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Artikel Ilmiah

Analisis Tingkatan Ranah Kognitif Mahasiswa Program Studi Pendidikan Geografi dalam Pembelajaran Mata Kuliah Geografi Regional Indonesia I
Armansyah

Penggunaan Metode Mind Mapping sebagai Upaya untuk Meningkatkan Aktivitas Belajar Siswa Kelas X di SMA Negeri 1 Pekalongan Kabupaten Lampung Timur
Lalil Rosita

Pengaruh Media Pembelajaran Audio Visual Terhadap Hasil Belajar Siswa Pada Mata Pelajaran IPS Terpadu (Geografi) Materi Siklus Hidrologi di SMP Nurul Iman Palembang Tahun Pelajaran 2015/2016
Robyansah Argha

Perbandingan Hasil Belajar Siswa dengan Menggunakan Multimedia Pembelajaran Interaktif dan Media Presentasi pada Mata Pelajaran Geografi Kelas X SMAN 1 Babat Toman Tahun Ajaran 2016/2017
Siti Aisyah dan Novi Yanti Artika

Perubahan Lingkungan dan Masa Depan Ekonomi Masyarakat Kampung Laut Kabupaten Cilacap
Moh. Soleh

Analisis Pengaruh Aspek Lingkungan dan Fisik Terhadap Kondisi Masyarakat Hilir Sungai Musi di Kecamatan Gandus Kota Palembang
Mega Kusuma Putri, Hefia Septiani, Ratna Emilia W.

Analysis of Sand Dunes Damages Using Remote Sensing Method in Parangtritis Kretek Bantul
Winang

Penataan Hirarki Orde-Ruang Pasar di Kota Palembang
Giyanto dan Nina Damayanti

Strategi Pengembangan Objek Wisata Alam Air Terjun Bayang Sani di Kecamatan Bayung Noranda

Distribusi Fasilitas Kesehatan bagi Peserta BPJS Kesehatan Kecamatan Boyolali
Ari Wijayanti

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PENGANTAR PENYUNTING

Syukur alhamdulillah **Jurnal Swarnabhumi** Volume 2 Nomor 2 (Agustus 2017) telah selesai diterbitkan. Swarnabhumi edisi kali ini menurunkan laporan penelitian atau artikel ilmiah yang terdiri dari empat artikel bertema bidang Pendidikan, dua artikel Geografi Lingkungan, Satu artikel bertema Penginderaan Jauh, satu artikel Geografi Ekonomi, Artikel Geografi Pariwisata dan terakhir bertema Geografi Pengembangan Wilayah. Jadi, Swarnabhumi tetap konsisten seperti dua edisi sebelumnya yang menenurunkan masing-masing sepuluh artikel. Sehingga jika dijumlah sampai edisi terakhir total artikel yang sudah berhasil diterbitkan oleh Swarnabhumi berjumlah tiga puluh artikel penelitian. Dengan tema yang tetap bervariasi.

Artikel pertama menampilkan hasil penelitian Armansyah mengenai Tingkatan Ranah Kognitif mahasiswa Program Studi Pendidikan Geografi dalam Pembelajaran Mata Kuliah Geografi Regional Indonesia I. Artikel kedua dari Laili Rosita tentang metode *Mind Maping* sebagai upaya untuk meningkatkan aktivitas belajar siswa kelas X di SMA Negeri I Pekalongan Kabupaten Lampung Timur. Artikel ketiga masih bertema pendidikan dari Robyansah Azgha dengan tema Pengaruh Media Pembelajaran Audio Visual terhadap hasil Belajar Siswa pada Mata Pelajaran IPS Terpadu (Geografi) Materi Siklus Hidrologi di SMP Nurul Iman Palembang tahun Pelajaran 2015/2016. Sedang artikel keempat bertema pendidikan dari Siti Asiyah dan Novi Yuni Artika berjudul Perbandingan Hasil Belajar Siswa dengan Menggunakan Multimedia Pembelajaran Interaktif dan Media Presentasi Pada Mata Pelajaran Geografi Kelas X SMAN 1 Babat Toman tahun Ajaran 2016/2017.

