Digital Receipt

This receipt acknowledges that Turnitin received your paper. Below you will find the receipt information regarding your submission.

The first page of your submissions is displayed below.

Submission author:	1 1
Assignment title:	NO REPOSITORY 024
Submission title:	Yunandar_2019_IOP_Conf._Ser.__Earth_Environ._Sci._284_012...
File name:	Yunandar_2019_IOP_Conf._Ser.__Earth_Environ._Sci._284_012...
File size:	1.15M
Page count:	9
Word count:	3,470
Character count:	18,408
Submission date:	16-Jun-2024 02:31AM (UTC-0400)
Submission ID:	2403269863

IOP Conference Series: Earth and Environmental Science

PAPER · OPEN ACCESS

The dynamic changes of Barito basin peat land ecosystem in South Borneo, Indonesia

To cite this article: Yunandar *et al* 2019 *IOP Conf. Ser.: Earth Environ. Sci.* **284** 012023

View the article online for updates and enhancements.

You may also like

- Implementations of policy for the development of partnership pattern plant (PLASMA) by plantation companies in Barito East District Central Kalimantan
T Kristiana, S Jaries and Oktavina
- The effect of land cover changes on the 2021 flood in the Barito watershed, South Kalimantan
R N Adi and E Savitri
- Oil spill contingency plan (OSCP) by environmental sensitivity index (ESI) analysis at East Barito District, South Barito District and Kapuas District (Tamiang Layang, Buntok and surrounding area), Central Kalimantan Province
Undang Hernawan and Rahayu Kusuma Riadianto

Yunandar_2019_IOP_Conf._Ser._Earth_Environ._Sci._284_012023.pdf

by 1 1

Submission date: 16-Jun-2024 02:31AM (UTC-0400)
Submission ID: 2403269863
File name: Yunandar_2019_IOP_Conf._Ser.__Earth_Environ._Sci._284_012023.pdf (1.15M)
Word count: 3470
Character count: 18408

The dynamic changes of Barito basin peat land ecosystem in South Borneo, Indonesia

IOP Conf. Series: Earth and Environmental Science **284** (2019) 012023 doi:10.1088/1755-1315/284/1/012023

The dynamic changes of Barito basin peat land ecosystem in South Borneo, Indonesia

Yunandar[1,2], Hefni Effendi[3], Widiatmaka[4], Yudi Setiawan[3,5]

[1]Study Program of Natural Resources and Environment Management, Graduate School, Bogor Agricultural University, Baranangsiang Campus Bogor 16144, Indonesia,
[2]Department of Aquatic Resource Management, Faculty of Fishery, Lambung Mangkurat University, Banjarmasin 70123, Indonesia,
[3]Center for Environmental Research, Bogor Agricultural University, Dramaga Campus, Bogor 16680, Indonesia,
[4]Department of Soil Sciences and Land Resources, Faculty of Agriculture, Bogor Agricultural University, Dramaga Campus, Bogor 16680, Indonesia,
[5]Department of Forest Resources Conservation and Ecotourism, Faculty of Forestry, Bogor Agricultural University, Dramaga Campus, Bogor 16680, Indonesia

E-mail: nandarco@yahoo.com

Abstract. The dynamic changes of aquatic ecosystem have an important role in order to maintain the sustainability of peat land ecosystem. The aquatic ecosystem is the main supply of freshwater in the Barito basin region, contribute to the water quality for consumption and production, habitat for aquaculture. Therefore, the spatial modelling of inundation changes is a pre-requisite for future peat land management. This study employed GIS and Remote Sensing techniques to monitored land cover/land use changes for observed inundation in Barito basin, South Borneo, Indonesia using multispectral satellite data obtained from Landsat at 1994, 1996, 2013 and 2015 respectively. The Barito peat basin areas, based on object dominance, were classified into five cover classes/dry land use compilation namely swamp bushes, open areas, transportation, galam vegetation *(Melaleuca sp)* and water bodies. The truth value was 88.48% for *Overall Accuracy* and 0.8 for Kappa which belonged to the substantial category. Land cover/land use resulting from spatial analysis showed a significant increase in water bodies totally 24% from 14% in 1994. Inundations that were close to the Barito river flow had a typical permanent compared to those that were far from the river. Regarding inundations throughout the season contributed to the management and development of the socio-economic area.

