

CHAPTER IV: LAND USE CHANGES

- **Development of Master Plans**
- **Changes in the Land Use Type**
- **Concentration of Peripheral Land Use**
- **Land Use Pattern Relating to Land Use Theories**
- **Physical Expansion**

Land use/ land cover change is perhaps the most prominent form of global environmental change since it occurs at spatial and temporal scales. Land use relates to human activity on the land whereas land cover relates to the type of feature present on the surface of the earth. The change in the land use in cities is the result of urbanization and at the same time it is the cause of a number of environmental problems, reflecting the direct and indirect interactions between human activities and the natural environment. A study of the mechanism of land use changes associated with industrialization and urbanization is essential not only for detecting the global environmental change but also for formulating sustainable strategies on the local scale (Chang-Qing KE, 2000).

Farmland is disappearing at an alarming rate to create industrial parks, new highways and sprawled housing developments. The loss reduces our ability to grow food crops. In many areas, urban development pressure is forcing farmers out of business. They often sell their lands for housing developments, to provide financial security for their livelihood. More and more agricultural land is being converted to non agricultural one; therefore, the urban area is expanding very rapidly (Pathan et al, 1991).

Most of the metropolitan areas face the growing problems of urban sprawl, loss of natural vegetation and open space. The public identifies these problems when they see residential and commercial development replacing land around them. Cities have changed from small, isolated population centers to large, interconnected economic, physical and environmental agglomerations. The process of urbanization often leads to haphazard growth in metropolitan cities, deterioration in living conditions and worsening of environmental scenario. It is, therefore, desirable to plan for the city and peripheral areas in an integrated manner (Pathan et al, 1991)

Rapid Industrialization and its complementary activities like population growth push urban services and infrastructure to expand. Rapid population growth of the city has put great pressure on the demand for urban spaces. In response to this, efforts are being made by the city government to incorporate the peripheral areas of the city. This results in change in the land use pattern of the city. Land use changes are one of the important indicators to determine the physical expansion of the city. Therefore, it is necessary to assess the land use changes within the city. The information regarding the land use

changes has been collected from Addis Ababa Urban Government Bureau. Hence, this study is aimed:

- a) To assess the land use changes in the study area
- b) To analyze the land use concentrations in the study area
- c) To examine the pattern of land use relating to land use theories, and
- d) To assess the impact of land use changes on the physical expansion of the city

Land use data were collected from different published and unpublished documents of the Addis Ababa City Government. These data include:

1. Temporal and spatial variations of land use of the study area
2. Urban expansion and its consequences

Maps and figures are used to depict the changes over time, and variations among sub cities of the city. Tables and percentages were used to assess the changes in land use types.

DEVELOPMENT OF MASTER PLANS

Addis Ababa city had made several infrastructural plans since its establishment in 1886 which brought changes in its physical and social growth (AACG, 2008). Addis Ababa city was trying to adopt land use plans from different countries by foreign and national professionals. However, it is observed that most of the plans were not fully implemented in the past and in most cases the city was expanding without following any workable land use plan (Admasu, 1997; Matios, 2007).

