Data Article

Data on spatiotemporal land use land cover changes in peri-urban West Arsi Zone, Ethiopia: Empirical evidences from Shashemene peri-urban areas

Tarekegn Girma a, Tebarek Lika b,*, Molla Maru b

a College of Social Science, Addis Ababa University, Ethiopia
b Department of Geography and Environmental Studies, Addis Ababa University, Ethiopia

A R T I C L E   I N F O

Article history:
Received 9 January 2018
Accepted 16 March 2018
Available online 22 March 2018

ABSTRACT

Urban expansion is one of the major problems in Ethiopia resulting in displacement of the rural people inhabiting areas bordering the cities/towns. It is also resulting in land use land cover (LULC) changes affecting the livelihoods of the people and the ecosystems (Messay et al., 2017; Ganamo, 2013) [1,2]. The data presented in this article, therefore shows the spatiotemporal LULC changes of peri-urban expansion areas of Shashemene City. The data were generated from Landsat Thematic Mapper (TM) and Enhanced Thematic Mapper plus (ETM+) images (with path/row numbers 168/055) from EarthExplorer.usgs.gov and the data was classified, interpreted and cross-tabulated using ERDAS IMAGIN 2013 and ArcGIS 10.4.1 software packages. The accuracy of the image classification was verified by geo-location data collected from ground control points by using Geo Positioning System (GPS) receiver and the spatial resolution (1 m) and very recent (2016) Imagery downloaded from Google Earth. The result indicates that the built-up areas have increased by 1938.71 ha (19.3871 km²) with 73.4%, and 17.6% decline in forest land and grassland respectively between 1973 and 2016.

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* Corresponding author.

https://doi.org/10.1016/j.dib.2018.03.082
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**Specifications Table**

| Subject area | Geography and Environmental Studies |
|--------------|-------------------------------------|
| More specific subject area | Land use land cover change, urban sprawl |
| Type of data | Table, figure and text file |
| How data was acquired | Data were extracted from Landsat TM and Landsat ETM+ images with path/row numbers 168/055 and first hand data were acquired by using GPS-based ground survey technique. |
| Data format | Analyzed |
| Experimental factors | The images were geo-referenced with World Geodetic System (WGS) 1984 datum and Universal Transverse Mercator (UTM) projection system zone 37 North. The images were classified based on visual interpretation and supervised classification using ERDAS IMAGINE 2013 and ArcGIS 10.4.1 software packages. |
| Data source location | Landsat and Shashemene area (7° 9′5″N - 7° 18′17″N, 38° 31′43″E - 38° 41′58″E) |
| Data accessibility | The data is with this article. |

**Value of the Data**

- The data is helpful to Shashemene City municipality to venture the extent of the spatiotemporal expansion of Shashemene and its potential effect on the City periphery.
- The data provides information on the status of urban expansion towards rural peri-urban areas around Shashemene.
- The data is vital to model urban expansion towards rural peri-urban areas surrounding Shashemene to mitigate its adverse effect on the livelihoods of the people inhabiting the area and the eco system.
- The data is useful to researchers, urban planners and experts working in the field.

1. Data

The data in this article offers information on the spatiotemporal LULC changes in Shashemene urban expansion areas between 1973 and 2016. Figs. 1–3 illustrate pictorially the spatiotemporal LULC classes of the area in 1973, 2000 and 2016. Crop land and grass land had dominated the land use in 1973 (Fig. 1) with very few built up areas, plantation and forestland. In 2000 (Fig. 2), plantation was tremendously expanded and crop land was considerably reduced. In 2016 (Fig. 3), built up area was extremely enlarged, crop land was almost disappeared and some part of the cropland was replaced by built up areas. Table 1 demonstrates LULC extent in hectare and percentage in 1973, 2000 and 2016 as well as rate of LULC changes in hectare (also Fig. 4) and percentage (%). Tables 2–4 demonstrate LULC change matrix between 1973 and 2000, 2000 and 2016, and 1973 and 2016.