1. Introduction

Peat land was an aquatic ecosystem that was unique from the ecological and economic context simultaneously both locally and globally. The use of peat land as a tangible ecosystem service had resulted in economic growth of the community as providers of fresh water [1], biological resources, food, recreation, and purification [2,3,4]. Furthermore, the intangible sector was as a retarding basin, global soil carbon storage, and bio-geochemical mechanisms in the environment [5,6].

South Kalimantan with an area of 38,744 km^2, had the largest peat land potential of around 35,548.4 hectares located in North Hulu Sungai Regency [7]. This ecosystem was part of the retarding basin of

the Barito river when the intensity of rainfall increased. The inundation dynamics in Peatland had a real impact on the sustainability of this ecosystem. Changes in inundation area were influenced by natural factors and land use for human purposes. Low rainfall and the limited overflow of the Barito River as a natural factor caused a reduction in inundation area. Population growth required food and land conversion for economic needs as contributors to land change. The extent of potential inundation periodically had an impact on the regional database for planning and controlling activities in aquaculture, animal husbandry, fishing, agriculture and water conservation.

Periodic mapping of inundations was useful in an optimal and sustainable management plan [8]. The application of remote sensing data combined with GIS had been used to classify and map land cover status as well as patterns of global inundations movement [9]. Spatial analysis of cover changes had been carried out partially so that the pools obtained are only temporary. Whereas to monitor the pattern of inundation dynamics related to land use activities, multi-temporal spatial data was needed [10]. The use of this data as a solution in mapping the pattern of dynamics of standing water at the study site. Therefore, this research used multi-temporal spatial data between 1994, 1996, 2013 and 2015 to monitor the dynamics of land changes in the distribution of inundation in the Barito basin ecosystem.

2. Methodology

2.1. Study site

The selected study location (Area of Interest) was based on the Barito river eco-region and the Negara river. This research had been conducted in the administrative area of North Hulu Sungai Regency, with Paminggir, Danau Panggang, Tabukan and Babirik Districts (figure 1). The selected area was 43,275.38 hectares based on the delineation technique with coordinates of $2^{0}1'37"$ to $2^{0}35'58"$ South Latitude and between $114^{0}50'58"$ to $115^{0}50'24"$ East Longitude consists of 63 villages, most in Babirik District.

2.2. Materials and Methods

Materials that were used as Landsat Image in July 1994 and 1996, 2013 and 2015 at June (row path 125/61, 117/62 with <10% cloud cover obtained from http://earthexplorer.usgs.gov/dan land use maps of Hulu Sungai Utara). Spatial data in the dry season between June and July as a minimum inundation condition with the influence of major rainfall and river runoff, so that the main pattern of inundation in the ecosystem of the Barito basin peat land was apparent. The selection of the year was closely related to the El Nino phenomenon in Indonesia and the availability of image data. The processing process during the research used equipment such as ArcGIS, ENVI, QGIS, Google earth and GPS. Processed with a supervised classification approach.

2.3. Research Procedure

This research was conducted with the spatial analysis of remote sensing. Deleniation of study site was being done using various digital image processing techniques. Land cover changes in the study area were analyzed temporal period (1994, 1996, 2013, and 2015). Procedure for research in figure 2.

2.3.1. Image Processing Analysis

Processing of Landsat imagery begun with delineation of study sites based on the ecological boundaries of the Barito River and Negara Basin water bodies. The thresholding delineation technique was then continued with classification in the water body by dividing the image into pixels of water (dark) and soil (bright). Histogram peaks, minimum and maximum values for water pixel segmentation, then masked images [11]. Thresholding could be done on singles or band combinations. The characteristics of band 5 on Landsat TM were an important channel for identifying wetlands, especially swamps because of their ability to discriminate between water and land features [12]. Channel combination 543, 654 was the best RGB band combination for detecting peat land. The image that had been separated from the object was used as a masking to do the cropping process so that it could be continued with classification.