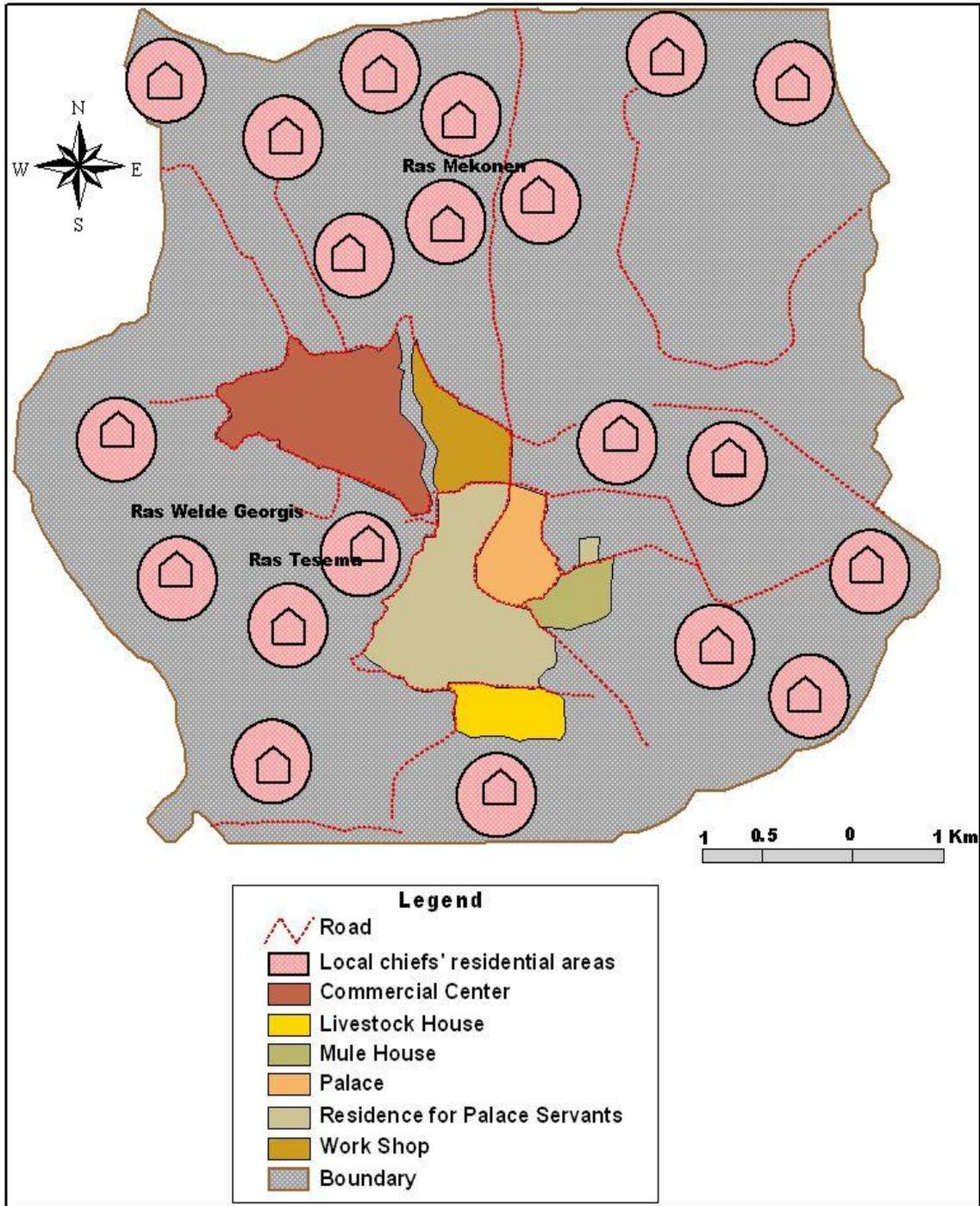
The city's early development was centered on three nodal points namely the Menelik Palace (political and administrative center), the Arada Saint George Church (Social and religious Center), and the Arada area (business and market center) (ORAAMP, 2002; AACG, 2008). The city was developing spontaneously in all directions, with particular emphasis toward the north, north west and south of the nodal points until the arrival of the Italians in 1936 (Admasu, 1997; Mateos, 2007).

As can be seen from Fig-4.1, land use category in the study area during its establishment and shortly after that was based on the interest of the Emperor Minilik and its servants. It was composed of local chiefs' residential areas, commercial center, livestock house, mule house, palace, etc. which exhibits the interests of the ruling family. This means that the interests of the society were not considered in preparing this master plan. Therefore, it is arguable that the land use system of this early time of the city's development was favorable for development.

The Italians put efforts to prepare a master plan and its implementation which reflects in the existing city structural features of Addis Ababa (Addis Ababa City Government, 2008). In 1955/1956, Sir Patrick Abercrombie, the renovated planner of London city, prepared a plan which incorporated a concept for sub cities and a ring road (Mateos, 2007). The street network of this plan is designed to channel vehicular traffic outward from central areas. In addition, his proposal includes the integration of satellite settlements in all directions around the core city (ORAAMP, 2002).

