

Change of Vegetation Cover in Malang District

Haris Kusmawan. H¹, Amin Setyo Leksono², Aminudin Afandhi³

¹ Postgraduate Program in Environmental Resources and Development Management, Universitas Brawijaya

² Department of Biology, Faculty of Mathematics and Natural Sciences, Universitas Brawijaya

³ Department of Plant Pests and Diseases, Faculty of Agriculture, Universitas Brawijaya

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Abstract- Declining environmental quality has threatened the survival of humans and living things along with the rapid development. Development activities in all aspects of life carry the risk of pollution and environmental damage. This study aims to examine the vegetation cover conditions in Malang District, measure and describe changes in vegetation cover and identify management efforts, protect environmental rehabilitation and conservation recommendations and control environmental damage (land) that has been done. The location of the research is in Malang District. The basis of the regulation is the Minister of Forestry Decree No. 395 / menhut-II / 2011, SNI 7645: 2010. The tool used is a Landsat 8.0 Image. The amount of vegetation cover in 2016 was 64.46% while the area was not vibrating at 35.54%. The amount of vegetation cover in 2017 is 76.69% while the area is not vibrating at 23.31%. The amount of vegetation cover in 2018 is 65.79% while the area that is not vibrating is 34.21%. Conservation efforts and control of environmental damage (land) that have been carried out include: Realization of tree planting; Forest and Land Rehabilitation; Tree Planting Activities on Former Mine Land. Keywords: Vegetation Cover, Landsat Image, Conservation

Index Terms- Change of Vegetation Cover, Citra Landsat 8.0, Conservation, Malang District

I. INTRODUCTION

Declining environmental quality has threatened the survival of humans and living things along with the rapid development. Development activities in all aspects of life carry the risk of pollution and environmental damage. Law Number 32 of 2009 concerning Protection and Management of the Environment, mandates that environmental development control measures need to be carried out to maintain and improve environmental quality. Vegetation (from English: vegetation).

In ecology is the term for the whole plant community in a particular place, including both communal mixtures of the types of its constituent flora and the land cover formed. Vegetable land cover is an important part of people's lives in urban areas, an increase in the population of Malang District has an impact on the conversion of vegetated land functions into built-in areas so that it can be observed that the development of regional development has taken place rapidly and is expected to continue.

This development will bring spatial impacts in the form of changes in spatial utilization patterns, both planned and unplanned. Changes in vegetation cover play an important role in

the growth rate of Malang District which reaches 0.67% per year with a population density of 0.148 ha / soul, Malang District. Changes in vegetation cover that occurred in Malang District without the management of spatial patterns of a region caused damage to the environment and ecosystems in it, so that the impact on the sustainability of environmental functions, other sources also stated that social factors are the trigger for changes in vegetation cover.

This study is to examine changes in vegetation cover in 2016 - 2018 in Malang District, taking into account several types of land that are part of the type of agriculture and other vegetation. Changes in vegetation cover in Malang District using remote sensing methods using Landsat 8.0 images with repeated retrieval techniques for maximum and specific results, so that the data quality from the Normalized Difference Vegetation Index (NDVI) through the spectral concept using bands ($NDVI = (NIR - Red) / (NIR + Red)$), description: NDVI -1 (water) to +1 (dense vegetation) so as to produce the greenness of the color of a plant, this study produces extensive value data from each sub-district in Malang District and tabulation data becomes processing on the map which produces thematic maps and matrix data.

Author Correspondence Address:

Haris Kusmawan. H

Email: haris.kusmawan@gmail.com

Address: Universitas Brawijaya

Jl. Veteran Kota Malang, 65145

II. LITERATURE

Land use reflects the extent to which business or human intervention in utilizing and managing the environment, data on land use / cover can be tapped from aerial photographs relatively easily, and changes can be known from multitemporal aerial photography. Aerial photo interpretation techniques included in remote sensing systems are science and art to obtain information about objects, regions or symptoms by analyzing data obtained using tools without direct contact with objects, regions, or symptoms studied (Lillesand and Kiefer, 1997).