2. Experimental design, materials and methods

Landsat Thematic Mapper (TM) and Enhanced Thematic Mapper plus (ETM+) images (with path/row numbers 168/055) as well as GPS-based ground survey records were vigorous data sources for
this data article. The analysis, such as data extraction and LULC classification, interpretation and creation of change matrices were done by using ERDAS IMAGINE version 2013 and ArcGIS 10.4.1 software. The images were geo-referenced with World Geodetic System (WGS) 1984. datum and Universal Transverse Mercator (UTM) projection system zone 37 North. Supervised and unsupervised image classifications techniques were applied to extract the data [3]. Supervised classification involved selecting pixels that represent land cover classes that are documented by the expert. Unsupervised image classification is computer-automated. It allows the expert to specify some parameters that the computer uses to disclose statistical patterns that are intrinsic in the data.

Fig. 1. LULC classes of Shashemene urban areas in 1973.

Fig. 2. LULC classes of Shashemene urban areas in 2000.
These patterns are bands of pixels with similar spectral features. Due to similar spectral appearances of grass, and crop, which were determined to be independent classes before classification, the application of unsupervised classification might not provide decent results. As a result, in the data extraction process, supervised image classification was used. After defining the land use features, the next step was deriving LULC change matrices. This was done through overlaying the classified satellite images and analyzing by image differencing algorithm. Lastly, the outputs of images classification were verified by conducting ground truth while recoding x and y co-ordinates of sample spatial features using GPS. Based on the scope of the study and pictorial interpretation of the satellite imageries, four classes were identified in Shashemene urban areas. These are Forest land/Plantation, Grassland, Cropland and Built up in the vicinity.
Table 2
Land use/Land cover change matrix in Shashemene Town during the period 1973–2000.

| Lu/Lc type          | Forest/Plantation | Grassland | Cropland | Built-up Area | Total |
|---------------------|-------------------|-----------|----------|---------------|-------|
|                     | Ha. %             | Ha. %     | Ha. %    | Ha. %         | Ha. % |
| Land use/Land cover |                   |           |          |               |       |
| Types 2000          |                   |           |          |               |       |
| Forest/Plantation   | 1483.0            | 49.3      | 513.3    | 39.4          | 0.0   |
| Grassland           | 1057.6            | 35.2      | 576.0    | 44.3          | 0.0   |
| Cropland            | 367.9             | 12.2      | 130.9    | 10.1          | 7856.5|
| Built-up Area       | 99.2              | 3.3       | 81.3     | 6.2           | 114.4 |
| Total               | 3007.8            | 100.0     | 1301.4   | 100.0         | 8355.2|

Table 3
Land use/Land cover change matrix in Shashemene Town during the period 2000–2016.

| Lu/Lc type          | Forest/Plantation | Grassland | Cropland | Built-up Area | Total |
|---------------------|-------------------|-----------|----------|---------------|-------|
|                     | Ha. %             | Ha. %     | Ha. %    | Ha. %         | Ha. % |
| Land use/Land cover |                   |           |          |               |       |
| Types 2016          |                   |           |          |               |       |
| Forest/Plantation   | 539.8             | 17.9      | 139.5    | 10.7          | 579   |
| Grassland           | 562.4             | 18.7      | 389.0    | 29.9          | 0.0   |
| Cropland            | 592.5             | 19.7      | 869.8    | 66.8          | 7132.2|
| Built-up Area       | 301.6             | 10.0      | 235.3    | 18.1          | 1165.1|
| Total               | 1996.3            | 66.4      | 1634     | 125.5         | 8355.2|

Fig. 4. Rate of LULC change in hectare per year.
Acknowledgements

We, the authors are thankful to Ethiopian Mapping Agency (EMA) for landsat images and topo-maps it provided us for the study. We are also grateful to all the data enumerators who helped us during GPS-based ground verification survey.

Transparency document. Supplementary information

Transparency data associated with this article can be found in the online version at http://dx.doi.org/10.1016/j.dib.2018.03.082.

References

[1] Messay Mulugeta, Bechaye Tesfaye, Addis Ayano, Data on Spatiotemporal Land Use Land Cover Changes in Peri-urban Addis Ababa, Ethiopia: Empirical Evidences from Koye-Feche and Qilinto Peri-urban Areas, Elsevier, Ethiopia, 2017.
[2] Beressa Ganamo, Remote Sensing and GIS Based Urban Sprawl Susceptibility Analysis; A Case Study of Shashemene Town, LAMBERT Academic Publishing press, West Arsi Zone, Ethiopia, 2013.
[3] D. Lu, Q. Weng, A survey of image classification methods and techniques for improving classification performance, J. Int. J. Remote Sens. 28 (5) (2007) 823–870.