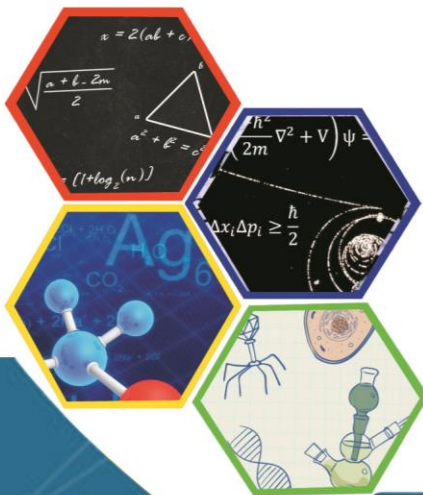




# PROCEEDING

The 2<sup>nd</sup> International Seminar of Basic Science  
Natural Science For Exploration The Sea-Island Resources  
Ambon, May 31<sup>st</sup> 2016



Organized by  
Faculty of Mathematics and Natural Science  
Pattimura University



# PROCEEDINGS

The 2<sup>nd</sup> International Seminar of Basic Science

*“Natural Science for Exploration The Sea-Island Resources”*

Poka-Ambon, 31<sup>st</sup> May 2016

**Mathematic and Natural Science Faculty  
Universitas Pattimura  
Ambon  
2016**

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The 2<sup>nd</sup> International Seminar of Basic Science

May, 31<sup>st</sup> 2016

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## Welcoming Address By The Organizing Committee

Today, We have to thank the The Almighty Allah SWT for the implementation of this international seminar. This is the second seminar about Basic Science in The Faculty of MIPA Pattimura University. The seminar under the title “Natural Sciences for Exploration the Sea-Island Resources” will be carried out on May 31<sup>st</sup> 2016 at Rectorate Building, Pattimura University. There are 200 participants from lecturers, research institute, students, and also there are 34 papers will be presented.

My special thanks refer to the rector of Pattimura University and the Dean of MIPA Faculty, Prof. Dr. Pieter Kakissina, S.Pd., M.Si. I also would like to express my deepest gratitude to Prof. Amanda Reichelt-Brushett, M.Sc., Ph.D. ; Kazuhiko Ishikawa, Ph.D. ; Nicolas Hubert, Ph.D. ; Prof. Dr. Kirbani Sri Brotopuspito ; Prof. Dr. Marjono, M.Phil. ; Gino V. Limon, M.Sc., Ph.D. as the keynote speakers.

The last, We hope this international seminar usefull for all of us, especially Mollucas People and very sorry if any mistake. Thank you very much.

**Dr. La Eddy, M.Si.**

Chairman of Organizing Committee

## Opening Remarks By Dean of Mathematic and Natural Sciences Faculty

I express my deepest gratitude to The Almighty God for every single blessing He provides us especially in the process of holding the seminar until publishing the proceeding of International Seminar in celebrating the 18<sup>th</sup> anniversary of MIPA Faculty, Pattimura University. The theme of the anniversary is under the title “Natural Sciences for Exploration the Sea-Island Resources”. The reason of choosing this theme is that Maluku is one of five areas in Techno Park Marine in Indonesia. Furthermore, it is expected that this development can be means where the process of innovation, it is the conversion of science and technology into economic value can be worthwhile for public welfare especially coastal communities.

Having the second big variety of biological resources in the world, Indonesia is rich of its marine flora and fauna. These potential resources can be treated as high value products that demand by international market. Basic science of MIPA plays important role in developing the management of sustainable marine biological resources.

The scientific articles in this proceeding are the results of research and they are analyzed scientifically. It is expected that this proceeding can be valuable information in terms of developing science and technology for public welfare, especially people in Maluku.

My special thanks refer to all researchers and reviewers for your brilliant ideas in completing and publishing this proceeding. I also would like to express my gratefulness to the dies committee-anniversary of MIPA Faculty for your creativity and hard working in finishing this proceeding, God Bless you all.

**Prof. Dr. Pieter Kakisina, S.Pd., M.Si.**

Dean of Mathematic and Natural Sciences Faculty

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## ACKNOWLEDGMENT

The following personal and organization are greatly  
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## SPATIAL DISTRIBUTION ANALYSIS OF O<sub>2</sub> BY USING *IN SITU* DATA AND LANDSAT 8 IMAGERY (STUDY CASE: GILI IYANG, SUMENEP)

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### ABSTRACT

All living things need O<sub>2</sub> for breathing. O<sub>2</sub> was functioned to establish the metabolism process or the exchange of substances which were produced the energy for the growth and reproduction. The purpose of this study was to analyze the spatial distribution of O<sub>2</sub> content at the region of Gili Iyang by using chemical electro method. The content of O<sub>2</sub> analyzing was identified by vegetation index value using Enhanced Vegetation Index (EVI) algorithm through Landsat 8, and it relationship with Digital Elevation Model (DEM) data. The result of the study was obtained the average of oxygen content at Gili Iyang of 20.9 %. The relationship between EVI and O<sub>2</sub> showed the low correlation with  $R^2 = 0.2236$ . The low correlation was also shown in relation between DEM and O<sub>2</sub> content ( $R^2 = 0.1962$ ). It means there was not relationship between EVI, DEM and O<sub>2</sub> content in the Gili Iyang.