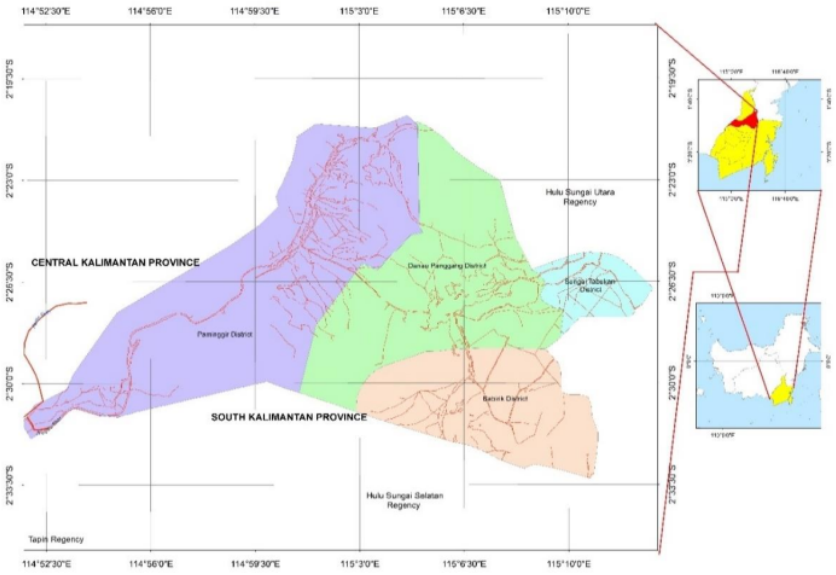

Figure 1. Study area.

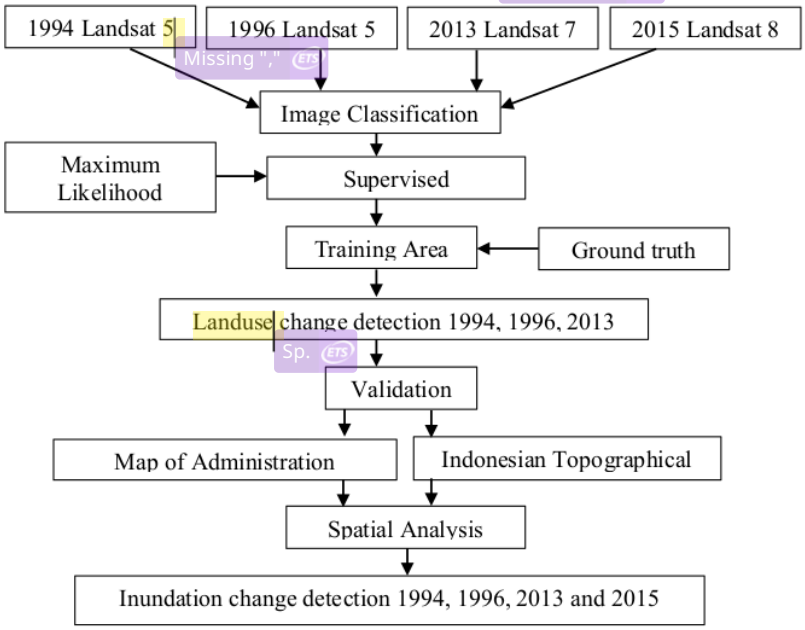

Figure 2. Research procedures.

The method of maximum likelihood classification as a classification technique that considered the chance of pixels to be classified into certain categories [13,14]. This technique produced 5 classes, namely water bodies, peat land shrubs, *galam* vegetation *(Melaleuca sp)*, open land, and settlements.

Explanation of class categories based on class definitions of water bodies was a pool of water including rivers, reservoirs and open waters. Swamp bushes included shrubs, peat land bushes, and aquatic plants whose properties had been settled. Vegetation galam (*Melaleuca sp*) including galam tree vegetation only, open land was an area without vegetation and settlements located along the river, main roads, transportation, and houses.

Distribution and extent of changes in land cover of the study area were needed as classification stages based on the desired category. The classification system for making land cover systems used Supervised Classification from 139 training areas assisted by ground truth check. The images collected and analyzed include 1994, 1996, 2013 and 2015. Testing the accuracy of the results of classification analysis techniques with Overall Accuracy (OA) and Kappa [15,16,17].