Artikel kelima hingga kesepuluh menurunkan tema *science* geografi. Muh. Sholeh melaporkan tentang Perubahan Lingkungan dan Masa Depan Ekonomi Masyarakat Kampung Laut Kabupaten Cilacap. Artikel keenam masih berbicara tentang tema Geografi Lingkungan dari Mega Kusuma Putri, Helfa Septinar dan Ratna Daulay W tentang Pengaruh Aspek Lingkungan dan Fisik Terhadap Kondisi Masyarakat Hilir Sungai Musi di Kecamatan Gandus Kota Palembang. Artikel ketujuh bertema Penginderaan Jauh dari Wenang Anurogo dkk mengambil judul *Analysis of Sand Dunes Damages Using Remote Sensing Method in Parangtritis Kretek Bantul*. Artikel bertema Geografi Ekonomi oleh Giyanto dan Nina Damayati mengambil judul Pemetaan Hirarki Orde-Barang Pasar di Kota Palembang. Artikel kesembilan oleh Nuranisa bertema Geografi Pariwisata berjudul Strategi Pengembangan Objek Wisata Alam Air Terjun Bayang Sani di Kecamatan Bayang. Terakhir, artikel kesepuluh dari Ary Wijayanti berjudul Distribusi Fasilitas Kesehatan bagi Peserta BPJS Kesehatan Kecamatan Boyolali.

Terselesaikannya edisi Volume 2 Nomor 2 bulan Agustus 2017 ini tidak lepas dari bantuan berbagai pihak, baik dari para penyunting dan penulis. Kerja ilmiah tidak lepas dari kerelaan yang tulus dalam mengembangkan ilmu pengetahuan, berdasar semangat itulah kami mengucapkan terimakasih kepada semua pihak yang telah memberi dukungan bagi terbitnya Swarnabhumi ini secara berkala dan konsisten. Semoga pada edisi berikutnya kami akan berusaha lebih keras lagi untuk memperbaiki diri baik dari sisi proses, format maupun kualitas laporan yang telah masuk ke redaksi kami.

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Jurnal Geografi dan Pembelajaran Geografi

Volume 2, Nomor 2, Februari 2017

DAFTAR ISI

PENGANTAR PENYUNTING i

DAFTAR ISI ii

Analisis Tingkatan Ranah Kognitif Mahasiswa Program Studi Pendidikan Geografi dalam Pembelajaran Mata Kuliah Geografi Regional Indonesia 1
Armansyah 1

Penggunaan Metode *Mind Mapping*sebagai Upaya untuk Meningkatkan Aktivitas Belajar Siswa Kelas X di SMA Negeri 1 Pekalongan Kabupaten Lampung Timur
Laili Rosita 6

Pengaruh Media Pembelajaran Audio Visual Terhadap Hasil Belajar Siswa Pada Mata Pelajaran IPS Terpadu (Geografi) Materi Siklus Hidrologi di SMP Nurul Iman Palembang Tahun Pelajaran 2015/2016
Robyansah Azgha 12

Perbandingan Hasil Belajar Siswa dengan Menggunakan Multimedia Pembelajaran Interaktif dan Media Presentasi pada Mata Pelajaran Geografi Kelas X SMAN 1 Babat Toman Tahun Ajaran 2016/2017
Siti Asiyah dan Novi Yuni Artika.....17

Perubahan Lingkungan dan Masa Depan Ekonomi Masyarakat Kampung Laut Kabupaten Cilacap
Muh. Soleh 22

Analisis Pengaruh Aspek Lingkungan dan Fisik Terhadap Kondisi Masyarakat Hilir Sungai Musi di Kecamatan Gandus Kota Palembang
Mega Kusuma Putri, Helfa Septinar, Ratna Daulay W. 32

Analysis of Sand Dunes Damages Using Remote Sensing Method in Parangtritis Kretek Bantul
Wenang 42

Pemetaan Hirarki Orde-Barang Pasar di Kota Palembang
Giyanto dan Nina Damayati 49