**Keywords:** Oxygen, Digital Elevation Model (DEM), Enhanced Vegetation Index (EVI), Landsat 8.

### INTRODUCTION

Indonesia is an archipelagoes country with a sea area was larger than the land (Nontji, 2005 *in* Zulkarnain et al, 2013). Gili Iyang is a small island located between the clusters of islands in the eastern of Madura Island. The concentration of O<sub>2</sub> in this island is very high with average of 21.4% (Jaelani et al, 2016).

O<sub>2</sub> was needed by all living things for the process of respiration. Humans being could live in the air that only contains 17 percent O<sub>2</sub> per volume, and yet when the concentration was less than this, the breathing became difficult and the symptom of anoxia (lack of O<sub>2</sub>) appears. Victims became drowsy, unable to think clearly, and finally got into the unconsciousness (Scarlett, 1958).

This study was aimed to analyze the distribution of O<sub>2</sub> levels by performing direct measurements in the field (*in situ*) using an electrochemical method. The parameters for analyzing oxygen levels was obtained by using remote sensing technology to identify the value of vegetation index that used an algorithm of Enhanced Vegetation Index (EVI) through Landsat 8 imagery.

Another parameter that was used to analyze the distribution of O<sub>2</sub> levels was by seeing the topography condition in the region of Gili Iyang to investigate the influence of elevation on the O<sub>2</sub> levels by used data from the Digital Elevation Model (DEM). DEM was a continuously

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digital picture according to the space of the state of the earth's surface relief. Attributes form regions / slope that could be derived from the DEM, as follows: the slope, slope shape, slope aspect, slope length, slope shape, and the difference in altitude (Buyung & Salwati, 2008).

According to Tempfli (1991), DEM is the digital data that describes the geometry of the shape of the earth's surface or its part which consists of a set of coordinate points sampling results from the surface with an algorithm that defined the surface using a set of coordinates.

## MATERIALS AND METHODS

### Study Area and Data Collection

This research was conducted in the area of Gili Iyang, Sub District of Dungkek, Sumenep Madura Island, East Java Province. Geographically Gili Iyang is located between  $6.96^{\circ}$  -  $7.01^{\circ}$  S and  $114.15^{\circ}$  -  $114.19^{\circ}$  E.

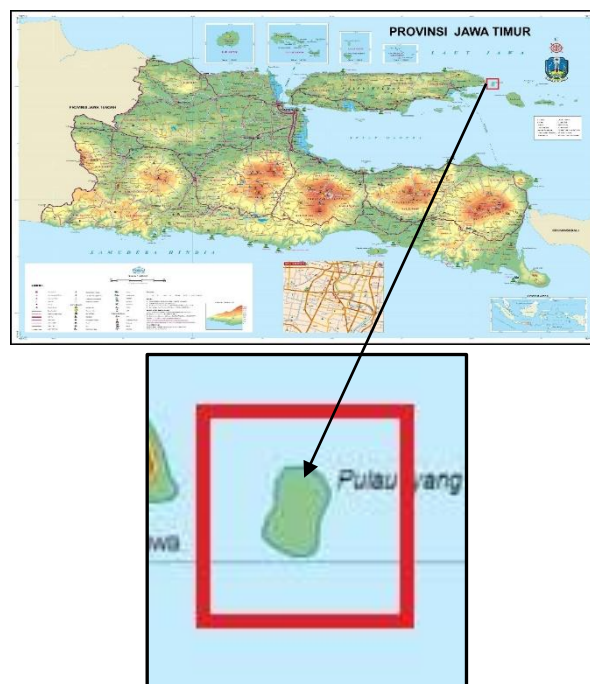


Figure 1. Location of the Research

### Data Acquisition

#### a. *In situ* data

*In situ* data was collected by measuring collection the levels of  $O_2$  and temperature using the DO Meter Lutron 5510, while the field coordinates was measured using HandHeld GPS. The distribution of sample points was done randomly at 16 stations with different elevation above the sea level. The distribution of the stations and coordinates observation were presented in the following table:

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Table 1. Field Measurement Coordinates