In a framework, according to Dent (1981) in making classification of land use is divided into levels which are divided into groups as follow:

- a. Land cover/land use Order (cover type)
- b. Land cover/land use Cover Classes
- c. Land cover/land use Sub-Classes

d. *Land cover/land use Management Units (comparable to land utilization types).*

From this classification, Malingreu was changed to 6 categories as follows:

- a. *Land cover/land use Order e.g. vegetated area*
- b. *Land cover/land use Sub-Order e.g. cultivated area*
- c. *Land cover/land use Family e.g. permanently cultivated area*
- d. *Land cover/land use Class e.g. Wetland rice (sawah)*
- e. *Land cover/land use Sub-Class e.g. irrigated sawah*
- f. *Land Utilization Type e.g. continous rice*

III. RESEARCH METHODS

Changes in Vegetation Cover in Malang Distrct is a type of quantitative research. In this study the description of vegetation cover conditions in Malang Distrct was carried out, measurements of 2016 vegetation cover changes were carried out in 2017 and 2018 using remote sensing interpretation methods of Landsat 8.0 satellite images and identification of conservation efforts and control of land damage was carried out.

IV. METHOD OF COLLECTING DATA

The main activities carried out for the method of Changing Vegetation Cover in Malang Distrct in data collection, are:

Data that must be collected includes:

1. Vegetation area management plan;
2. Plan for controlling the area of vegetation;
3. Current land use;
4. Activity data and potential for vegetation cover;
5. Environmental problem.

V. STUDY AREA

Malang Distrct is located between 112o 17 ' , 10.90 "East Longitude and 112o 57', 00.00" East Longitude and between 7o 44 ' , 55.11 "South Latitude and 8o 26', 35.45" South Latitude. With an area of around 345578.72 Ha.

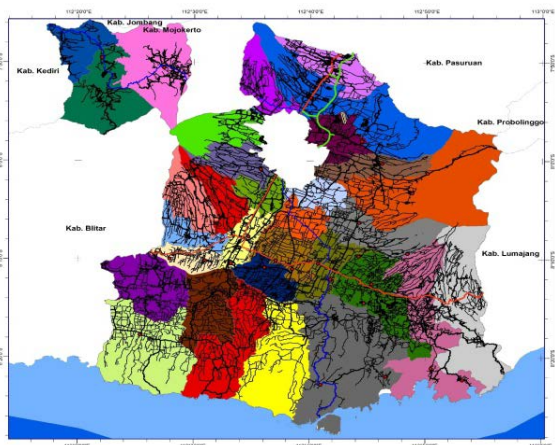


Figure 1. Map of Administration of Malang District

Administratively, Malang Distrct is divided into 33 sub-districts, 12 sub-districts, 378 villages, 1,368 sub-villages, 3,183 neighborhood units and 14,869 neighborhood units. The central government is in Kepanjen Subdistrict as stipulated in Government Regulation (PP) Number 18 of 2008 concerning the Transfer of the Capital of Malang Distrct from the Malang City Region to the Kepanjen City of Malang Distrct.

VI. ANALISYS METHOD

The stages of analysis carried out are as follows:

1. Analysis of suitability and availability of vegetation in Malang Distrct.
2. Analysis of the vegetation land cover map of Malang Distrct in real time.
3. Map analysis of green open space.

One technique used for analysis of land cover changes is the interpretation of Landsat image data. Steps in analyzing Landsat image data for analysis of land cover changes using GIS applications, ArcMap. The band used in this study is Landsat 8.0, namely band 6,5,3.

Before image analysis, preprocessing must be done. The stages in preprocessing include :

1. Geometric Correction.

Geometric correction (retification) is a process of transformation from one grid system using a geometric transformation. Geometric correction is done because of the distortion that results from variations in satellite height, satellite rigidity, and speed (Lillesand & Kiefer 1990). The purpose of geometric correction is to improve the position of objects in the image due to the actual distortion of position on the face of the earth. Geometric correction using the GCP point. Geometric correction is done using the Google Earth Pro application.

2. Image cutting

Image cropping (image cutting) is done to separate the area that is the focus of the study of land cover analysis, namely Malang Distrct, East Java Province, Indonesia.