Strategi Pengembangan Objek Wisata Alam Air Terjun Bayang Sani di Kecamatan Bayang
Nuranisa 55

Distribusi Fasilitas Kesehatan bagi Peserta BPJS Kesehatan Kecamatan Boyolali
Ari Wijayanti 63

PENGINDERAAN JAUH

ANALYSIS OF SAND DUNES DAMAGES USING REMOTE SENSING METHOD IN PARANGTRITIS KRETEK BANTUL

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ABSTRAK

Indonesia passed the equator make Indonesia get some kind of wind. The wind helps the formation of sand dunes such as those on parangtritis. Human population is growing and is not supported by the increase of the land, then the existence of sand dunes began to interfere with land transfer function for the fulfillment of human needs. The purpose of this research is to determine the extent of damage and reduction of the sand dune area in parangtritis and the cause of its damage. The method used in this research is the extraction of information from spatial data in each year of data recording then analyzed to obtain data or information regarding changes in sand dunes area. The interpretation results show that the area of sand dunes in 2003 was 277,083 Ha, while the area of sand dunes with visual interpretation of the image of 2015 shows that the current sand dune area is 169.378 Ha. The results of both areas of the sand dunes experienced a reduction of 107,705 hectares or it can be said that the sand dunes area over the year span experienced a reduction of 47.4%.

Key Word: *Sand dunes; Spatial Data; Land Transfer Function.*

INTRODUCTION

Java Island is geomorphologically divided into three main zones that stretch across the island. It is the southern zone, the middle zone, and the northern zone (Marwasta & Priyono, 2016). The zone has differences in each region, both in Central Java, West Java, and East Java. The northern zone comprises a folding structure and a series of hills interspersed with volcanoes. The southern zone has the features of a sloping slant southward towards the Indian Ocean and sometimes erodes due to the great winds in the south. This erosion material is dominated by sediments derived from sandy sandy material volcanoes that are carried to the beach reworked by waves and stored as coastlines along the coast. Sandy material along the coast is carried by wind (Surya *et al*, 2017; Khoirunnisa*et al*, 2017) to the coast forming a dune and there are several factors to form the perfect sand dunes, including the result of the Baturagung Mountains and the seasonal winds that make this sand dune formed into active sandbanks and passive sandbanks (Nugroho, 2013).

Sand dune is a mound of hills or igirs from the wind-blown sand. Sand dune can be found in areas that have sand as the main material, high wind speeds to erode and transport sand-sized grains, and soil surface for sand deposition, usually formed in arid (dry) areas. Sand dune tend to form with unsymmetric cross sections. If there is no stabilization by the sand dune vegetation it tends to shift toward the wind blowing, this is because the grains of sand are blown from front to back of the gumuk (Nuraini *et al*, 2016). The formation of sand dune on the south coast is influenced by the existence of several streams, the Opak-Oyo River in the east and the Progo river in the west. As has been described previously that the material from Merapi carried by the flow of the river in the vicinity, the rivers then merge to form a larger river order to unite to form the river Opak, Oyo, and Progo. After the sand material reaches the sea, there is interference from the ocean waves so that the material settles on the south coast and then flown by the wind. On the southern coast of Java, the material is not deposited on the front of the river which eventually forms the delta, this is

because the strong currents and sea waves of the south coast and its direction from the southeast cause the material to be deposited on the western part of the river (Tejakusuma, 2013).

As time passes the growing human population that is not supported by increasing land, the existence of this sand dunes began to be disturbed by the establishment of buildings, especially kampongs (Hartanto, 2012). There was a very significant change in the passive sand dunes, the sand dune that could no longer form a sandbound. The surrounding community began to take advantage of this passive sandbelt by building on the site of the passive sand dune. Currently the existence of the sand dune began to be disrupted by human activity (Widodo, 2011).