Station	Longitude ( <sup>o</sup> )	Latitude ( <sup>o</sup> )
ST 1	114.17349	-6.96955
ST 2	114.16871	-6.97123
ST 3	114.17826	-6.97446
ST 4	114.18559	-6.97716
ST 5	114.16759	-6.98051
ST 6	114.16939	-6.98142
ST 7	114.17246	-6.98361
ST 8	114.17731	-6.9838
ST 9	114.17926	-6.98918
ST 10	114.18027	-6.98941
ST 11	114.18418	-6.98873
ST 12	114.17893	-7.00082
ST 13	114.17499	-7.00201
ST 14	114.16341	-7.00014
ST 15	114.16193	-6.99725
ST 16	114.16541	-6.98233

b. Landsat 8 Imagery

Imagery used in this study was the image of the Landsat 8 satellite recorded on October 15, 2015 in the area around Gili Iyang, Sumenep, Madura Island at a path/row = 117/065. The data was ordered and downloaded through <http://espa.cr.usgs.gov/>.

c. Digital Elevation Model (DEM)

DEM data used in this research was data downloaded through software of Global Mapper particularly the region of Gili Iyang.

## Phase Data Processing

Landsat 8 used was the surface reflectance (SR) that has been atmospherically corrected. The vegetation index value was calculated from Landsat 8 – SR data. The algorithm used to analyze the vegetation index was the algorithm Enhanced Vegetation Index (EVI). Based on the research of Liu and Huete (1995), EVI algorithm could be written as follows:

$$EVI = G \times \frac{NIR - RED}{NIR + (C1 \times RED - C2 \times BLUE) + L}$$

Where:

*NIR* = Value canal near infrared reflectance

*RED* = Reflectance value of the red channel

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*BLUE* = Reflectance value of the blue channel

*C1* = The effect of atmospheric correction coefficients in the red channel

*C2* = Correction coefficients atmospheric influences on the blue channel

*L* = Background illumination correction ground

*G* = gain factor

The data from 16 stations were extracted following field coordinates. All of the data processing in this study was performed using software BEAM - VISAT 5.0. From the processed image, the coefficient of determination ( $R^2$ ) between the field measurement data (content of O<sub>2</sub>) and the value of vegetation index were calculated.

DEM data processing was more devoted to the altitude only. The results of the DEM processing were used to see the elevation difference at every point of the measurement of O<sub>2</sub>.

## RESULTS AND DISCUSSION

### Analysis of Vegetation Index

Vegetation index is a indication of the optical level of greenness of vegetation canopy, the composite nature of the composite of leaves, leaf area, and a canopy covered by the vegetation (Huete, 2011). Enhanced Vegetation Index (EVI) is a vegetation index that was developed to minimize the effect of background canopy and atmospheric variations that better than NDVI.

EVI was calculated by using the reflectance of the blue band (0.45 – 0.51  $\mu\text{m}$ ), red band (0.64 – 0.67  $\mu\text{m}$ ), and near infrared (0.85 – 0.88  $\mu\text{m}$ ). Here is a table of field measurements of O<sub>2</sub> and EVI value from Landsat 8 data.

Table 2. Results of Measurement of O<sub>2</sub> Content and EVI

Stations	EVI	O <sub>2</sub> Content (%) ( <i>in situ</i> )
St 1	0.21163863	20.9
St 2	0.2332807	20.8
St 3	0.1971175	20.4
St 4	0.24284512	20.7
St 5	0.20165534	21
St 6	0.1903107	20.8
St 7	0.18200293	21.3
St 8	0.20591395	20.6
St 9	0.19659388	20.8
St 10	0.20280726	20.3
St 11	0.16036086	21.5
St 12	0.1791406	21.1
St 13	0.19634955	21.2
St 14	0.22291346	21
St 15	0.23698081	20.8
St 16	0.20364502	20.7
Average	0.203972269	20.9

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Table 2 shown that O<sub>2</sub> levels in Gili Iyang was very high with average of 20.9%. The average value of EVI obtained from Landsat 8 data was very low of 0.203972269. The low value of index vegetation caused Gili Iyang was in dry conditions. Therefore it could be concluded that, the low value of the vegetation was not affected by the high level of O<sub>2</sub>.