3. Image sharpening

Image sharpening aims to improve the quality of visual images so that it simplifies the process of interpretation. Improving the visual quality of images can be seen from the spatial aspects and spectral aspects.

4. Image classification

Classification is a processing technique in images by grouping pixels into a number of classes, so that each class has unique and specific spatial patterns or distributions that reflect an object or useful information according to needs. The classification in this study was carried out unsupervised (not guided) for Landsat 8. In the non-guided classification, classification starts with checking statistics for all pixels and dividing them into classes whose numbers are determined.

VII. RESULT AND DISCUSSION

Analysis of Vegetation Cover in Malang Distrct.

Analysis of changes in land cover can be done using remote sensing techniques. One of the techniques used to analyze land

cover changes is the interpretation of Landsat image data and can be classified according to SNI 7645-2010.

VIII. VEGETATION COVER

Vegetation Cover in Malang District 2016

The results of the 2016 vegetation cover analysis include land cover in accordance with Forestry Ministerial Decree No. 395 / MenHut-II / 2011 that other use areas (APL) are described in vegetated cover areas and are not vegetated, according to SNI 7645-2010 described in the classification code the object and toponym are 23 clustering, Malang District has a shrinkage by minimizing the meaning of vegetated and non-vegetated areas, so that it gets vegetated and non-vegetated areas along with their area.

Table 1. Classification of Vegetarian Areas and Non-Vegetarian 2016

Year	Classification	Area (Ha)
2016	All Areas	345578.72
	Cloud	46183.89
	Forest	163914.25
	Settlement	17115.50
	Shrub	58852.66
	Unused Land	57967.71
	Water Bodies	1544.70
	Vegetation Areas	222766.91
	Non Vegetated	122811.80

Source: Results of taking 2018 satellite imagery

Vegetable areas in Malang District dominate, among others: forests and shrubs, while non-vegetated areas in Malang District outside vegetated areas include: settlements, Unused land, clouds, water bodies, and water bodies. The results of the formation of 2 (two) areas of land in 2016 had a vegetation area, 163914.25 ha of forest, and 58852.66 hectares of bush. resulting in a vegetation area of 222766.91 hectares and non-vegetated areas of 122811.80 hectares.

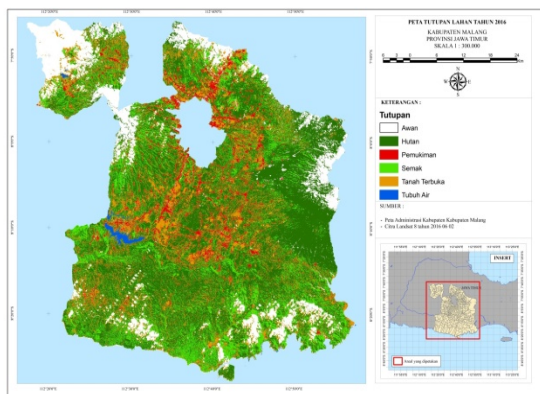


Figure 2. Map of Vegetation Cover in 2016

Vegetation Cover Malang District 2017

Vegetarian areas in Malang District dominate, among others: forests and shrubs, whereas non-vegetated areas of Malang District outside the vegetated areas include: settlements, Unused land, clouds, water bodies. The results of the establishment of 2 (two) areas of land in 2017 in the area of vegetation, forests of 180958.51Ha, and thickets of 84074.72Ha. resulting in a vegetated area of 265033.23Ha and a non-vegetated area of 80545.49Ha.