The spatial planning of coastal sand dunes of Parangtritis and its surroundings that is oriented towards coastal conservation and protection needs to be done immediately in an effort to prevent the utilization of potentially damaging sand dune space (Budianto, 2011). Law No. 26 of 2007 on Spatial Planning and Law No. 27 of 2007 on the Management of Coastal Zones and Small Islands, has mandated that the sand dune area can become a conservation area or conservation area that must be protected. In addition, Law Number 24 Year 2007 on Disaster Management and Law Number 32 Year 2009 on Environmental Protection and Management gives positive signal for disaster mitigation in the form of spatial planning and conservation of coastal natural resources (Khakim, 2009).

Indigenous knowledge of the area that is usually in the form of customs, beliefs, and restrictions of society is often underestimated because it is considered unscientific. In our diverse society there are positive traditions that have been tested by the age of its benefits. The utilization of indigenous knowledge can encourage the level of community participation as people have become familiar with it. Community participation is the key to successfully solving planning problems. If participation is fully formed it will lead to the situation; Sense of belonging, increased commitment to achievement of goals and outcomes, long-term social conservation, community empowerment realized (Rekha, 2016).

RESEARCH METHOD

The research method is the steps - steps that must be done in the collection, processing and data analysis to describe the problem solving research. The method used in this research is a combination of remote sensing image analysis, geographic information system, and field measurement. The method used in this research is the extraction of information from the spatial data with visual interpretation on each year of data recording and then analyzed the function of land to obtain data or information about the change of land conversion function for Parangtritis and surrounding area.

The location of this research includes Parangtritis Tourist Beach, Parangkusumo Beach, and Depok Beach. Physiographically, this region borders the northwest and north side by the flow of the Opak River, and on the eastern side is limited by Plato Gunung Sewu and the southern side is bordered by the Indonesian Ocean located between 8 South Latitude and between 110 East Longitude exactly 7 0 59 '27‖- 80 02 '29‖ S and 110 ° 16' 47‖ - 110 ° 22 '21‖ E. This study uses a spatial approach with descriptive analysis. This descriptive study is conducted by collecting information about the circumstances that occurred in the past in accordance with the time specified and the present state. The goal is to describe the circumstances that occurred in the past and at the time of the study, and observed the symptoms of change which will then be analyzed descriptively, spatially, and spasiotemporal.

Visual Interpretation

Visual interpretation was done to restrict the sand dunes in both data recording and to limit the cover of the sand dunes in the second year of data recording (Lillesand, 1993). Classification of land cover used classification of land cover (Malingreau, 1981) order 2 with the addition of classes in accordance with existing conditions in the study area. Visual interpretation is done by considering the eight elements of interpretation that play an important role in the introduction of objects on the surface of the earth. The eight elements are color, tone, shape, size, shadow, texture, pattern, site, and association (Farizki and Anurogo, 2017).

The result of the land cover interpretation was obtained land cover map for two years of data recording. Interpretation results are then validated in the field. The accuracy test method used is to use the error matrix or conflution matrix (Jensen, 1986). This method uses an independent set of data that is logically more acceptable to the truth. The accuracy test carried out is to test the results of the land cover interpretation. The results are then conducted overlapping or overlay to determine the change in land cover resulting from data extraction for the second lapse of the year (Danoedoro, 2012).

Land Transfer Function

Over the function of land area of sand dunes in this research using primary data that is multithemporal high resolution remote sensing data. The extraction of the high-resolution spatial data was then obtained by the amount of sand dunes of each recording year, from the results of each year of the recording (Anurogo *et al*, 2015), then overlaid to obtain differences or changes in sand dunes. Other extractions obtained are information on land use contained in sand dunes in two years of data recording. The data of land use of sand dunes in each year of recording are then compared and analyzed to obtain information about the transfer of land area of sand dune area so that finally got information about the cause of damage from the sand dunes area.

