	0.57	0.48	0.45	0.53
Kilbet Rasu	0.50	0.57	0.46	0.49	0.41	0.49
Gabi Rasu	0.56	0.65	0.60	0.59	0.48	0.58
Fantena Rasu	0.52	0.56	0.50	0.54	0.34	0.49
Hari Rasu	0.44	0.47	0.49	0.46	0.37	0.45
Region	**0.55**	**0.58**	**0.54**	**0.50**	**0.43**	**0.52**
Pearson chi2	**101.79**	**72.50**	**173.99*** **	**77.15**	**67.16**	**286.05**

Source: Authors' computation (2020).

There are only nine livelihood assets and capabilities, which are evaluated for their moderate and higher role and importance in contributing to livelihoods of the population in the region (Figure 6). The rest (with index at or below 0.6) have low or very low importance in forming the livelihoods of the population, indicating that the region has a limited range of livelihoods to establish sustainable and resilient livelihoods.

Figure 6: The top 15 livelihood assets/capabilities/activities in the Afar region

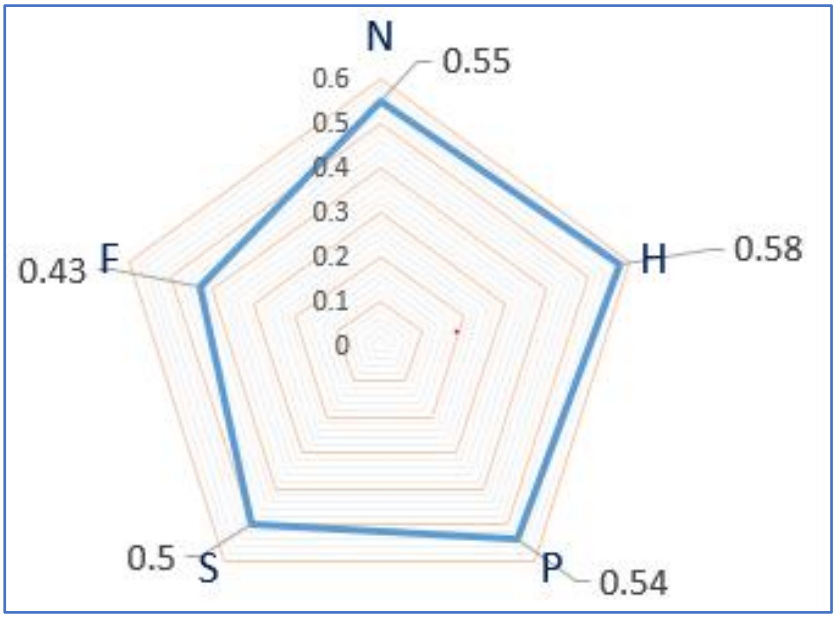


Source: Authors' computation (2020).

5.2. Asset Pentagons

The relative importance of livelihood capitals is depicted in Figure 7. The importance of livelihood assets in the livelihoods of the population in the region evaluated out of five ordinal scales (very high = 5, high= 4, moderate = 3, low 2, very low = 1) suggest that the overall role of livelihood capitals in the region was 0.52, indicates that the overall importance of livelihood capitals is below moderate (0.60). The maximum index is 0.58 for human capital followed by natural and social capitals. The least important livelihood capital in the region was financial capital signifying that financial income and related sources of livelihoods are limited.

Figure 7: Pentagon of importance of livelihood capitals



Source: Authors' computation (2020).

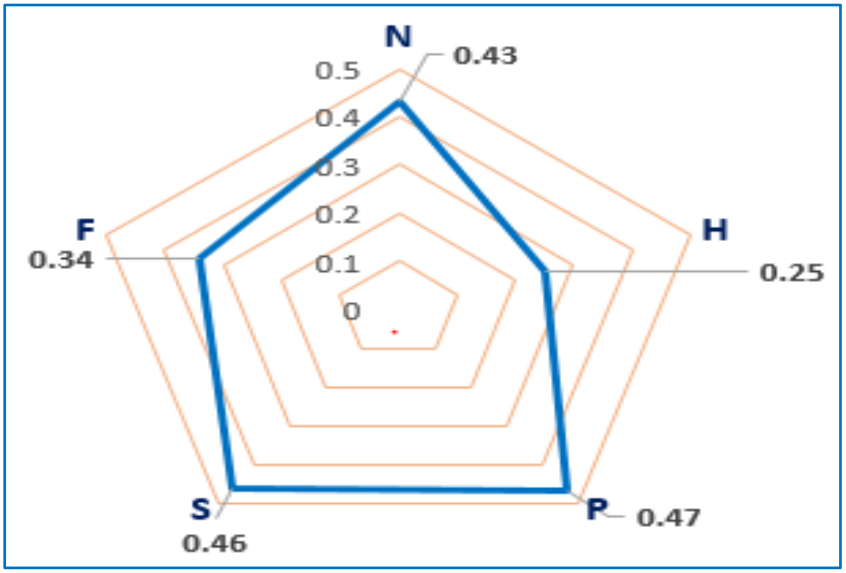
5.3. Sustainability of Livelihoods

Livelihood may be defined as a means of securing the necessities of life. Livelihoods are sustainable when they are resilient in the face of external shocks and stresses; are not dependent upon external support (or if they are, this support itself should be economically and institutionally sustainable); are able to maintain

the long-term productivity of natural resources; and do not undermine the livelihoods of, or compromise the livelihood options open to others. Livelihoods can be sustainable environmentally, economically, socially, and institutionally. Environmental sustainability is achieved when the productivity of life-supporting natural resources is conserved or enhanced for use by future generations. Economic sustainability is achieved when a given level of expenditure can be maintained over time. Social sustainability is achieved when social exclusion is minimized and social equity maximized. Institutional sustainability is achieved when prevailing structures and processes have the capacity to continue to perform their functions over the long term.

Sustainability of assets and capabilities and the formation of resilient livelihoods and durable socio-economic development varies across areas and social groups. Evaluation of the livelihood assets and capabilities under the five livelihood capitals by respondents enables us to identify the type (environmental, economic, social, or institutional) and intensity of their sustainability. Respondents expressed their agreement whether the specific livelihood asset, capability, or activity was environmentally, economically, socially, or institutionally sustainable. Agreement of respondents took a value of 1, and 0 otherwise. The specific types of sustainability indices were analyzed and aggregated.

Figure 8: Pentagon of livelihood sustainability



Source: Authors' computation (2020).

The sustainability indices of the livelihood assets and capabilities in the four dimensions of sustainability are reported in Figure 8 with a pentagon of asset sustainability. Sustainability of livelihood capitals aggregated from all livelihood assets, capabilities and activities do not significantly vary across administrative zones. Almost all livelihood capitals are unsustainable (below 0.5 index), human and financial capitals being the most unsustainable livelihood capitals in the region.

5.4. Vulnerability of Livelihoods

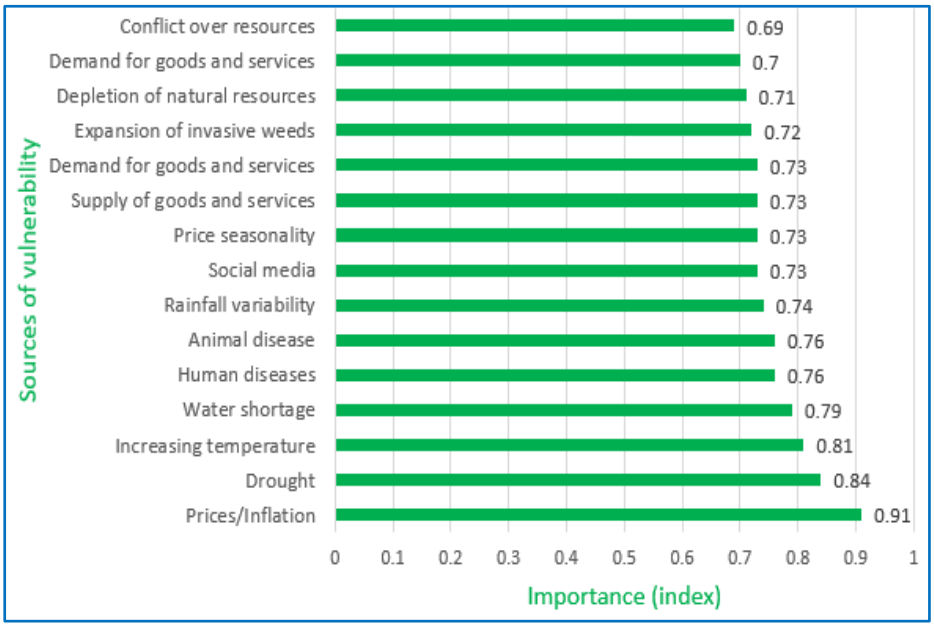
Vulnerability is the quality or state of being exposed to the possibility of being attacked or harmed, either physically or emotionally. The vulnerability context in a society frames the external environment in which people exist. People's livelihoods and the wider availability of livelihood assets are fundamentally affected by critical trends, shocks and seasonality[3], over which they have limited or no control.

5.4.1. Sources of vulnerability

Assets, capabilities, and activities are vulnerable to different changes at different levels. They are influenced by the vulnerability context of trends, shocks and seasonality. To identify the type and frequency of vulnerability, respondents were asked to rank their evaluation as 3 if the occurrence of the source of vulnerability was often, 2 if rare/seldom, or 1 if never. About 27 potential sources of vulnerability of livelihood assets were evaluated by respondents. The results indicate that intensity of prevalence of all of the sources of livelihood vulnerability were found to occur often (index above 0.67) as shown in Figure 9. The top five important sources of vulnerability in the region were price/inflation, drought, increasing temperature, scarcity of water, and human disease.

[3] A trend is a general long-run direction in which something is developing or changing. A shock is a sudden event or experience affecting current condition of a variable. Seasonality is a pattern that repeats itself every 12 months.

Figure 9: Top 15 important source of vulnerability of livelihoods in Afar region



Source: Authors' computation (2020).

5.4.2. Livelihood vulnerability index (LVI)

Assets, capabilities, and activities are vulnerable to changes arising from the different sources of vulnerability discussed above. To identify the dimensions of vulnerability of assets (whether trend, shock or seasonality), respondents were asked to reflect their agreement. In addition, they were also allowed to rank their evaluation of overall intensity of vulnerability as 4 if the vulnerability was high, 3 if moderate, 2 if low, or 1 if none.

The results generally show that all the five livelihood capitals were found to be vulnerable or moderately vulnerable to the various trends, shocks and seasonal changes (LVI > 0.5), physical capital being the first (LVI=0.61) (Table 18). In terms of intensity of vulnerability of livelihoods, there is no significant difference among zones of the region. The overall vulnerability of livelihoods in the region was about 0.56.

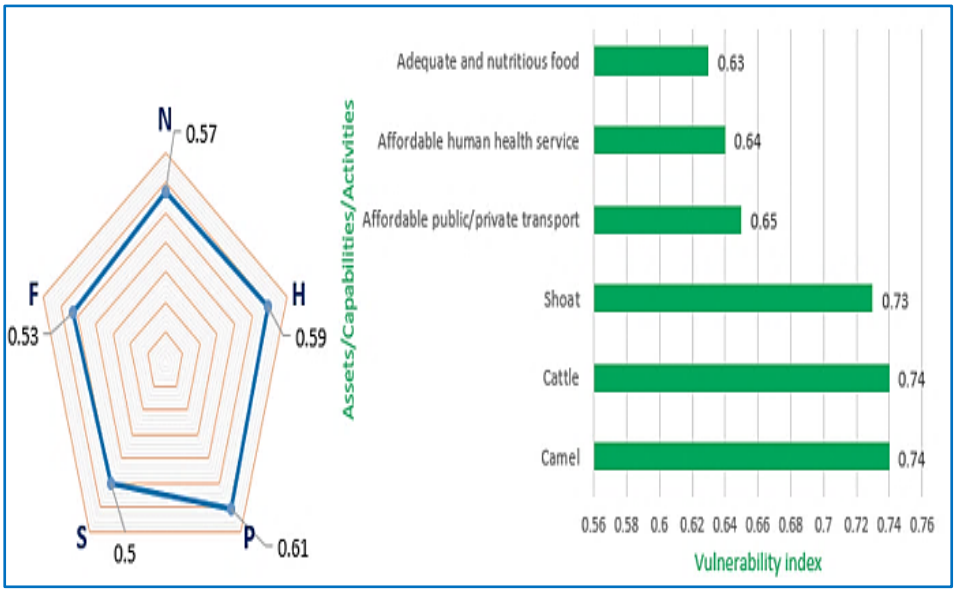
Table 18: Vulnerability of livelihood capitals by administrative zones

Population subgroup	Livelihood Vulnerability Index (LVI)					LVI (overall)
	Natural	Human	Physical	Social	Financial	
Awsi Rasu	0.51	0.54	0.58	0.45	0.47	0.51
Kilbet Rasu	0.60	0.64	0.61	0.51	0.55	0.58
Gabi Rasu	0.69	0.62	0.70	0.65	0.66	0.66
Fantena Rasu	0.56	0.59	0.64	0.51	0.53	0.57
Hari Rasu	0.62	0.66	0.62	0.51	0.56	0.59
Region	**0.57**	**0.59**	**0.61**	**0.50**	**0.53**	**0.56**

Source: Authors' computation (2020).

The relative vulnerability of livelihood capitals in the region is illustrated in the left panel of Figure 10. The level of vulnerability of physical capitals is relatively higher followed by natural and human capitals. The relative levels of the top six vulnerable assets or capabilities are also illustrated in the right panel of the figure. These are the three livestock elements (camels, cattle, and shoats), transport, health services, and food.

Figure 10: Vulnerability of livelihood capitals and assets



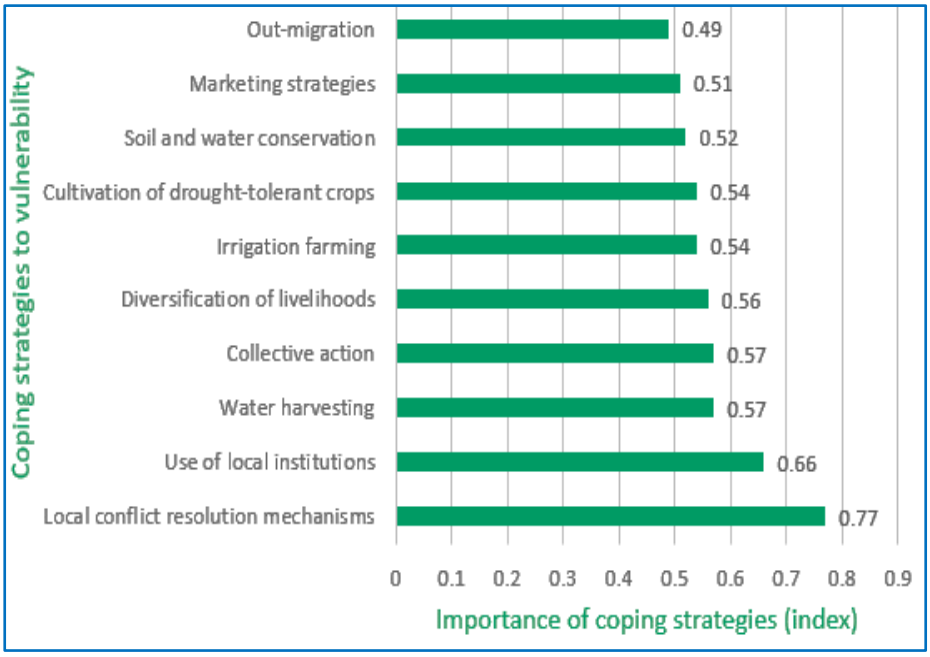
Source: Authors' computation (2020).

5.4.3. Coping strategies

People adopt different coping or adaptation strategies in order to reduce their vulnerability. The coping strategies enable them to create resilient livelihoods. Ten coping strategies of livelihoods were identified and evaluated by respondents for their intensity of adoption in the region. The coping strategies were ranked as 4 if widely/highly adopted, 3 if moderately adopted, 2 if less adopted, or 1 if no adoption.

The most widely adopted coping strategy for securing livelihoods in the Afar region was a local conflict resolution mechanism (index=0.77=high) followed by coping strategies with a moderate role including local institutions, collective action and water harvesting (Figure 11). The importance of other potential coping strategies which require due focus for reducing vulnerability of livelihoods and securing livelihoods in the region is also low (index below 0.5). We would note that because of the harsh agroecology in the region, the adoption of irrigation farming, livelihood diversification, and suitable marketing strategies for livestock and crop products could have particular importance to secure livelihoods in the region.

Figure 11: Relative importance of coping strategies to asset vulnerability



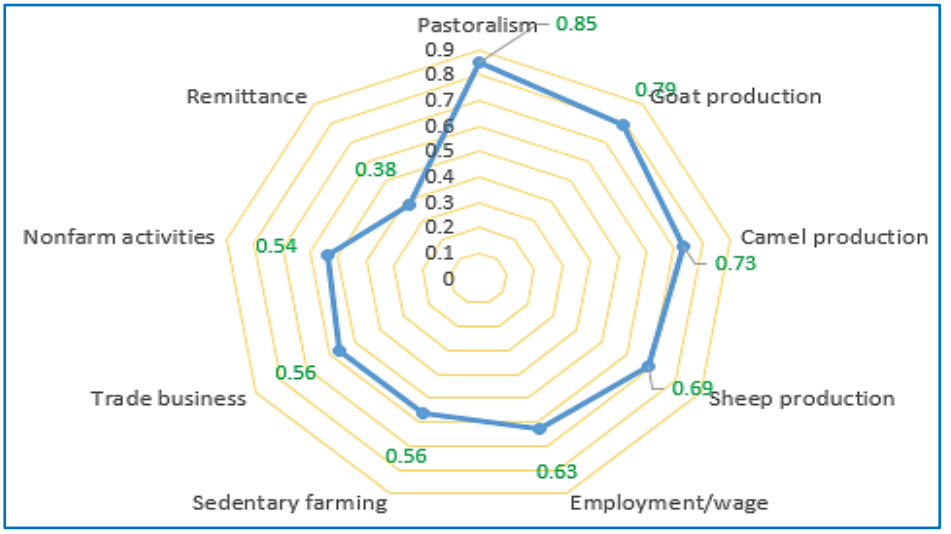
Source: Authors' computation (2020).

5.5. Livelihood Strategies

The livelihoods approach seeks to promote choice, opportunity and diversity. It is the overarching concept used to denote the range and combination of activities and choices that people make/undertake in order to achieve their livelihood goals, including productive activities, investment strategies, reproductive choices, and so on. And people choose different combinations of livelihood strategies. To secure livelihoods, individuals/households have to combine different livelihood strategies. Respondents were therefore asked to rank the adoption of nine potential livelihood strategies of relevance in the Afar region. They were allowed to attach one of four ordinal values, 4 if high, 3 if moderate, 2 if low, or 1 if none, to each of the strategies.

The evaluation results indicate that pastoralism and goat production are relatively the most widely adopted livelihood strategies in the region (Figure 12). Camel and sheep production are the other preferred livelihood strategies. The other means of livelihoods, including nonfarm activities, sedentary farming, trade business and wage from employment, are rarely practiced. This emphasizes that the region should give due attention to the creation of nonfarm employment opportunities, villagization of pastoralists for sedentary and mixed farming, and creation of business activities.

Figure 12: Intensity of adoption of livelihood strategies in Afar region



Source: Authors' computation (2020).