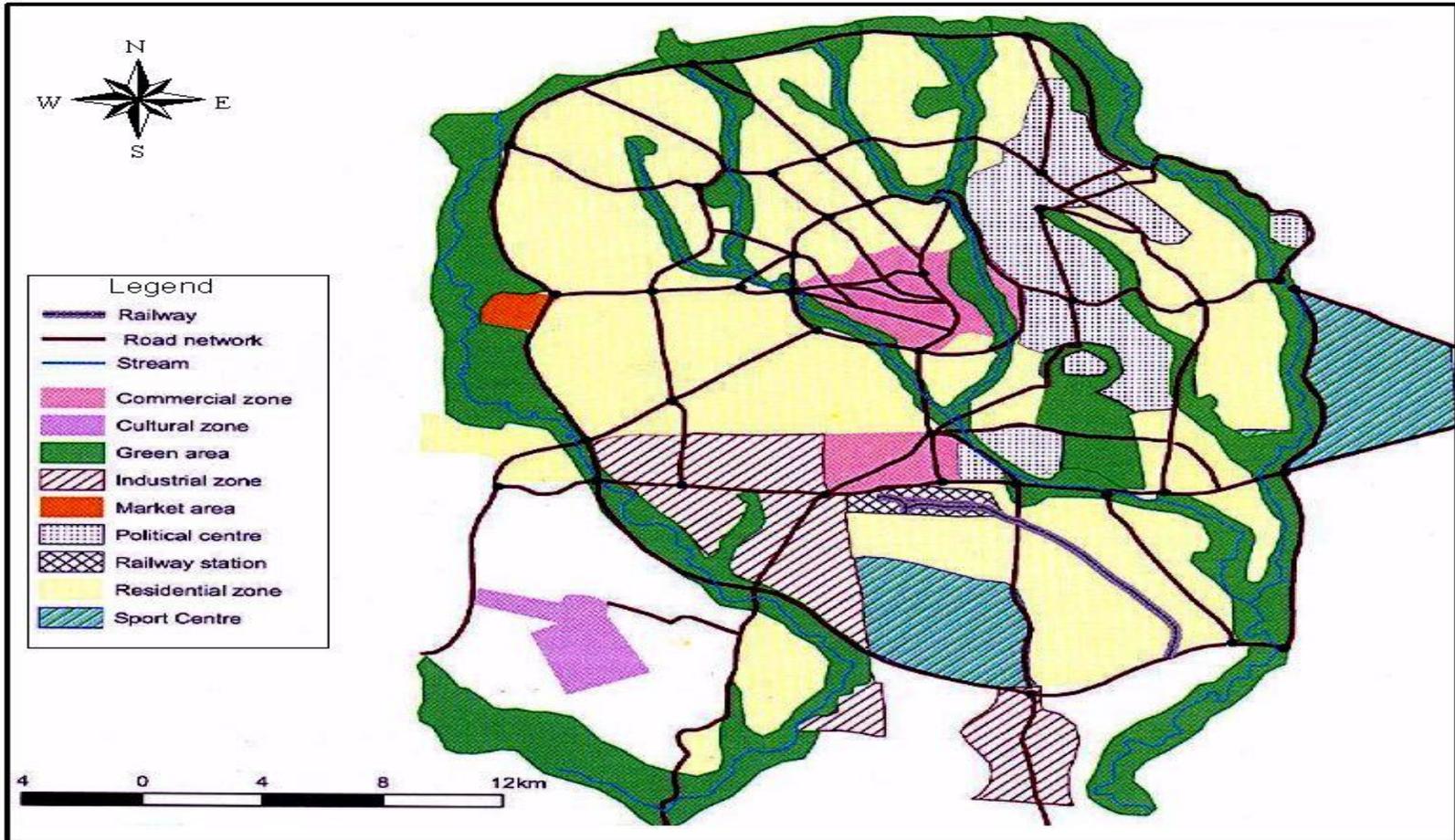
In 1958/1959 another master plan was prepared based on Abercrombie's concept (Fig-4.2) by Bolton Hennessey. Based on that plan, part of the street network and the satellite towns were developed (ORAAMP, 2002).

Further, based on the master plan prepared by Le DI Maryion (1966-1967) and Polloni (1975) most of the city's road network was developed and also connecting roads between Addis Ababa and adjacent towns constructed (ORAAMP, 2002). Addis Ababa Master Plan Project Office (AAMPPO) prepared another plan during 1984 – 1986. But much attention was not given in this plan for a proper planning of the city and its physical infrastructure such as roads, squares, buildings (Mateos, 2007). Later this master plan revised by the office of the revision of the Addis Ababa master plan (ORAAMP) during 2000. Within the five years of implementation of this revised plan, a substantial change in the city's structure was occurred (Mesfin, 2009; Mateos, 2007).



Source :- Guidi & Valle Master Plan

Fig-4.1 The Early (during its establishment) Land Use Patterns of the Study Area



Source :- Sir Abercrombie's Master Plan

Fig-4.2 Land Use Patterns During 1955/1956 in the Study Area

CHANGES IN THE LAND USE TYPE

Pattern of Land Uses during the Period 1986

It can be observed from Table-4.1 that the extent of agricultural land use was higher when compared to other land uses. It is the dominant constituting 51 percent of all land uses. It was mainly found in the peripheral regions of the city. The second dominant land use type during this time was urban and its associated land use type constituting 34 percent. It dominated the central part of the city.

