



Urbanization and land use pattern in Arba Minch town, Ethiopia: driving forces and challenges

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Abstract The objective of this study was to explore the driving forces of urbanization, land use pattern, and its challenges in Arba Minch town, Southern Ethiopia. Mixed research design was employed to generate and analyze data. Four sample kebeles [Mehal Ketema, Dilfana, Bere and Woze] were selected using simple random sampling technique. Stratified proportional sampling technique was used to obtain data from selected kebeles (197 households) through questionnaires. Interviews were made with key informants. Aerial photo, Google Earth Image and Satellite images of LANDSAT (1975, 2000 and 2018) were visualized to quantify land use and land cover [LULC] change and its pattern. Field observation was made to cross-check results from other sources. Data was analyzed using SPSS (23), Erdas Imagine (2014) and ArcGIS (10.3). The study revealed rapid urbanization mainly induced by migration. Physically, Arba Minch has grown from fragmented neighborhoods (since 1950s to mid 1970s) to a conurbated urban fabric in recent years. Built-up area has increased by 780 ha at the expense of agriculture, plantation and

mixed forests between 2000 and 2018. Continual land demand for development [road infrastructure, education and tourism] and rural economic transformation ignited rapid urbanization in Arba Minch. The study revealed housing shortage and the proliferation of informal settlements in different pockets of the town and poor vacant land management as challenges. Therefore; Arba Minch municipality and other stakeholders should work hand-in-hand to promote sustainable urban development through: optimal vacant land management; monitoring informal settlements; promoting vertical development and preserving the scenic urban fabric.

Keywords Arba Minch · Urban expansion · Urbanization · Land use pattern · LULC

Background and justification

Urbanization is not a new phenomenon in Africa. It has been occurring since about 10,000 years ago when Africans began founding permanent settlements, which paved the way for the first urban revolution around the Nile Valley in Egypt (Muhammed 2011). Despite long urbanization history, Africa remains mostly rural. Nevertheless; the continent has been experiencing dramatic urban growth (3.23% per annum) particularly after the second half of the 20th century (UN Habitat 2010). Evidences shows that approximately 15% of Africa's population lived in

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urban centers in 1960. The proportion increased to 25% in 1975. In the year 2000, the share of urban population in Africa rose to 38% and this figure reached to 40% in 2010. The proportion of urban population in Africa is projected to rise to 47% by 2015 and to 60% by 2050 (Thou 2010).

The history of urbanization in Ethiopia can be summarized by dividing it into three periods of development. The first period was the pre-Italian Period (1900–1935) which was dominated by the social and economic role played by the dynasties at a given time. The second period, the Italian occupation period (1935–1941), is characterized by the construction of roads, bridges, schools, and other facilities by the Italians. The third period is the post Italian period (since 1950s) whereby the country was under socio-economic reconstruction with new phase of urban development. From those periods onwards, the number of towns increased with unprecedented population growth (Damte 1993).

With only 17% of urban population, Ethiopia is one of the least urbanized countries even by African standard. The country exhibits fastest rate of urbanization (CSA 2007). Written evidences further stated that the level of urbanization has been only 6% in the 1960, which has increased to 11% in 1984, 14% in 1994, and reached 17.2% by 2013 and projected to account for 30% of the total population in the year 2025 (MUDHCo 2013). As per the National Urban Systems Study (2015), the urban population of Ethiopia will increase by some 31 million and the total population by 43 million between 2015 and 2035. Therefore; urban population accounts for nearly 75% of the total population growth in the country. Even though there are about 973 urban centers in Ethiopia with different stages of development and size, Addis Ababa, the capital city, accounts 3.5 million (30% of the urban population in the country) (CSA 2007).

Arba Minch town is a located in Gamo Gofa Zone of the Southern Nations, Nationalities and Peoples Region (SNNPRS hereafter). The town is one of the fast urbanizing towns in the region and it has been highly expanding to its sphere of influences in horizontal pattern overtime. The town's population increases dramatically through time; for instance, it was 20,020 in 1984. This figure grew to 40,020 in 1994, and reached to 74,843 in 2007 (CSA 1984, 1994, 2007).

As a result of continuous fast population growth, Arba Minch town is now strained with increasing demand for land, physical infrastructures and social services. Indeed, the disequilibrium between socio-physical infrastructures supply and demand in the town reduces through time because of the ongoing fruitful efforts of the municipality. However, solving the increasing land demand of the residents, particularly the poor segment of the society, is still a challenge in Arba Minch. The weak and non-modern land controlling and monitoring scheme, improper urban plan implementation experiences and the land lease system further aggravates land related problems in the town. In this regard, the economically disadvantaged ones were forced to hold land illegally and actively engage in the informal land transaction. The physical observation of researchers revealed negligible number of residential apartments, high fenced but underutilized/unused vacant land, and expansion of squatter settlements in Arba Minch town. These situations are common almost in all sub-cities of the town with notable disparities. The degree of informality is very high particularly in newly emerging settlement areas located in the outskirts of the town.

Research works on studying urban expansion and land use patterns are very limited in the study area. For instance, Dube (2013) studied 'urban planning and land management challenges; Torora (2015) investigated 'urban morphology types and recreational ecosystem services' and Dibeta (2008) made a study on 'residential land management' in Arba Minch town. Except Engida's work, these studies were partial and focused on specific issues of urban morphology and residential land. Similarly, Engida's work was not complete in that it did not show urbanization processes and land use patterns and trends in Arba Minch town.

Therefore; the current study is aimed to: identify the driving forces of urbanization and examine its trends; visualize and quantify land use land cover (LULC) change and its pattern and examine the challenges and future prospects of urbanization in Arba Minch town.

Theoretical issues

Driving forces and challenges of urbanization in developing countries

The concept of “urban” and or “urbanization” varies from discipline to discipline and between countries. Nevertheless; there are common criteria for defining these concepts. Broadly, Pacione (2009) categorized the driving forces of urbanization into demographic, social, economic, technological, cultural, political and environmental factors. Urbanization can be *migration-led* or *growth-driven*. *Migration-led* urbanization is mainly a function of demographic transition and is rapid. Urbanization that has the capacity to improve the quality of life through state-market responses is *growth driven* (Tegenu 2010). This, however; does not mean that urbanization in every country in the world is caused by all these factors. As demonstrated in the upcoming paragraphs, the driving forces of urbanization are contextual and vary from place to place.

For example; a study by Hu (2013) revealed that conventional thinking that seeks to explain China’s urban development that focuses on macro-level institutional factors, such as globalization, economic growth and national policy reforms does not suffice to explain China’s urbanization (Hu 2013). The non-institutional factors like demography, government behavior, market demand, market speculation and others need to be given attention. Demographic, social and economic factors including distance to the road were found to be the major driving forces of urbanization in Jakarta-Bandung mega urban region using geographically weighted regression model (Pravitasari et al., 2018).

Therefore; it is certainly vital to look at the driving forces of urbanization at micro-level. However, overemphasizing some factors over the others does not aid a big picture to capture the trends of urbanization and its driving forces. In this regard, a study by Hofmann and Wan (2013) suggested that urbanization is better explained by a country’s development in a range of economic and human dimensions rather than a mere income factor. Thus, they concluded the positive effects of GDP, industrialization and education on urbanization rate. Osman et al. (2016) discussed the driving forces of informal urbanization in the greater Cairo metropolitan region. The informal urbanization patterns have been

extremely influenced by seven driving forces: geographical characteristics, availability of life facilities, economic incentives, land demand and supply, population increase, administrative function, and development plans. The influences of these factors, however; vary significantly with varied geographies.

Urbanization, particularly in developing countries; brings with it a wide range of challenges: proliferation of informal settlements, rise in the cost of land and/or housing that would potentially exclude the urban poor (Admasu 2018). Especially in the developing world, where most mega-cities are located and urbanization is particularly rapid and not necessarily controlled, providing good living conditions to urban populations is one of the main challenges of our time (UN Habitat 2004).

In order to make urbanization work well, countries should offset two challenges, namely; to foster the growth of productive activities that benefits from agglomeration and scale economies and to manage the likely side effects of economic growth in cities: congestion, regional inequality and high prices of land and housing. Attaining second challenge is vital for mitigating the divisive impacts of successful economic growth and spreading the benefits of higher economic productivity widely (Buckley et al. 2009).