The adoption of different livelihood strategies to secure livelihoods requires the identification of strategies which are competitive or complementary to enhance the options. This interdependence should either be positive (if they are complementary or can be operated together to enhance livelihoods) or negative (if they are competitive for resources and cannot be adopted simultaneously) (Table 19).

The results generally show that there are no wider options and strong linkages of livelihood strategies in the region. The complementary strategies include pastoralism with livestock production including camels (0.48), goat (0.34), and sheep (weak). Nor has sedentary farming been significantly pursued as a livelihood strategy for improving livelihoods in the region. It would seem strongly advisable to widen livelihood options in the region by enhancing nonfarm activities, trade business, and employment opportunities.

Table 19: Interdependence/correlation of livelihood strategies in Afar Region

Livelihood Strategies	Pastoralism	Sedentary farming	Camel production	Goat production	Sheep production	Nonfarm activities	Trade business	Employment/wage
Pastoralism	1.00							
Sedentary farming	-0.09	1.00						
Camel production	0.48	0.10	1.00					
Goat production	0.34	0.03	0.54	1.00				
Sheep production	0.27	0.06	0.53	0.61	1.00			
Nonfarm activities	0.05	0.15	0.13	0.04	0.16	1.00		
Trade business	-0.06	0.09	0.05	-0.27	-0.19	0.39	1.00	
Employment/wage	-0.21	0.12	-0.08	-0.12	-0.12	0.22	0.53	1.00
Remittance	-0.17	0.18	0.00	-0.15	-0.04	0.19	0.23	0.23

Source: Authors' computation (2020)

5.6. Livelihood Outcomes

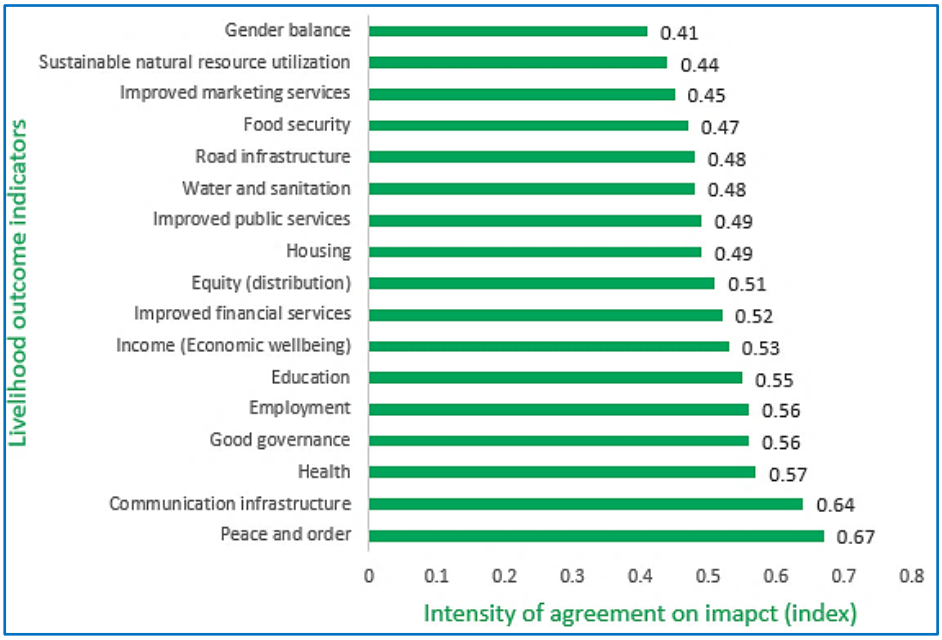
Livelihood outcomes are the realization, the output of livelihood strategies. The important idea associated with this component of the SLF is that we, as outsiders, should investigate, observe and listen, rather than jump to quick conclusions or make hasty judgements about the exact nature of the outcomes that people pursue. In particular, we should not assume that people are entirely dedicated to maximising their income. Rather, we should recognise and seek to understand the richness of different potential livelihood goals. This, in turn, will help us to understand people's priorities, why they act as they do, and where major constraints lie.

Some 17 livelihood outcome indicators were identified. Respondents were asked to express their views of any positive impact of socio-economic development interventions on these livelihood outcomes and the welfare of the society in the last five years. They were also asked to rank the intensity of the impact, from 5 very high, through 4 high, 3 moderate, 2 low, to 1 very low.

The results suggest dissatisfaction due to the negligible livelihood impacts of socio-economic interventions undertaken in the last five years. A majority of the respondents did not agree on the positive impact of interventions related to housing, equity, and natural resource utilization; though the impact of socio-economic development interventions, including good governance, road and communication infrastructure, health, employment, peace and order, and education, were perceived to have had positive livelihood impact in the region.

The top five indicators evaluated for their improved livelihood outcomes were income, financial services, equity (distribution), public services, and housing. However, apart from peace and order, socio-economic development interventions were evaluated to have low level of livelihood outcomes on all indicators (Figure 13). The results generally suggest that socio-economic development interventions in the region largely had low and unsatisfactory livelihood outcomes in many aspects.

Figure 13: Relative levels of perception on livelihood impacts of development interventions

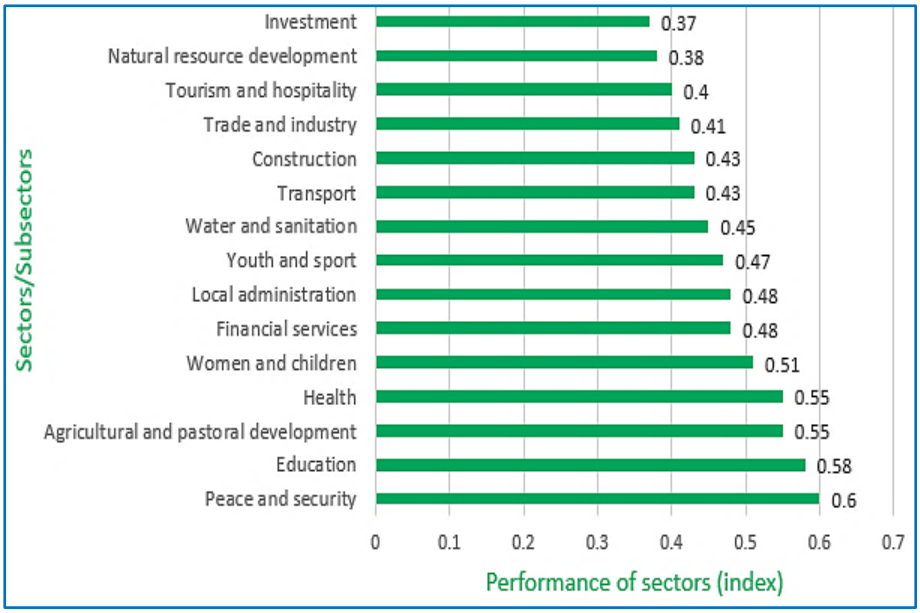


5.7. Performance of Sectors

The success of socio-economic development interventions in the region may be expected to have different levels of achievements and multiple constraints. Respondents were asked to evaluate the success/performance of these socio-economic interventions in their respective areas over the last five years, attaching 1 to 5 ordinal values for performance (5=very high, 4=high, 3= moderate, 2=low, or 1=very low).

The results indicate that, except peace and security (which was the best performance rating), all the sectors had low and/or very low performance (index below 0.6) in the last five years (Figure 14). The top four sectors evaluated to have moderate performance (index between 0.4 and 0.6, below peace and security) were education, health, agricultural and pastoral development, and women and children. Investment and development of natural resources had exceptionally low performances in the region (index below 0.4).

Figure 14: Development performance of sectors and subsectors in Afar region



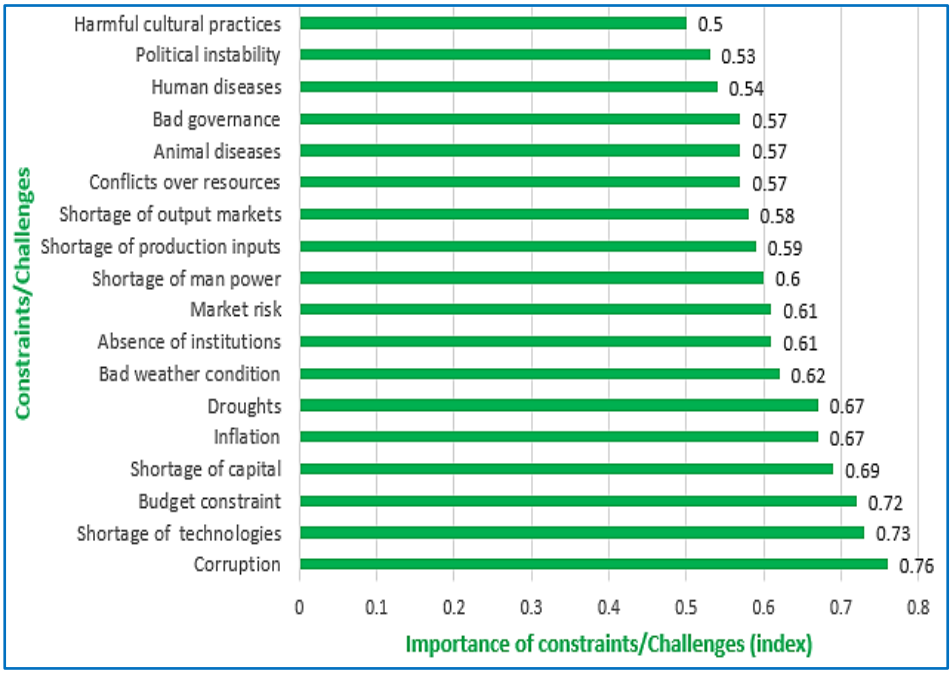
Source: Authors' computation (2020).

5.8. Constraints and Obstacles to Development

Multiple constraints and challenges can be expected to have affected the success of socio-economic development interventions in the region. About 18 potential constraints/ challenges/ problems were identified and evaluated by respondents. Respondents were allowed to rank the importance of each constraint and obstacle using a five-point Likert scale (5 = very high, 4 = high, 3 = moderate, 2 = low, or 1 = very low or negligible). The major factors adversely affecting the success of socio-economic interventions in the last five years are reported in Figure 15. The findings show that the top six challenges and constraints adversely affecting the success of socio-economic development intervention were corruption (high), shortage of appropriate technologies, budget constraint, shortage of capital, inflation, and drought.

Bad weather condition, absence of institutions, market/price risk, and shortage of production inputs were also shown as important factors (index 0.6-0.62). Shortage of output markets, conflicts over resources, human and animal diseases, bad governance, political instability, and harmful cultural practices were considered relatively less important constraints in affecting the success of development interventions.

Figure 15: Challenges and constraints of development interventions in Afar region



Source: Authors' computation (2020).

6. Poverty and Equity

6.1. Access to Basic Services and Facilities

Access to basic services and facilities is one of the major indicators of non-monetary wellbeing. Access to roads, markets, administrative centers, water and sanitation facilities, health and related services and facilities are indicators of welfare (Table 20). The population in the Afar region have relatively lower access to the major services and facilities. They are particularly and relatively poorer in access to urban centers, safe drinking water, sanitation facilities, and human and veterinary health/medical services.

Table 20: Access to basic services and facilities

Variables/Services/Facilities	Proportion (%)	
	Regional	National
Distance to the nearest major road (km)	22.8	12.7
Distance to urban centers (km)	134.5	32.8
Distance to the nearest market (km)	48.1	55.4
Distance to the capital of residence zone (km)	117.9	143.0
Access to source of safe drinking water (piped & protected)	90.16	69.00
Treatment of water for safety	10.77	16.74
Access to off-farm activity	23.95	14.4
Ownership of telephone services	90.23	74.20
Access to credit (in the last 12 months)	19.73	23.3
Access to washing water	5.00	8.46
Incidence of health problem (in the last 4 months)	22.51	11.40
Consultation for medical assistance (in the last 12 months)	49.92	25.20
Incidence of food shortage (in the past 7 days)	21.51	17.39
Improved toilet facilities	95.92	71.37
Unimproved and shared toilet facilities	57.20	24.80
Access to livestock vaccination	4.43	10.70

Source: Authors' computation (2020).

6.2. Nutrition and Child Growth

Anthropometry is the study of the measurement of the human body in terms of the dimensions of bone, muscle, and adipose (fat) tissue. Anthropometric measures

are a series of quantitative measurements of the muscle, bone, and adipose tissue used to assess the composition of the body which is the result of adequate and nutritious food, particularly in identifying child growth standards[4]. The core elements of anthropometry include height, weight, and body mass index (BMI).

Children's access to food and the growth situation in the Afar Region was analyzed and compared with the national average in Ethiopia (Table 21). The average weight of children under five in Afar Region is relatively lower (14.1 kgs) compared to the national average (14.9 kg), though they are nearly similar in their height (97.7 cm). Though prevalence of stunting of children under five due to access to nutrition is high in Ethiopia, incidence is relatively higher (38.1%) in Afar Region compared to the national average (32.8%). A great proportion of children under the age of five in the Afar Region are too short for their age. Similarly, the percentage of children under five who are underweight in the Region is also higher (39.2 %) compared to the national average (24.7%). Overall, a great proportion of children under the age of five are too small for their age.

Table 21: Child health and anthropometric measures in Afar region

Anthropometric measures	Value	
	Regional	National
Weight (kg)	14.07	14.91
Height (cm)	97.68	97.65
Age (years)	3.72	4.03
Weight-for-age	9.11	7.22
Height-for–age	62.81	47.61
Weight-for height	0.14	0.16
Body mass index (BMI)	0.28	0.32
Prevalence of stunting (%)	38.1	32.8
Prevalence of underweight (%)	39.2	24.7

Source: Authors' analysis (2020).

[4] Stunting is low height for age, reflecting a past episode or episodes of sustained undernutrition. Underweight is low weight for their age in children, and a body mass index of less than 18.5 in adults, reflecting a condition resulting from inadequate food intake, past episodes of undernutrition or poor health conditions.

6.3. Housing

Housing is one of the major indicators of welfare serving as a measure of the living standards of individuals and societies in a country. Although Ethiopia is very poor in housing and related facilities, the Afar region is particularly poor in terms of the quality of housing. About 73% of the population live in very poor housing (Table 22).

Table 22: Housing ownership status

Ownership status	Proportion (%)	
	Regional	National
Private	73.29	83.42
Free	20.33	4.27
Rented	6.37	11.77
Other	-	0.53

Source: Authors' analysis (2020).

The quality of housing in this study is characterized by the materials from which the walls, floors, and roofs are made. The number of rooms available in a house is another indicator used to assess the likelihood of access of households to adequate housing conditions.

As reported in Table 23 below, the greatest proportion of the population in the Afar region live in houses made of poor materials including wood and mud (48.1%), or wood and thatch (18.5%), and these proportions are far above the national average of poor housing quality. Only small proportions of the population live in houses made of stone or cement and blocks.

Table 23: Materials from which walls of the main dwelling is made

Make of house wall	Proportion (%)	
	Regional	National
Wood and mud	48.14	77.62
Wood and thatch	18.49	4.54
Wood only	1.29	2.48
Stone only	0.13	0.54
Stone and mud	-	7.83
Stone and cement	3.67	1.97
Blocks, plastered with cement	1.57	2.58
Blocks, unplastered	-	0.15
Bricks	-	0.10
Mud bricks (traditional)	-	0.31
Steel	1.04	0.19
Cargo container	0.29	0.00
Chip wood	-	0.01
Corrugated iron sheet	3.81	0.29
Asbestos	-	0.01
Reed or bamboo	-	0.26
Others	21.59	1.13

Source: Authors' analysis (2020).

Floors of houses in Ethiopia are generally of very poor materials such as mud and/or dung (Table 24). Similarly, floors of the great majority of houses (78.3%) in the Afar region are of poor materials, though this is not significantly different from the national housing situation (75.2%). Only just over 20% of the regional population live in floors of houses made of quality materials like cement.

Table 24: Materials from which floors of houses are made

Make of house floor	Proportion (%)	
	Regional	National
Mud / dung	78.32	75.18
Reed / bamboo	-	1.27
Wood planks	-	0.61
Parquet of polished wood	-	0.15
Cement screed	21.67	18.51
Plastic tiles	-	0.60
Cement tiles	-	1.34
Brick Tiles	-	0.69
Ceramic / marble tiles	-	1.48
Others	-	0.17

Source: Authors' analysis (2020).

Another indicator of housing quality is the materials from which the roofs of houses are made (Table 25). About 46% of the regional population live in houses with corrugated iron sheets, far below the national average of 64.8%. The great majority live under roofs made of wood and mud (18.5%), plastic canvas (9.3%), thatch (7.5%), and other poor materials (18.9%).

Table 25: Materials from which roof of the house is made

Make of house roof	Proportion (%)	
	Regional	National
Corrugated iron sheet	45.75	64.78
Concrete / Cement	-	1.12
Thatch	7.53	28.15
Wood and mud	18.50	2.92
Reed / bamboo	-	1.25
Plastic canvas	9.30	1.09
Asbestos	-	0.11
Bricks	-	0.03
Others	18.92	0.56

Source: Authors' analysis (2020).

The number of rooms in a house, excluding toilet and kitchen, is an indicator of housing poverty and this is shown in Table 26. On average, about 66.6% of the entire regional population live in a single room, regardless of the relatively higher average household size, 6.3 in Afar and 5.9 elsewhere across the country. Nationally, the population living in a single room amounts to some 27% compared to the situation in the region (66%). About 33.1% of the regional population live in houses with two rooms. Housing poverty in Afar region is serious. It requires particular focus and policy interventions designed to improve housing and related living conditions to enable the population to tolerate the harsh climate and weather conditions of the region.

Table 26: Number of rooms owned (excluding toilet and kitchen)

Number of rooms	Proportion (%)	
	Regional	National
1	66.64	26.64
2	33.06	33.34
3	1.10	25.65
4	0	9.13
5	1.20	2.61
6+ rooms	-	2.63

Source: Authors' analysis (2020).

6.4. Sources of Energy

Sources of energy for lighting and cooking is an important welfare indicator. About 13 sources of energy were identified and for analysis (Table 27). The Afar region is relatively well off in terms of energy sources for lighting with about 90% of the population having access to standard sources of lighting including electric meter, solar, or generator. Similarly, access to standard sources of energy for cooking is relatively higher (about 89%) compared to the national access rate (78%).

Table 27: Main source of light and cooking fuel

Energy source	Light (%)		Cooking fuel (%)	
	Regional	National	Regional	National
Electricity meter - private	32.04	23.67	41.65	56.45
Electricity meter - shared	56.44	18.67	17.40	14.95
Electricity from generator	-	0.82	29.81	6.62
Solar energy	2.05	11.33	-	5.98
Bio gas	-	0.02	-	4.80
Electrical battery	0	0.77	-	0.13
Lantern	-	0.04	-	0.13
Light from dry cell with switch	0.64	18.80	-	0.18
Kerosene light lamp (imported)	-	1.53	11.14	9.53
Kerosene lamp (local kuraz)	8.06	21.76	-	0.02
Candle/wax	-	0.12	-	0.00
Fire wood	0.77	1.39	-	0.50
Others		1.07	0	0.70

Source: Authors' analysis (2020).