RESULTS AND DISCUSSION

The main data used in this study is high resolution data taken from google earth (Lubis *et al*, 2017; Astutik *et al*, 2017) recording year 2003 and the recording data of 2015. The high resolution data, before it can be used must be adjusted to the location or position on the surface of the earth (Anurogo*et al*, 2017). This adjustment is also called geometric correction. The geometric correction performed on both the recording data 2003 and 2015 is non-systematic geometric correction performed using a ground control point (GCP). Non-systematic geometric correction uses first-order polynomial algorithms, since the physiographic conditions of the region are mostly terrain. Non-systematic geometric correction is performed by image to image registration with reference to georeferencing image map using base map of RBI scale of 1: 25.000 which has been corrected, with Universal Transverse Mercator (UTM) projection system, WGS datum 1984. The study area included in zone 49 M. The M zone is south of the equator. The amount of GCP used is presented in Figure 1.

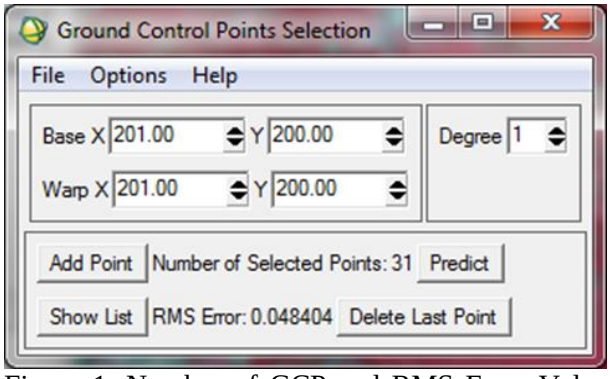
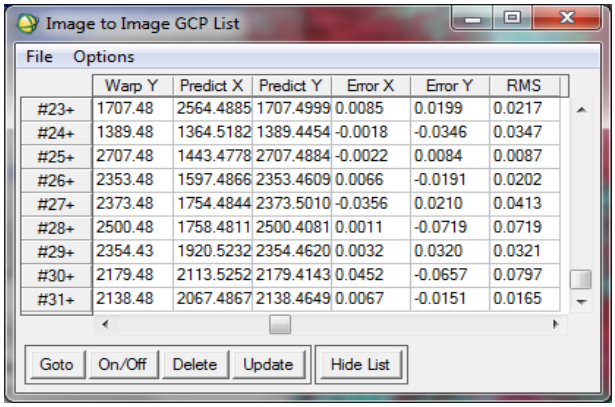


Figure 1. Number of GCP and RMS Error Value on Geometric Correction (Data analysis, 2015)

Ground Control Point retrieval point is a place that has the same appearance that can be identified from both images. The appearance to be used is the appearance that is considered the same and does not experience a fluctuating change or in other words the appearance that does not change quickly within a certain period. These objects can be large crossroads or large river curves (order 1). The number of GCP taken in a scene image of this research as much as 31 points and taken to spread on the entire coverage of the image.The result of geometric correction of the image data, resulting in an error value or RMS Error of 0.048404, so it can be said that the image has a shift of 0.2 m in each pixel. The value can still be tolerated considering the reference used also has geometric errors so that the data is still eligible to continue in the next process. The value of RMS e can be more clearly seen in Figure 2.



	Warp X	Predict X	Predict Y	Error X	Error Y	RMS
#23+	1707.48	2564.4885	1707.4999	0.0085	0.0199	0.0217
#24+	1389.48	1364.5182	1389.4454	-0.0018	-0.0346	0.0347
#25+	2707.48	1443.4778	2707.4884	-0.0022	0.0084	0.0087
#26+	2353.48	1597.4866	2353.4609	0.0066	-0.0191	0.0202
#27+	2373.48	1754.4844	2373.5010	-0.0356	0.0210	0.0413
#28+	2500.48	1758.4811	2500.4081	0.0011	-0.0719	0.0719
#29+	2354.43	1920.5232	2354.4620	0.0032	0.0320	0.0321
#30+	2179.48	2113.5252	2179.4143	0.0452	-0.0657	0.0797
#31+	2138.48	2067.4867	2138.4649	0.0067	-0.0151	0.0165

Figure 2. RMS Error Value Each GCP (Data analysis, 2015)

The result data from the geometric correction step is then analyzed the prediction of land use that is in the area by using visual interpretation method. The land use class located in the area is divided into the land use class (Malingreau, 1981) 2nd order with the addition of class according to the existing condition in the study area. The result of the visual interpretation is that the sand dune area is divided into several land uses: sand dune, moor, open land, bush / shrub, wake land, water body. The visual interpretation results for both years of the recording are then overlaid or overlaid to obtain a change of sand dune area and changes in sand dune cover in 2003 and 2015.