Urbanization and land use land cover (LULC) change

In a metropolitan area with high projected population growth and uncertain development dynamics, land use change is more challenging since the drives of land use change are more complex, interrelated and unpredictable (Berke et al. 2006). Identifying the causes of land-use change requires understanding both how people make land-use decisions (decision-making processes) and how specific environmental and social factors interact to influence these decisions (decision-making context). LULC change occurs either formally or informally. Formal change is mainly carried out by the government through regular urban planning interventions. In response to rapid urbanization, however; there is a huge gap between demand and supply of land for development activities. An abnormal¹ land demand for investment since recent years has

¹ Higher than country average.

skyrocketed land prices thereby inducing further expansion to agricultural and forest land among others (Admasu 2015).

As stipulated by Ellis (2007), the causes of land-use and land-cover change is twofold: *proximate* (direct or local) and *underlying* (indirect or root). The *proximate* causes of land-use change explain how and why local land cover and ecosystem processes are modified directly by humans, while *underlying* causes explain the broader context and fundamental forces underpinning these local actions. *Proximate* causes operate at the local level (individual farms, households, or communities) and *underlying* causes originate from regional (districts, provinces, or country) or even global levels, though complex interplays between these levels of organization are common. As a result, underlying causes also tend to be complex, formed by interactions of social, political, economic, demographic, technological, cultural, and biophysical variables.

Research methodology

Description of the study area

Minch Arba town is one of the large urban centers in Southern Nations Nationalities and Peoples Region (SNNPRS). Geographically, Arba Minch is situated between the Gamo highlands and the two known rift valley lakes: Abaya and Chamo. Presently, the town serves as the capital city of Gamo Gofa Zone (GGZ) and Arba Minch Zuria Woreda (AZW). Arba Minch emerged as an urban settlement in 1963. The naming of the town is linked to the ‘forty springs’ which literally means a group of forty magnificent springs that are situated in the scenic natural forest of Arba Minch at the base of the western side of the Great East African Rift Valley. The town is situated about 505 km and 275 km south of Addis Ababa (National Capital) and Hawassa (Regional Capital) respectively. The town is surrounded by Arba Minch Zuria woreda in the North, West and South and Nech-Sar National park (including Abaya and Chamo lakes) in the East. Currently, it consists of four administrative sub-cities namely; *Secha, Sikella, Abaya and Nechsar*, and each

sub-city holds 3 kebeles² except Abaya which has two kebeles (AMTM 2015). As described in “[Background and justification](#)” section, the population of Arba Minch grew from 20, 000 in 1984 to 75, in 2007. Economically, Arba Minch is highly endowed with banana plantation and other cash crops produced in the Gamo highland. Currently, the economy of Arba Minch is further boosted with the expansion of service giving sectors: academic institutions, financial institutions, hotels and restaurants. Figure 1 illustrates the study area.

Research design

Mixed research design, which integrates the qualitative and quantitative approaches, was employed in this study. Many writers noted the multi-faceted importance of mixed method in an inquiry and they believe that it is a good way of approaching research. For instance, Dawson (2002) noted that a mixed research design enables the researcher to counteract the weaknesses in both qualitative and quantitative research. Creswell (2009) stated that mixed methods in research gives wider opportunity to enrich data sources and analysis tools, solve weaknesses inherent to one design and often requires relatively little investment on researcher’s part. Teshome (1998) recommended that using of both quantitative and qualitative methods simultaneously is more advisable and fruitful than using a single approach. Among the strategies of mixed research design identified by Creswell (2009), Concurrent Triangulation Strategy (CTS) was customized in the current study. CTS was preferred to apply in this inquiry because it allows simultaneous collection and analysis of qualitative and quantitative data; and such combined utilization helps to importantly investigate the raised issue and to use resources economically.

Samples and sampling techniques

Arba Minch town has four sub-cities and eleven kebeles. Thus, all the sub-cities and kebeles within the town were taken as a sample frame for this study. All sub-cities of Arba Minch town were deliberately included in the study and sample kebeles were selected

² Smallest administrative units in Ethiopia.

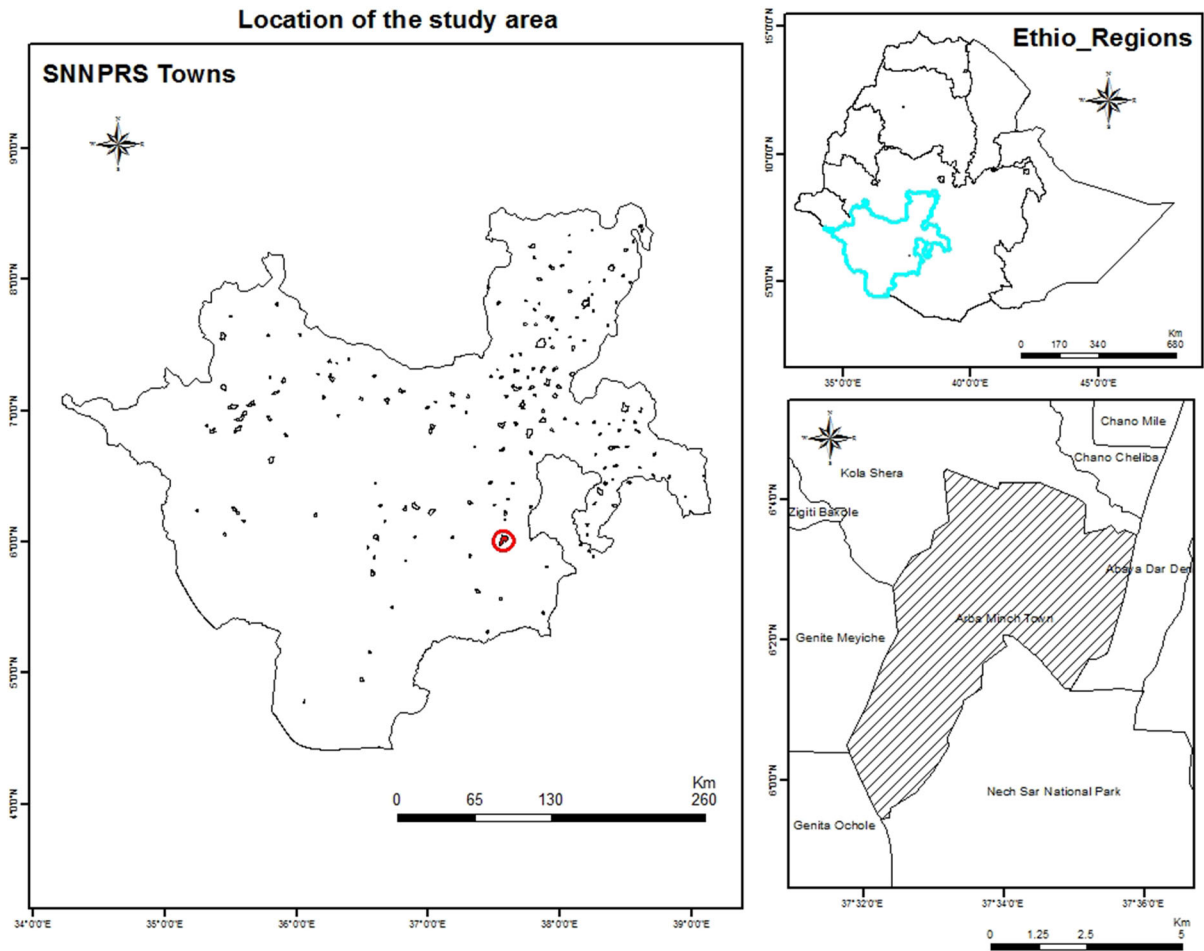


Fig. 1 Location of the study area

from each sub-city. The incorporation of the four sub-cities as the main subject of the study is also important to make comparative analysis between old and newly emerged settlements of the town. Sample kebeles were selected using simple random sampling technique. Thus, *Mehal Ketema, Dilfana, Bere and Woze* kebeles were selected as a sample from *Nech Sar, Sikela, Secha and Abaya* sub-cities respectively. Based on the data obtained from kebele administration office in 2015, sample kebeles had a total 5336 households, of which *Mehal Ketema, Dilfana, Bere and Woze* consisted 760, 1159, 968 and 2449 household heads respectively. In order to determine the sample size from the entire household heads, the researchers used the following statistical formula (Yamane 1967).

$$n = \frac{N}{1 + N(e)^2} \tag{1}$$

where n sample size, N the population size and, e level of precision (estimated marginal error in this study at 7% (0.07).

$$\text{Therefore; } n = \frac{5336}{1 + 5336(0.07)^2} = 197$$

Thus, 197 households were taken as a sample in this study since sample sizes were rounded up to the nearest whole number. Moreover, the researchers used proportional sample allocation formula in order to take representative sample size from each target kebele (Kothari 2004).

$$Nh = \left(\frac{Nh}{N} \right) * n \tag{2}$$

where h sample size of the stratum, Nh total population of the stratum, n total sample size.

