



## Comparative analysis of the area of existing land use and master plan of Adigrat Town

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### ABSTRACT

In this paper area of existing land use and master plan of Adigrat town was compared. To map the existing land use of the town Aerial images with 15 cm spatial resolution were used. Geodatabase created by Ethiopian mapping agency was used to collect information of land parcels. Land parcels were classified, codified, analyzed with percentage analysis and mapped based on field survey and master plan of Adigrat town. Master plan map prepared by municipal office was changed from CAD format to shape file format. The area of existing land use was compared with the area master plan of the town.

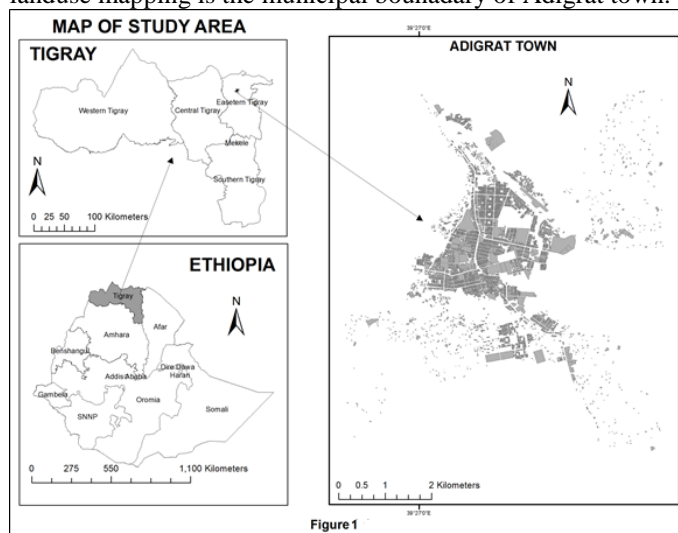
As a result growth was calculated in the area of ward no. one as 5.17%, ward no. two as 26.59% ward no. three as 7.25%, ward no. four as 33.23%, ward no. five as 4.49% and ward no. six as 6.02%.

### 1) INTRODUCTION

Land use involves the management and modification of natural environment [1]. The current extent and rates of urbanization force us to rethink land connectivity, competition, and decision making [2]. Duranton provided an integrated treatment of the theoretical literature on urban land use inspired by the monocentric model [3]. Today, global land use is affected by a variety of factors, including urbanization and the growing interconnectedness of economies and markets [4]. Literature on urban land governance suggests cadastres play an important role in delivering equal land access, adequate tenure security, sustainable land use, accountability of actors, and transparency [5]. Land use changes were mapped using satellite images, while binary logistic regression was used to model the probability of observing urban development as a function of spatially explicit independent variables [6]. A geo-environmental evaluation for urban land-use planning often requires a large amount of spatial information [7]. Governments use land-use planning to manage the development of land within their jurisdictions. In doing so, the governmental unit can plan for the needs of the community while safeguarding natural resources [8]. The plan is prepared using the information gathered during the data collection and goal setting stages. Plans may also contain separate sections for important issues such as transportation or housing which follow the same standard format [9]. In the next 20 years, African cities will more than double in population, and their spatial extent could more than triple [10].

### 2) MATERIALS AND METHODS

**Study Area:** Adigrat town is the study area. It is located in the Eastern zone of Tigray State of Ethiopia at longitude 39°27'E and latitude 14°16'N with an average elevation of 2457 meters above sea level, below a high ridge to the west. Study area for land use mapping is the municipal boundary of Adigrat town.



### Materials and Methodology of work

- a. Materials:** Data: Aerial Photographs, Geodatabase and Master Plan of Adigrat Town.  
Software: ArcGIS 10.1, ArcGIS online, Google Earth

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**Table 01 – Ward wise area (m<sup>2</sup>) of exiting land use in Adigrat town. 2015**

Land Uses	Ward 1	Ward 2	Ward 3	Ward 4	Ward 5	Ward 6
Pure Residential	317291.1	447070.7	164220.9	457287.1	340452.4	391676.5
Mixed Resid.	73092.84	32939.96	92315.29	113684.8	71674.75	21998.45
Resid. Cond.	0	1858.181	1601.035	10734.64	1001	1699.464
Gov. Institutions	831.2956	33038.78	2171.122	17166.23	84182.16	31831.98
Education	104659.1	981661	80381.36	880599.3	73292.9	75102.91
Health Centers	133714.7	0	329.8433	2050.766	0	0
Civic & Culture	0	2496.53	0	0	2219.904	0
Religious	26574.77	837.6358	77212.97	3797.481	104487.7	68577.27
Drives Training	0	0	0	0	0	1999.464
Utility Services	0	0	1066.142	0	5614.744	0
Municipal Ser.	731.7201	235.3331	373.2612	0	298.1264	500.907
Manufacturing	61947.7	71728.44	941.232	0	0	0
Warehouses	7115.381	4073.676	4271.551	0	47129.4	0
Workshops	7215.462	3569.467	1924.037	2569.4	16219.46	0
Building M Prod.	0	127217.7	0	168280.5	0	0
Bus Terminal	0	0	0	0	0	11440.23
Open Spaces	27488.29	0	315.9783	44772.33	4309.05	36613.79
Green Areas	0	49238.64	0	39724.7	0	0
Resort Centers	7721.996	781.1657	2523.921	0	1651.103	0
Military Camp	0	322919.2	0	0	0	0
Commercial	55821.14	43867.44	42693.75	38855.4	51986.99	18137.62
Market Places	12658.97	7589.906	46713.55	0	0	0
Stadium	0	0	30006.51	0	0	0
<b>Total Land use</b>	<b>836864.46</b>	<b>2131123.75</b>	<b>549062.45</b>	<b>1779522.65</b>	<b>804519.69</b>	<b>659578.59</b>
<b>Ward Area</b>	<b>4017731.28</b>	<b>4676516.96</b>	<b>787834.98</b>	<b>3094159.09</b>	<b>2271593.06</b>	<b>3821295.06</b>
<b>land use %</b>	<b>20.83</b>	<b>45.57</b>	<b>69.69</b>	<b>57.51</b>	<b>35.42</b>	<b>17.26</b>