2.3.2. Spatial Analysis

Further remote sensing analysis data were classified and calculated changes in water bodies and land cover with analysis overlay techniques. The spatial analysis referred to in this study by overlaying the results of the classification analysis map, the administrative boundary map obtained from the Statistics Agency in 2018 and topographical maps of Indonesia from the Geospatial Information Agency. Calculation of the coverage of each land change class from 1994, 1996, 2013 and 2015 was spatially analyzed with ArcGIS.

The product of this activity was in the amount of area based on class and year so that the inundation rate could be compared, the rate of change in land and vegetation at the study site. The join operation technique attributed to a set of data that was used together or in the same area. The resulting data set identified new spatial relationships in the pattern of inundation in 1994, 1996, 2013 and 2015 during the dry season.

3. Result and Discussions

Landsat imagery as the primary data source from 1994–2015 informs spatial-temporal changes to monitor the distribution of the dynamics of surface inundation. Maps of spatial analysis results from 1994, 1996, 2013 and 2015 with annual rainfall data in figure 3. The overall accuracy and kappa accuracy were 88.48% and 0.8. Kappa accuracy were between 0.61 to 0.8 represent substantial [17].

The results of the study showed that there was a phenomenon of trade-off towards resources. The biggest decrease was experienced by the *galam* vegetation class *(Melaleuca sp)*, while the water bodies, shrub, open land and settlement area were increased. Vegetation *Melaleuca sp* shrunk from 25% to 2%, while the class of water bodies increased from 14% to 24%. Settlements had increased significantly since 2013 from 3% to 12%. The classification results for 1994 to 2015 were summarized in table 1. Changes in land cover for 21 years at the study site explained the trend of increasing land use change with economic motives as the main stimulus to anthropogenic land changes [18].

The pattern of inundations dynamics in general increased from 1994 to 2015 by 4,666,184 hectares, but there was a decrease in 2013 to 2015 of 10.52% with minimum rainfall conditions (figure 3 and 4). Inundations in 1994 amounted to 14.08% in the northern part adjacent to the *Melaleuca sp* ecosystem which was always flooded with extreme water conditions. As the vegetation decreased, the area was converted into swamp and flooded shrubs for areas close to the Barito river flow. In contrast to areas far from the river, the inundations pattern started from the loss of vegetation into swamp shrubs, then became open land and filled with inundations. Water bodies that occurred in this zone, the inundation ability were only temporary, it was in contrast to the areas close to river flows. Therefore, periodic inundation increased from 14.08% (1994), 18% (1996), 22.49% in 2013 and 24.86% in 2015 (table 1).