Finally, systematic random sampling was employed to access specific sample respondents for this study.

Methods of data collection and analysis

The data for this research was obtained from both primary and secondary sources. The primary data were collected from sample households, officials and the physical environment through household survey questionnaire, key informant interview and field observation respectively. To acquire primary data from resident's households, open and close ended questions were prepared and reviewed at different stages. Key informant interview was administered with the municipality, informal residents and kebele administrators. Survey data was organized into themes and analyzed using SPSS package (23.0). Satellite Image data was obtained from the Ethiopian Mapping Agency (EMA) and USGS archive as shown in Table 1. Satellite images were analyzed using the procedures shown in Fig. 2. Aerial photo of 1975 was visually interpreted and discussed. LANDSAT images of the year 2000 and 2018 were changed into 8-thematic classes (*Built-up, Agriculture, Plantation, Forests, Mixed-Forests, Bare, Swamps and Water*) using *supervised classification* and *maximum likelihood algorithm*. The two images were classified separately with 91% and 89% overall-accuracy and 89% and 87% Kappa-statistics respectively. Land use and land cover (LULC) change was detected using post-classification comparison method. Validation points for the classification (X–Y data) were collected using Google Earth Image of the study area.

Results and discussion

The presentation and analysis of the findings are grouped into three thematic parts. The first section deals with urban expansion and the associated driving forces. The second part focuses on patterns of land use. Section three presents the challenges and prospects of urbanization in the study area.

Urban expansion in Arba Minch town: trends and driving forces

Demographic changes in AMT since the 1960s

Demographically, the population size of Arba Minch town has been increasing at an alarming rate and now Arba Minch has become a home for more than 100,000 people. In this regard, the 1984 CSA data revealed that the total population of Arba Minch was about 20,020, of which 53.61% were male and the rest were female. The town's population doubles itself within a decade time gap. Thus, the total population of the town had reached to 40,020 in 1994. Out of these, 49.8% were female population and the rest were males. In the 2007 CSA report, the total population of Arba Minch has reached to 74,843. Out of these, 47.6% were female population while the rest were males (CSA 1984, 1994, 2007). The 2007 census further shows that Arba Minch town accounts 4.8% and 47% of the *regional* and *Zonal* urban population respectively. The doubling time for Ethiopia's population, is however; 23 years. Therefore; from the above data someone can comprehend that the population of the town is continuously increasing.

The exact population size of Ethiopia in general and Arba Minch town in particular was not clearly known before the 1984 and after 2007 census periods respectively. However, this study attempted to fill this gap in the study area through conducting pre-censal and post censal population estimations. The population of Arba Minch before 1984 was estimated through using the following method:

$$P_t = \frac{P_o + (P_n - P_o)}{t/n} \quad (3)$$

where P_t population in question at time, P_o beginning population, P_n population at later census, t time interval between P_o and P_t , n time elapsed between two census periods. Source: (Stanley et al. 2001).

On the other hand, the population of the town after 2007 is projected by using geometric method:

$$P_n = P_o(1 + r)t \quad (4)$$

where P_n population size to be estimated, P_o initial population, r rate of population growth and t time. Source: Jacob and David (2004).

Figure 3 illustrates the trends of pre-censal and post-censal population growth in Arba Minch Town.

Table 1 Satellite information

Satellite/spectral ID	Path/row	Date of acquisition	Spatial resolution (m)	Source
Aerial photo	–	1975-12-01	0.000984252	EMA ^a
Landsat-5	169/56	2000-02-20	30	USGS
Landsat-8	169/56	2018-02-05	30	USGS

^aEthiopian Mapping Agency

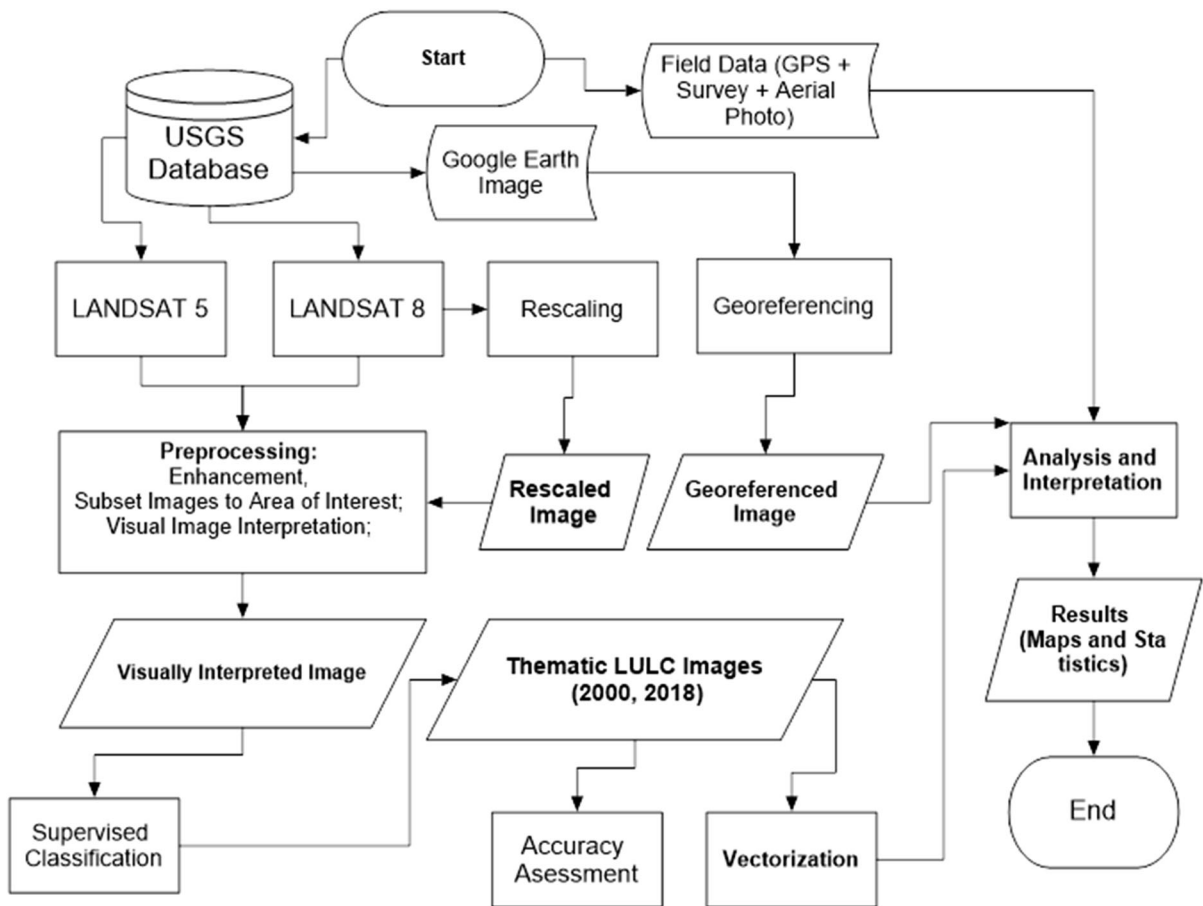


Fig. 2 Method for analyzing GIS and remote sensing data

From Fig. 3, one can understand that the population of the town keeps on growing and will reach to 110,000 by 2025 and to 562,000 by 2050. Presently, the population of Arba Minch is 37.6 fold compared to the 1960s. This should be taken as an alarm to urban planners and the concerned stakeholders to plan and design an urban fabric which ensures social, economic and environmental sustainability in the years to come. This can be ensured through reserving land banks for

housing, investment and other development activities which are yet to come.