The result of the interpretation accuracy test shows that the accuracy of the visual interpretation of land cover in 2015 compared to the existing field condition has a match of 83.44%. The results are said to be quite high. Errors of interpretation are caused by the rapid transfer of land functions or changes in land cover in the area. The data used is the June 2015 recording while the field

interpretation accuracy test was conducted in November 2015. The 5-month time difference with rapid land conversion resulted in the result of the accuracy of the interpretation.The extraction results from remote sensing data obtained map of distribution of land cover in 2003 and 2015. Both data are then compared to get change from sand dune area. Spatial data on sand dune land cover are shown in Figures 4 and 5.

Table 1. Table of Accuracy Test of Land Cover Classification.

Field / Interpretation	Sand Dune	Moor	Open field	Building land	Water	Shrubs	Amount
Sand Dune	30	2	1	4	0	2	39
Moor	0	10	0	2	0	3	15
Open field	0	0	25	3	1	0	29
Building land	0	0	0	32	0	0	32
Water	0	0	1	0	10	0	11
Shrubs	0	3	3	0	0	19	25
Amount	30	15	30	41	11	24	151

Source: Analysis Result, 2015

$$\frac{30 + 10 + 25 + 32 + 10 + 19}{} \text{ X } 100\% = 83.44\%$$

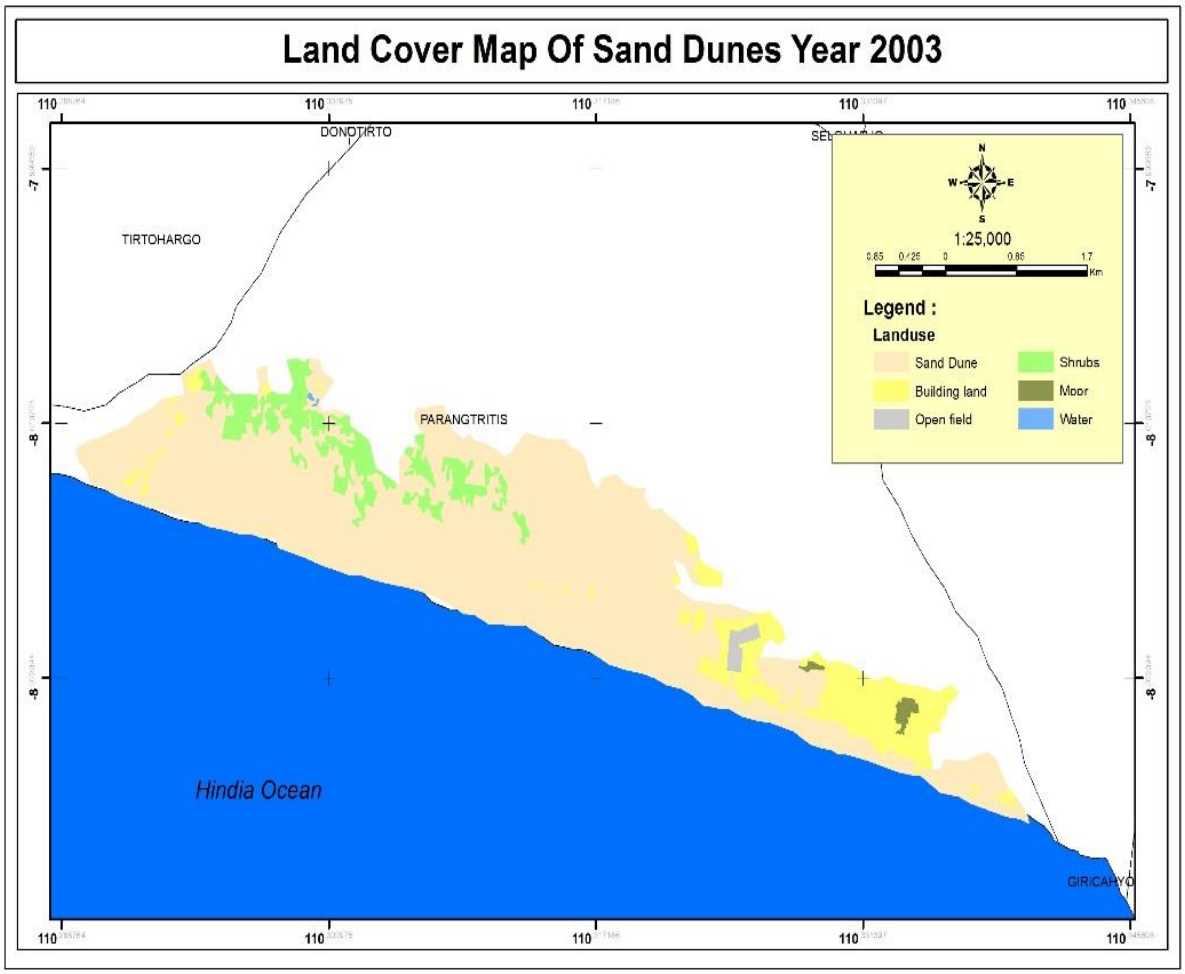


Figure 3. Land cover map of sand dune area in 2003

The area of sand dune can be identified from the year of research used by conducting an analysis of overlapping of the result of land cover result of visual interpretation. Changes in the general extent of the sand dune area can be known from the results of visual interpretation so as to facilitate and accelerate the calculation of the area of sand dunes that undergo those changes.Interpretation results show that the area of sand dunes in 2003 was 277,083 Ha. The results are based on the visual appearance obtained from google earth pictures of the recording of July 2003. The results of the area of sand dunes with visual interpretation of images in 2015 shows that the extent of sand dunes is now 169,378 Ha. The results of both areas of the sand dunes experienced a reduction of 107,705 hectares or it can be said that the sand dunes from 2003 to 2015 decreased by 47.4%.