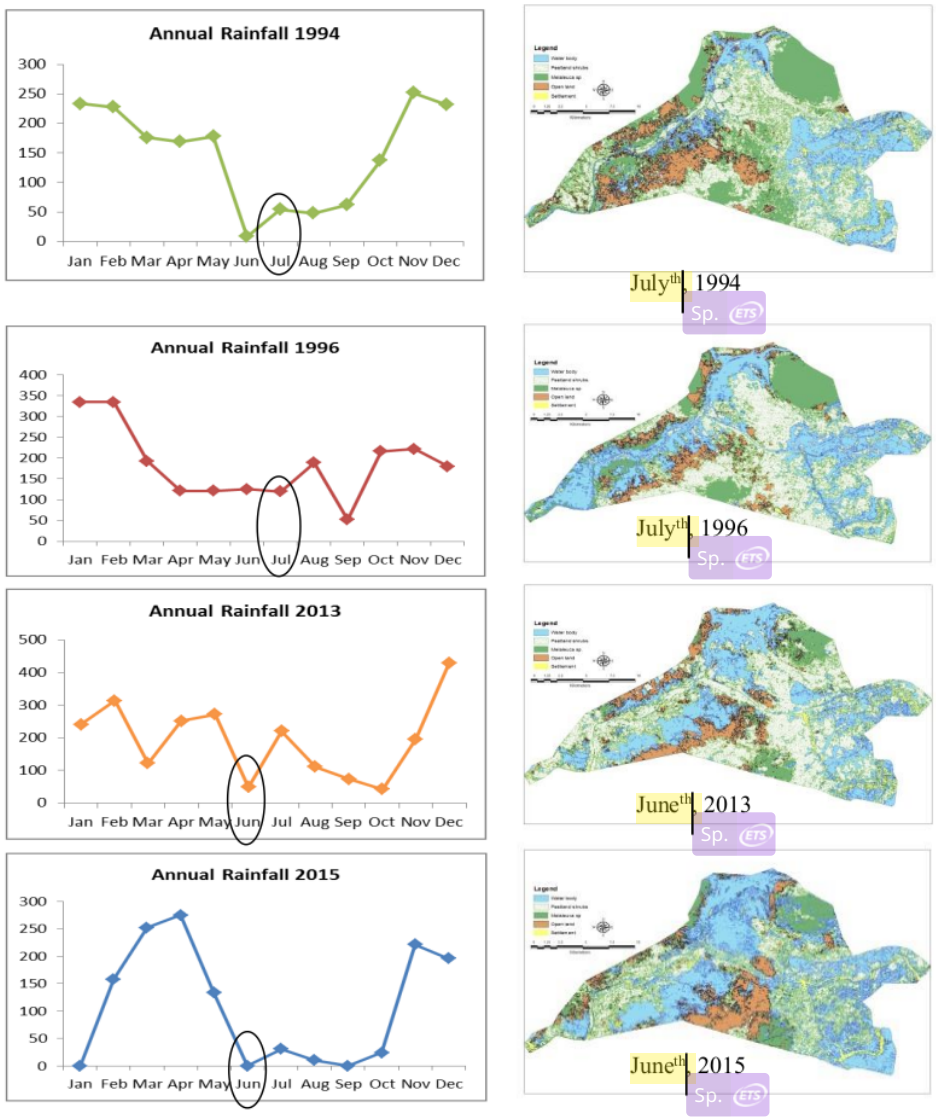

Figure 3. Graph of Annual Rainfall and Land use Classification of Barito Basin Peatland Ecosystem.

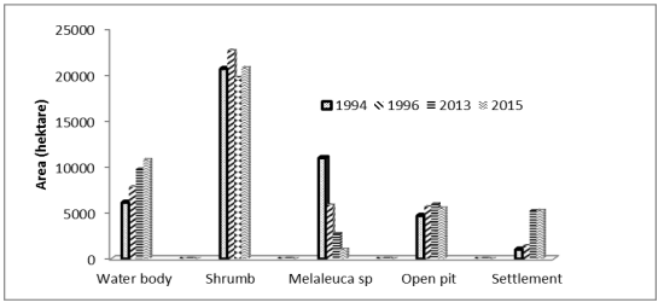

Figure 4. Land cover change area from 1994, 1996, 2013 and 2015.

Table 1. Land cover class, area extent and magnitude of change the study are between 1994 and 2015.

Land cover class	1994		1996		2013		2015	
	Land area (hectare)	(%)	Land area (hectar)	(%)	Land area (hectare)	(%)	Land area (hectare)	(%)
Waterbody	6,091.143	14	7,790.698	18	9,732.963	22	1,0757.327	24
Shrub	20,604.868	47	22,605.010	52	19,646.402	45	20,730.296	47
Melaleuca sp	10,930.198	25	5,825.134	13	2,714.350	6	1,033.425	2
Open pit	4,655.784	10	5,635.507	13	5,947.986	13	5,508.897	12
Settlement	993.589	2	1,419.231	3	5,233.881	12	5,245.636	12

Source : primary data (1994-2015)

Open land classes increased by 12% in 2015. This increase was due to logging of Melaleuca sp and swamp shrubs, leaving the land open without vegetation when the drought arrived. The biggest increase in settlement was 12% in 2015, with a population of 19,593 people becoming 21,576 [19], requiring food and shelter. The increase in the human population was the main cause of the reduction in Melaleuca sp because the livelihoods of the local population mainly depend on this swamp ecosystem. The peat land area near the main river had been used as a settlement and built area. Utilization as an area of aquaculture, traditional livestock to meet needs.