Figure 4 demonstrates the rates of population growth in Arba Minch town. The population of Arba Minch town has been growing by 23%, 16.2%, 9.7%, 6.7% and 4.8% from 1967–1975, 1975–1984, 1984–1994, 1994–2007 and 2007–2015 respectively. Nevertheless; the annual population growth rate declines progressively as shown in Fig. 4. Decline in

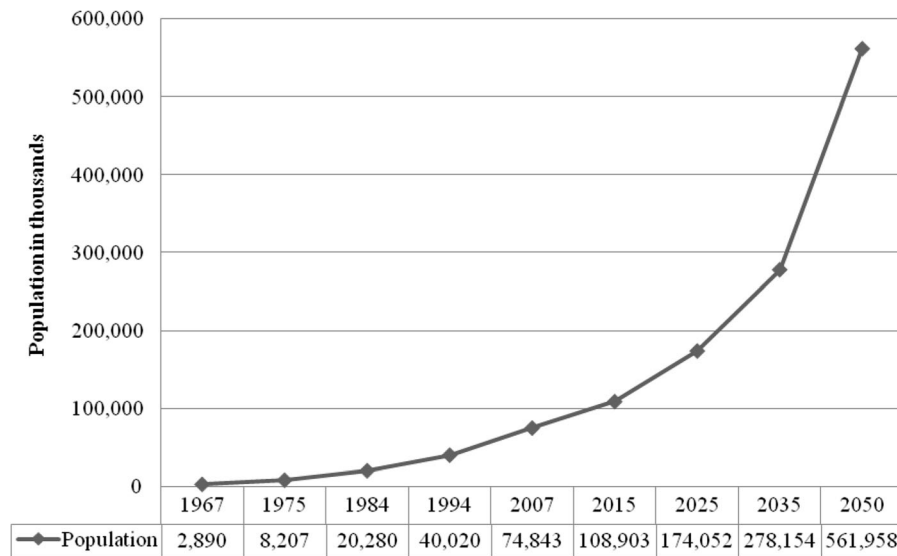


Fig. 3 Pre-censal and post censal population estimations



Fig. 4 Population growth rate of Arba Minch town, 1967–2015

growth rate of urban population might result from increase in education level of child raising families and their demand for a better urban life with a nucleated family. Rise in the cost of life in urban areas might be another reason. Decentralization of infrastructure like schooling and other services might also stem rural population from migration to urban areas.

As shown in Table 2, the majority (26.8%) of sampled respondents replied population growth as a

major cause of urban expansion, the second largest group (19%) associate urban expansion with housing shortage and consequent informal settlement expansion. The third largest proportion (15.7%) of respondents pointed out that tourism and investment activities are responsible for the outward expansion of Arba Minch town. Furthermore, infrastructural expansion (14%), reclassification of rural land into urban (12.7%), and rural–urban economic

Table 2 Major causes of urban expansion in the study area. *Source:* Household Survey

Major causes	Frequency	Percent (%)
Rapid population growth	123	26.8
Growth of tourism and investment activities	72	15.7
Housing shortage and intensification of informal settlers	87	19
Re-classification of rural land to urban	58	12.7
Infrastructural expansion	64	14
Rural–urban economic transformation	45	9.8
Others	9	1.9
Total	458	100

transformation (1.9%) were described as responsible factors for rapid urban expansion in Arba Minch.

The survey result (Table 3) revealed that the lion’s share (66%) of the sampled household heads were originated from outside Arba Minch, while household heads who were born in the town accounted about (34%) of the total respondents. Consequently, the data obtained on the living experiences of sampled respondents in the town indicated that close to half percent (48.4%) of the participants have lived in the town for less than 15 years, and only 28% of the respondents lived 27 years and above in the town (Table 3). Similarly, the 1994 and 2007 CSA data shows high proportion of migrants in the town (Arba Minch), which accounts 62.37% and 60.10% of the total

population respectively. The numerical data discussed in the current section generally indicates the powerful impacts of rural–urban migration on population rise and expansion of Arba Minch town.

Urban centers are perceived as places where one could have a better life; better income, better services and better lifestyles. The perceived opportunities attract poor people from rural areas (Neha 2001). Therefore, urbanization in Arba Minch is overwhelmingly the result of urban ward migration of people from different parts of the zone, region and/or country in response to the specified better economic and natural opportunities and services (Arba Minch is one of the few large tourist destination towns in Ethiopia and it is well known in its natural beauty and cultural

Table 3 Birth place of households * Length of stay in AMT cross tabulation. *Source:* Household Survey

Birth place of households	Elements	Length of stay in years						Total
		< 5	5–15	16–26	27–37	38–48	≥ 49	
Arba Minch town	Count	8	7	4	27	20	1	67
	% within households birth place	0.12	0.11	0.05	0.41	0.30	0.02	1.00
	% within length of stay in AMT	0.29	0.35	0.60	0.31	0.39	0.5	0.34
GGZ rural kebeles	Count	15	45	23	8	2	1	94
	% within households birth place	0.16	0.48	0.25	0.09	0.01	0.01	1.00
	% within length of stay in AMT	0.54	0.52	0.44	0.40	0.20	0.5	0.48
SNNPRS out of GGZ	Count	2	6	7	4	1	0	20
	% within households birth place	0.10	0.30	0.35	0.20	0.05	0.0	1.00
	% within length of stay in AMT	0.07	0.07	0.14	0.20	0.20	0.0	0.10
Out of SNNPRS	Count	3	9	2	1	0	1	16
	% within households birth place	0.20	0.60	0.13	0.07	0.00	0.0	1.00
	% within length of stay in AMT	0.11	0.10	0.04	0.05	0.00	0.0	0.08
Total	Count	28	67	36	40	13	3	197
	% within households birth place	0.14	0.34	0.18	0.20	0.07	0.02	1.00

diversity. The town has also good infrastructural make up and better social services and amenities). The high population density (average 289 persons/km²) and very small agricultural land size (on average less than 0.50 hectare) in Gamo highland fuels the urban ward migration of people from the uplands to the town, since Arba Minch is the only large town (it can be taken as a primate town at the level of Gamo Gofa Zone (GGZ) in the area that can provide wide range of services for these migrants.

With regard to causes of urban growth, Pacione (2009) reported a combination of natural increase of urban population and net in migration to urban areas. Kaplan et al. (2009) mentioned three demographic processes that promote urban growth in less developed countries: natural increase, rural to urban migration and the primate city phenomenon. The field survey result is consistent with these scholars viewpoint.

The continual population growth in Arba Minch exerts a huge pressure on the existing services and infrastructure and the land resource as well. Municipal officials acknowledge the issue and they noted that their office, in collaboration with the town's administration, has been investing much budget and effort for infrastructural expansion, service provision, employment creation, housing development and the like with the aim of addressing the pressing needs of the population. However, complains are raised from the people side especially on the problem of housing and unfair distribution of services and infrastructure. Thus, the study concludes that fast population growth is the main driver of urban expansion in Arba Minch town.

Physical expansion patterns of Arba Minch town

Horizontal physical expansion with low urban density is the common feature of most cities and towns in Ethiopia. Arba Minch town is one of the fast urbanizing towns in SNNPRS and it is expanding outwards to the surrounding urban fringe at a large scale. The town is marked by a tremendous population growth (“Urban expansion in Arba Minch town: trends and driving forces” section) that has put great pressure on the demand of urban spaces for residential, commercial, industries, recreational, investment, infrastructure and other urban services.

As can be seen from Fig. 5, Arba Minch town had a very fragmented settlement in 1975 and before. In the

meantime, the town was dissected into many parts and these sub-parts were acted as an independent development nucleus; the present *Secha*, *Sikella* and *Limat* areas were the growth poles of Arba Minch by the time. Figure 5 further demonstrates that the proportion of built up area was small compared to the non-built up area. The different growth centers of the town in the pre-1975 were not internally connected to each other by road and the Addis Ababa–Jinka road was the only highway that passes through the town. Generally, between 1963 and 1975 Arba Minch town was characterized by little/no land use differentiation, very low urban density and the domination of forested land, vacant spaces, and agricultural plots in its boundary. The poor implementation of the town's master plan, weak infrastructural base and absence of decentralization policy during the imperial period might be responsible for the slow development and less compactness of the town before 1975.

The LULC map of Arba Minch town in 2000 (Fig. 6) illustrates that the built-up area is still negligible compared to the huge surrounding vacant land. The 2018 LULC map (Fig. 6), however; represents huge built-up area than the non-built up areas. Except unsuitable areas for building, the rest are occupied by settlements. The independent development nuclei's of the town are now merged together and formed the present compact morphology of Arba Minch. The physical expansion of infrastructure which attracted investment and continuous growth in the town's population resulted in high demand for urban land. Therefore; rapid urbanization and the need for investment has resulted in urban density and reduction of physical development gaps (vacant land) between *Secha*, *Sikella* and *Limat* parts of the town in the recent times as can be seen from Fig. 6.