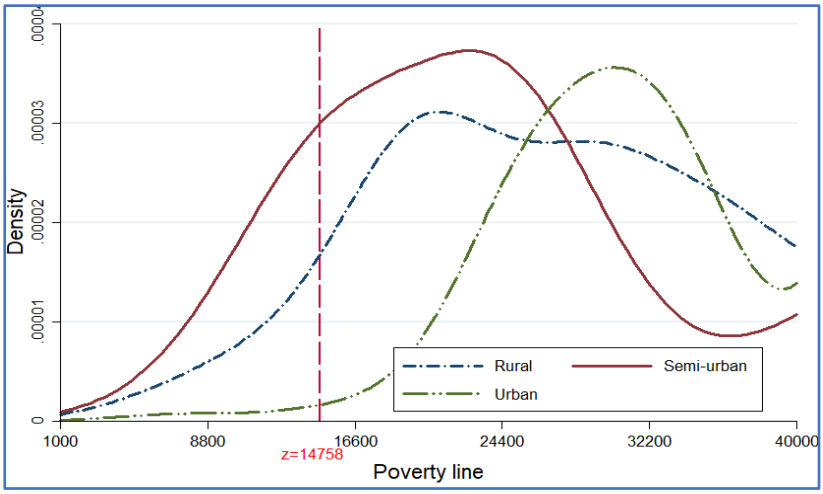
6.5. Economic Wellbeing

Economic welfare or monetary poverty in this study is measured by annual real consumption expenditure per capita where ETB 14758 (or $1.9 a day) is considered as the international or absolute poverty rate.

6.5.1. Patterns of poverty

The distribution of consumption expenditure shows that greatest majority of the population in the Afar region is above the poverty line (left of the vertical poverty line) in all areas of residence as indicted by the vertical line (at z=14758) (Figure 16). However, poverty is relatively more prevalent in semi-urban areas of the region. This is different from the poverty situation across the country where semi-urban areas are usually expected to be relatively better-off in terms of poverty compared to their rural counterparts. It offers clear evidence suggesting the need to design policy interventions to reduce poverty in small towns of the region where poverty is worse than in rural areas.

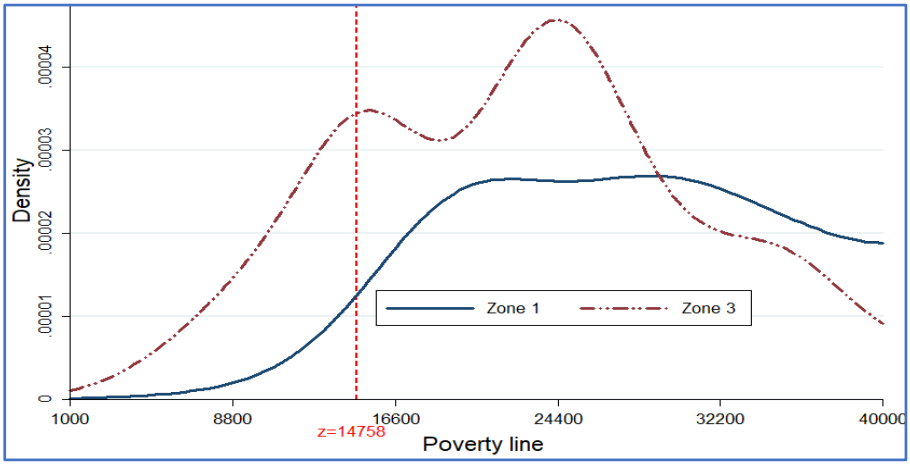
Figure 16: Patterns of poverty in the Afar region



Source: Authors' computation (2020).

The distribution of poverty incidence was also plotted by the two administrative zones representing the region in the LSMS data (Figure 17). Poverty incidence in Awsi Rasu of the Afar region is far higher than the situation in Gabi Rasu, and there is a substantial difference in poverty situation across the different zones of the region. This emphasizes the need to reduce spatial welfare differentials using relevant policy interventions to ensure equitable growth and redistribution in the region.

Figure 17: Zonal distribution of poverty in the Afar region



Source: Authors' computation (2020)

6.5.2. Prevalence and depth of poverty

The prevalence and depth of poverty in Afar region is measured and compared to the national average in Table 28, and the results clearly indicate that both the incidence and depth of monetary poverty are far lower in Afar region (5.4% and 1.5% respectively, compared to the national averages (22.1% and 6%). The spatial distribution of poverty by place of residence is also nearly similar across the region. This compares to the situation across the country where rural poverty is twofold higher than in urban areas.

Table 28: Levels and distribution of poverty by place of residence

Place of residence	Poverty incidence		Poverty gap	
	Regional	National	Regional	National
Rural	0.060	0.241	0.018	0.064
Semi-urban	0.053	0.155	0.009	0.052
Urban	0.007	0.127	0.003	0.034
All	0.054	0.221	0.015	0.060

Source: Authors' computation (2020).

6.5.3. Elasticity of poverty

Growth elasticity of poverty (GEP) in this case measures the percentage reduction in poverty rates associated with a percentage change in mean real income or expenditure. Elasticity of total poverty with respect to average

expenditure growth in the Afar region is high (Table 29). A unit percentage growth in real consumption expenditure reduces poverty incidence by 4.6% and 10.2% in rural and semi-urban areas of the region, respectively. This level of elasticity is relatively very high compared to the poverty elasticity in Ethiopia (2.45 and 1.5%). The total regional growth elasticity of poverty is higher (-5.1%) compared to the national average (-2.2%). The same pattern of depth of poverty is observed in the region. This level of poverty elasticity suggests a positive responsiveness to potential poverty reduction interventions in the region.

Elasticity of poverty with respect to consumption inequality is also relatively very high compared to the national average. A unit percentage growth in inequality would increase total incidence of poverty by about 5.4% and 1.9%, respectively, in rural and urban areas of the region. The elasticity of poverty due to inequality is exceptionally low (1.9%) in urban areas of the region, but more elastic with reference to inequality (5.9%) compared to the national average (4.7%).

Table 29: Elasticity of total poverty in Afar region

Place of residence	Poverty incidence		Poverty gap	
	Regional	National	Regional	National
Growth elasticity of poverty				
Rural	-4.57	-2.39	-2.74	-2.95
Semi-urban	-10.20	-1.48	-2.86	-1.73
Urban	-0.42	-1.13	-0.23	-1.56
All	-5.11	-2.17	-2.52	-2.70
Poverty elasticity with respect to inequality				
Rural	5.43	2.31	5.84	5.14
Semi-urban	6.96	1.76	3.66	4.06
Urban	1.92	1.52	1.79	3.47
All	5.94	2.18	5.10	4.72

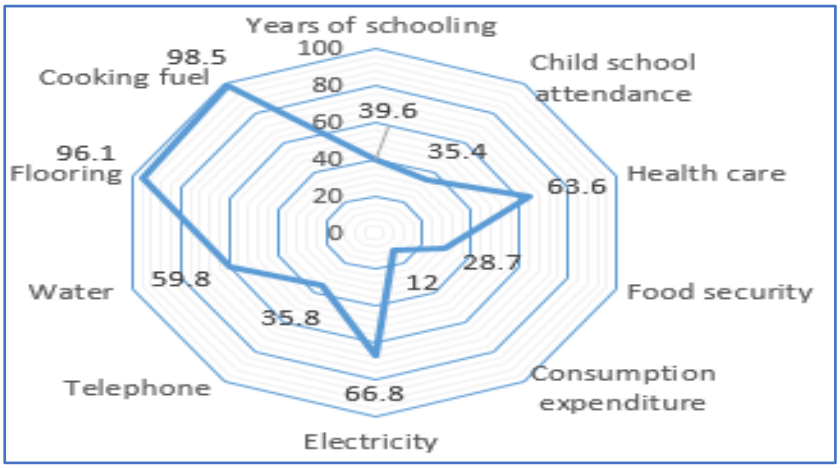
Source: Authors' computation (2020).

6.6. Multidimensional Deprivation

The incidence of multidimensional deprivation for the 10 indicators of poverty is reported in Figure 18, indicating significantly different incidence of deprivation. Living conditions of the population related to access to standard sources of cooking fuel (98.5%) and clean floors of housing (96.1%) show the highest levels of deprivation, while deprivation in education (proxied by child

school attendance and years of schooling) and health (captured by health care and food security) were relatively lower.

Figure 18: Relative levels of deprivation rate for the 10 poverty indicators



Source: Authors' computation (2020).

The mean index of deprivation for the 10 indicators is also shown by place of residence in Table 30.

Table 30: Mean index of deprivation by place of residence in Afar region

Indicators	Mean index of deprivation		
	Rural	Urban	Both
Education	0.589	0.494	0.558
Years of schooling	0.451	0.336	0.420
Child school attendance	0.302	0.503	0.368
Health	0.471	0.466	0.470
Health care	0.696	0.512	0.646
Food security	0.247	0.419	0.294
Consumption expenditure	0.060	0.037	0.054
Living condition	0.701	0.358	0.607
Electricity	0.722	0.000	0.524
Telephone	0.272	0.014	0.201
Water	0.527	0.000	0.382
Flooring	0.985	0.859	0.950
Cooking fuel	1.000	0.916	0.977
Incidence of MD deprivation	0.966	0.563	0.834
Intensity of deprivation (weighted)	0.458	0.331	0.416

Source: Author's computation (2020).

6.6.1. Education

Years of schooling: If there was a household member who has not completed six years of schooling, the household was considered poor or deprived. This measure indicated that the mean index of deprivation in years of schooling was 42%. As expected, deprivation in years of schooling decreased with increasing urbanization from 58.9% in rural areas to 49.4% in urban areas.

Child school attendance: The second indicator of education poverty was school attendance. Any school-aged child is considered deprived if s/he is not currently attending school up to grade eight. The mean index of deprivation in school attendance of school-aged children was about 36.8%, suggesting that the great majority of children were not attending school. Deprivation in school attendance unexpectedly increased with increasing urbanization from 30.2% in rural areas to 50.5% in urban centers.

6.6.2. Health

Health care: If individuals in the households did not consult any medial practitioner in the last 12 months, they were considered deprived. The mean index of deprivation in health care of the population was 64.6%, suggesting that majority of the population did not consult any medical practitioner within a year. This is attributable to different factors including absence or scarcity of health centers and practitioners and/or the inability of households to access the health services due to financial and other constraints.

Food security: Food insecurity also leads to undernourishment and provides an indicator of health poverty. Households were considered deprived or food insecure if they faced difficulty in satisfying food needs over the previous 12 months. Shortage of food for an extended period is an indicator of food insecurity in terms of both quantity (energy requirements) and quality (nutrition) which can adversely affect human health. The mean index of deprivation in food was 29.4% where a significant proportion of the population had faced difficulty in satisfying their food needs, suggesting that health was adversely affected by food shortage and poor nutrition. Food insecurity significantly increased with increasing urbanization from rural (24.7%) to urban centers (41.9%). Unlike rural areas, the urban centers in Afar region are characterize by food shortages.

6.6.3. Expenditure

Real consumption expenditure per capita was the indicator of income poverty used in this study. Individuals living below the absolute poverty line, ($1.90 or ETB 40.43 per day at an exchange rate of 21.28 in December 2015), were considered consumption poor. Accordingly, the absolute poverty line, determined by using the annual real consumption expenditure per capita, was ETB 14758. Individuals falling below this absolute poverty line were 5.4% (considered income poor).

6.6.4. Living condition

Electricity: Individuals with no access to lighting from standard sources (electricity from electric meter, electric meter from generator, solar energy, biogas, electric battery, lantern, dry cell) were considered poor in electricity. About 52.4% of the population lacked electric light from standard sources, the majority of which were rural residents (72.2%). There was no significant deprivation in electricity among the urban population of the region.

Telephone: A second indicator of living condition or service poverty is ownership of private telephone services, and individuals were considered poor if they had no private access to any type of telephone services. About 20.1% of the regional population had no private telephone services of which 27.2% was the deprivation rate among rural residents.

Water: Access to sources of safe drinking water is another important indicator of poverty of living condition. About 38.2% of the entire population and over half of the rural population (52.7%) were deprived of safe drinking water. There was no significant deprivation of safe drinking water among the urban population.

Flooring: Individuals were considered deprived if the household was living in a house with dirt floor or floor made of sand or dung. The proportion of the population living in a house with dirt floor was very high (95.0%). The majority of population in the region were house poor, living in houses with unclean floors, and this included about 98.5% of the rural population.

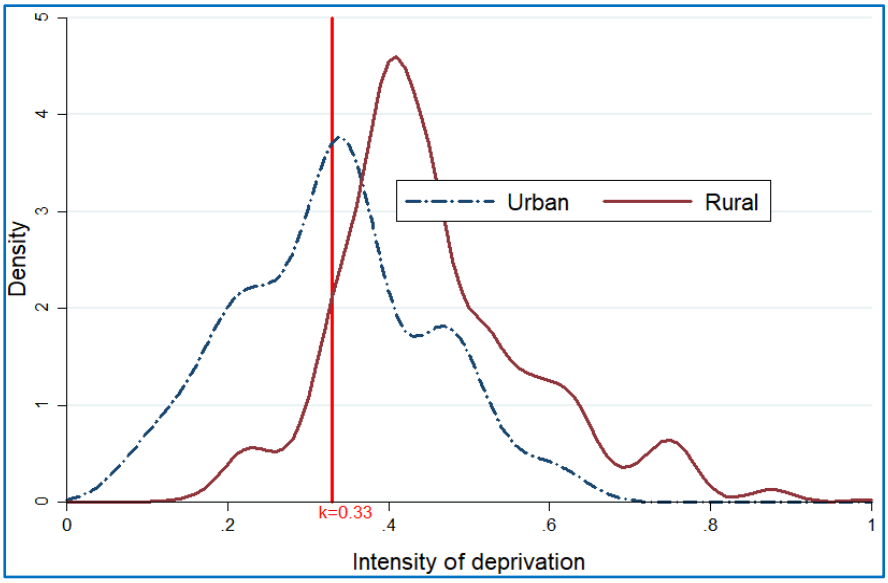
Cooking fuel: Individuals in households were considered deprived if the households' source of cooking fuel was dung, wood or charcoal. About 97.7% of the total population were poor in terms of their sources of cooking fuel, and the entire rural population (100%) and 91.6% of the urban population used poor sources of cooking fuel.

6.6.5. Multidimensional deprivation

Incidence of deprivation: Generally, the incidence of multidimensional derivation in the region was 83.4%, with rural residents more highly deprived (96.6%) compared to their urban counterparts (56.3%).

Intensity of deprivation: The density curves of the intensity of multidimensional deprivation for the 10 indicators between rural, small towns and large towns are plotted in Figure 19. The density curves indicate the proportion of poor and non-poor population by areas of residence. A greater proportion of the rural population was relatively more multidimensionally deprived, falling above the dimensional poverty cut-off point (at k = 0.333), indicating that intensity of multidimensional deprivation decreases with increasing urbanization.

Figure 19: Density curves of intensity of multidimensional deprivation



Source: Author's computation (2020).

6.7. Regional Multidimensional Poverty Index (MPI)

The MPI as a measure of welfare reflects both the incidence of poverty and the intensity of poverty (the percentage of deprivations suffered by each person or household on average). It reflects the proportion of weighted

deprivations that the poor experience in a society out of all the total potential deprivations that the society could experience, and it represents the share of the population that is multidimensionally poor adjusted by the intensity of the deprivation suffered.

The Alkire-Foster (AF) (2011) methodology of multidimensional poverty analysis was employed to estimate these measures. The spatial distributions of these measures are shown in Table 31. The results indicate that 96% of the population in the Afar region was multidimensionally deprived of the 10 weighted indicators. Regardless of the different indicators and dimensions used in this study, the incidence of multidimensional poverty is higher than national average (83.1%) (Degye Goshu, 2020). But prevalence of multidimensional poverty increases with increasing urban growth. Rural areas relatively contributed 72% to the incidence of multidimensional poverty in the region.

The MPI (55%) is the product of the two factors, headcount ratio (H) and intensity. Because they were, on average, deprived in 96% of the weighted indicators, the population in the region were deprived in 55% of the total potential deprivations they could experience overall. Like the incidence of multidimensional deprivation, the MPI increased with the increasing level of urban growth, rising from 52% in rural areas to 63% in urban areas.

Table 31: Spatial distribution of poverty in Afar region

Multi-dimensional poverty measures	Rural	Urban	Regional
MPI			
Population share	0.74	0.27	1.00
Headcount ratio (H0)	0.94	0.99	0.96
Adjusted headcount (MPI=M0)	0.52	0.63	0.55
Relative contribution to incidence (H0)	0.72	0.28	1.00
Relative contribution to adjusted headcount (M0)	0.69	0.31	1.00
Non-monetary MPI			
Headcount ratio (H0)	0.75	0.98	0.819
Adjusted headcount (MPI=M0)	0.35	0.52	0.39
Relative contribution to incidence (H0)	0.67	0.33	1.00
Relative contribution to adjusted headcount (M0)	0.64	0.36	1.00
Monetary poverty			
Incidence of poverty (α=0)	0.060	0.037	0.054
Poverty gap index (α=1)	0.018	0.007	0.015

Squared poverty gap index (α=2)	0.008	0.003	0.006

Source: Author's computation (2019).

The incidence of non-monetary poverty estimated with three non-monetary dimensions of wellbeing (education, health and living conditions) is 81.9%, 14 percentage points lower than the overall MPI (98%). Similarly, the non-monetary MPI was 55%, which is 16% lower than the overall MPI. Non-monetary MPI was higher in urban areas compared to the rural counterparts, indicating that non-monetary poverty is increasing with urban growth. Incidence of monetary poverty, estimated by using the Foster-Greer-Thorbecke (FGT) method, was 5.4%, far lower than the other two multidimensional measures. The results generally suggest that income poverty in the Afar region was significantly and relatively lower than the other forms of poverty.

In order to estimate the relative and absolute contributions of the 10 indicators and the four (aggregated) dimensions of multi-dimensional poverty, the AF (2011) total MPIs (H0 and M0) were decomposed to their constituent parts (Table 32). The contribution of the four dimensions to the total MPI, in order of importance, are income, health, education and living condition with significant and comparable contributions.

Table 32: Decomposition results of the MPIs by indicators/ dimensions using the Shapley approach

Dimensions/Indicators	Contribution to H0		Contribution to MPI	
	Absolute contribution	Relative contribution	Absolute contribution	Relative contribution
Education	0.143	0.148	0.090	0.162
Years of schooling	0.088	0.092	0.056	0.101
Child school attendance	0.054	0.056	0.034	0.061
Health	0.190	0.198	0.122	0.221
Health care	0.060	0.062	0.040	0.073
Food security	0.130	0.136	0.082	0.148
Income	0.502	0.524	0.256	0.462
Consumption expenditure	0.502	0.524	0.256	0.462
Living condition	0.125	0.130	0.086	0.155
Electricity	0.034	0.035	0.022	0.040
Telephone	0.046	0.048	0.033	0.059
Water	0.041	0.043	0.028	0.050
Flooring	0.003	0.003	0.002	0.004

Cooking fuel	0.001	0.001	0.001	0.002
Regional	0.957	1.000	0.554	1.000

Source: Authors' computation (2020).

Education: Education contributed 14.3% and 14.8% to the total head count ratio in absolute and relative terms, respectively. This was the third largest contribution (next to health) to the incidence of total MPI. Similarly, the relative contribution of education to the total MPI (M0) was 16.2%. Compared to child school attendance, years of schooling contributed more to education poverty.

Health: Health ranked second in its contribution to total MPI in both absolute and relative terms. It contributed 19.8% to the total multidimensional deprivation (H0). Similarly, the relative contribution of health to the total MPI (M0) was 22.1%. Compared to health care, food security contributed more to health poverty.