Massive exploitation that occurred in the Galam vegetation *(Melaleuca sp)* during 1994-1996 in addition to the high market demand for wood at that time and the construction of grazing buffalo swamps. This fact was supported [20], the growth of woody vegetation was greater outside the grazing area by 8.8% than in it was 4.0%. Conversion of other land used in study areas such as fish farming, livestock farming, settlements, and agriculture as the main sources of decline in this habitat.

The ease of accessibility to standing water had consequences for total nitrogen (TN) and total phosphor (TP) resulting from the activities of the surrounding population, fisheries, livestock, and agriculture in peat land. The TN content is 0.234 - 1.186 mg/L and TP 0.277 to 1.025 mg/L increased the abundance of *Chlorella sp* in sediments as eutrophication [21]. Deforestation also contributed to increased surface runoff and was responsible for the flow of nutrients, sediments [22,23] in the peat land ecosystem.

The incorporation of remote sensing applications and GIS to monitor the dynamics of changes in land use patterns towards inundation distribution was important in this ecosystem. Overall, the accuracy of 88.48% of the land use/land cover classification map showed that the integration of the supervised classification with visual interpretation was an effective method for documenting changes in land use and inundation in an area.

4. Conclusion

The dynamics of land change in the Barito basin ecosystem from the results of remote sensing analysis and GIS concluded that land cover/use has changed for 21 years. Monitoring of inundation distribution had increased with changes in other land uses. The dynamics of standing water in the northern part adjacent to *Melaleuca sp* were always flooded in the dry season due to the influence of the Barito river flow. In contrast to areas far from the river, inundations that were left were temporary as the land dries into open land. Water bodies that occurred in this zone, the inundation ability was only temporary, in contrast to the areas close to river flows. The accuracy test on the map informed the value of 88.48% for Overall Accuracy and 0.8 in the substantial category. Availability of season-wide inundation as a database in the management and development of peat land areas to increase economic value and regional welfare. The limitations of the study with Landsat images of cloud cover <10% affected the classification process for land cover types.

References

[1] Holden J 2005 Peatland hydrology and carbon release: why small-scale process matters *Philos. Trans. R. Soc. A.* **363** 2891–2913
[2] Chen Z R and Wong M H 2016 Integrated wetlands for food production *Environmental Research*. **148** 429–442.
[3] Chen H, Yang-Chi C, Kung-Chen C 2014 Integrated wetland management: An analysis with group model building based on system dynamics model *J. of Environmental Management*. **146** 309-319.
[4] Grand-Clement E, Anderson K, Smith D, Angus M, Luscombe D J, Bray L S, Brazier R E, Gatis N 2015 New approaches to the restoration of shallow marginal peatlands (Review). *J of Environm. Manag.* 1-14.
[5] Gorham E 1991 Northern peatlands: role in the carbon cycle and probable responses to climatic warming. *Ecol.Appl.* **12** 182–195.
[6] Evans M, Warburton J., Yang J 2006 Eroding blanket peat catchments: global and local implications of upland organic sediment budgets *Geomorphology* **79** 45–57.
[7] Wahyunto, S. Ritung, Suparto, H. Subagjo 2005 Peat distribution and carbon content in Sumatra and Kalimantan, Wetlands International Indonesia *Programmed an Wildlife Habitat Canada* Bogor.
[8] Prasad S N, Ramachandra T V, Ahalya N, Sengupta T, Kumar A, Tiwari A K, Vijayan V S and Vijayan L 2002 Conservation of wetlands of India – a review *Tropical Ecology* **43** 173-186.
[9] Tiner R 2004 Remotely-sensed indicators for monitoring the general condition of "natural habitat" in watersheds: An application for Delaware's Nanticoke River watershed. *Ecological Indicators* **4** 227-43.
[10] Ahmed F 2012 Detection of change in vegetation cover using multi-spectral and multi temporal information for District Sargodha, Pakistan *Soc. Nat.* **24** 557–572.
[11] Manju G, Chowdary VM, Srivastava YK, Selvamani S, Jeyaram A and Adiga S. Mapping and characterization of inland wetlands using remote sensing and GIS *Journal of the Indian Society of Remote Sensing* **33** 51-66.
[12] Kelley G W, Hobgood J S, Bedford K W and Schwab D J 1998 Generation of three-dimensional lake model forecasts for Lake Erie *Weather and Forecasting* 1998 **13** 305-315.
[13] Foody G M, Campbell N A, Trodd N M, Wood T F 1992 Derivation and applications of probabilistic measures of class membership from the maximum-likelihood classification *Photogrammetric Engineering and Remote Sensing* **58** 1335-1341.
[14] Jia K, Xiangqin W, Xingfa G, Yunjun Y, Xianhong X, Bin L 2014 Land cover classification using Landsat 8 operational land imager data in Beijing, China *Geocarto International* **29** 941-951.
[15] Gwet K 2002 Kappa statistic is not satisfactory for assessing the extent of agreement between