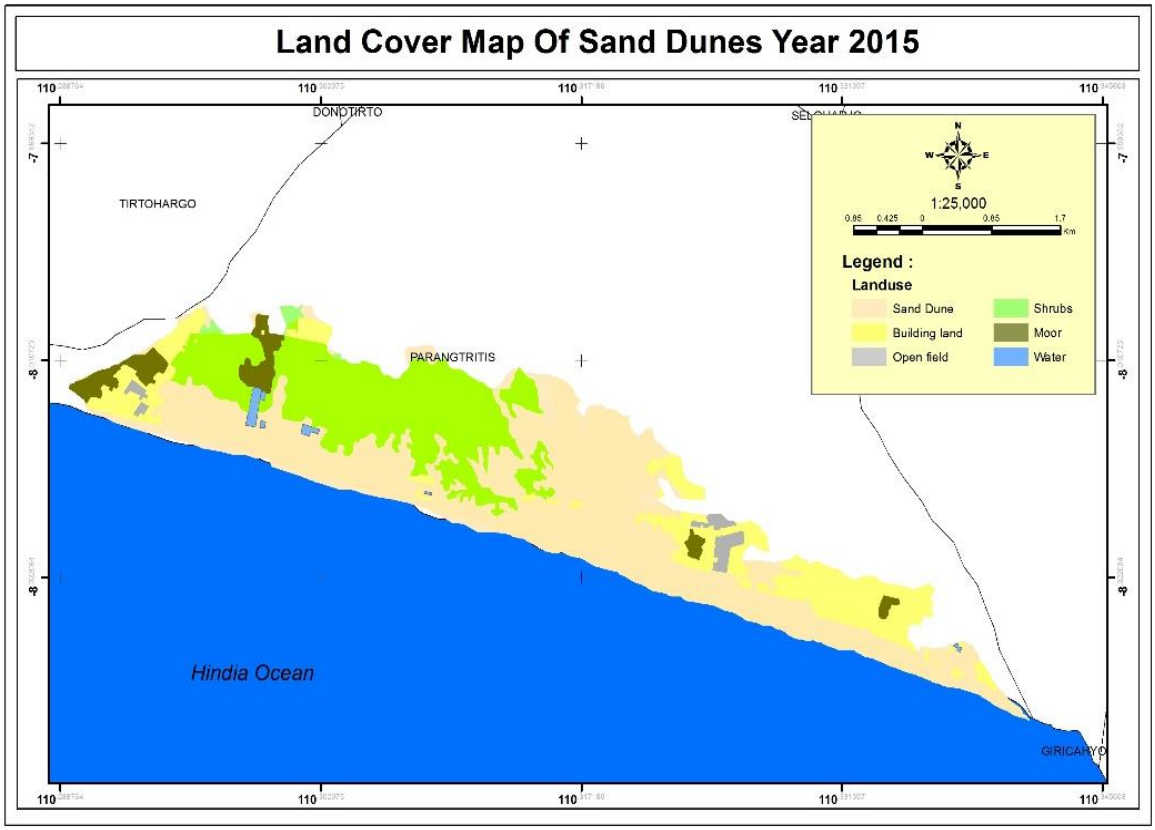


Figure 4. Land cover map of sand dune area in 2015

Changes in the area of sand dunes from year to year tend to decrease. This reduction in the area of the sand dunes is largely due to human activities of the area. The results of observation indicate that there are several factors of human activity which become the main factor in the decrease of Parangtritis sand dune area.Human activity that impacted in the decline of the area of Parangtritissan dune is the first development of shelter or buildings around the area Parangtritis. The construction of this shelter is in addition to the human needs of the house, is also proportional to the condition of the area Parangtritis used as a tourist area. The construction is in addition to residential homes also in the form of hotel / motel buildings and stalls. Built land located in the sand dunes can block the sand-carrying winds that form the sand dune.

The subsequent human activity that affects the reduction of the area of sand dunes is the transfer of land in the sand dunes into shrimp ponds. The common phenomenon in almost all of the southern coast of DIY is the rise of ponds that appear on almost along the coast. Aquaculture activities directly affect the reduction of sand dunes because in addition to converted land function including the sand dune area itself, the pond also affects in disturbing the formation of sand dunes because the material of sand carried by the wind that should form a disturbed by the existence of ponds that exist in the gulf Around the area.Other human activities that directly affect the decline of this sand dunes area is the mining of gumuk sand that is used as material for making house or material stockpile. This mining is usually done by individuals and included in illegal mining activities.