Expenditure: As expected, over half of the total multidimensional poverty in the Afar region is attributable to consumption poverty. It provides 52.4% and 46.2% relative contributions to MP incidence and the MPI, respectively.

Living condition: Living condition of the population, as captured by access to major utilities and facilities, makes a comparable contribution to the other dimensions of wellbeing. In relative terms, it contributes 13% to incidence of multidimensional deprivation and 15.5% to MPI. Access to telephone and safe drinking water make relatively larger contributions to the total MPI; however, cooking fuel and flooring have relatively lower contributions to poverty.

6.8. Multi-dimensional Inequality

The multidimensional inequality index (MII) was computed by using the Araar MII (Araar, 2009) with uniform dimensional weights of 25% for each dimension of inequality (Table 33). To apply this method of analysis, the 10 weighted indicators were aggregated to the four dimensions. The results indicate that the relative MII in Afar region was 0.282 and it did not significantly vary by areas of residence (rural-urban). The non-monetary MII estimated by excluding the income dimension of wellbeing was 0.152, significantly lower than the overall MII (0.282). On the other hand, the monetary inequality was 0.248, with little variation by place of residence.

The total MII, decomposed to the welfare dimensions, indicate that the primary sources of inequality in Afar region were identified to be real consumption expenditure with 60.2% contribution to the overall regional MII. The other three dimensions (education, health and living condition) had nearly comparable contributions to the total MII, with 14.8%, 14.7% and 10.3% contributions, respectively. As expected, the greatest proportion of MII was attributable to consumption inequality. The population of the region are more likely to face equity problems mainly arising from the difference in their consumption expenditure.

The highest source of non-monetary inequality in the region was education (37.8%) followed by health (36.9%) and living condition (25.4%). Non-monetary inequality due to education and health generally decreased with increasing level of urbanization. However, the contribution of living condition to non-monetary MII increased with increasing urbanization, suggesting that urbanization in the region was not accompanied by improved basic urban facilities and services.

Table 33: Spatial distribution of inequality among the poor and relative contribution of dimensions (%)

Inequality measures	Inequality index	Education	Health	Income	Living condition
MII (λ=0.5)	0.282	14.83	14.69	60.16	10.32
Rural	0.268	12.27	13.81	65.87	8.06
Urban	0.269	20.37	18.61	55.52	5.50
Non-monetary MII (λ=0.5)	0.152	37.79	36.86	-	25.35
Rural	0.126	37.52	39.62	-	22.86
Urban	0.176	44.83	43.45	-	11.72
Monetary inequality (Gini)	0.248	-	-	-	-
Rural	0.249	-	-	-	-
Urban	0.240	-	-	-	-

Source: Authors' computation (2020).

7. Development Trends and Gaps

This section focuses on the performances, trends, and gaps of different sectors and subsectors in the Afar National Regional State. The major sectors considered include education, health, agriculture and pastoral development, trade and industry, basic utilities, budget, expenditure and revenue.

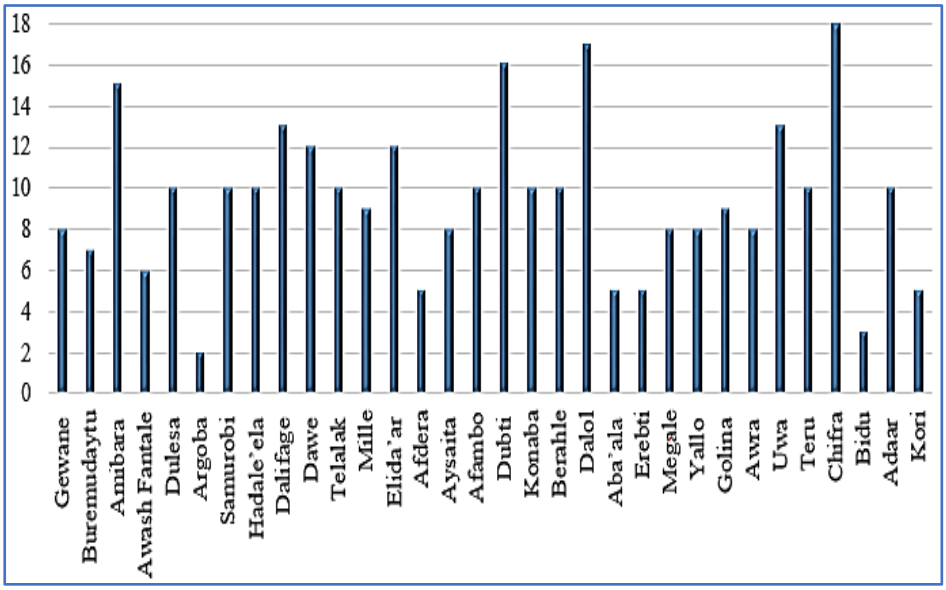
7.1. Agricultural and Pastoral Development

The Afar National Regional State is basically a pastoral and agro-pastoral region, known for its livestock production. The region holds about 63.5% of the camel population, 2.91% of the cattle, 13.6% of sheep, 25.6% of goats, and 4.6% of donkeys in Ethiopia in 2019 (CSA, 2019b).

As a result, livestock development demands the provision of inputs required for enhancing productivity from this sector. Among these, availability of veterinary clinics and animal health posts have a significant role. Indeed, the region is expected to expand animal health facilities together with necessary utilities required for effective functioning of these physical facilities. In terms of number and distribution of veterinary clinics and health posts, Chifra woreda has the most, followed by Dalol, Dubti, Amibara, Dalifag, and Uwa woredas in that order. Argoba woreda has the least in terms of number, followed by Bidu woreda (Figure 20). The region needs to work on equitable distribution of animal health related facilities among its woredas based on available livestock resources, proximity to markets, and so on. Focus group discussion participants reported that many of the available veterinary clinics and animal health posts were not providing the required functions due to the absence of the necessary utilities, such as electricity, water, and medical supplies. There is an urgent need to provide the necessary utilities (water, electricity, medical supplies) to run the clinics and health posts.

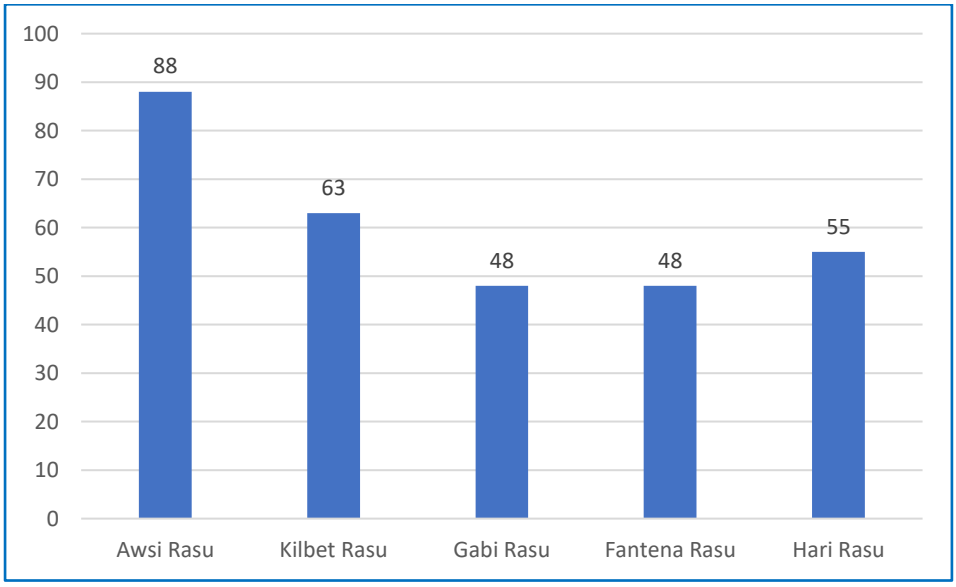
When the figures are aggregated at zonal level, Awsi Rasu has the most number of veterinary clinics and animal health posts (88) followed by Kilbet Rasu and Hari Rasu in that order (Figure 20). Given the fact that the region in general is known for its livestock population, the available number of veterinary clinics and animal health posts seems inadequate.

Figure 20: Distribution of veterinary clinics and animal health posts by Woreda, 2019



Source: Authors' computation from regional data (2020).

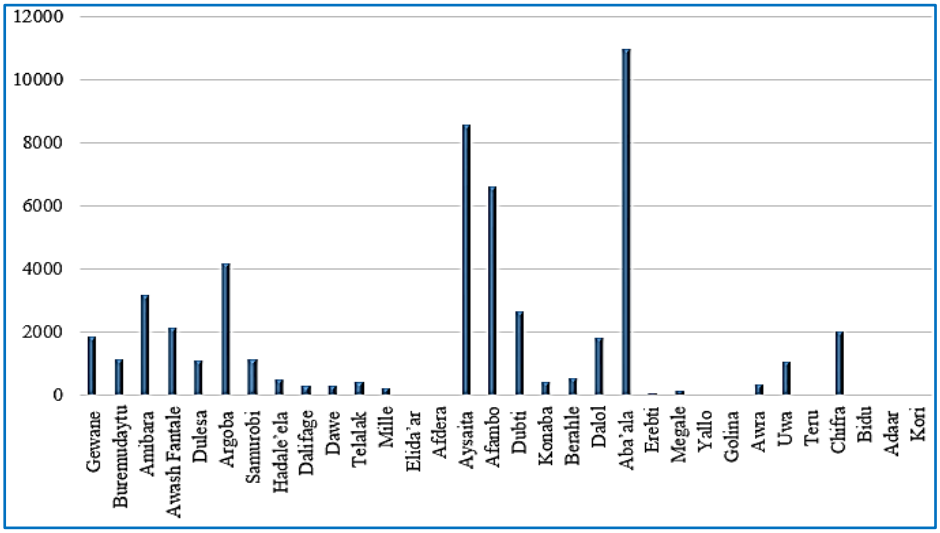
Figure 21: Distribution of veterinary clinics and animal health posts by Zone, 2019



Source: Authors' computation from regional data (2020).

Though the region is known for its livestock production, crop production is also practiced in some parts of the region. In terms of area allocated for crop production, Aba'ala woreda took the lead followed by Aysaita, Afambo, and Argoba woredas (Figure 22).

Figure 22: Area allocated for crop production (ha) by woreda, 2019



Source: Authors' computation from regional data (2020).

Zonal comparisons indicate that crop production is more common in Awsi Rasu as the zone leads in terms of land allocated to crop production (20135ha), total crop production (769740 thousand quintals), and number of agrochemical users (161,080 households) (Table 34) followed by Kilbet Rasu, Gabi Rasu, Hari Rasu and Fantena Rasu in that order.

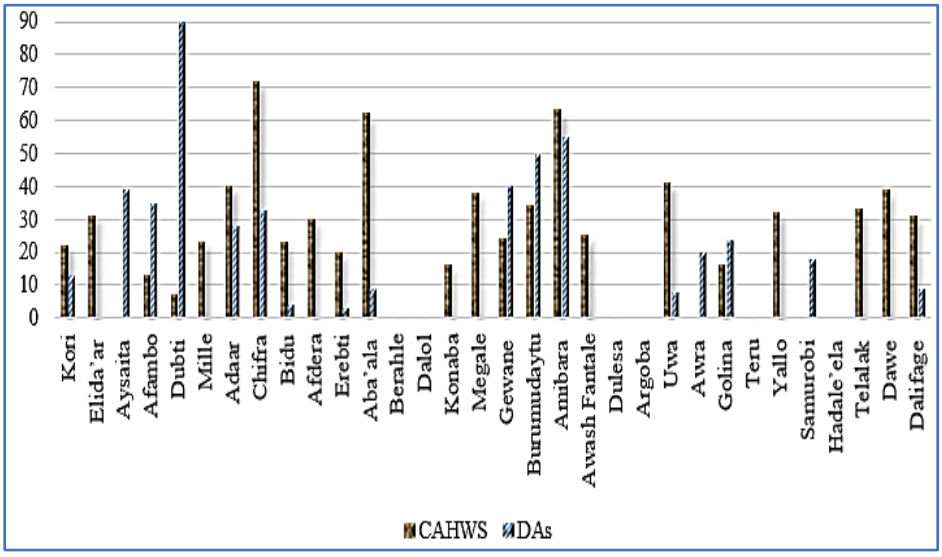
Table 34: Zonal comparison of activities related to crop production and input use, 2018/19

S/N	Particulars	Awsi Rasu	Kilbet Rasu	Gabi Rasu	Fantena Rasu	Hari Rasu
1	Area under crop production (ha)	20135	13929	13579	1505.5	2671
2	Total production (1000 Qt)	769740	396395	471340	22582.5	59150
3	Users of agrochemicals (number of households)	161080	111432	108632	12044	21368

Source: Authors' computation from regional data (2020).

In order to provide pastoralists, agro-pastoralists, and farmers with technical support, trained professionals are deployed throughout the country. Community Animal Health Workers (CAHWS) are responsible for taking care of animal health-related issues while Development Agents (DAs) are there to support production and management aspects of crops, livestock, and natural resources. In line with this, CAHWS and DAs are placed in different kebeles and woredas of the Afar region. Dubti woreda has the largest number of DAs followed by Amibara woreda, while Chifra took the lead in terms of CAHWS followed by Amibara and Aba'ala woredas (Figure 23). Amibara woreda is in a better position than others in terms of both CAHWS and DA numbers. Woredas like Aba'ala which are reported to have a larger area of land allocated to crops, have a smaller number of development agents. This is an indication that some revision of the placement of CAHWS and DAs based on the reality of livestock and crop coverage is required.

Figure 23: Distribution of CAHWS and Das by Woreda, 2019

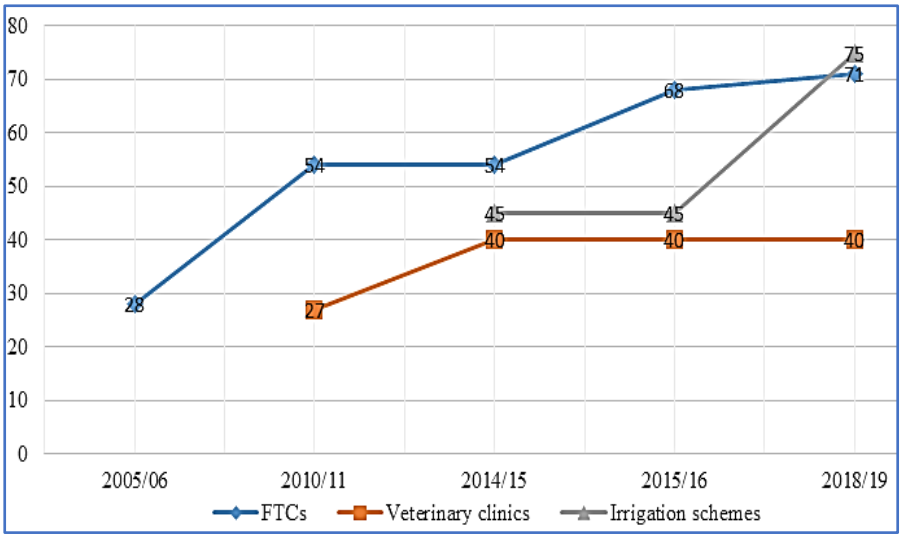


Source: Authors' computation from regional data (2020).

The region has given due attention to expanding irrigation schemes as it has a huge potential for irrigated agriculture. Indeed, an increasing trend in terms of the number of irrigation schemes observed, which is very encouraging (Figure 24). The number of farmer/pastoralist training centers (FTCs) has also been

increasing over the last decade in the region. However, the number of veterinary clinics has remained almost stagnant. Given the fact that the region is known for its livestock resources, it is advisable to focus on the expansion of veterinary clinics for the region as a matter of urgency.

Figure 24: Trend of numbers of FTCs, Veterinary Clinics, and irrigation schemes

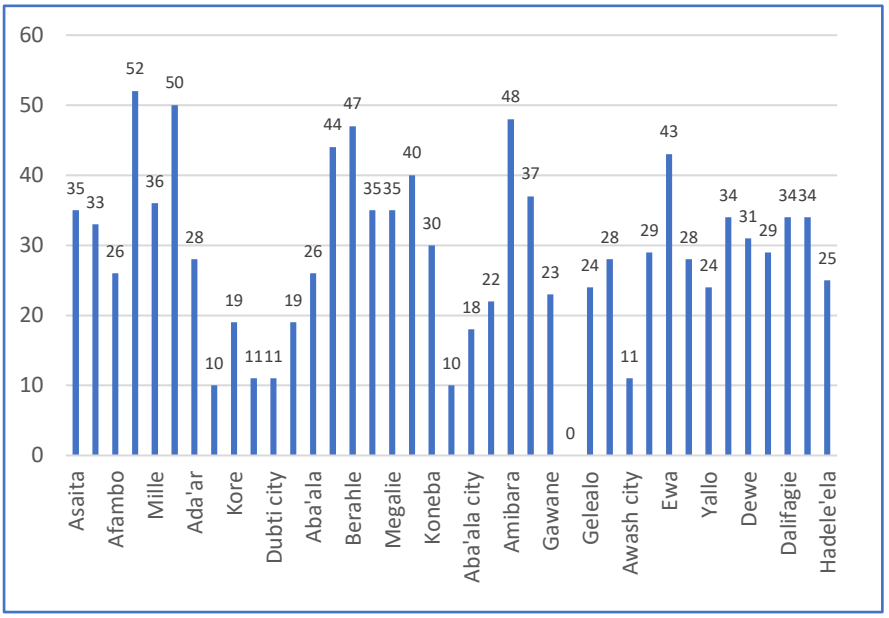


Source: Authors' computation from regional data (2020).

7.2. Education Sector Development

Education is instrumental in bringing economic growth and development. Education in Ethiopia is at the center of the government's policies as the country is striving to achieve its target of becoming a low middle-income country and that of the sustainable development goals by 2030. In connection to this, for the last 20 years, expansion of education in Ethiopia played significant role in terms of improving the livelihoods of the people. The following sections present educational careers and achievements in Afar region. The discussion starts from the sector's education pillars; namely, schools, students, and teachers. Comparisons between students' and teachers' sex and educational qualification, and differences among the different weredas and zones have been explored (Figure 25).

Figure 25: Distribution of primary schools by woreda, 2018/2019

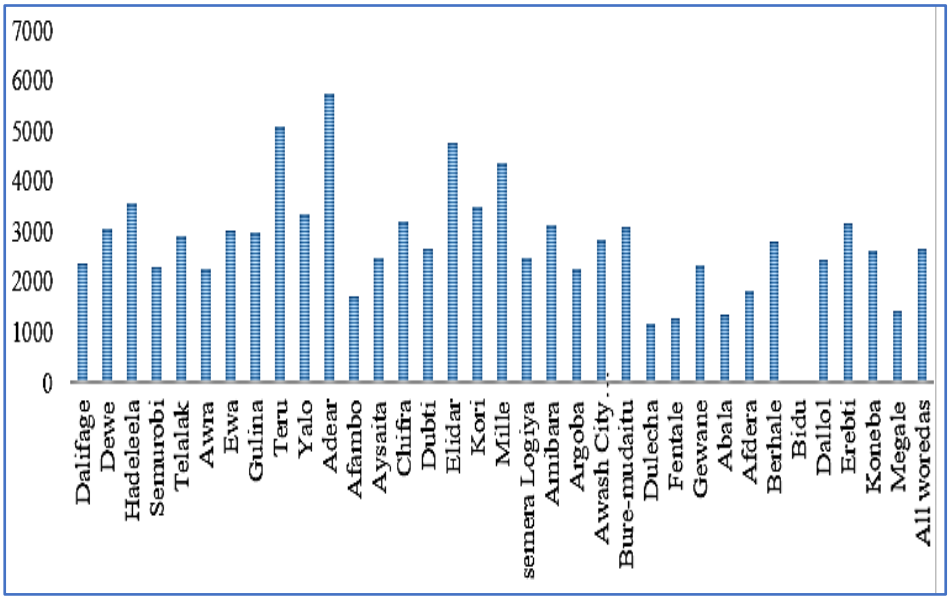


Source: Authors' computation from regional data (2020).