Figure 7 illustrates detailed LULC change in Arba Minch between 2000 and 2018. Accordingly, built-up area has increased by 780 ha witnessing rapid urbanization (Figs. 7, 8). Built-up area has increased at the rate of 41% annually. This expansion is however at the expense of other land uses: agriculture, plantation and mixed forests (Fig. 7). Plantation, agriculture and mixed forests were reduced by 38%, 30% and 17% annually.

Surprisingly, the water-level (Lake Abaya) has increased by 11.85 ha annually. This is due to high sediment accumulation from the highland parts of Arba Minch. Increase in Swamps by 24 ha annually is

Arbaminch and its Builtup Area_1975

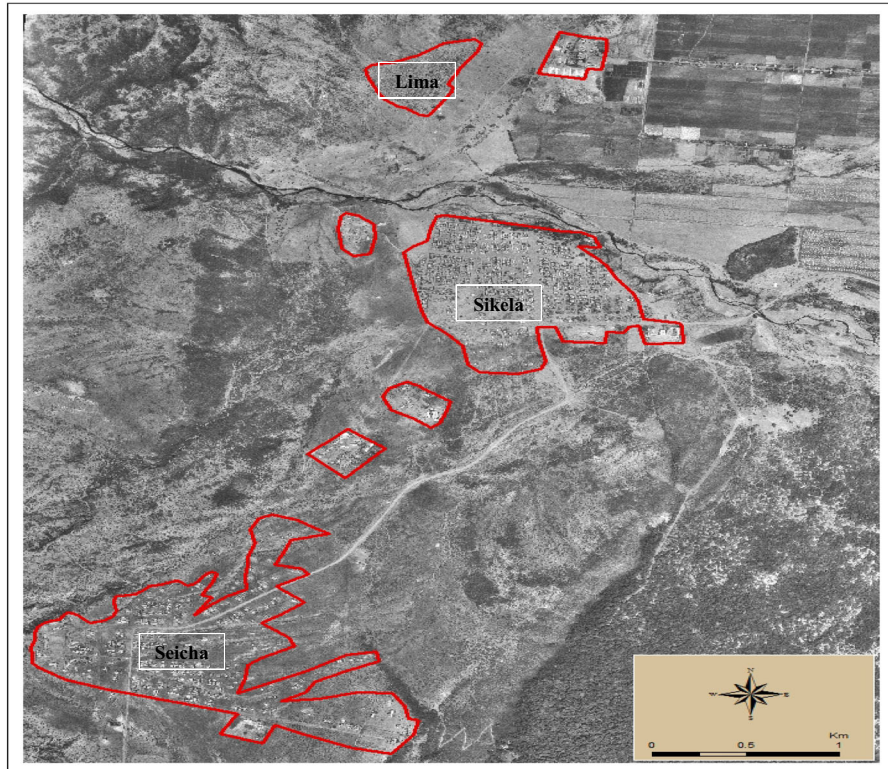


Fig. 5 Arba Minch in 1975

also in response to irrigation and increase in the volume of the surrounding water body due to siltation.

The town's municipality has no complete and adequate data on the rates of urban expansion to its fringe with respect to time. However, MUDHCo (2015) report has shown that Arba Minch town has been expanding to its sphere of influences between 2010 and 2013 although the extent of expansion was not even in the different years. As can be seen from Table 4, Arba Minch town encroached 205.23, 125.59, 46.12, 143.47 hectares of land in the year 2010, 2011, 2012 and 2013 respectively. Additionally, the data presented below shows as the town highly expanded between 2012 and 2013 and on the contrary its expansion was minimal between 2011 and 2012. From the available data and field observation, it can be concluded that Arba Minch has expanded much after 2010.

Challenges and prospects of urbanization Arba Minch

Housing shortage and intensification of informal settlers

Housing is one of the basic necessities of human life and most important aspects of material culture that plays a central role in shaping and determining human life. Lack of affordable houses, high and ever increasing land price combined with poor land management system results in informal settlement expansion. According to the information obtained from Arba Minch town's municipality, there were only 150 housing units in 1964 with a total population of 2890. In 1994 there were 8776 housing units with a total population of 40,020. In 2001, there were 12,544 housing units with a total population of 57,223. By the year 2009, there were 15,351 housing units with total population of 98,509 (AMTM 2015). This shows the presence of acute housing shortage in the town where the majority of the population does not have their own

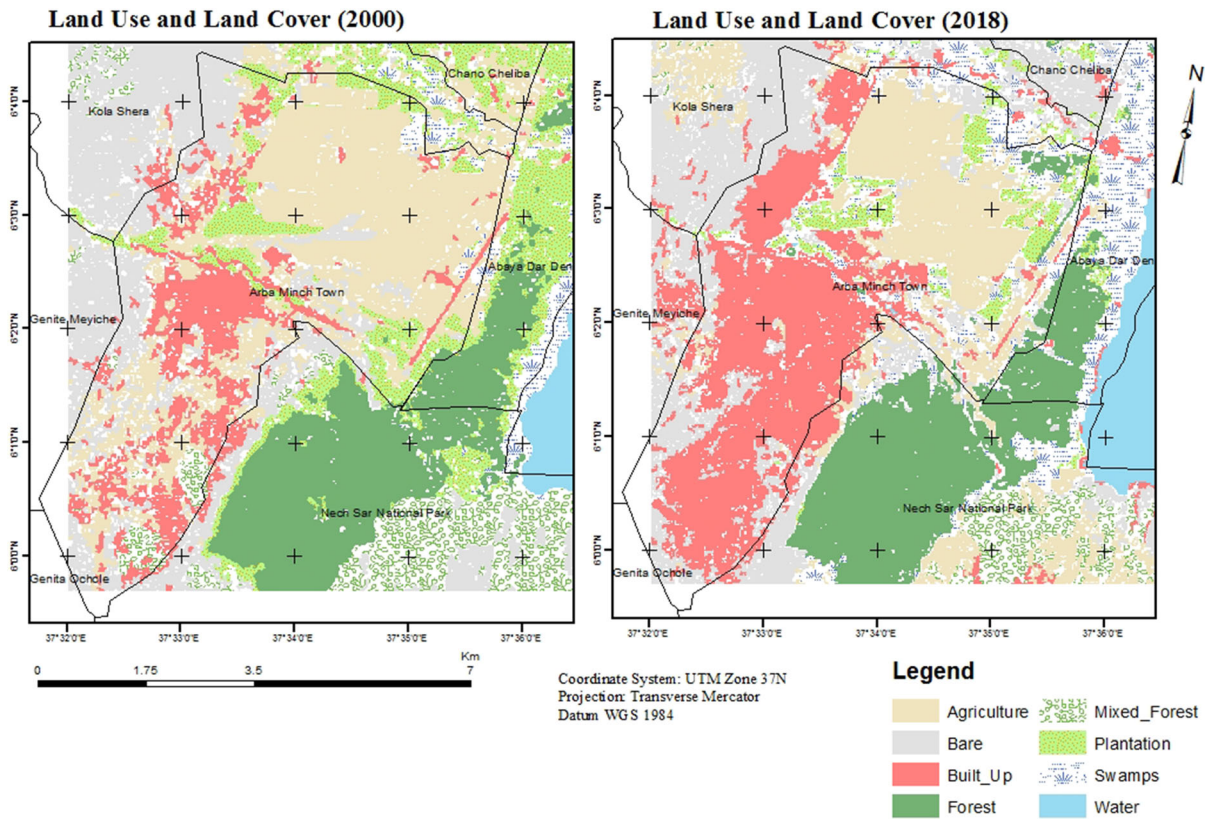
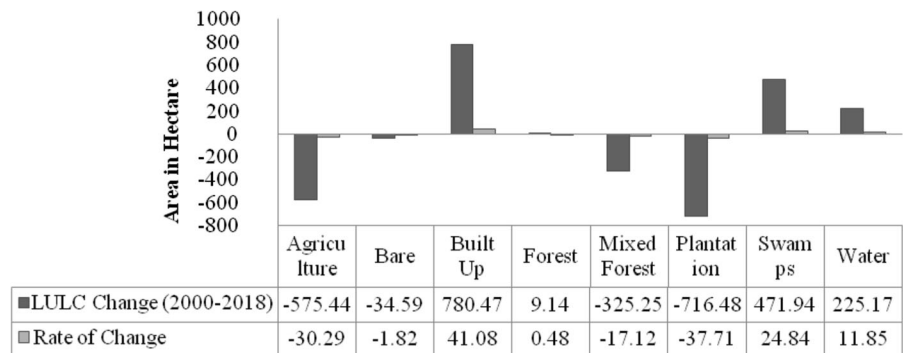


Fig. 6 LULC in Arba Minch, 2000 and 2018

Fig. 7 Rate of LULC change in Arba Minch (2000–2018)



house. Key informants have noted that limited supply of land for housing in the study area forced people, particularly the poor, to set their residences in the upland areas of the town, which in turn results in outward physical expansion. Hence, the researchers conclude that lack of access to affordable housing and the resultant gap between demand and supply causes unplanned horizontal expansion to the outskirts of the town. Figure 9 shows a glimpse of the present

morphology of Arba Minch town and its future possible expansion direction.