Another factor that also affects the diminished sand dune area is the absence of integrated waste management for human activities living in the area.

Integrated waste management is required so that people living in sand dunes do not waste and collect garbage in the Sand dune area. Disposal and collection of garbage around the sand dunes slightly disturbs the sand dune ecosystem, especially the process of its formation.Preservation of sand dune reserves found in the Parangtritis area need to be maintained and conserved because the sand dune in addition to the process of formation takes a long time, geoheritage site is a unique natural phenomenon that can be used as one of the natural tourist attraction for the district and province. Conservation is done by parties - parties concerned or concerned about the sand dunes either the agency, agency, or individual.

Another research on the analysis of land use dynamics in Parangtritis gumukpasir area Bantul district year 2003-2014 conducted Dani et al, 2016 mentioned that in the study the total area of geo tourism sands parangtritis sand in 2014 decreased total area of 178.13 ha. The area is obtained by knowing the level of land cover change around the parangtritis sand dune area in the year 2003-2006-2010-2014. Each year of recording in land cover data extraction to find land use change in each recording year up to 2014. The end result is a total change in total area of sand dunes from 2003-2014.

CONCLUSION

Parangtritis sand dunes mostly dominated by pentutp gumuk and shrubs, some other pentupp in Parangtritis sand dunes are land, water bodies, moor and open land with the change area of the second year of recording is a reduction of 47.4%. The reduction of sand dune area is caused by the transfer of sand dune area around Parangtritis majority due to human activities.

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