The distribution of primary schools in each woreda in Afar region was assessed. The highest number of primary schools, 52, was found in Elidar woreda. Chifra, Amibara, and Berehale woredas also have 50, 48 and 47 primary schools, respectively. Gereni and Budi have 10 primary schools. The result shows education performance is in a good position in terms of the distribution of primary schools in the region though more focus is still required to assure equity among the woredas. Indeed, the education sector can be considered one of the most successful achievements in the last 20 years, with the exception of the quality problem which is not unique to Afar region. Responses from the focus group discussions in Hari Rasu| indicated that education was the most important sector contributing to better performances in the region.

Figure 26 shows students' enrolment in primary schools in the different woredas. Teru and Adear woredas have the highest student enrollment, both with more than 5000 students. Elidar and Mille have the second highest student enrollment with 4700 and 4300 students, respectively. Afambo, Dulecha, Fentale, Abala, Afdera woredas, however, have the lowest enrollments with less than 2000 students.

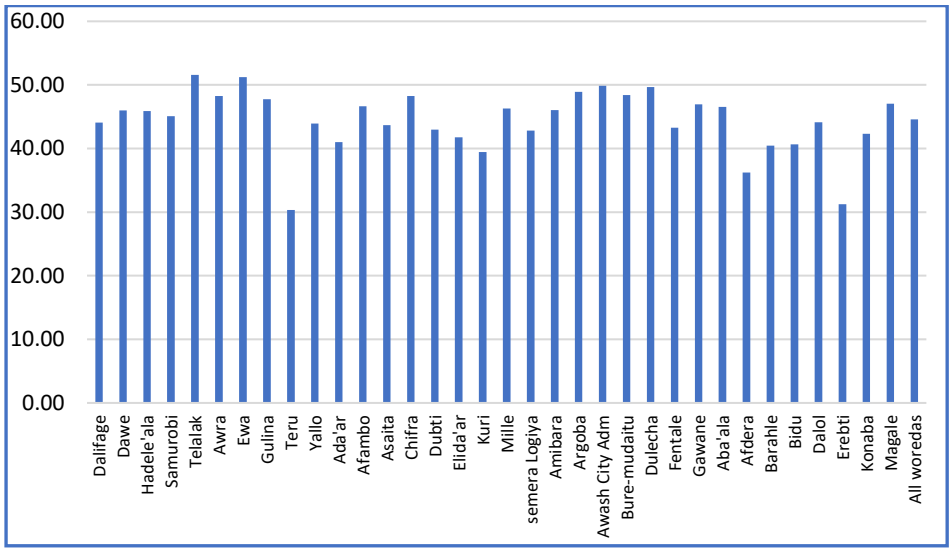
Figure 26: Distribution of student enrollment in primary schools by woreda, 2018/2019



Source: Authors' computation from regional data (2020).

Even though the education sector has showed improvement in general, the share of female students' enrolment in primary schools in Ethiopia remains low, due to complex interplay of socio-cultural, economic and structural factors. This is also the case in the Afar region. Figure 27 shows the proportion of female students' enrolment in the region at woreda level in the year 2018/19. Female students' enrolment is found to be about 50% or more in Ewa, Telalak, Awash City Administration, and Dulecha woredas, more or less the same as the national level. The figures are smaller for Teru and Erebti woredas where the proportion of female students is closer to 30%. This indicates a lot to be done to encourage households to send their daughters to school. Except for these two woredas, all of the woredas have more than 40% of female student engagement in primary schools.

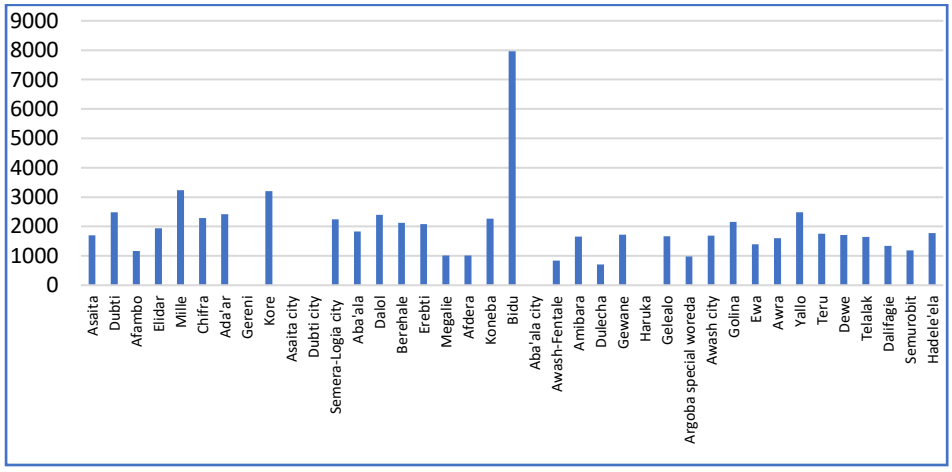
Figure 27: Proportion of female students in primary schools by woreda, 2018/2019



Source: Authors' computation from regional data (2020).

Figure 28 shows population to primary school ratios for the woredas in Afar region. The shortage of primary schools is most prevalent in Bidu woreda where one primary school serves about 8000 people. Dulecha, Awash Fentale, Ab'ala, Afdera, Magale, Afambo, and Argoba woredas are relatively well placed in terms of the population to primary school ratio.

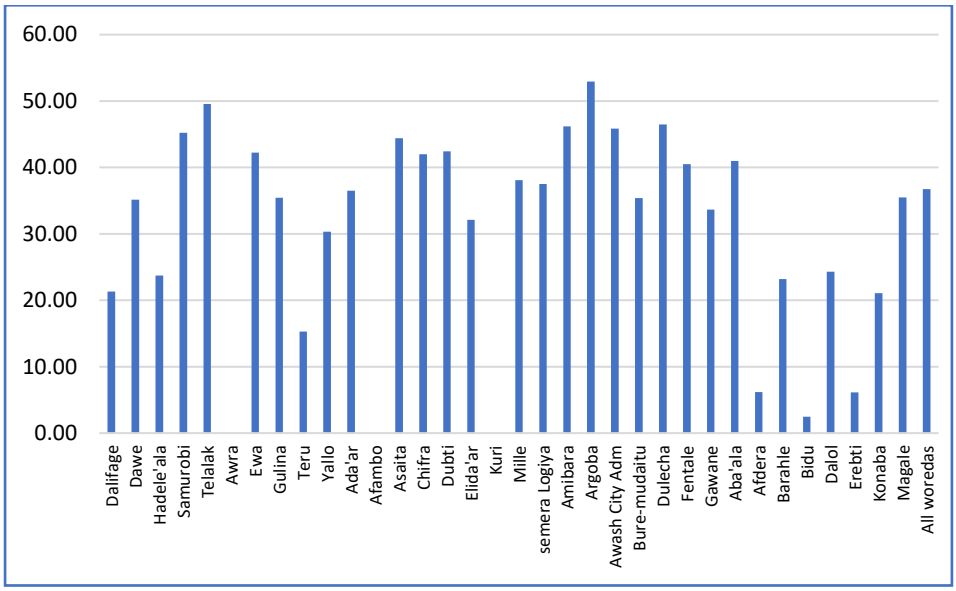
Figure 28: Population to primary school ratio by woreda, 2018/2019



Source: Authors' computation from regional data (2020).

Figure 29 shows the proportion of female students enrolled in high school, (grades 9-12) in different woredas of the region. The highest proportions of female students were observed in Telalak and Argoba woredas (about 50%), while less than 10% female students were registered in Afdera, Budi, and Erebti woredas where a lot will have to be done to improve the proportion of female students. The majority of the woredas enrolled between 30% and 50% female students in grades 9-12 in 2018/19.

Figure 29: Proportion of female students in grades 9-12 by woreda, 2018/19



Source: Authors' computation from regional data (2020).

Zonal level comparison of some variables at primary school are indicated in Table 35 below. In terms of the proportion of female students in primary schools, all the five zones are more or less similar, though Gabi Rasu has relatively more and Kilbet Rasu relatively less, more than 47% or more than 42% of female students, respectively. The figures are not bad though improvements are still required to have the same proportion of male and female students at primary school levels. In grades 9-12, Gabi Rasu has a relatively higher proportion of female students (45.2%) followed by Awsi Rasu (40.2%). Kilbet Rasu had the smallest proportion (26%) of female students in grades 9-12 in 2018/19. Improvements in female student enrollment is necessary in grades 9-12 in all zones. In terms of the population to primary school ratio, one primary school

serves 3278 people in Fantena Rasu followed by 3215 people in Awsi Rasu. Kilbet Rasu is in a relatively better position with one school serving 2168 people. Kilbet Rasu also had a greater number of total student enrollment (49603 students) in primary schools followed by Awsi Rasu (44597 students) in 2018/19.

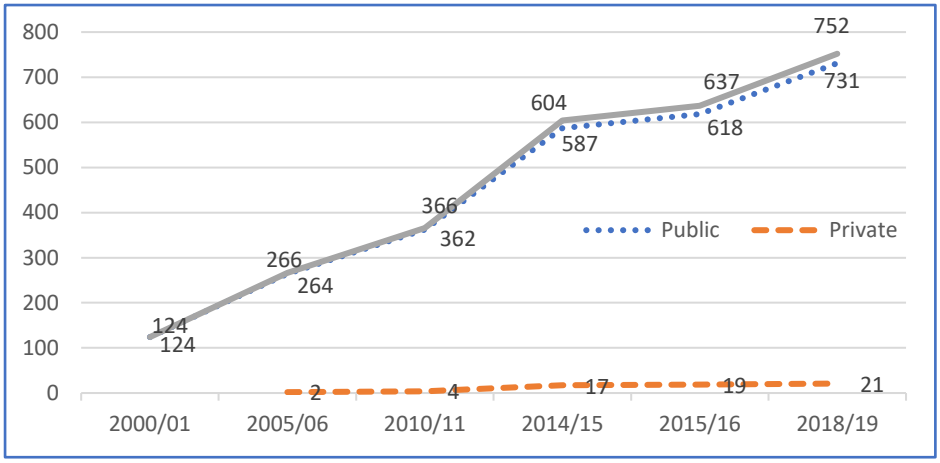
Table 35: Zonal comparison of educational variables at primary school levels, 2018/19

S/N	Particulars	Awsi Rasu	Kilbet Rasu	Gabi Rasu	Fantena Rasu	Hari Rasu
1	Proportion of female students in primary schools (%)	44.6	42.4	47.4	44.8	46.7
2	Proportion of female students in grades 9-12 (%)	40.2	26.0	45.2	31.0	33.4
3	Population to primary school ratio	3215	2168	2305	3278	2772
4	Student enrollment in primary schools (number of students)	44597	49603	25455	13850	16128

Source: Authors' computation from regional data (2020).

Ethiopia has given emphasis to the expansion of private schools as a means to shift costs to users. As a result, the current dual system of education has grown significantly in the country though the number of private schools in the Afar region remains small. The data presented on the line graph (Figure 30) shows the number of private and public primary schools in the region. This shows the number of private primary schools set up since 2010 is only 15 and despite the country's effort to increase the private educational sector, no significant progress has been noticed for 8 years in the Afar region. It has, however, been able to maintain and improve the growth of public schools. The number of public primary schools, for example, has increased by about 71% since 2010. In 2010, the number was 409 but by 2014, the number had increased to 593, in 2015 to 626, and by 2018 to 700.

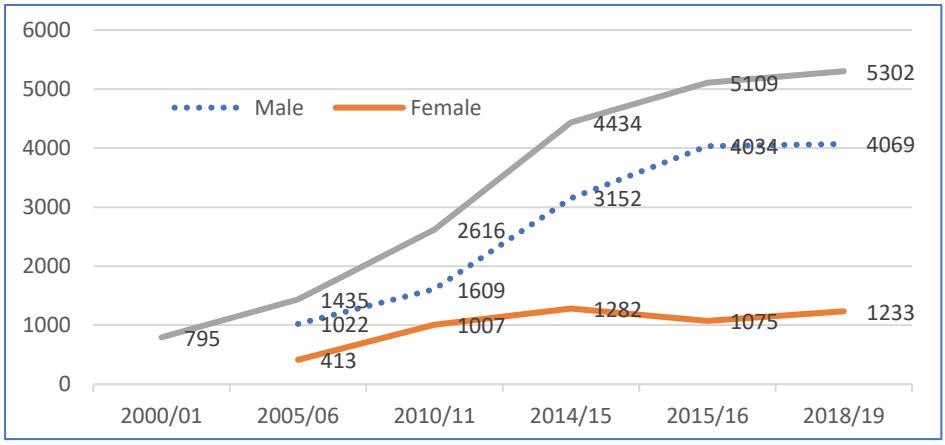
Figure 30: Number of private and public primary schools in Afar region



Source: Authors' computation from regional data (2020).

With the intention of improving the quality of education, Ethiopia has been investing in teacher capacity development over the last two decades. Figure 31 shows the number of teachers in the region from 2014 to 2018. In 2014 the total number of primary school teachers was 4434 and the number grew to 5302 in 2018, an increase of 19.6% within 4 years. The growth in the number and gender of teachers along with school growth was also compared. The gap between the numbers of female and male teachers in 2014 was 1870. In 2018, the gap had grown to 2836, and it can be seen that male teachers dominate primary schools in the region.

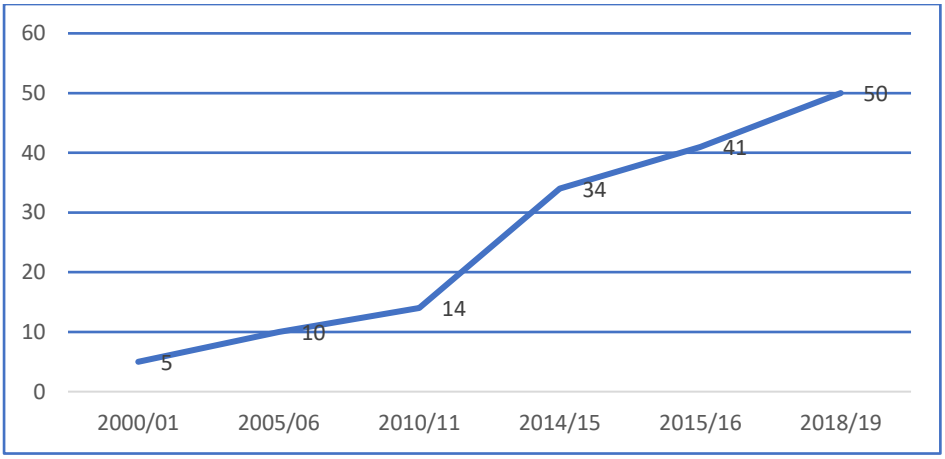
Figure 31: Number of primary school teachers in Afar region



Source: Authors' computation from regional data (2020).

Figure 32 shows the growth of number of secondary schools in the region in the past ten years, with a considerable increase between 2010 and 2014, demonstrating performance of the region to improve access to secondary schools.

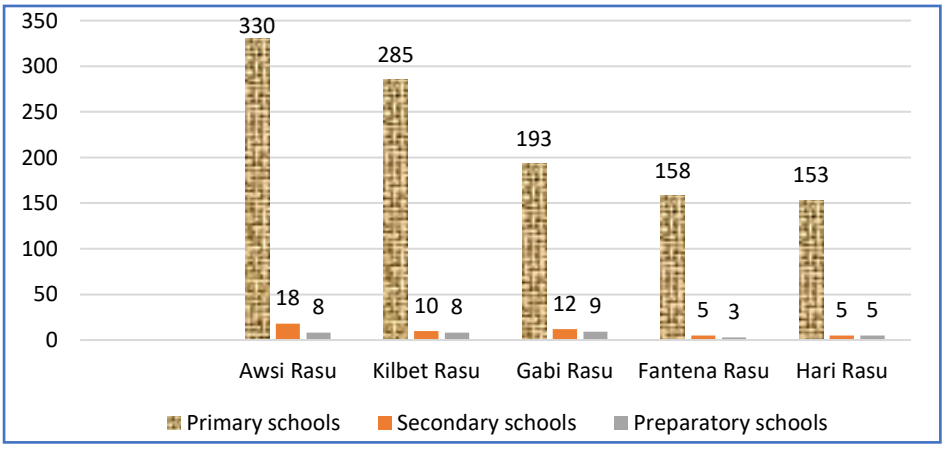
Figure 32: Number of secondary schools in Afar region over years



Source: Authors' computation from regional data (2020).

When the primary and secondary schools are disaggregated by zones, Awsi Rasu is in the best position followed by Kilbet Rasu and Gabi Rasu. As with other developments in the region, there remains considerable differences between the zones.

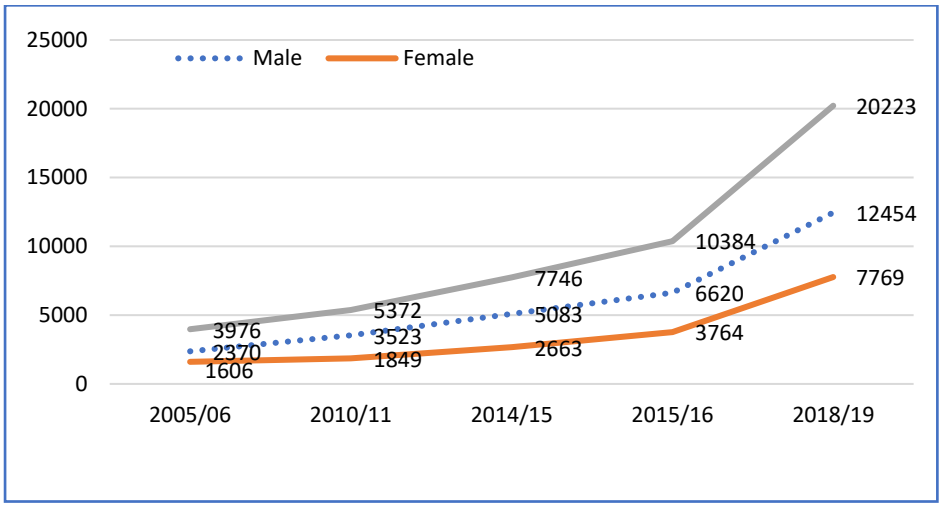
Figure 33: Distribution of schools by zones, 2018/2019



Source: Authors' computation from regional data (2020).

The Afar region, like the country's education system, has also showed improvement in secondary school students' enrollment. Figure 34 shows enrollment in secondary schools with the number of students increasing by about fivefold, from 3976 in 2005 to 20223 in 2018. This also underlines the improving access to secondary schools in the region.