The pattern of land uses during by 2000

During this period there was an increase in built up land use of the city. In contrast to this there was a decrease in forest and agricultural land uses. The total forest cover of the city was decreased by 739 hectares while agricultural land use is decreased by 3730 hectares (Table-4.1). A study made by Fekerte (1991) showed that the forest resource depletion of the city was attributed to ownership arrangement and the growing demand of wood for construction and domestic purposes. The expansion of built up area is at the expense of forest and agricultural land area; and this shows anthropogenic factor of deforestation due to the need of building houses and raising domestic animals and practicing urban agriculture.

The study made by ORAAMP (1999) confirms this as follows: much of the growth taking place in Addis Ababa (probably up to 70 percent of the total), takes place in the slums and squatter settlements at the periphery of the city. This informal settlement may be responsible for the changes occurred. ORAAMP (1999) has also reported the conversion of agricultural land and forest to built up areas. According to his source, informal land transaction and formal land allocations for built up areas are the main reason for forest and agricultural land retreat. The conversion of agricultural land to built-up land use type forced the indigenous people of the area to shift their livelihood strategies.

The pattern of land uses by 2010

It may be observed from Table-4.1 that the extent of built up area was far higher when compared to other land uses. Compared to the year 2000, land use type of forest cover showed some increment. Leulsseged et al (2011) found out that the rate of the declining trend of forest cover by -1.30 between the year 2000 and 2010 as compared to -7.98 rate between the year 1986 and 2000 could be attributed to the improved tree plantation activities conducted in the city. Agricultural land is the only land use type which continued its former rate of change, i.e. it shows a continuous declining trend since 1986.

Table-4.1 Temporal Variation in the Land Use Type

LUC	1986		2000		2010	
	Area (ha)	Area (%)	Area (ha)	Area (%)	Area (ha)	Area (%)
Urban and associated	7,721	34	14,672	58.5	33,900	62.8
Forest Cover	3,258	14	2,519	10.0	12,647	23.4
Agricultural Areas	11,506	51	7,776	31.0	7,453	13.8
Water and wetlands	128	1	128	0.5	0	0.0
Total	22,613	100	25,095	100.0	54,000	100.0

Source: AACG, 2010; Mesfin, 2009

PATTERN AND DISTRIBUTION OF LAND USE TYPES

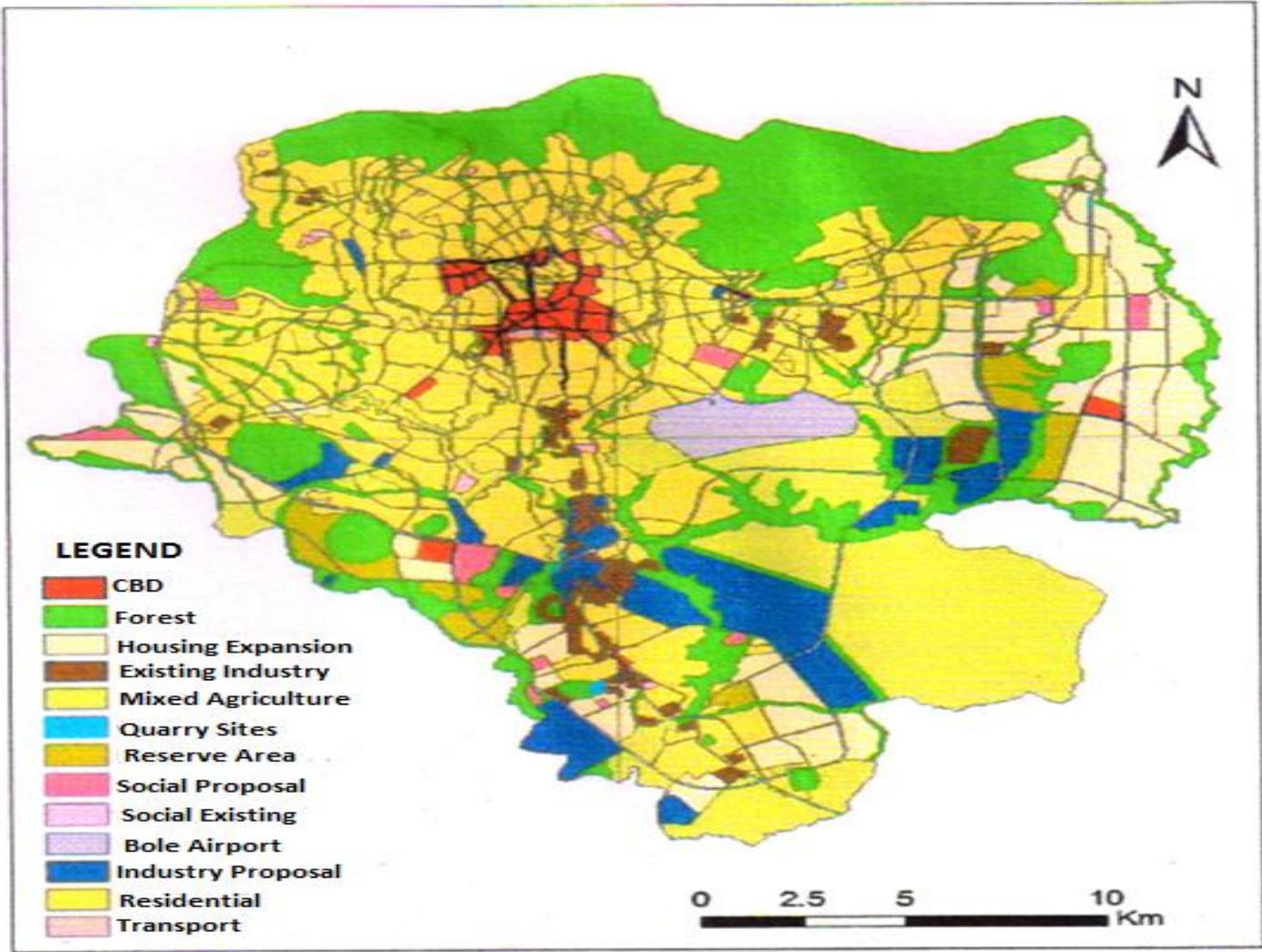
At present, the total area of Addis Ababa is about 54,000.00 hectares (Table-4.2). During the last expansion period (2000-2010), the city attained its maximum expansion as it grew from 25,095.00 hectares in the prior expansion period to 54,000.00 hectares during this period. This is mainly because of the fact that during this period, 23 Peasant Associations with total areas of more than 25,000 hectares were annexed to the city administration (ORAAMP, 2002; Mesfin, 2009).