Table 2. Classification of Regional Vegetation and Non-Vegetarian 2017

Year	Classifications	Area (Ha)
2017	All Areas	345578.72
	Cloud	6772.35
	Forest	180958.51
	Settlement	29503.55
	Shrub	84074.72
	Unused Land	42806.21
	Water Bodies	1463.38
	Vegetation Areas	265033.23
	Non Vegetated	80545.49

Source: Results of taking 2018 satellite imagery

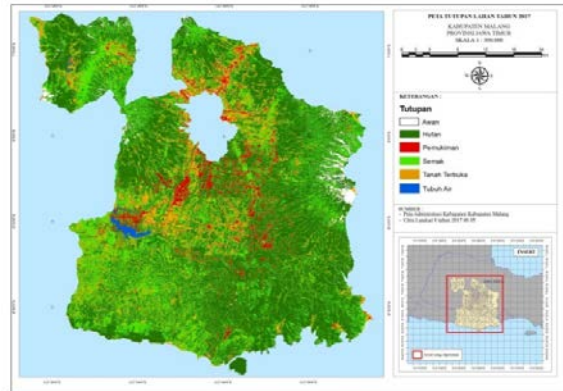


Figure 3. Map of 2017 Vegetation Cover

Vegetation Cover Malang District 2018

The vegetated area of Malang District dominates, among others, forests and thickets, whereas the non-vegetated regions of Malang District outside the vegetated areas include: settlements, Unused land, clouds, water bodies. The results of the establishment of 2 (two) areas of conflict in 2018 have an area of vegetation, forests of 103029.38 hectares, and thickets of 120786.37 hectares. resulting in a vegetation area of 223815.75Ha and a non-vegetated area of 118207.07Ha.

Table 3. Classification of Vegetarian and Non-Vegetarian Areas 2018

Year	Classifications	Area (Ha)
2018	All Area	345578.72
	Cloud	1850.23
	Forest	106585.28
	Settlement	17819.79
	Shrub	120786.37
	Unused Land	97452.95
	Water Bodies	1084.10
	Vegetation Area	227371.65
	Non Vegetated	118207.07

Source: Results of taking 2018 satellite imagery

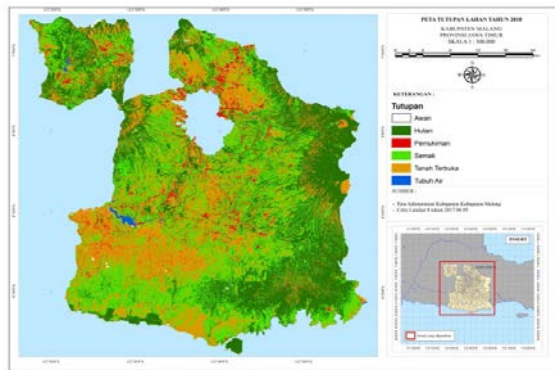


Figure 4. Map of the Vegetation Cover in 2018

Retrieving the latest data via landsat satellite images 8.0 using ArGIS software was obtained in 2016, 2017 and 2018 on the December 2018 observation, monitoring carried out as much as 10x interval from 25 calendar days to produce optimal results of data obtained and to minimize the level of cloud cover less than 10%, the results of the data are managed and in the cloud based on clustering and include the results of vegetated areas in dark green in the forest and shrubby light green.

Change in Land Cover Data for 2016 to 2018

The mapping results (realtime) using Landsat 8.0 Satellite changes in vegetation cover in the data area in getting the pattern of taking the last 3 (three) years, namely: 2016, 2017 and 2018, taking in the last 3 years maximized to see changes - changes to vegetation cover in Malang District, this aims to see the level of small-scale efforts of its annual actions on efforts to control land damage to control programs for environmental damage.

Table 4. Data table for the last 3 years Vegetation Cover

Year	Classifications	Area (Ha)	Percantage
2016	Vegetation Area	222766.91	64.46%
	Non Vegetated	122811.80	35.54%
2017	Vegetation Area	265033.23	76.69%
	Non Vegetated	80545.49	23.31%
2018	Vegetation Area	227371.65	65.79%
	Non Vegetated	118207.07	34.21%