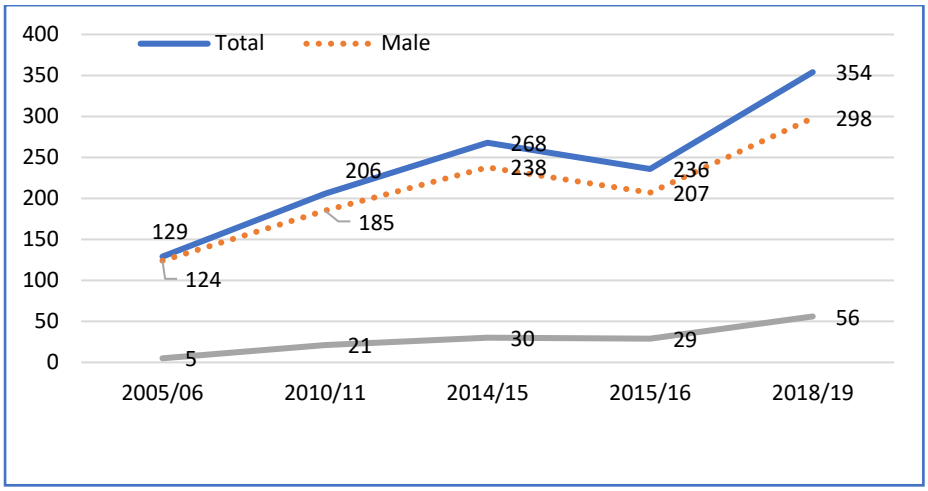
Figure 34: Secondary school students' enrollment, 2018/2019



Source: Authors' computation from regional data (2020).

Figure 35 shows the number of teachers involved in secondary schools between 2005 and 2018. In 2004, the number of teachers was 129 but by 2018 had reached 354. The number of male teachers was 124 in 2005 with only five female teachers. Thirteen years later, the number of female teachers had risen to no more than 56 while there were 298 male teachers. There is still a major difference that needs to be addressed.

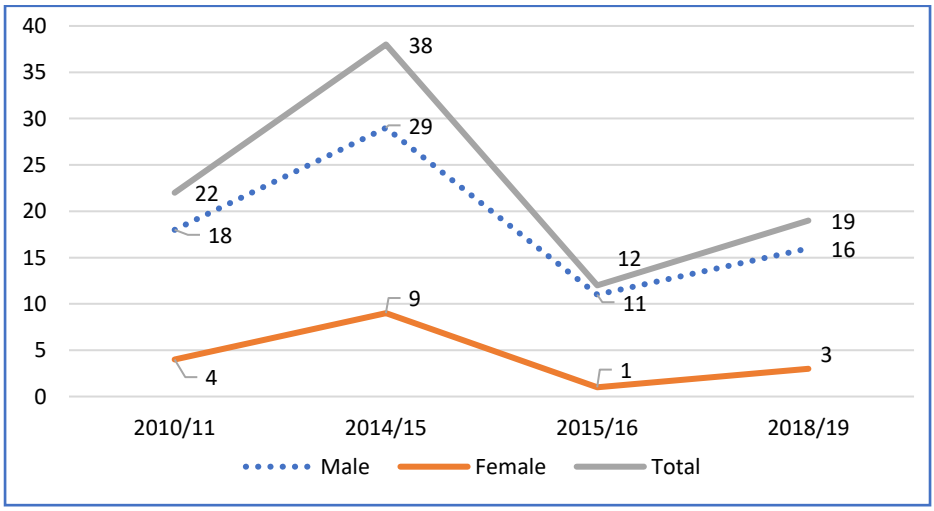
Figure 35: Gender balance of secondary school teachers in the Afar region



Source: Authors' computation from regional data (2020).

Figure 36 shows the numbers of secondary school teachers with diploma qualification over the past 8 years. In 2010, they numbered 22, but after increasing to 38 in 2014, this figure declined to 12 in 2015, probably because these diploma holders obtained the chance to upgrade their education through pursuing degree programs.

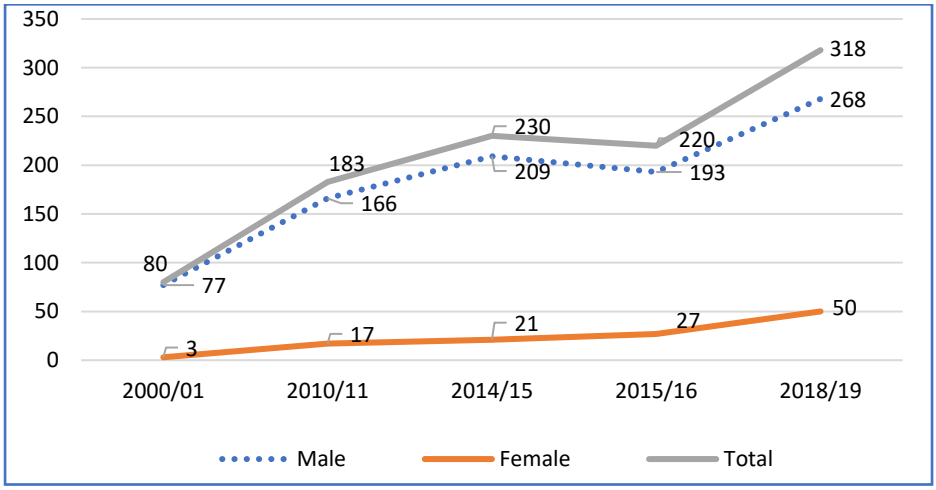
Figure 36: Secondary school teachers with diploma qualification



Source: Authors' computation from regional data (2020).

The number of secondary school teachers with a BA/BSc degree in the region is indicated in Figure 37. In 2014, there were 230 with a BA/BSc qualification; by 2018, the number was 318. The difference between the numbers of female and male teachers has remained high: in 2014 the number of female teachers with a BA/BSC qualification was only 21 while there were 209 male teachers with this qualification. In 2018, the numbers were 50 female teachers and 268 male teachers.

Figure 37: Secondary school teachers with first degree in Afar region

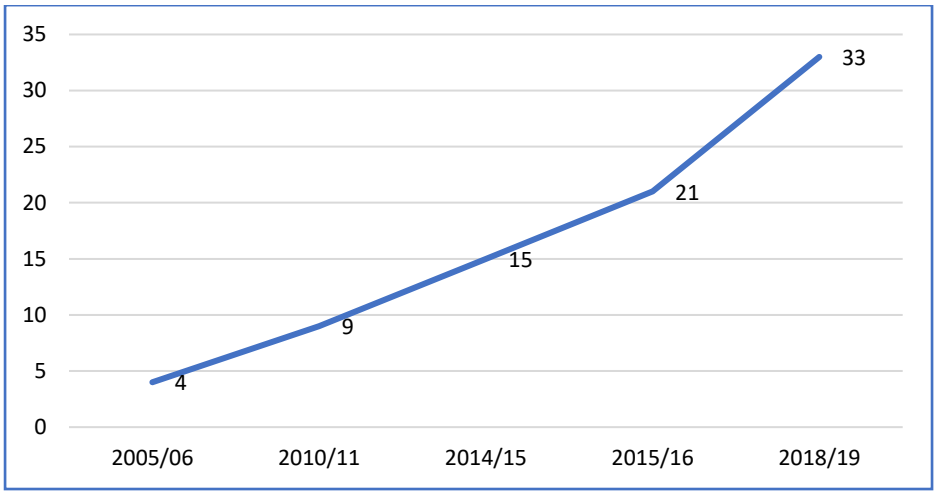


Source: Authors' computation from regional data (2020).

Similarly, in terms of second-degree qualifications, a lot needs to be done. Only four (three male and one female) and 14 (12 male and 2 female) second degree holders were available in 2015/16 and 2018/19 academic years.

In terms of expanding preparatory schools, the regional education office has given due attention to expanding numbers, increasing the number of preparatory schools from 4 in 2005 to 15 in 2014 and then to 33 in 2018.

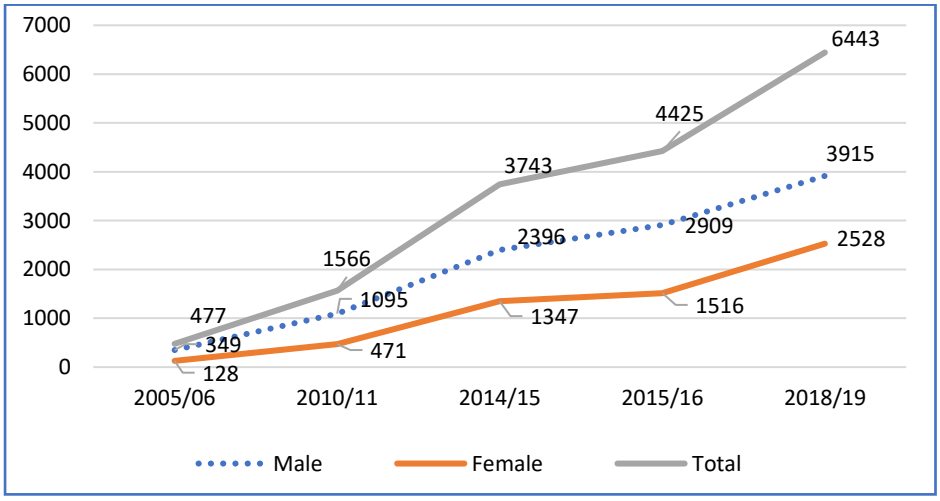
Figure 38: Number of preparatory schools in Afar region



Source: Authors' computation from regional data (2020).

Figure 39 shows the number of preparatory school students enrolled from 2005 to 2018. In 2005, the number was only 477 out of which 73% were male students and the remaining 27% female. In 2014, the numbers had risen to 3743 and in 2018, 6447, out of which 39.2% were female.

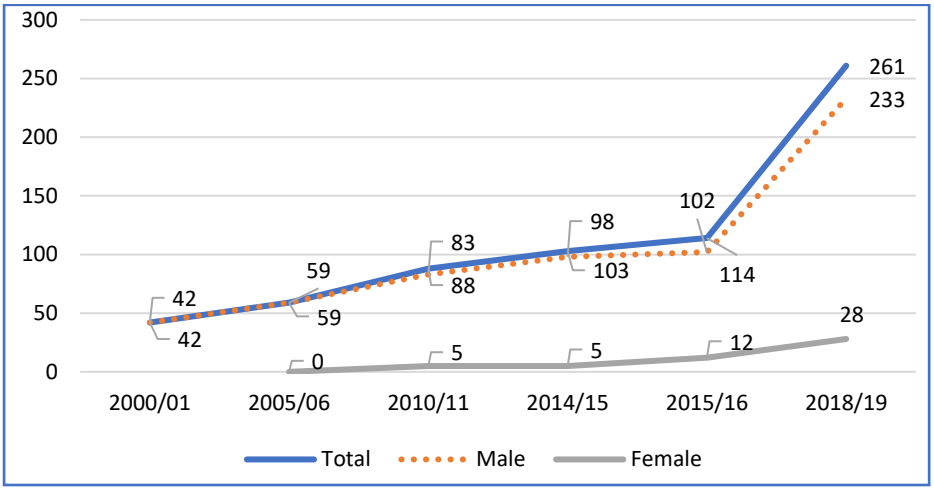
Figure 39: Preparatory school students' enrollment in Afar region



Source: Authors' computation from regional data (2020).

As indicated in Figure 40, the number of preparatory school teachers in 2005 was 59. None were female. Ten years later, in 2015, the number had increased to 114, 12 of whom were female teachers. By 2018, the number of teachers had grown to 261 with about 11% being females. Although far from adequate, this does show some results have been registered towards increasing the number of female teachers.

Figure 40: Number of preparatory school teachers in Afar region



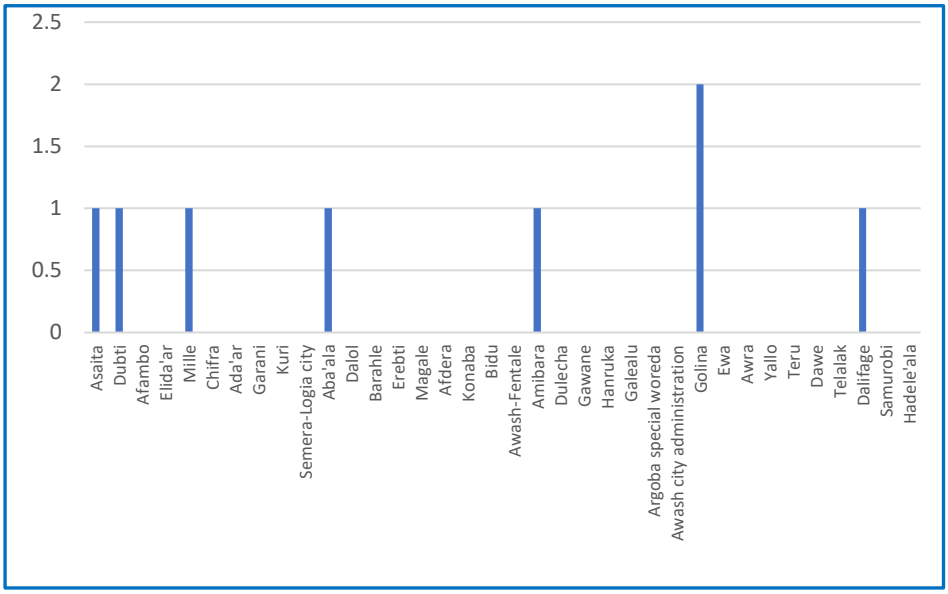
Source: Authors' computation from regional data (2020)

7.3. Health Sector Development

The major activity of the healthcare sector is to facilitate the basics for health-related services. This includes funding and regulate complex health industries in order to ensure the provision of healthcare to patients in need. We look here at the healthcare sector development that includes health posts, clinics, hospitals and health centers in the Afar region which has 8 hospitals, 44 clinics, 76 health centers, and 276 health posts. And the finding of this study shows there has been considerable achievement and attention by the regional and the federal governments. Health service performance and local perceptions were among the issues raised during the FGDs held in different zones of the region and most concluded that health services in their locality had been improved over the last 20 years.

Nevertheless, there are still problems, including a lack of health professionals especially midwives. A lack of transport (ambulance service) to a health facility was a major challenge reported in some zones, and FGD participants complained of problems in health facility infrastructure including beds and road access as well as shortages of medical supplies. Overall, another concern was the imbalance of facilities across the zones and woredas. Figure 41 shows that only seven woredas have hospitals, and of these one, Golina has 2 hospitals. The rest of the woredas do not have a hospital.

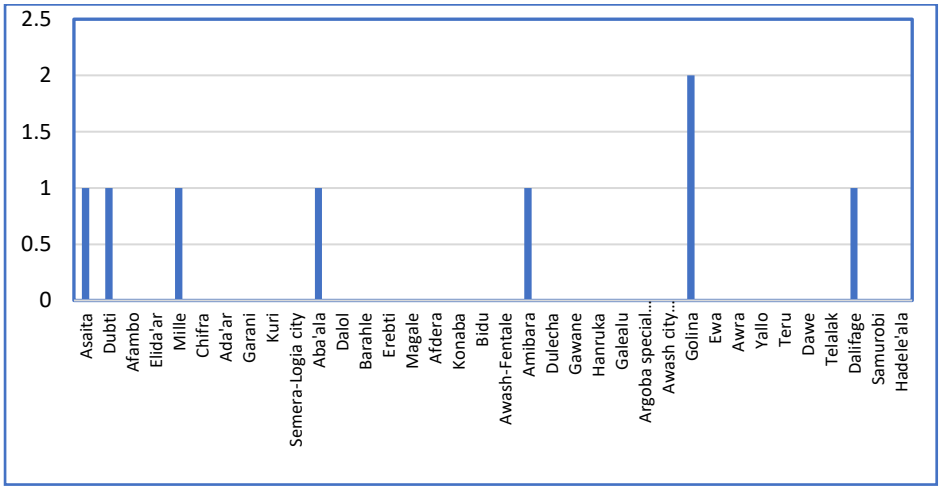
Figure 41: Number of hospitals in the Afar region, 2018/2019



Source: Authors' computation from regional data (2020).

There are similar issues with clinics (Figure 42). Only 11 of the 39 woredas have clinics, and of those 11, Asaita, for example, has 11 clinics. Elidar and Kore have 6 and 8, respectively. Dalol and Gewane, however, have only one clinic each.

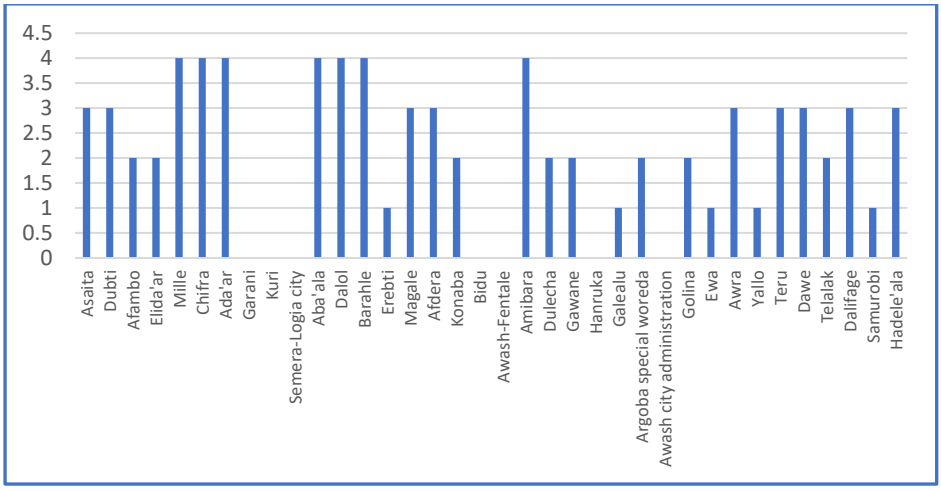
Figure 42: Number of clinics in the region, 2019/2019



Source: Authors' computation from regional data (2020).

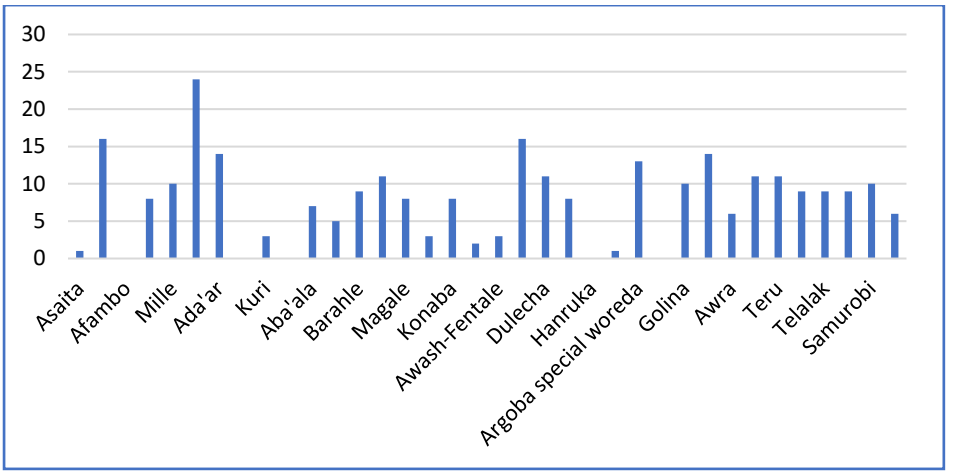
Health centers are more fairly distributed (Figure 43). Only three woredas, Kore, Dubti, and Abala City Administration, have no health centers, though Kore as noted above, has 8 clinics. Some of the woredas, such as Dubti, Awash City Administration, and Abala City Administration, have neither health centers, clinics nor hospitals. There are some woredas without health posts and available ones are not always adequate compared to the population size and the dispersed nature of settlement in the region (Figure 44).