Generally, the trend of Addis Ababa physical expansion shows the rapid expansion both planned and unplanned. The overall expansion direction was mainly southwards, eastwards and westwards along four outlets of the city (excluding Fiche road mainly due to its topography). This rapid horizontal expansion indicates the rapid encroachment of the farmland by the urban settlement. It also created formidable problems for residents and farming community in the periphery that could be problems of deprivation, lack of access to essential basic services, and an inadequate income for their survival (Tegegne, 2000). The land use distribution as per the master plan, shows that most of the development as of the city is mixed with no well defined residential, commercial and industrial areas.

Table-4.2 Present Day Concentration of Land Uses in the Study Area

Land Use Categories	Area in hectare	Percentage share
City centers(CBD)	1,317	2.4
Forest	12,647	23.4
Agriculture	7,453	13.8
Existing Industry	1,292	2.4
Proposed Industry	1,846	3.4
Mixed use(Housing) built up	16,900	31.3
A proposed social service	624	1.2
Existing Social Service	514	1.0
Reserved	1,085	2.0
Transport	1,029	1.9
Mixed use expansion	7,243	13.4
Road Network	2,050	3.8
Total	54,000	100.0

AACG, 2010



Source: Yetnayet, 2012

Fig-4.3 Land Use Classification of the Study Area

Concentration of City Centers (CBD)

This type of land use is found in parts of the northern tip of Qirkos, eastern Addis Ketema and Lideta and the majority of the Arada sub city. It constitutes about 2.4 percent of the total area of the city (Fig-4.3).

Concentration of Residential Areas

The greater proportion of residential land use is found in the land next to the CBD. This type of land use is found in parts of Qirkos, Lideta, Addis Ketam and Arada. To a greater extent, it is found in Kolfe Keranio, southern part of Gullele, western and south central part of Yeka, central and northern part of Nefas Silk Lafto, western part of Bole and south central part of Akaki Qaliti. It constitutes about 31.3 percent of the total land use types of the city (Fig-4.3).