Source : GIS based Study

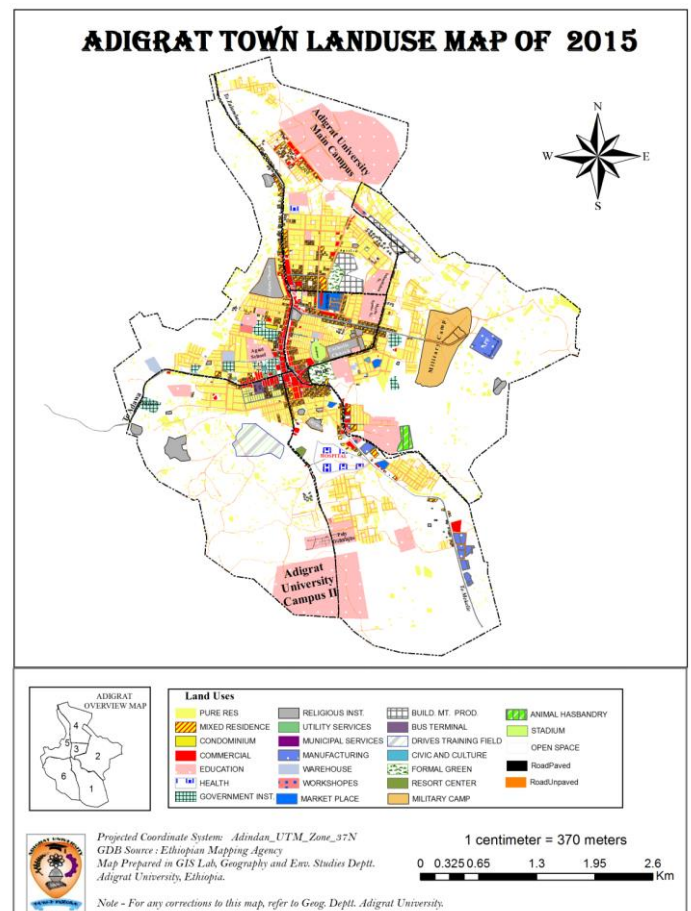
**b. Methodology:** Landuse map was prepared using the Parcel features of geodatabase (GDB) of Adigrat town. The master plan of the town prepared by municipal office was converted to ArcGIS environment from AutoCAD format. Esri Feature adjustment tool was used to synchronize both the data. Land use information from master plan was copied to Geodatabase of the town.

### 3) RESULT AND DISCUSSION

Table 1 shows the build-up area of each ward. Ward one has the area of 836864.46 m<sup>2</sup>, ward two has the area of 2131123.75 m<sup>2</sup>, ward three has the area of 549062.45 m<sup>2</sup>, ward four has the area of 1779522.65 m<sup>2</sup>, ward five has the area of 804519.69 and ward six has the area of 659578.59 m<sup>2</sup>. The same table shows the percent of buildup area in each ward. Ward one has the 20.83% area, ward two has 45.57% area, ward three has 69.69% area, ward four has the area of 57.51% area, ward five has 35.42% area and ward six has 17.26% area.

Table two shows the proposed growth in land use as per master plan in Adigrat town. Ward one has proposed growth in land use as the area of 207955.19 m<sup>2</sup>, ward two has proposed growth in land use as the area of 1243833.73 m<sup>2</sup>, ward three has proposed growth in land use as the area of 57135.67m<sup>2</sup>, ward four has proposed growth in land use as the area of 1028421.36 m<sup>2</sup>, ward five has proposed growth in land use as the area of 102060.57 m<sup>2</sup> and ward six has proposed growth in land use as the area of 230289.18 m<sup>2</sup>.

The same table shows the percent of the proposed growth in land use in each ward. Ward one has the 5.17% area proposed



**Fig 2: Land use Map of Adigrat Town**

**Table 02:** Proposed growth in land use as per master plan in Adigrat town 2015

Land Uses	Ward 1	Ward 2	Ward 3	Ward 4	Ward 5	Ward 6
Total Land use	836864.46	2131123.75	549062.45	1779522.65	804519.69	659578.59
Ward Area	4017731.28	4676516.96	787834.98	3094159.09	2271593.06	3821295.06
land use %	20.83	45.57	69.69	57.51	35.42	17.26
Proposed area	207955.19	1243833.73	57135.67	1028421.36	102060.57	230289.18
Proposed area %	5.17%	26.59%	7.25%	33.23%	4.49%	6.02%

Source : Municipal office, Adigrat town 2015

to build, ward two has 26.59% area proposed to build, ward three has 7.25% area proposed to build, ward four has the area of 33.23% area proposed to build, ward five has 4.49% area proposed to build and ward six has 6.02% area proposed to build.

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