raters. Stat. Methods Inter-Rater Reliab *Assess*. **76** 378–382.
[16] Viera A J, Garrett J M 2005 Understanding inter-observer agreement: the kappa statistic *Family Med*. **37** 360–363.
[17] Jaya I 2015 Analisis Citra Digital: Perspektif Penginderaan Jauh untuk Pengelolaan Sumber Daya Alam Teori dan Praktek Menggunakan Erdas Imagine *IPB Press*.
[18] Wang X, Zheng D, Shen Y 2008 Land use change and its driving forces on the Tibetan Plateau during 1990–2000 *Catena* **72** 56–66.
[19] Landis J R and Koch G G A 1977 One-Way Components of Variance Model for Categorical Data *Biometrics* **33** 671-679.
[20] Arifin Y F, Hamidah S, Arifin Y F 2016 Ecological Analysis Of Gelam *(Melaleuca cajuputi)* on Peatland In South Kalimantan *J. Silvikultur Tropika* **7** S77-S79.
[21] María G C, María A C, María C C 2013 Vertical distribution of epiphyton biomass and diversity in a shallow lake during contrasting ecosystem regimes *Aquat. Bot.* **110** 38–47.
[22] Ali M, Khan S J, Aslam I, Khan Z 2008 Simulation of the impacts of land-use change on surface runoff of Lai Nullah Basin in Islamabad, Pakistan *Landscape Urban Plann* **102** 271–279.
[23] Mendoza M E, Granados E L, Geneletti D, Perez-Salicrup D R, Salinas V 2011 Analysing land cover and land use change processes at watershed level: A multi temporal study in the Lake Cuitzeo Watershed, Mexico (1975–2003) *Appl. Geogr*. **31** 237–250.

Yunandar_2019_IOP_Conf._Ser.__Earth_Environ._Sci._284_01...

ORIGINALITY REPORT

0%	0%	0%	0%
SIMILARITY INDEX	INTERNET SOURCES	PUBLICATIONS	STUDENT PAPERS

PRIMARY SOURCES

Exclude quotes	On	Exclude matches	< 100%
Exclude bibliography	On		

Yunandar_2019_IOP_Conf._Ser.__Earth_Environ._Sci._284_012C

PAGE 1

Article Error You may need to use an article before this word.

Sp. This word is misspelled. Use a dictionary or spellchecker when you proofread your work.

Sp. This word is misspelled. Use a dictionary or spellchecker when you proofread your work.

Sp. This word is misspelled. Use a dictionary or spellchecker when you proofread your work.

Sp. This word is misspelled. Use a dictionary or spellchecker when you proofread your work.

Sp. This word is misspelled. Use a dictionary or spellchecker when you proofread your work.

Sp. This word is misspelled. Use a dictionary or spellchecker when you proofread your work.

PAGE 2

Sp. This word is misspelled. Use a dictionary or spellchecker when you proofread your work.

Article Error You may need to use an article before this word. Consider using the article **the**.

Article Error You may need to remove this article.

Article Error You may need to use an article before this word.

Missing "," Review the rules for using punctuation marks.

PAGE 3

Sp. This word is misspelled. Use a dictionary or spellchecker when you proofread your work.

Sp. This word is misspelled. Use a dictionary or spellchecker when you proofread your work.