Concentration of Forest Land Use

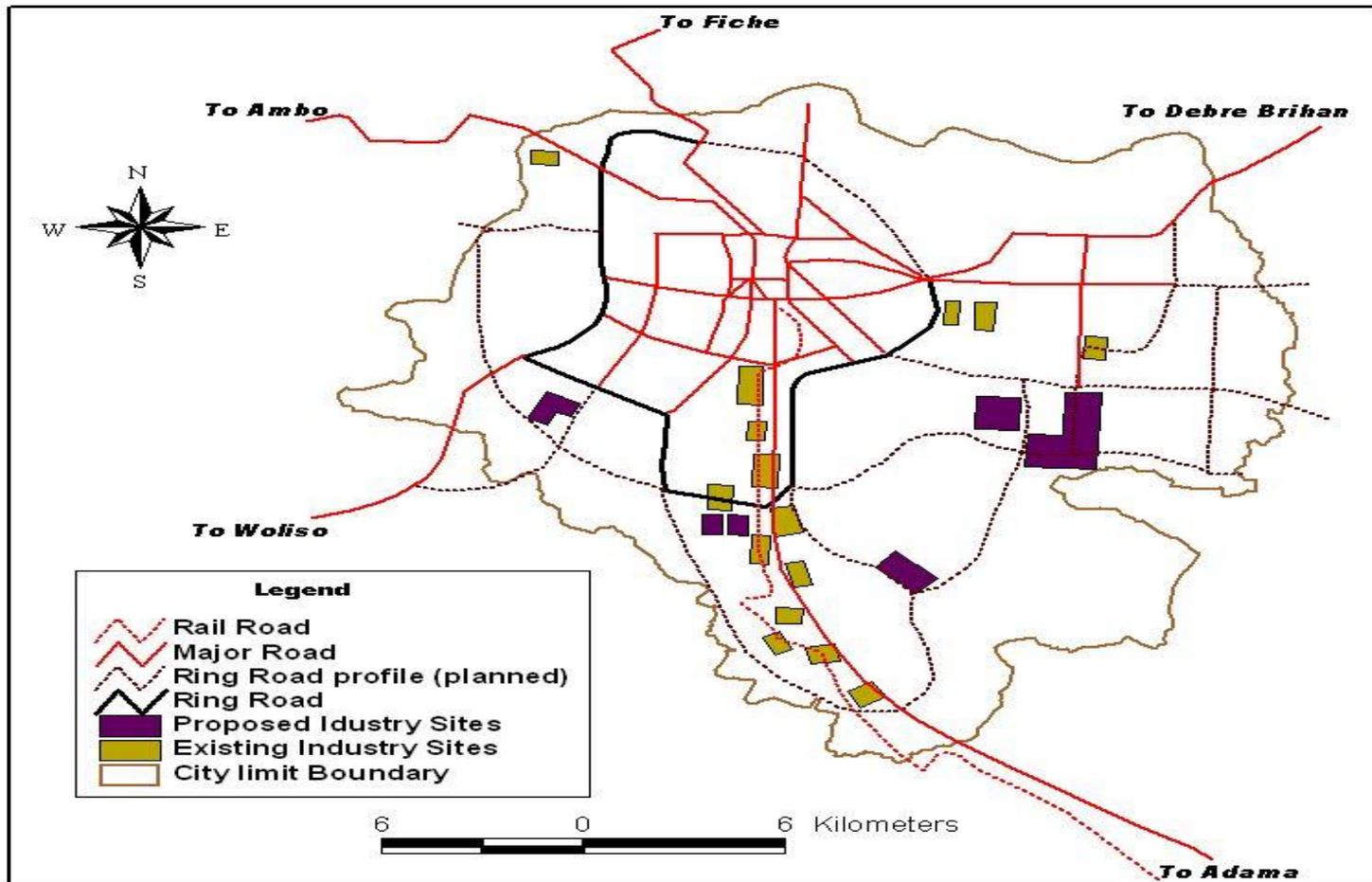
The majority of this type of land use concentrates on the northern part of the city (northern part of Gullele and Yeka sub city). It constitutes about 23.4 percent of the total land areas of the city (Fig-4.3).

Concentration of Agricultural Land Uses

This type of land use is concentrated in the western and southern tip part of Akaki Quality, southern parts of Bole, and western tip of Nefas Silk Lafto. It constitutes about 13.8 percent of the total land area of the city (Fig-4.3).

Concentration of Industrial Land Use

The majority of this type of land use is concentrated in the Akaki Quality sub city developed along transportation routes to Adama. It is also found in parts of Bole, north eastern tip of Nefas Silk Lafto, and parts of the Gullele sub city. It constitutes only 2.4 percent of the total land area of the city (Fig-4.3& 4.4).



Source :- Executive Summary of Addis Ababa City Development Plan 2001-2010, page 27

Fig-4.4 Location Map of Industries in the Study Area

Concentration of Social Service Land Use

This type of land use is the smallest in terms of the land it covers; it constitutes only 1 percent of the total land area of the city. It is found in parts of Nefas Silk Lafto, Bole, and Kolfe Keranio sub cities(Fig-4.3).