Figure 43: Number of health centers in the region, 2018/19



Source: Authors' computation from regional data (2020).

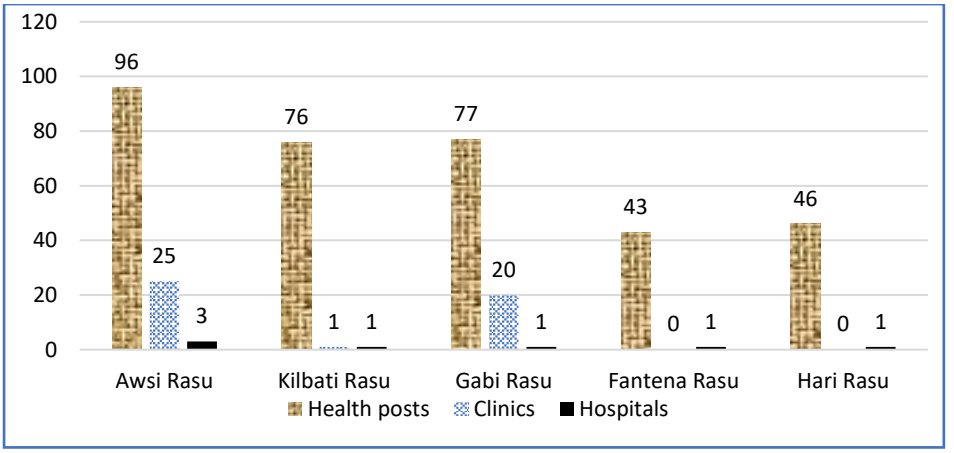
Figure 44: Number of health posts, 2018/2019



Source: Authors' computation from regional data (2020).

In terms of the zonal distribution of health posts and clinics, Awsi Rasu is in a better position while Fantena Rasu has the least number of health posts and clinics (Figure 45). Hospitals are relatively fairly distributed among the five zones. However, it appears nearly a quarter (24.1%) of the health facilities in the region are non-functional for various reasons, most related to absence of the required basic utilities including electricity, water, latrine services, laboratory facilities or similar. More effort is necessary to ensure effective functioning of available health facilities besides expanding new facilities for currently inaccessible areas.

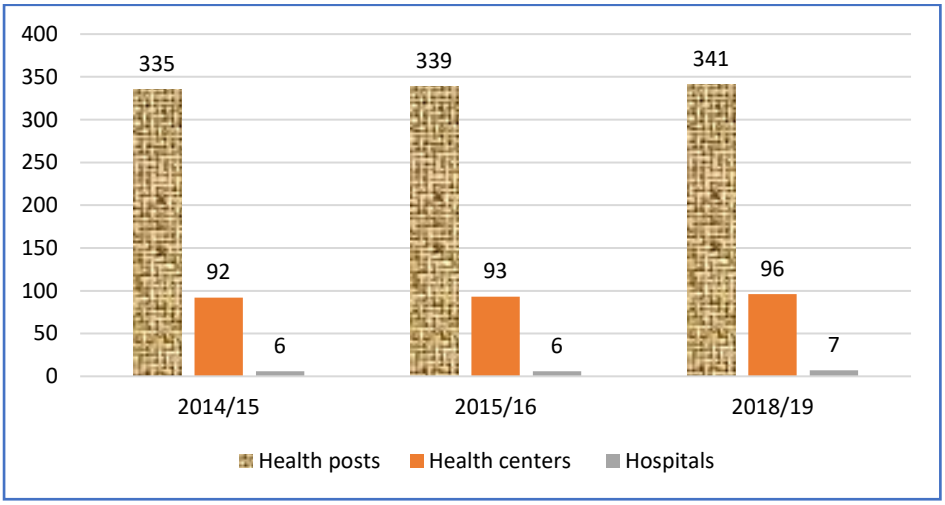
Figure 45: Distribution of health infrastructure by zones, 2018/2019



Source: Authors' computation from regional data (2020).

In terms of the expansion of health facilities over time, there has been little increase in the last few years: there were 335 health posts in 2014, increased to 341 by 2018. The number of health centers grew from 92 to 96 during the same period (Figure 46).

Figure 46: Trends of health facilities across different years



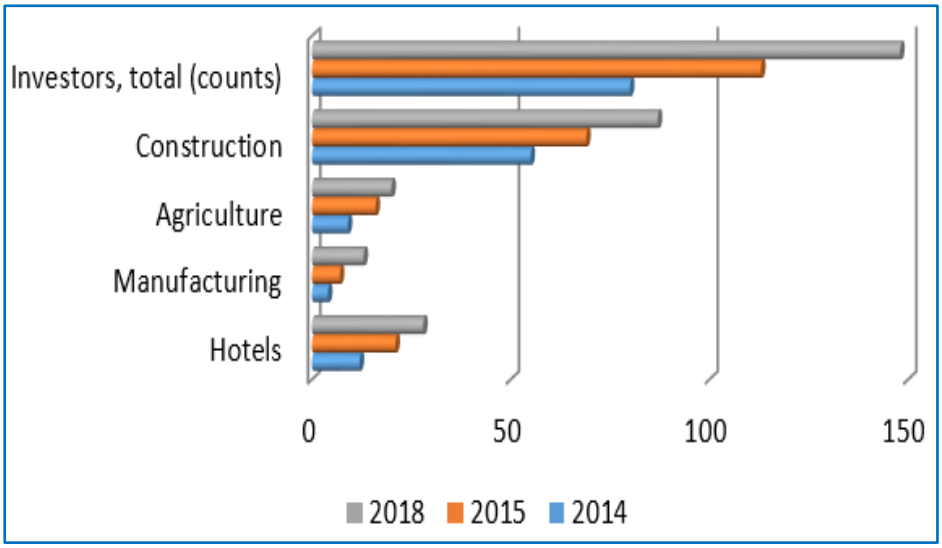
Source: Authors' computation from regional data (2020).

The top 10 diseases in the region in 2019/20 were acute fever illness (AFI), malaria (Plasmodium falciparum), pneumonia, diarrhea, acute upper respiratory infection, malaria without laboratory confirmed, typhoid, urinary tract infection, malaria confirmed by lab, and dyspepsia (or indigestion) in that order.

7.4. Investment, Informal Sectors, and Unemployment

Investment trends in the region are promising. The number of investors has been increasing from year to year. These increments have been witnessed almost in all sub-sectors including construction, agriculture, manufacturing, and hotel sub-sectors (Figure 47). These activities are assumed to create job opportunities.

Figure 47: Number of investors operational in the region by sector



Source: Authors' computation from regional data (2020).

In addition to the formal sectors, involvement in the informal sector is common in the region. As of June 2018, for instance, about 39% of workers were involved in the informal sector in Afar region as compared to about 22% at national level, and involvement of females in the informal sector is higher than males. In terms of unemployment rates, regional figures are better than national figures. Total unemployment in the region is 15%, with youth (15-29 years) unemployment at 22.7%. This compares to the national level averages of 19.1% and 25.3%, respectively. Female unemployment rates are higher than those of males at both national and regional levels (Table 36).

Formalizing some of the informal sectors in the region will increase regional revenue from these sectors and also improve working efficiency of firms, enabling them to benefit from formal support services including credit and training support. One of the major challenges for the region as well as for the nation is minimizing the unemployment rate, especially for youth, and it calls for broadening employment opportunities by encouraging private investment and business undertakings.

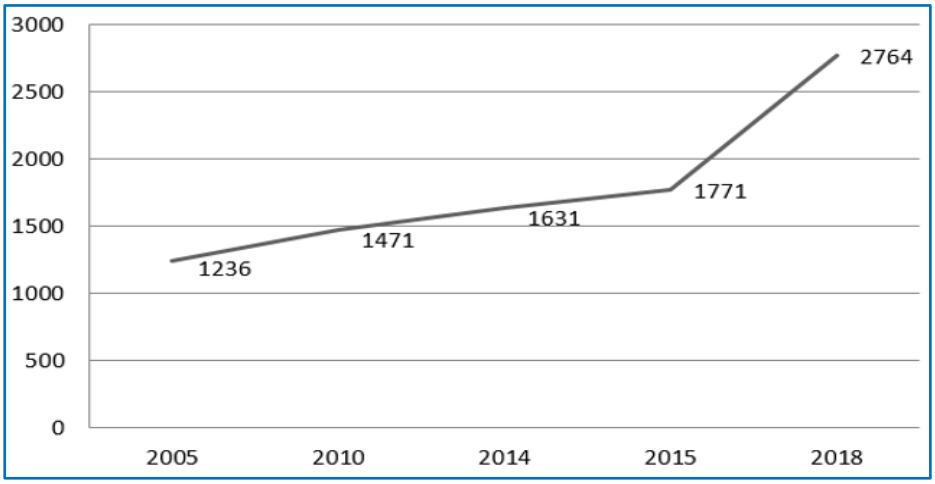
Table 36: Involvement in informal sectors and unemployment rates, 2018

S/N	Particulars	Afar Region			National level		
		Male	Female	Total	Male	Female	Total
1	Proportion of people involved in informal sectors (%)	32.4	48.8	38.9	17.1	28.2	21.7
2	Total unemployment rate in urban areas (%)	7.6	24.3	15	12.2	26.4	19.1
3	Youth (15-29 years) unemployment rate in urban areas (%)	16	29.5	22.7	18.6	30.9	25.3

Source: CSA (2018).

In terms expansion of road infrastructure, the region has more than doubled the paved roads, from about 1236 kilometers in 2005 to about 2764 kilometers in 2018 (Figure 48). However, given the size of the region and the sparse distribution of people over this area, further improvement in road infrastructure is necessary.

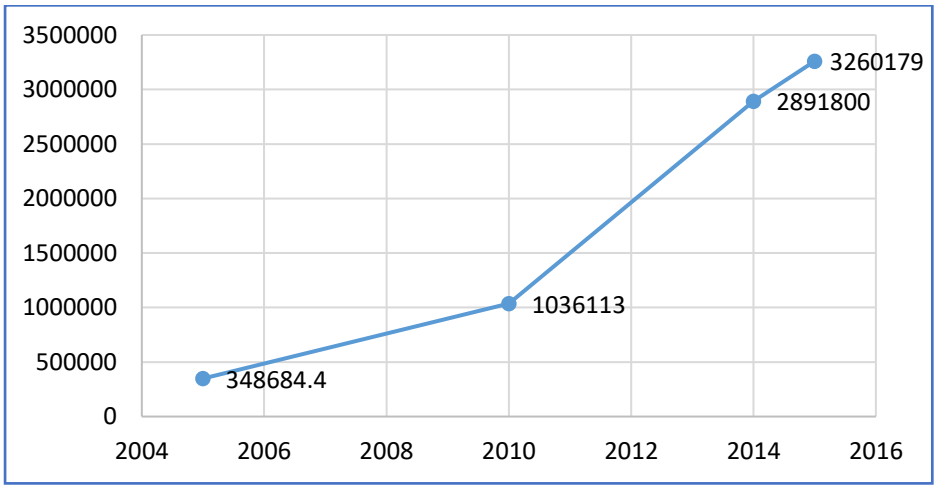
Figure 48: Trends of paved roads in Afar region (km)



7.5. Budget and Expenditure

The Afar region's budget allocation, revenues collected and expenditure have all been rising steadily. Figure 49 shows the regional budget from 2005 to 2015 (all figures are in thousand Ethiopian currency, ETB). In 2005, the regional budget was about 348.7 million ETB rising to about 1.04 billion ETB in 2010, a 197% increase. By 2014, it reached about 2,89 billion ETB, an increase of 180%. A year later, it was about 3,26 billion ETB after an increase of 13%, the least increment in 10 years.

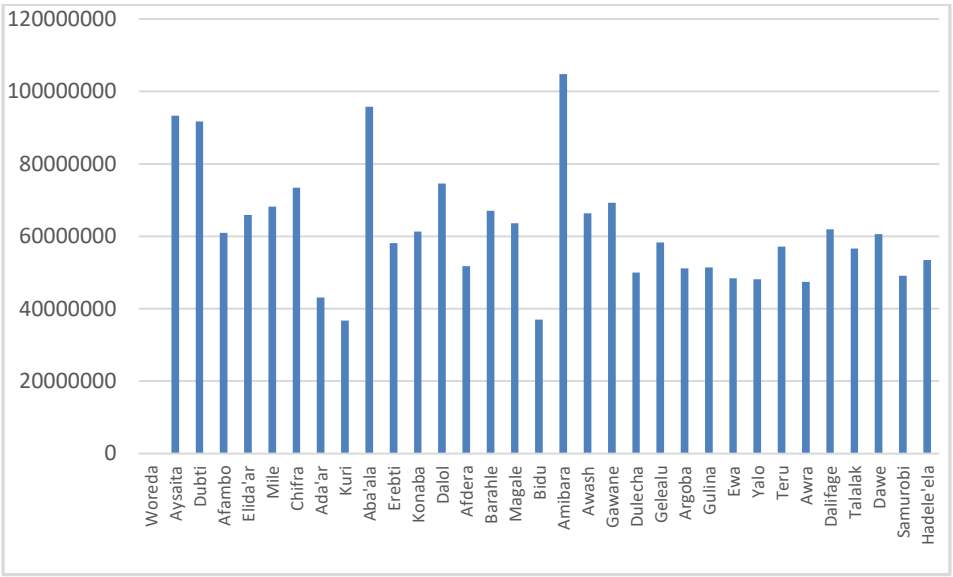
Figure 49: Trends of budget allocation for Afar region (thousand ETB)



Source: Authors' computation from regional data (2020).

Figure 50 shows the woreda budgets for the region with Amibara having the highest total annual budget (104,766,039.2 Birr) in 2018, and Kori the lowest total annual budget (36,750,648.9 Birr). Abala and Aysaita had the second and third highest budgets.

Figure 50: Distribution of total annual budget by woreda, 2018

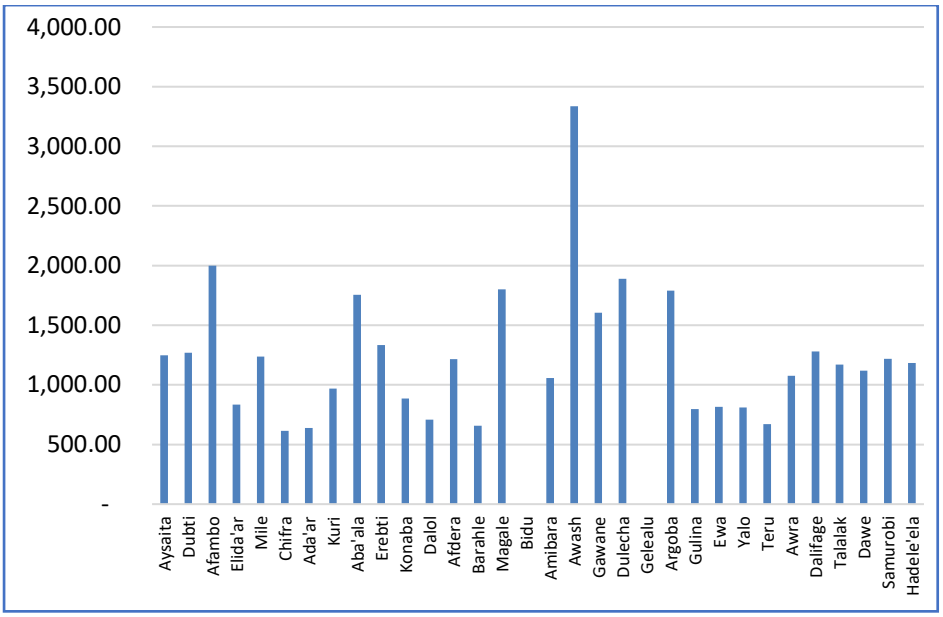


Source: Authors' computation from regional data (2020).

Figure 51 shows the per capita budget of the different woredas in 2018, ranging from 3,335 Birr for Awash woreda to 614 Birr for Chifra woreda. The second highest budget per capita, more than 1800, was for Afambo, Magale, and Dulecha woredas. The per capita budget distribution, in fact, is uneven with some woredas better off compared to others. Though there is no expectation of equal budget to population ratios while allocating budgets, this suggests the need to revisit the formula for budget distribution among the different woredas and taking population size, relative proximity to available infrastructure, available resources, and other factors into account.

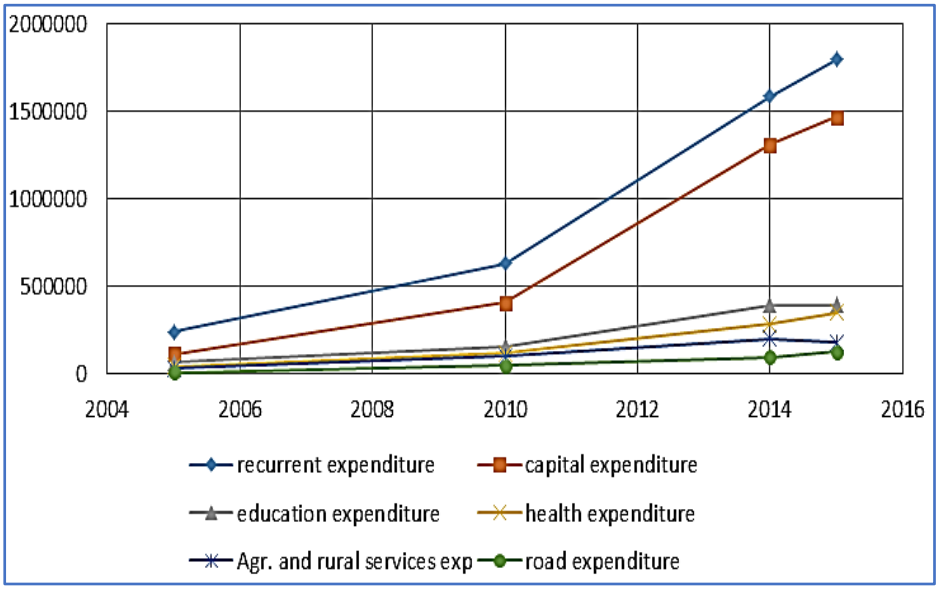
Figure 52 shows the region's expenditure categories. In 2005, the region's expenditure was less than 236.66 million ETB. After 10 years, recurrent and capital expenditure had increased by 1,558,651,000 and 1,352,844,000 ETB respectively. However, expenditure on roads, education, health, and agricultural and rural services showed little improvement, despite the federal government's attention to poverty-targeted expenditure (on health, education, road, and agriculture). The regional government is also expected to make significant improvement in poverty-targeted expenditure and it will need to focus on developing roads (especially rural roads), agriculture, health, and education in the years to come.

Figure 51: Distribution of budget to population ratio (Birr), 2018



Source: Authors' computation from regional data (2020).