Article Error You may need to use an article before this word. Consider using the article **the**.

P/V You have used the passive voice in this sentence. You may want to revise it using the active voice.

Sp. This word is misspelled. Use a dictionary or spellchecker when you proofread your work.

Sp. This word is misspelled. Use a dictionary or spellchecker when you proofread your work.

Sp. This word is misspelled. Use a dictionary or spellchecker when you proofread your work.

Sp. This word is misspelled. Use a dictionary or spellchecker when you proofread your work.

Sp. This word is misspelled. Use a dictionary or spellchecker when you proofread your work.

Sp. This word is misspelled. Use a dictionary or spellchecker when you proofread your work.

Sp. This word is misspelled. Use a dictionary or spellchecker when you proofread your work.

Sp. This word is misspelled. Use a dictionary or spellchecker when you proofread your work.

Article Error You may need to use an article before this word. Consider using the article **the**.

Sp. This word is misspelled. Use a dictionary or spellchecker when you proofread your work.

Article Error You may need to use an article before this word.

Sp. This word is misspelled. Use a dictionary or spellchecker when you proofread your work.

Sp. This word is misspelled. Use a dictionary or spellchecker when you proofread your work.

Sp. This word is misspelled. Use a dictionary or spellchecker when you proofread your work.

Sp. This word is misspelled. Use a dictionary or spellchecker when you proofread your work.

Sp. This word is misspelled. Use a dictionary or spellchecker when you proofread your work.

Article Error You may need to use an article before this word.

Article Error You may need to use an article before this word.

Sp. This word is misspelled. Use a dictionary or spellchecker when you proofread your work.

Sp. This word is misspelled. Use a dictionary or spellchecker when you proofread your work.

P/V You have used the passive voice in this sentence. You may want to revise it using the active voice.

Sp. This word is misspelled. Use a dictionary or spellchecker when you proofread your work.

Article Error You may need to use an article before this word.

Missing "," Review the rules for using punctuation marks.

Sp. This word is misspelled. Use a dictionary or spellchecker when you proofread your work.

Article Error You may need to use an article before this word.

Missing "," Review the rules for using punctuation marks.

Missing "," Review the rules for using punctuation marks.

Sp. This word is misspelled. Use a dictionary or spellchecker when you proofread your work.

Article Error You may need to use an article before this word.

Sp. This word is misspelled. Use a dictionary or spellchecker when you proofread your work.

Article Error You may need to use an article before this word. Consider using the article **the**.

P/V You have used the passive voice in this sentence. You may want to revise it using the active voice.

Proofread This part of the sentence contains an error or misspelling that makes your meaning unclear.

Article Error You may need to use an article before this word.

Sp. This word is misspelled. Use a dictionary or spellchecker when you proofread your work.

Possessive Review the rules for possessive nouns.

Sp. This word is misspelled. Use a dictionary or spellchecker when you proofread your work.

Sp. This word is misspelled. Use a dictionary or spellchecker when you proofread your work.

Sp. This word is misspelled. Use a dictionary or spellchecker when you proofread your work.

Sp. This word is misspelled. Use a dictionary or spellchecker when you proofread your work.

Article Error You may need to use an article before this word.

Sp. This word is misspelled. Use a dictionary or spellchecker when you proofread your work.

Sp. This word is misspelled. Use a dictionary or spellchecker when you proofread your work.

PAGE 7

Article Error You may need to use an article before this word. Consider using the article **the**.

Article Error You may need to use an article before this word.

Article Error You may need to use an article before this word.

Article Error You may need to use an article before this word.

Article Error You may need to use an article before this word.

Sp. This word is misspelled. Use a dictionary or spellchecker when you proofread your work.

Article Error You may need to use an article before this word.

Article Error You may need to use an article before this word. Consider using the article **the**.

Missing "," Review the rules for using punctuation marks.

Article Error You may need to remove this article.

Prep. You may be using the wrong preposition.

PAGE 8

Sp. This word is misspelled. Use a dictionary or spellchecker when you proofread your work.

Sp. This word is misspelled. Use a dictionary or spellchecker when you proofread your work.

Article Error You may need to use an article before this word. Consider using the article **the**.