Concentration of Transport Land Use

The road transport system is the only means of motorized transport in the city. It has a radial form which is shaped by five major roads radiating out of CBD into the outskirts. The ring road has added an orbital shape. It constitutes about 3.8 percent of the total land use type. However, an efficient system needs 20 to 25 percent (Fig-4.4).

Concentration of Reserved (Vacant) land Use

The majority of reserved area is found in Nefas Silk Lafto, parts of Bole, Yeka and Akaki Qaliti sub cities. It constitutes about 2.0 percent of the total land use type(Fig-4.3).

CONCENTRATION OF PERIPHERAL LAND USE

The urban land use in the periphery varies from place to place. The land use along the outlet to Adama is dominated by industrial and commercial while those on Woliso road dominated by commercial and residential. Similarly, land use along the outlet to Ambo is intermixed (commercial, industrial and residential) while to Debre Brihan it is dominated by residential and government institutions (ORAAMP 1999; Fig-4.4).

LAND USE PATTERN RELATING TO LAND USE THEORIES

Land use theories such as Concentric, Sector and Multiple–nucier Theory may not be applied to cities of developing countries because of the fact that these theories were originally developed to assess American Cities. However, it is important to relate the land use pattern of the city to one of the land use theories.

Originally, the city started to follow the concentric land use model, especially during 1937 to 1975. However, now days, the spatial spread is mainly guided by topography and road network development. After the construction of the ring road, new settlements were observed around South Eastern part of the city (Yetnayet, 2012). This shows that

the city has shown linear development along four regional outlets excluding the *Fiche* road. The expansion along *Adama* road is the most elongated one with more of an industrial land use, while the expansion into the Kotebe (eastern tip of Yeka sub city) area is intense, dense and more residential in function. Further westward, expansions along *Jimma* road is characterized by informal residential developments (Mesfin, 2009). Therefore, the city's land use exhibits sector pattern.

PHYSICAL EXPANSION TREND IN ADDIS ABABA

The rapid growth of the population of the city has put great pressure on the demand for urban spaces. In response to this demand, efforts are being made by the city government to incorporate the peripheral areas of the city, which is resulting in hastening the expansion of the built-up area of the city. Accordingly, Addis Ababa has experienced rapid physical expansion (Mesfin, 2009).

Feyera (2005) revealed that incapable and the unstable administrative system is the other reason for the rapid expansion of the city. The city administration was strongly influenced by the policies of the government and is subject to change its structure with political motives of the government. As the change occurred in the management system, there was also reshuffling of human and material resources that took some time to reorganize and commence the system. Unstable and incapable administration system has a loose implementing capacity of the existing plan giving a room for the unplanned expansion of the city. Even though plans are formulated, the overall effects of these plans are insignificant due to lack of detailed legislation in implementing the plan and administration system capable of enforcing the planning segments. Office of the revision of the Addis Ababa master plan (1999) classified trends of physical expansion of the study area into five development periods. These are: Original development between 1886 and 1936; expansion between 1937 and 1975; expansion between 1976 and 1985; expansion between 1986 and 2000, and expansion between 2000 and 2010 and it is explained in Table 4.3.

During the original development period (1886-1936), areal coverage of the city was 1863.13 hectares (Table-4.3). There was not distinguished land use type classified as

built up areas and none built up areas. Therefore, for about half a century, the city showed insignificant physical development. A study conducted by (ORAAMP, 1999) also clarified that the early development of the city was characterized by fragmented settlements. The next physical expansion period of the city was from 1937 to 1975. During this period, the city began to show a considerable physical expansion, and the average areal coverage of the city was 4186.87 hectares, thus increasing a cumulative total to 6050 hectares (Table-4.3). Mesfin (2009) revealed that the built up land use type during this period was characterized by a compact type development.