Source: Results of Analysis of Lansat 8.0 image mapping in 2018

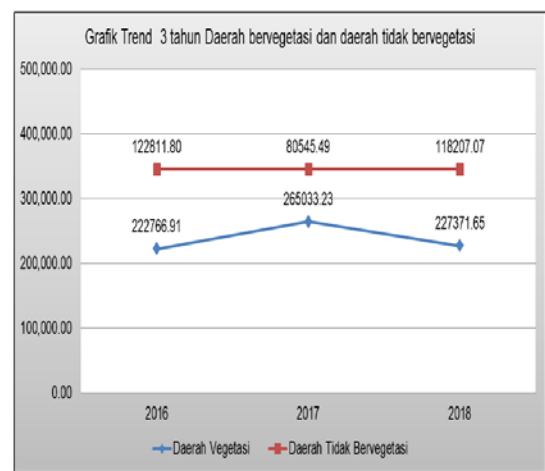


Figure 5. Graph of changes in 3 years of vegetation and non-vegetated areas

The pattern of the yield of the vegetated area in the last 3 (three) years resulted in changes in data increasing and decreasing at the end of 2018, the conclusion of the difference in yields was 4604.73 Ha or 1.33%. Unused Land, water body, and clouds).

The area data of 4604.73 Ha or 1.33% is the result of reduced vegetation cover in Malang District due to the increase in the value of non-vegetated areas changing back to non-vegetated areas, 2016 towards 2017 at +12388.05 Ha with the calculation of area in 2016 value of 17115.50 Ha minus area in 2017 29503.55Ha the condition is seen to have increased or increased settlements in Malang District, but in 2017 the value of 29503.55Ha towards the year 2018 with a value of 17819.79Ha has a decrease in land area of -11683.76Ha.

In addition to clustering settlements that have a large influence on the lack of vegetation cover, clustering on Unused Land has a significant impact on the amount of open area, changes in vegetation cover addressed at the beginning of 2016 Unused Land has an area value of 57967Ha (16.77%) and in 2017 42806.21Ha (12.39%), there is a decrease of 15161.50Ha or 3.38% in Unused Land, it is very possible that the rapid development development is directly proportional to the loss of vegetation cover, in addition to development, the mining industry sector becomes Unused Land to produce data decline vegetation

cover in Malang District in 2018, economic growth of the community by opening new land to plant production crops and the existence of unpredictable old disasters that occur within the last 1 (one) year in disaster risk areas, among others: disasters landslide, banjir, and kerringan create Unused Land for degradation which causes damage to the land.

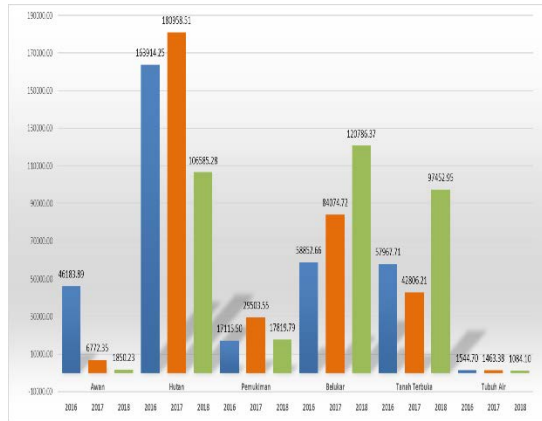


Figure 6. Graph of Changes in Vegetation Cover per year based on Clustering

Recommendation

Based on the results of the analysis of changes in vegetation cover in Malang District, efforts have been made to increase the addition of the area of vegetation cover within the framework of recommendations, namely aimed at efforts to increase vegetation cover / land quality and environmental sustainability.

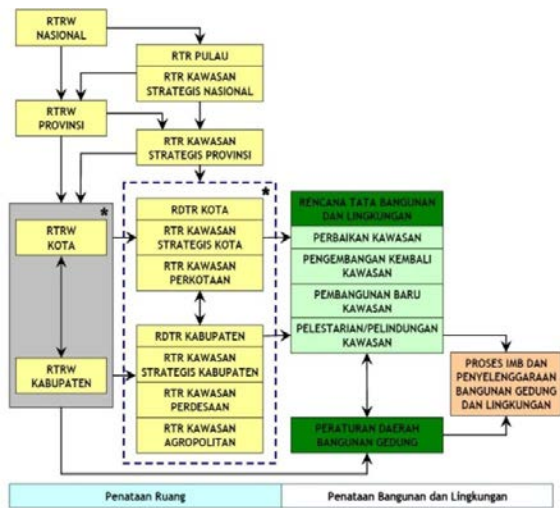


Figure 7. Concept of Environmental Management Efforts

Green Open Space Management and Development Aspect

Adding Green Open Space in accordance with Minister of Public Works Regulation No. 05 / PRT / M / 2008 concerning Guidelines for Provision of Green Open Space in Urban Areas.