According to the data obtained from physical observations and Arba Minch town municipality office, the town expands horizontally to its sphere of influences in the Northern (to Kola Shara), Southern parts of the town to Jinka road and to the North-west part (Ganta-direction). Urban expansion to the Eastern direction is restricted by the presence of Nech-Sar

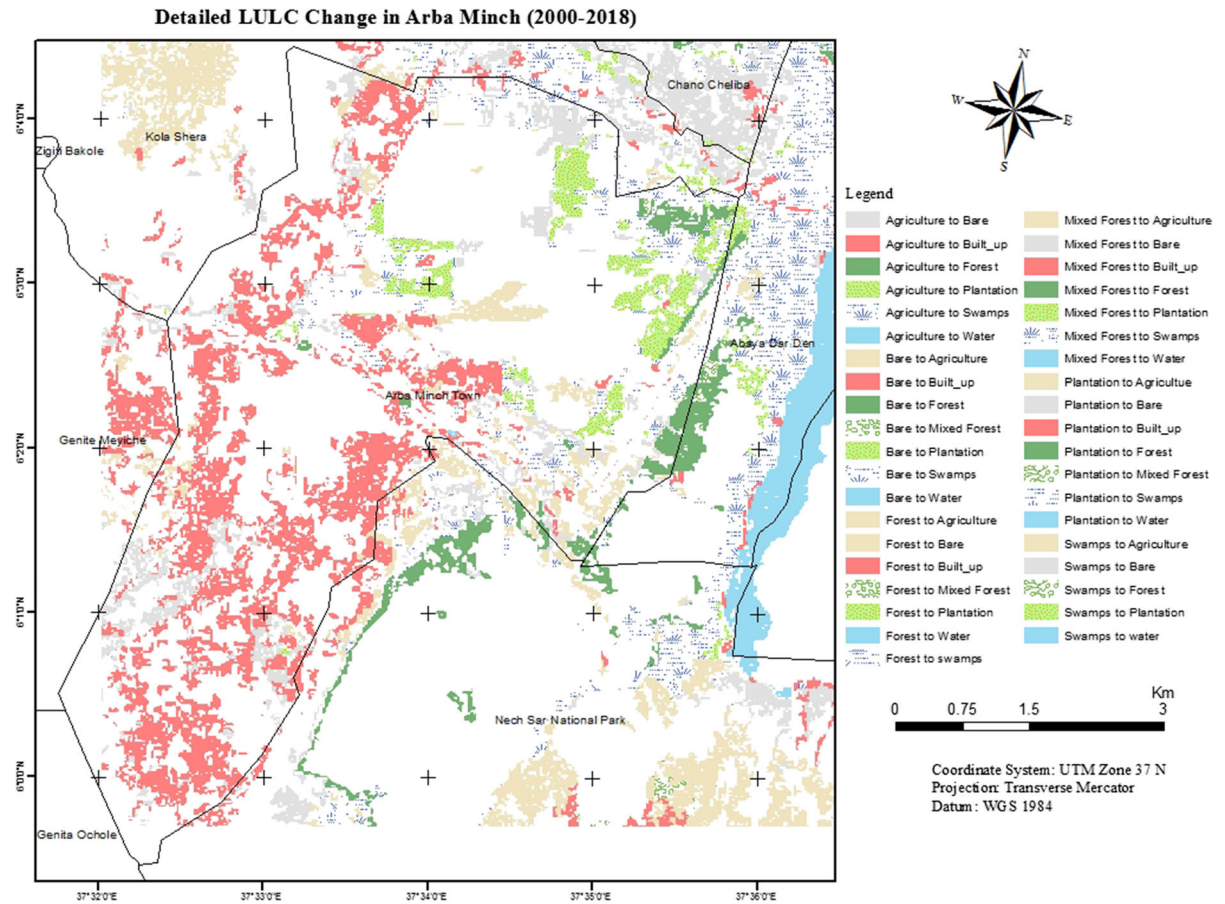


Fig. 8 Detailed LULC change in Arba Minch (2000–2018)

Table 4 Arba Minch town expansion 2010–2013—in hectares (ha). *Source:* Household Survey

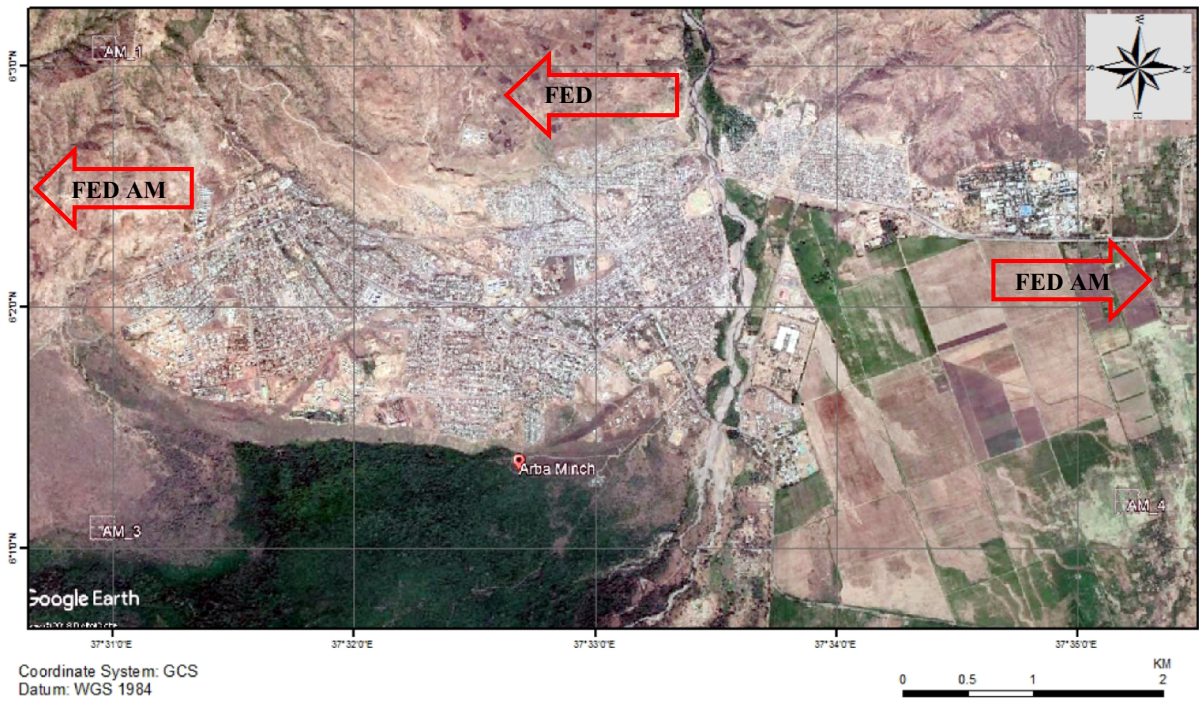
Year		Expansion rate			Total (2010–2013)		
2010	2011	2012	2013	2010–2011	2011–2012	2012–2013	520.41
205.23	125.59	46.12	143.47	0.62	0.37	3.11	

national park and the lakes. Likewise, horizontal expansion of the town to the Western, Northwestern, and Southwestern direction seems to be restricted by Mountain Chain and rugged topography of the town. The state farm which is found in the northern part of the town constrained the free expansion of the town. Apart from this, the 2009/10 structural Plan (SP) of Arba Minch town recognized the presence of high percentage of (980.69 ha, 17.65%) unsuitable area for buildings. These areas encompass gully, gorges and its buffer, swamp areas, river and its slope, high tension

buffer line and hardly built up area due to slope. The presence of such large unsuited land under the category of special functions in the town directly or indirectly contributes for the rapid proliferation of informal settlements.