Figure 52: Regional expenditures by categories (thousand ETB)

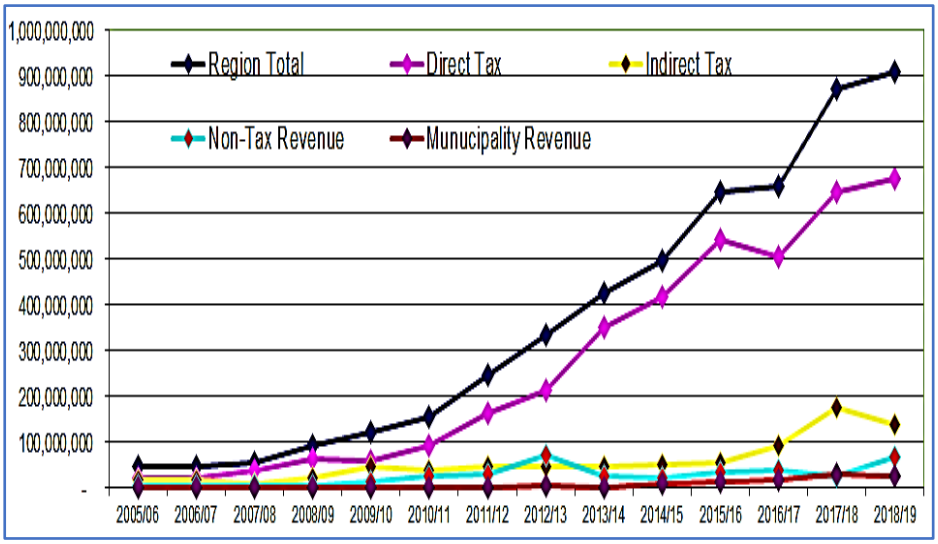


Source: Authors' computation from regional data (2020).

7.6. Revenue

The region's development is financed by the revenue generated from three main sources, with the main source being tax revenue. Non-tax, tourism and hospitality were found to be insignificant. Figure 52 shows performance of the region's tax, non-tax, and tourism and hospitality revenue generation between 2010 and 2018. In 2010, less than 200 million was collected. By 2014/15, the amount of revenue collected increased to about 500 million ETB, and by 2018, the revenue had significantly improved to more than 911 million Birr. Although the amount collected from the region has been increasing, the figures remain significantly less than regional expenditure figures. The disparity between revenue and expenditure underlines the region's dependence on federal government and other support to fill the gap.

Figure 52: Regional revenue by categories

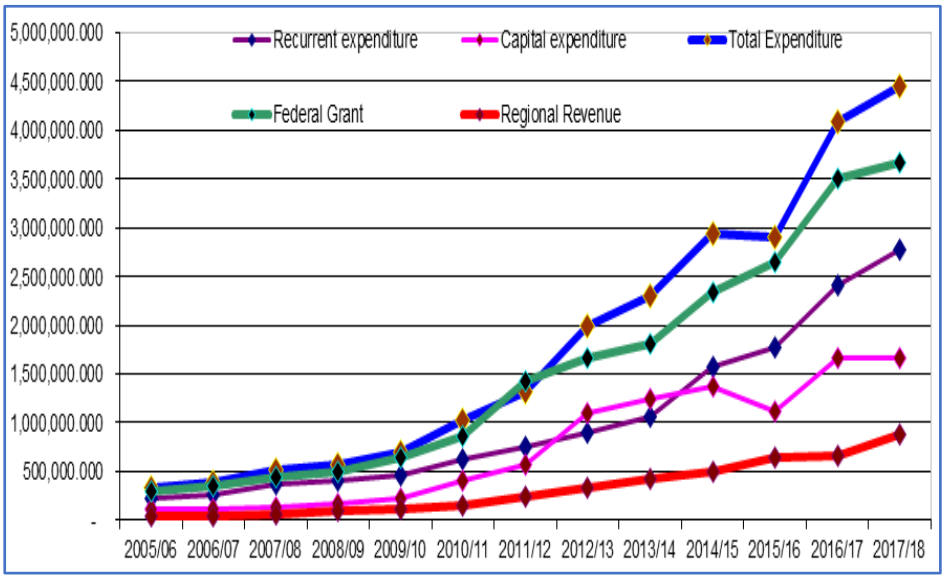


Source: Authors' computation from regional data (2020).

Figure 53 shows the region's annual expenditure and revenue from 2005 to 2017. It also shows the recurrent and total expenditure, the federal grant, and the revenue of the region. Total expenditure (both recurrent and capital expenditure) steadily and sometimes significantly increased over these 12 years. Equally, the federal grant consistently increased every year since 2005. The

regional revenue, however, did not show any consistent or significant increment as total expenditure and the federal grant did.

Figure 53: Annual regional expenditure and revenue (Birr)



Source: Authors' computation from regional data (2020).

8. Conclusions and Policy Implications

The major findings of this study suggest a considerable number of policy implications for the region. The most important are summarized below:

Evaluation of the major soil constraints for crop and livestock production in the region indicate that there are many soil constraints for crop production in the Afar region. To undertake crop production with or without irrigation, the region requires to adopt soil treatment and improved soil management practices.

The use of agricultural inputs for crop production in the region is very limited. The region should introduce and disseminate appropriate production inputs, technologies, and other methods and innovations to boost agricultural production and productivity.

The five most important sources of vulnerability in the region were found to be price/inflation, drought, increasing temperature, scarcity of water, and human disease. The region should design policies for managing and mitigating the sources of vulnerability of its assets. These could include creating access to major markets and marketing systems for livestock, the introduction and use of drought resistant crop varieties, creating substantial access to irrigation, and improvement of human health facilities.

The three most vulnerable regional assets are camels, cattle, and shoats. They are also the major livelihoods. The region, therefore, needs to design and implement appropriate policy intervention measures to reduce their vulnerability or to improve their sustainability for improving livelihoods, particularly food security. One option would be to improve methods of livestock production (pastoralism or sedentary) as well as access to livestock markets.

The wide spread of invasive plants, such as prosopis, is a major threat to both crop and livestock production in the region. The regional government should design short- and long-term plans on how to utilize and/or control such plants to ensure sustainable development.

The incidence of drought is very high in the region. It is of vital importance to invest in irrigation schemes for increasing development of crop and fodder production. The predominantly good soil types, suitable topography, and better ground water resources offer good opportunities for the expansion of irrigation facilities. This also requires consideration of soil treatment measures and the adoption of soil management practices as well as improving irrigation facilities. The Awash River is the primary source of irrigation water in the region,

but it offers both a threat and an opportunity to the region. During the main harvest season of 2020, the river floods seriously affecting about 17 woredas in the downstream areas, destroying crops and the lives of thousands of livestock. This disaster was evaluated to been related to mismanagement of the river in upstream areas. The Regional government should work in close collaboration with the Federal government to properly manage the river and maximize its development benefits, both actual and potential.

Encouraging livelihood diversification is necessary to overcome the harsh agro-ecological condition of the region. The livelihood strategies could include camel and goat production, sheep production, non-farm activities, sedentary farming, trading, and wage employment. Any three or more of these could be pursued simultaneously for diversification.

Performance in the area of peace and security is reported to be very high. This should be strengthened and the region could provide an example for other regions. Conversely, investment and development of natural resources are low performing sub-sectors. The region should focus on improving these and try to attract investors and encourage existing ones through different incentive mechanisms. These should address the region's multi-faceted problems by creating job opportunities for youth and women, improving access to different manufactured products, facilitating transfer of knowledge to the people, and boosting the regional economy.

One of the major challenges facing the region in its efforts to realize socio-economic development is considered to be corruption. The region needs to establish transparent systems of planning, budgeting, implementing and monitoring socio-economic development projects and programs, and ensuring access and equity among different social groups and administrative zones in the new regional administration.

Improving access to major services and facilities including road, safe drinking water, sanitation facilities, and human and veterinary health/medical services should remain the major focus of development interventions by the regional authorities. Though there is the basic infrastructure for these services, most of them remain less than full functional.

Housing conditions are very poor in the region. Initiating housing projects, especially in urban areas, to improve access to quality housing at relatively affordable prices is very important.

The prevalence of stunting and under-weight children under five is high in the region compared to the national average. It is, therefore, necessary to strengthen available nutrition projects and initiate new ones. Nutrition security should be pursued in tandem with food security projects as food insecurity is also prevalent in the region.

Semi-urban areas of the region are characterized by a relatively higher prevalence of poverty, a situation which differs from the poverty situation elsewhere in the country. The region should design policy interventions which enable it to implement basic urban services and facilities in small towns.

Elasticity of total poverty with respect to average expenditure growth in the Afar region is high. This suggests that poverty alleviation interventions can lead to a high rate of poverty reduction. The region should accelerate poverty reduction by selecting relevant interventions with high poverty alleviation impact involving more population or creating access to the wider community.

Deprivation in school attendance of school-aged children is high suggesting that a significant proportion of children are not attending school. Unexpectedly, deprivation in school attendance also increases with expanding urbanization (rural to urban). The region should look for and introduce alternative methods of increasing child school attendance by creating access to education. This should include establishment of more primary and satellite schools.

Deprivation in health care of the population remains high suggesting that a majority of the population do not consult any medical practitioner in a year. Creating access to health facilities and health professionals should still be the overriding objective and policy focus of the region.

Deprivation in adequate and nutritious food is also high, underlining the need to create access to and utilization of food, to improve the health conditions of the entire population through short- and long-term interventions including food security programs, income generating activities, and other employment opportunities differentiated by place of residence (rural and urban) and vulnerable social groups, including women and youth.

The region should expand animal health facilities together with necessary utilities required for effective functioning of these physical facilities. It should look to fair distribution of these facilities among the zones and woredas on the basis of their livestock resources. It is essential to train additional animal health workers and revise the current placements of CAHWS on the basis of the distribution of the livestock population among the different woredas.

Poverty in the region remains high and multidimensional. The incidence of non-monetary poverty (education, health and living condition) is considerably high with significant differences by place of residence. Non-monetary poverty in the urban centers is relatively higher where the region is expected to implement projects related to education, health, and other basic services and facilities to improve living conditions.

Improving gender composition of students and teachers following different affirmative actions to encourage involvement of female students and teachers is required. It is also necessary to improve total student enrollment. Constructing additional schools to improve education coverage is vital. It also important to work on teachers' capacity building through short- and long-term training and to ensure fair distribution of the number of schools, teachers, and other educational facilities across all zones and woredas.

Though there have been major improvements in the regional health sector, there are still issues that require attention. Expanding health facilities, increasing the number of health professionals with different specializations, and improving health utilities, including access roads, ambulances, water, electricity, and health supplies, are important. It is also necessary to look into the distribution of these facilities among the zones and woredas.

Livestock are a major and important asset in the region, access to livestock markets is reported to be among the major bottlenecks for development. It is advisable to establish accessible local livestock markets properly linked with zonal, regional, national and ultimately export markets.

In order to improve regional revenue, the region should broaden the tax base and encourage non-tax revenues such as tourism earnings.

The region suffers from absence of up-to-date, relevant and quality data for planning socio-economic development interventions. It should establish a data compilation and management unit at each sector and administration level to organize regional data for designing appropriate development plans.

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Appendix

Appendix Table 1: Importance and role of livelihood assets

No.	Livelihood Assets/ Capabilities/ Activities	Importance (Index)
1.	Natural capital (N)	
2.	Use rights to land	0.62
3.	Communal land	0.67
4.	Natural forests	0.54
5.	Clean rivers/waters	0.56
6.	Minerals for mining	0.46
7.	Resources for tourist attraction	0.42
8.	Human capital	
9.	Education	0.65
10.	School attendance (enrolment)	0.56
11.	Adequate and nutritious food	0.48
12.	Information	0.68
13.	Public awareness on their public rights, policies and regulations impacting their livelihoods	0.52
14.	Social/Political capital	
15.	Availability of civic organizations	0.49
16.	Availability of cooperatives/unions	0.49
17.	Participation in local administration councils	0.50
18.	Existence of saving and credit association	0.41
19.	Existence of influential rules, norms or laws impacting community development	0.54
20.	Existence of influential indigenous institutions impacting community development	0.60
21.	Physical capital	
22.	Camel	0.73
23.	Cattle	0.67
24.	Shoats	0.72
25.	Pack animals	0.54
26.	Crops	0.47
27.	Dependable and affordable energy	0.46
28.	Dependable and affordable private telephone services	0.60
29.	Safe drinking water and sanitation	0.50
30.	Adequate drinking water and sanitation	0.50
31.	Clean and secure housing	0.46
32.	Affordable human health services	0.52
33.	Affordable veterinary health services	0.46
34.	Access to all weather roads	0.48
35.	Affordable public/private transport	0.47
36.	Access to irrigation water	0.46
37.	Financial capital (F)	
38.	Wage from employment	0.56
39.	Income from trade business	0.53
40.	Income from nonfarm activities	0.42
41.	Credit	0.35
42.	Saving in banks	0.42
43.	Remittance	0.31

Appendix Table 2: Sustainability of livelihood assets

No.	Livelihood Assets/ Capabilities/ Activities	Livelihood Sustainability Index			
		Environmental	Economic	Social	Institutional
1.	Natural capital (N)	0.55	0.56	0.55	0.48
2.	Use rights to land	0.63	0.68	0.64	0.60
3.	Communal land	0.67	0.62	0.64	0.43
4.	Natural forests	0.46	0.42	0.44	0.38
5.	Clean rivers/waters	0.58	0.53	0.57	0.49
6.	Minerals for mining	0.48	0.59	0.51	0.49
7.	Resources for tourist attraction	0.51	0.50	0.51	0.51
8.	Human capital	0.32	0.31	0.33	0.32
9.	Education	0.88	0.88	0.92	0.89
10.	School attendance (enrolment)	0.77	0.61	0.64	0.68
11.	Adequate and nutritious food	0.53	0.46	0.57	0.52
12.	Information	0.88	0.90	0.87	0.77
13.	Public awareness on their public rights, policies and regulations impacting their livelihoods	0.48	0.54	0.60	0.62
14.	Social/Political capital	0.51	0.55	0.63	0.63
15.	Availability of civic organizations	0.51	0.56	0.66	0.62
16.	Availability of cooperatives/unions	0.50	0.56	0.60	0.66
17.	Participation in local administration councils	0.60	0.64	0.77	0.74
18.	Existence of saving and credit association	0.33	0.46	0.40	0.49
19.	Existence of influential rules, norms or laws impacting community development	0.49	0.53	0.68	0.64
20.	Existence of influential indigenous institutions impacting community development	0.61	0.60	0.68	0.63

No.	Livelihood Assets/ Capabilities/ Activities	Livelihood Sustainability Index			
		Environmental	Economic	Social	Institutional
21.	Physical capital	0.57	0.59	0.60	0.58
22.	Camel stock	0.80	0.87	0.87	0.73
23.	Cattle stock	0.81	0.79	0.76	0.66
24.	Shoat stock	0.82	0.86	0.89	0.74
25.	Pack animals	0.61	0.59	0.58	0.50
26.	Crop stock	0.49	0.54	0.57	0.46
27.	Dependable and affordable energy	0.56	0.49	0.49	0.51
28.	Dependable and affordable private telephone services	0.71	0.68	0.72	0.76
29.	Safe drinking water and sanitation	0.51	0.49	0.49	0.59
30.	Adequate drinking water and sanitation	0.37	0.36	0.44	0.43
31.	Clean and secure housing	0.41	0.47	0.43	0.44
32.	Affordable human health services	0.56	0.56	0.63	0.63
33.	Affordable veterinary health services	0.46	0.50	0.50	0.54
34.	Access to all weather roads	0.54	0.61	0.63	0.61
35.	Affordable public/private transport	0.48	0.59	0.50	0.54
36.	Access to irrigation water	0.46	0.46	0.47	0.46
37.	Financial capital (F)	0.39	0.45	0.45	0.41
38.	Wage from employment	0.66	0.68	0.68	0.68
39.	Income from trade business	0.53	0.59	0.59	0.56
40.	Income from nonfarm activities	0.41	0.54	0.51	0.48
41.	Credit	0.22	0.23	0.24	0.23
42.	Saving in banks	0.36	0.43	0.44	0.37
43.	Remittance	0.16	0.22	0.22	0.18

Appendix Table 3: Sources of vulnerability of livelihoods

No.	Sources of Vulnerability	Vulnerability index
1.	Trends	
2.	Prices/Inflation	0.91
3.	Increasing temperature	0.81
4.	Rainfall variability	0.74
5.	Social media	0.73
6.	Expansion of invasive weeds	0.72
7.	Depletion of natural resources	0.71
8.	Demand for goods and services	0.70
9.	Globalization	0.67
10.	Norms and culture	0.66
11.	Intensity of floods	0.66
12.	Agricultural production	0.66
13.	Institutions	0.65
14.	Technology	0.60
15.	Shocks	
16.	Drought	0.84
17.	Water shortage	0.79
18.	Human diseases	0.76
19.	Animal disease	0.76
20.	Conflict over resources	0.69
21.	Floods	0.69
22.	Pest outbreak (e.g. locust)	0.65
23.	Political instability/insecurity	0.64
24.	Crop diseases	0.63
25.	Public policy (changes)	0.62
26.	Volcanic eruption	0.52
27.	Seasonality	
28.	Price seasonality	0.73
29.	Production and supply of goods and services	0.73
30.	Demand for goods and services	0.73

Appendix Table 4: Intensity of asset vulnerability

No.	Livelihood Assets/ Capabilities/ Activities	Livelihood Vulnerability Index (LVI)
1.	Natural capital (N)	
2.	Use rights to land	0.58
3.	Communal land	0.56
4.	Natural forests	0.59
5.	Clean rivers/waters	0.61
6.	Mineral resources for mining	0.54
7.	Resources for tourist attraction	0.53
8.	Human capital	
9.	Access to education	0.61
10.	School attendance of school-aged children	0.60
11.	Adequate and nutritious food	0.63
12.	Information	0.59
13.	Awareness of public rights, policies and regulations affecting livelihoods	0.51
14.	Social/Political capital	
15.	Membership in civic organizations	0.49
16.	Membership in cooperatives/unions	0.48
17.	Participation in local administration councils	0.49
18.	Saving and credit association	0.50
19.	Influential public organizations affecting people's livelihoods	0.53
20.	Rules, norms or laws positively affecting community development	0.52
21.	Physical capital	
22.	Camel	0.74
23.	Cattle	0.74
24.	Shoat	0.73
25.	Pack animals	0.61
26.	Crop	0.57
27.	Dependable and affordable energy	0.53
28.	Dependable and affordable telephone service	0.62
29.	Adequate drinking water and sanitation	0.56
30.	Safe drinking water and sanitation	0.53
31.	Clean and secure housing	0.52

No.	Livelihood Assets/ Capabilities/ Activities	Livelihood Vulnerability Index (LVI)
32.	Affordable human health service	0.64
33.	Affordable veterinary health services	0.60
34.	Adequate all-weather roads	0.60
35.	Affordable public/private transport	0.65
36.	Irrigation water	0.56
37.	Financial capital (F)	
38.	Income from wage employment	0.59
39.	Income from trade business	0.56
40.	Income from nonfarm activities	0.56
41.	Credit	0.50
42.	Saving in banks	0.55
43.	Remittance	0.41

Appendix Table 5: Evaluation of livelihood impacts of development interventions in the last five years

No.	Livelihood Outcome Indicators	Proportion of Respondents Perceiving Positive Impacts (%)	Intensity of Agreement (Index)
1.	Peace and order	90	0.67
2.	Communication infrastructure	81	0.64
3.	Health	84	0.57
4.	Good governance	80	0.56
5.	Employment	89	0.56
6.	Education	93	0.55
7.	Income (Economic wellbeing)	67	0.53
8.	Improved financial services	63	0.52
9.	Equity (distribution)	50	0.51
10.	Housing	49	0.49
11.	Improved public services	74	0.49
12.	Water and sanitation	78	0.48
13.	Road infrastructure	81	0.48
14.	Food security	67	0.47
15.	Improved marketing services	62	0.45
16.	Sustainable natural resource utilization	53	0.44
17.	Gender balance	74	0.41