Formulation

- Encouraging the public to manage private space to open green space;

- Optimizing government-owned land and building as an ideal green space model;
- Establish private green open spaces in multi-storey buildings and areas that are dense with hanging gardens, vertical gardens and plant pots.
- To increase the existence of public spaces, especially RTH in urban areas, it is necessary to do several things, especially those related to the provision of legal instruments, NSPM, and encourage the war of society and business

Policy and Regulation

Aspect

Resist the rate of land conversion

Formulation

- Restore the function of river banks as rainwater catchment areas by planting vegetation stands
- Institutionally, the problem of open green space is also related to the absence of adequate legislation regarding green open space, as well as technical guidelines for the implementation of green open space so that the existence of green open space is still marginal.
- Sub-optimization of the availability of green space is related to the fact that there is still insufficient proportion of the area allocated for open space.

City Forest Management and Development

Aspect

Tree planting

Formulation

- Prioritize local local tree species or endemic species in the framework of germplasm conservation while minimizing tree species towards scarcity and extinction
- Adapted to local ecological conditions.
- Availability of seeds (plants are easy to obtain), local types and inexpensive prices Types of trees that are not easily fallen, and are not susceptible to pests and diseases
- Does not require intensive care
- Not invasive
- Not competitive with other plants
- Not competitive with other plants
- Can produce oxygen and can absorb pollutants according to location
- Do not endanger the community or animals
- Attract a lot of wildlife

Community and Private Empowerment

Aspect

- Increase awareness and environmental education to the community
- Involve the private sector in managing the management of CSR (Corporate Social Responsibility) funds

Formulation

- Incorporating environmental curricula into all levels of education. It is expected that from an early age, students have behaved in an environmentally sustainable manner;

- Involving the community in managing the environment especially plants and trees. Community groups need to be actively involved in supervising and preserving nature
- Establish a CSR Forum at the District / City level that is strengthened by Regional Regulations. This forum consists of regional apparatus organizations, the private sector, NGOs and the community;
- Conduct routine coordination to discuss the development of environmental management programs;
- Develop an action plan for massive and structured environmental management.

- The data reference obtained from the Regional Government Organization is not part of the area calculation stated in the analysis results, but the data has been counted in it when taking Landsat 8.0 satellite images.

Management of Forest Areas

Aspect

Programs

Formulation

- Social forestry is the main focus program of the Republic of Indonesia Ministry of Environment and Forestry (KLHK)
- Supervision in illegal logging
- Maintain conservation of Conservation in all aspects of flora and fauna.

IX. CONCLUSION

- Control of damage to Unused Land identified is greater in 2017 and 2018 due to the growth rate of development in the industrial and residential sectors, control is carried out with programs to rehabilitate conservation areas, examining land and reforestation in protected and conservation forest areas;
- The use of Landsat 8.0 image has a zoom capability of 1: 250,000 scale, but the lack of justification for the use of colors is based on certain regulations, both SNI and government regulations so that color rendering on the map is based on the author's knowledge to be easily criticized;
- Landsat 8.0 has not been able to show images or layers to obtain data overlays from the three years of changes in Vegetation Cover in Malang District, but can display area data and calculate the difference from the changes in the matrix;
- Beginning in 2016 Unused Land has an area value of 57967 (16.77%) Ha and in 2017 42806.21Ha (12.39%), a decrease of 15161.50Ha or 3.38%;

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AUTHORS

First Author – Haris Kusmawan. H, Postgraduate Program in Environmental Resources and Development Management, Universitas Brawijaya

Second Author – Amin Setyo Leksono, Department of Biology, Faculty of Mathematics and Natural Sciences, Universitas Brawijaya

Third Author – Aminudin Afandhi, Department of Plant Pests and Diseases, Faculty of Agriculture, Universitas Brawijaya