Growth of tourism and investment activities

Arba Minch is one of the few tourist destination towns in Ethiopia because of its natural and cultural endowments: Nechsar National Park, Lake Abaya and



FED = Future Expansion Direction of Arba Minch

Fig. 9 Arba Minch in 2017 and its future expansion

Chamo, Crocodile ranch, Scenic natural forest, Forty springs, God’s bridge, and cultural diversity. Thus, it is difficult to isolate the development of Arba Minch from the tourism industry. The town’s culture and tourism development office report indicated increasing trends of tourist flows as well as income gain from the sector between 2008 and 2014. More, specifically, Arba Minch town’s income gain from tourism industry increased by 1.61%, 1.49%, 2.07%, 2.00%, 1.02% and

1.06% from 2008–2009, 2009–2010, 2010–2011, 2011–2012, 2012–2013 and 2013–2014 respectively (Table 5).

This data clearly reflects the increasing trends of tourism industry and its benefit to the people and economy of the town. Tourism intensifies the flux of investors in the hotel industry of the town. That is why numerous lodges and standardized hotels are largely concentrated in the urban fringe particularly near to

Table 5 Tourist flow and income gain in Arba Minch town. *Source:* AMT CTDO (2015), CTDO Culture and Tourism Development

Year	Tourist number			Income/birr/	Annual income growth (%)
	Domestic	Foreign	Total		
2008	50,408	21,781	72,189	4,751,362	
2009	53,137	30,537	83,674	7,654,851	1.61
2010	116,812	52,781	169,593	11,400,000	1.49
2011	60,616	15,769	76,385	23,600,000	2.07
2012	70,019	35,928	105,947	47,322,430	2.00
2013	79,673	38,671	118,344	48,330,105	1.02
2014	86,965	41,060	128,025	51,597,092	1.06
Total	517,630	236,526	754,156	194,655,840	

scenic natural forest of Arba Minch. According to (2014) Arba Minch Town Administration (AMTA) report, there were 61 investment projects in the town, of which, 4, 6, 8, 32, and 11 projects were engaged in industry, service, education, hotel and tourism, and market centre correspondingly. From this figure, we can generalize that the tourism and hotel sector accounts more than half of the investment activities in the town so far. Presently, Arba Minch is the home of 26 Pension, 34 Hotels and Restaurants and 2 Loges (AMTM 2015). Moreover, the data obtained from AMT investment office revealed that a total of 7.83 ha of land have been allocated for trade and investment purpose in the town between (2012/13–2016/17). Furthermore; Arba Minch is one of the few towns connected by air transportation in SNNPRS. This offers a high potential for attracting various types of investments particularly in service industry to the area. As can be seen from Fig. 10, there is a continual decline in land allocation for investment. Nevertheless; field data reveals that there is a huge land demand for investment. Field observation of the researches has shown that there are numerous fenced plots which were transferred to investors but remained vacant for years. This signifies poor vacant land management in different corners of Arba Minch town.

Expansion and improvements in infrastructure

Physical infrastructures particularly road plays an important role in shaping the overall layout and morphology of a given urban centre. The quality and physical extension of intra-urban road network greatly influences the future economic fate and physical expansion pattern of urban centers. MUDCo (2012) revealed that the share of roads out of the total built-up area of urban centers is between 15 and 25% range in the case of large towns. In this regard, Arba Minch town has been successful in that road-networks account for 22.2% of its built up area. Arba Minch has been experiencing a huge investment in the road sector which in turn demands land. From the total road in the town (172 km), gravel road accounts the highest (48%) proportion followed by unclassified/earth road (31%). Asphalted road and cobblestone constituted relatively smaller proportion 12% and 9% respectively. Arba Minch town also has an international air port and this makes the town pioneer from SNNPRS region in air transport. Besides, researchers' experience and observation in the town revealed that before 2010 there were no asphalted roads that connect the sub-parts of the town to the main asphalt road. Currently, however; intra-urban asphalted roads are expanding. Similarly, cobblestones were not built in most parts of the town unlike today. Moreover, between 2010 and 2016, investigators of this inquiry have noticed the upgrading of significant portion of

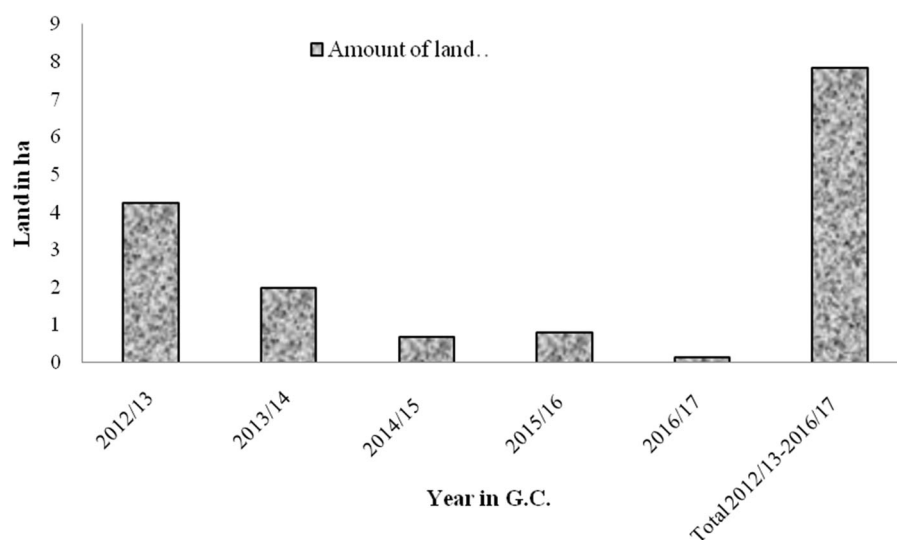


Fig. 10 Land allocated for investment in AMT (2012/13–2016/17)

‘unclassified and earth’ road to gravel road status. Thus, from the survey result we can conclude that the town possesses a better transportation network which has direct implications for its recent development, because; it helps to attract investment to Arba Minch.

Furthermore, the expansion of Arba Minch University (AMU) into various campuses was reported by sampled respondents as an additional factor that contributes for the expansion of the town into different direction. It is well remembered that initially AMU was situated in a single site (at the northern tip of the town). Currently, however; there are five campuses in the town and each act as a growth centre for attracting service giving activities in and around their location. Key informants pointed out the positive impacts of AMU’s expansion for the physical development of Arba Minch town. In this regard, it is not a surprise if Arba Minch is designated as a “*University Town*”.

Re-classification of rural land to urban

Methods of urban land acquisition have its own impact on horizontal expansion of the city towards the periphery. Reclassification of land from rural to urban area has significant role in population growth and expansion of the city. During the last few years, the town has been expanded towards an already vacant land, forested areas and peasant agricultural landholdings so as to meet the increasing land demand in the town for different purposes (“[Physical expansion patterns of Arba Minch town](#)” section). The vacant pocket areas that were found within and outside the municipal boundary as well agricultural land in the surrounding areas, mainly in the Northern and Southern parts of the town have been reclassified into urban area through time. The data obtained from Arba Minch Zuria Woreda Agriculture and rural development office (AMZWARD) (2009) revealed that the town expanded to *Shara, Gurba and Abulo* areas. The office further estimated that on average 647 farmers at *Shara and Gurba* and 102 farmers at *Abulo* and a total of 749 farmers are expected to be displaced due to town’s horizontal expansion.

Rural–urban economic transformation

Arba Minch town is surrounded by agriculturally productive areas that mainly produce cash crops like *banana, papaya, mango, apple* and the like. Farmers

in and around Arba Minch town are the main supplier of such high valued crops to the national market and in recent years these farmers started to export banana to the external world (particularly Saudi Arabia) and they obtained high amount of revenue. Regarding the amount of production, GGZ ARDO (2015) reported that cash crop producers in and around Arba Minch supplied 85,353, 10,560, and 2829 tones of *banana, mango* and *papaya* annually to the domestic market and 22 tones of *banana* to Saudi Arabia. The data presented in the current section clearly reflects the important role of agricultural productivity for rural–urban transformation in the study area. In this regard, interviewed residents of the town underlined that quality residential houses in Arba Minch are mainly constructed and owned by farmers. Besides, banana farmers are believed to buy urban land from individuals at a higher price.