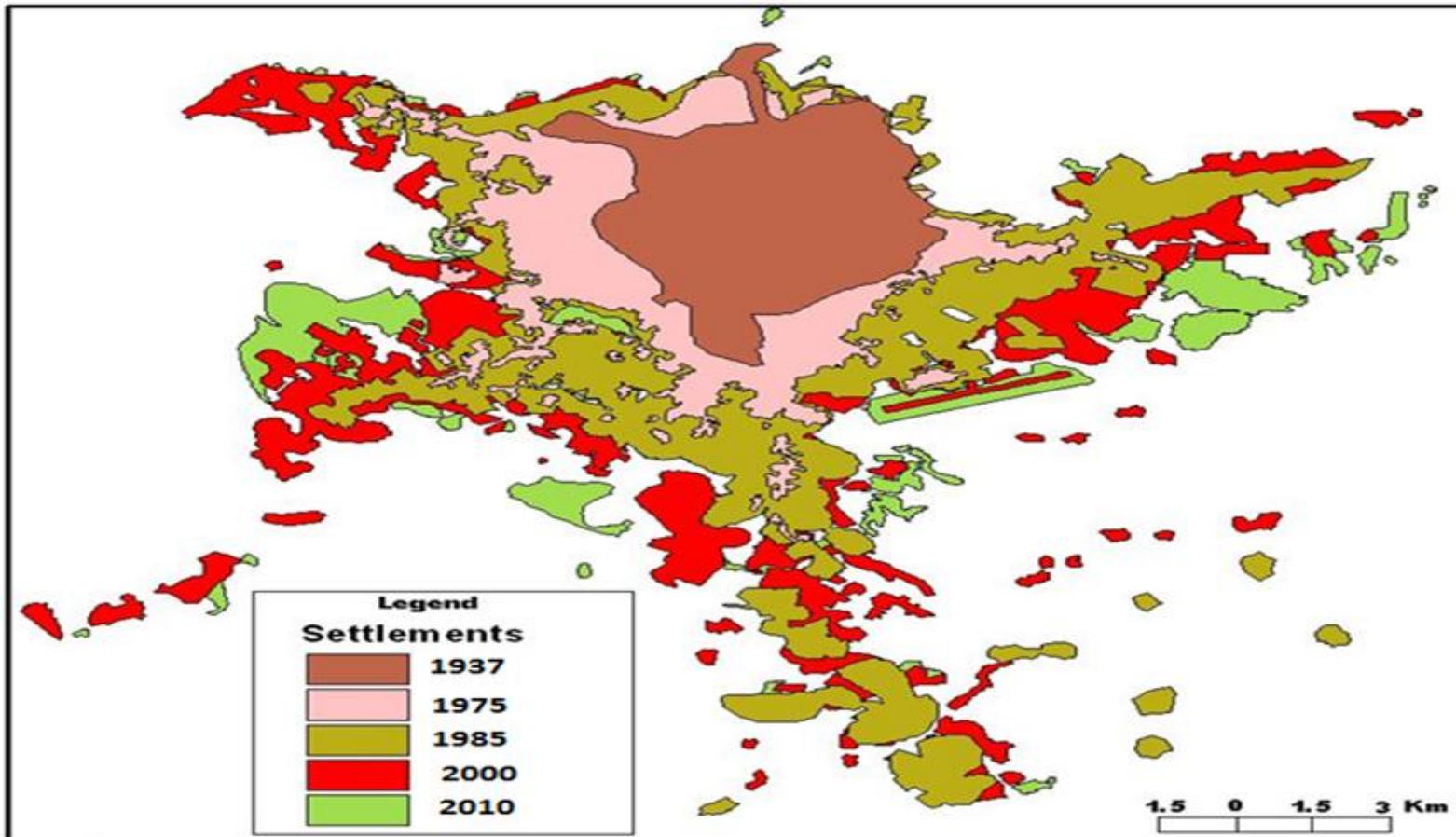
The third period of physical expansion of the city was between 1976 and 1985, when the total area of the city was expanded by 16563 hectares increasing the cumulative total to 22613.00 hectares. During the fourth development period (1986-2000), the total land area of the city was increased to 25095.00 hectares, and by 2010 it reached 54,000 hectares (Table-4.3).

Table-4.3 Physical Expansion of the Study Area (1886-2010)

Period	Average Covered (ha)	Total area (ha)	Annual growth rate
1886-1936	1,863.13	863.13	
1937-1975	4,186.87	6,050.00	3.1
1976-1985	16,563.00	22,613.00	6.0
1986-2000	2,482.00	25,095.00	1.6
2000-2010	28,905.00	54,000.00	1.2

Source: AACG, 2010; Mesfin, 2009

The study conducted by Feyera (2005) shows that the expansion of Addis Ababa to the periphery is followed by loss of agricultural land, deforestation, loss of environmental protection and loss of resource (mainly minerals). On the other hand, the degree of the physical expansion of Addis Ababa outpaced the provision of basic urban services of the city administration. This was significant as one move from the center to the periphery. Recently, the government had intended to intervene in urban renewal and new provision of urban housing plot to solve the housing problems in the city through new projects at the periphery.



Source: Yirgalem, 2001; CSA, 2007

Fig-4.5 Urban Expansion Trends of the Study Area