Conclusions

The objective of this study was to explore the driving forces of urbanization, land use pattern and its challenges in Arba Minch town, Southern Ethiopia. Mixed research design was employed to generate and analyze data. 197 households were surveyed to collect data. Aerial photo, Google Earth Image and Satellite images of LANDSAT (1975, 2000 and 2018) were visualized to quantify land use and land cover (LULC) change and its pattern. Field observation was made to cross-check results from other sources. Data was analyzed using SPSS (23), Erdas Imagine (2014) and ArcGIS (10.3).

The results of the study revealed that Arba Minch town is in a state demographic and physical growth. The population size of the town increased from 2890 in 1967 to 108,908 in 2015; which is almost 38 fold of the 1960’s population. The population is projected to reach 175,000 by 2025 and to 562,000 by 2050. The huge growth of population in the town is mainly linked to massive rural–urban migration (66%) and consequent conversion of rural land into urban through boundary redefinition. Demographic growth coupled with higher demand for housing and other investment sectors (hotel, tourism, road infrastructure, education) and rural economic transformation resulted in horizontal physical expansion of Arba Minch town. Evidently, built-up area has increased by 780 ha

between 2000 and 2018. Nevertheless; plantation, agriculture and mixed forests have declined by 716 ha, 575 ha and 325 ha respectively between 2000 and 2018. Historically, the town had a low urban density and limited geographical coverage (mid 1970s). Through time, however; Arba Minch town has been transformed from an isolated dwelling (mid 1970s) to a more or less a compact morphology in recent years (2010–2018). The study revealed that Arba Minch town mainly expands to the northern and southern directions due to topographic and eco-environmental factors. Huge gap between demand and supply of land, proliferation of informal settlements in different pockets of the town (namely; the north-western plateaus and other unsuited lands) and poor vacant land management were found to be the notable challenges in Arba Minch town. Therefore; Arba Minch municipality and other stake holders should work hand-in-hand to promote sustainable urban development through: optimal vacant land management; monitoring informal settlements; promoting vertical development and preserving the scenic urban fabric.

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Compliance with ethical standards

Conflict of interest The authors declare that they have no conflict of interest.

References

- Arba Minch Town Administration (AMTA). (2014). *Town wide short report written in its 50th year's anniversary*. Arba Minch, unpublished document.
- Arba Minch Town Culture and Tourism Development Office (AMT CTDO). (2015). *Report on trends of tourism development in Arba Minch town*. Arba Minch, unpublished document.
- Arba Minch Town Municipality (AMTM). (2015). *The first five years strategic plan of Arba Minch town*. Arba Minch, unpublished document.
- Arba Minch Zuriya Woreda Agriculture and Rural Development (AMZWARD). (2009). *Reports on urban expansion and agricultural enrichment*. Arba Minch, unpublished document.
- Admasu, T. G. (2015). Urban land use dynamics, the nexus between land use pattern and its challenges: The case of Hawassa city, Southern Ethiopia. *Land Use Policy*, 45(November 2012), 159–175. <https://doi.org/10.1016/j.landusepol.2015.01.022>.
- Admasu, T. G. (2018). Informal housing and the urban poor: Experiences from Hawassa, Ethiopia. In *Handbook of research on urban governance and management in developing countries* (pp. 138–157). <http://doi.org/10.4018/978-1-5225-4165-3.ch008>.
- Berke, P., Kasier, E., Godschalk, D., & Rodriguez, D. (2006). *Urban land use planning* (5th ed.). Champaign: University of Illinois Press.
- Buckley, R. M., Annez, P. C., & Spence, M. (2009). *Urbanization and growth: Commission on growth and development*. Washington, DC: World Bank.
- Central Statistical Authority (CSA). (1984). *Population and housing census report of Ethiopia*. Addis Ababa: Ethiopia.
- Central Statistical Authority (CSA). (1994). *Population and housing census report of Ethiopia*. Addis Ababa: Ethiopia.
- Central Statistical Authority (CSA). (2007). *Population and housing census report of Ethiopia*. Addis Ababa: Ethiopia.
- Creswell, J. W. (2009). *Research design: Qualitative, quantitative, and mixed methods approaches* (3rd ed.). London: Sage Publications Ltd.
- Damte, A. (1993). *Urbanization in Ethiopia: Pre and post revolution experience*. Ph.D. dissertation, The University of Wisconsin, Milwaukee.
- Dawson, C. (2002). *Practical Research Methods A user friendly guide to mastering research techniques and projects*. Oxford: How to Books Ltd. <http://www.howtobooks.co.uk>.
- Dibeta, D. (2008). *Assessing land delivery systems for residential housing development in Arba Minch town, Ethiopia*. Unpublished MA thesis, ECSC, Addis Ababa, Ethiopia.
- Dube, E. E. (2013). Urban planning & land management challenges in emerging towns of Ethiopia: The case of Arba Minch town. *Journal of Urban and Environmental Engineering*, 7(2), 340–348.
- Ellis, E. (2007). Land-use and land-cover change. *The Encyclopedia of Earth*.
- Gamo Gofa Zone Agriculture and Rural Development Office (GGZ ARDO). (2015). *Annual zonal report on agricultural production and associated problems*. Arba Minch, unpublished document.
- Hofmann, A., & Wan, G. (2013). *Determinants of urbanization*. ADB economics working paper series, 355 (p. 31).
- Hu, R. (2013). Drivers of hina's urbanization and property development. *Australasian Journal of Regional Studies*, 19(2), 156–180.
- Jacob, S., & David, S. (Eds.). (2004). *The methods and materials of demography*. San Diego: Elsevier Academic Press.
- Kaplan, D., Wheeler, J., & Holloway, S. (2009). *Urban geography* (2nd ed.). New York: Wiley.
- Kothari, C. R. (2004). *Research methodology: Methods and techniques* (Revised ed.). New Delhi: New Age International (P) Ltd Publisher.

- Ministry of Urban Development and Housing Construction (MUDHCo). (2012). *Revised standards for structure plan preparation and implementation*. Urban planning, sanitation and beautification bureau, Addis Ababa.
- Ministry of Urban Development and Housing Construction (MUDHCo). (2013). *Urban land development and management policy and strategy*. Ethiopia: Addis Ababa.
- Ministry of Urban Development and Housing Construction (MUDHCo). (2015). *The state of Ethiopian cities*. Addis Ababa: Ethiopian Civil Service University.
- Muhammed, B. (2011). Urbanization and its impact on electoral management in Nigeria. *Nasarawa Journal of Political Science*, 1(2), 161.
- Neha, M. (2001). Urban sprawl: A developing country approach. *e-journal of the world student community for sustainable development*.
- Osman, T., Divigalpitiya, P., & Arima, T. (2016). Quantifying the driving forces of informal urbanization in the western part of the greater cairo metropolitan region. *Environments*, 3(13), 1–17. <https://doi.org/10.3390/environments3020013>.
- Pacione, M. (2009). *Urban geography: A global perspective* (3rd ed.). Routledge: Taylor and Francis Group.
- Pravitasari, A. E., Rustiadi, E., Mulya, S. P., Setiawan, Y., Fuadina, L. N., & Murtadho, A. (2018). Identifying the driving forces of urban expansion and its environmental impact in Jakarta–Bandung mega urban region. *IOP Conference Series: Earth and Environmental Science Paper*, 149(12044), 1–10.
- Stanley, K. S., Tayman, J., & Swanson, D. A. (2001). *State and local population projections: methodology and Analysis*. New York: Kluwer Academic Publishers.
- Tegenu, T. (2010). *Urbanization in Ethiopia: Study on growth, patterns, functions and alternative policy strategy*. Stockholm: Stockholm University.
- Teshome, N. (1998). *Media utilization and school improvement. A case study of primary Education Ratio Support Programs in Ethiopia*. Doctoral dissertation for the Ph.D. degree in International and Comparative Education, Institute of International Education, Stockholm University, Sweden.
- Thuo, A. D. M. (2010) *Community response to land-use transformation in Nairobi rural–urban fringe, Kenya*. University of Waikato, field action report.
- Torora, T. (2015). *Mapping urban morphology types (UMTs) of Arba Minch town and assessment of recreational ecosystem services*. MA thesis, Addis Ababa University, Addis Ababa, Ethiopia.
- UN Habitat. (2004). *Dialogue on the urban poor: Improving the lives of slum dwellers*. Pre-session document for the World Urban Forum, 13–17 September, 2004, Barcelona, Spain.
- UN Habitat. (2010). *Cities without slum: Situation analysis of informal settlements in Addis-Ababa, a slum upgrading program*. Nairobi: UN Habitat.
- Yamane, T. (1967). *Statistics, an introductory analysis* (2nd ed.). New York: Harper and Row.

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