## Regression Model

The O<sub>2</sub> content could not be processed by using satellite data. To determine the relationship between the data in this study, the regression model was used. The relation ( $R^2$ ) between O<sub>2</sub> content and EVI was 0.2236. This result showed a low relationship between these data. The relation between oxygen content and EVI could be seen in the figure 2 below:

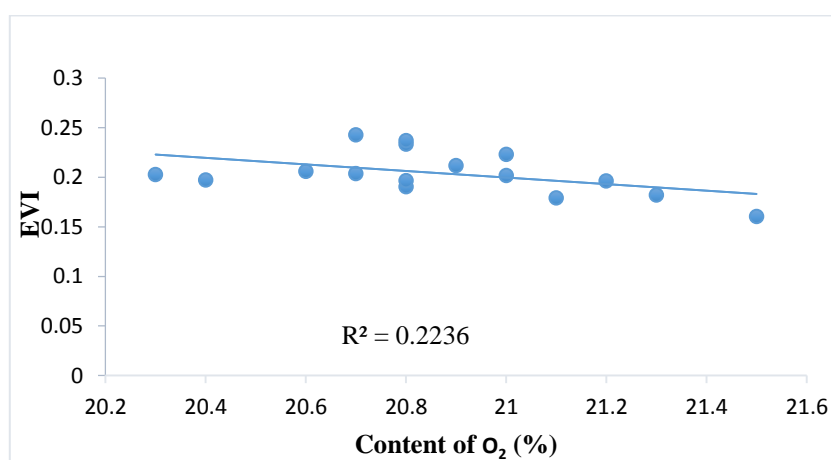


Figure 2. The relation between O<sub>2</sub> content and EVI

Thus the weakness of correlation between O<sub>2</sub> content and EVI was caused by field campaign was performed during a long dry season indicated by brown-leaves vegetation, condition within the area of Gili Iyang was suitable for vegetation analysis. The condition of Gili Iyang was shown in figure 3 below:

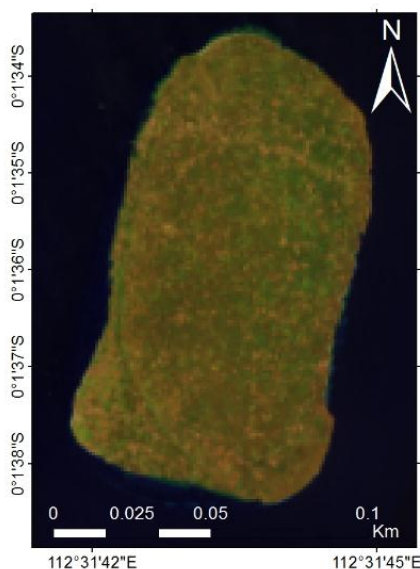


Figure 3. Landsat 8, recorded in 15<sup>th</sup> October 2015 (RGB 7;5;3)

**DEM Analysis**

In this study, DEM was used to see the topography condition of Gili Iyang area specifically for the elevation. The elevation result was 0 – 45 m. DEM was classified into 6 classes to analyze the effect of elevation. The relationship between elevation and content of O<sub>2</sub> was presented in the table 3 below:

Table 3. The relationship between elevation and content of O<sub>2</sub>

Class	Elevation (m)	Stations	Average O <sub>2</sub> Levels (%)
1	0 - 5	11	21.5
2	5 - 14	2	20.8
		14	
		15	
		16	
3	14 - 22	4	20.7
4	22 - 28	1	20.8
		5	
		8	
		9	
		10	
		13	
5	28 - 34	12	21.1
6	34 - 45	3	20.8
		6	
		7	

Based on Table 3, the highest of O<sub>2</sub> content was produced 21.5% at station 11 with the range of elevation 0 to 5 m. Meanwhile the lowest of O<sub>2</sub> content was obtained 20.7% at station 4 with the range of elevation 14 to 22 m.

The correlation between O<sub>2</sub> content and elevation could be seen in the figure 4.

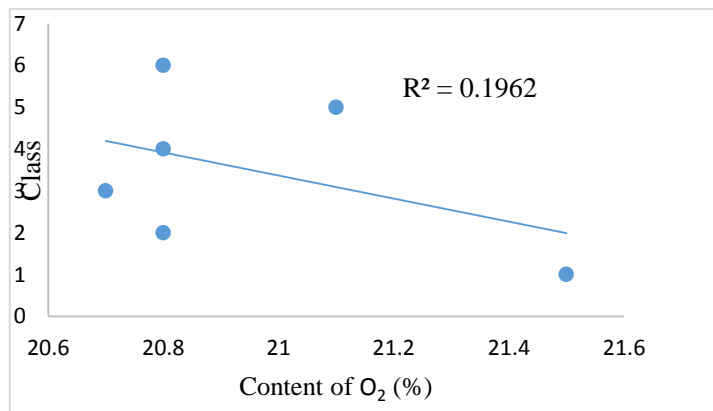


Figure. 4. The correlation between the elevation and O<sub>2</sub> levels

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Figure 4 shown that the correlation between elevation and levels of O<sub>2</sub> had a low correlation. The elevation in figure 4 based on classification that made in previous stage. The low correlation produced of 0.1962. It means, there was not relationship between elevation and O<sub>2</sub> content in the Gili Iyang.

## CONCLUSION

Study spatial distribution analysis of O<sub>2</sub> by using *in situ* data and Landsat 8 imagery in the Gili Iyang has been done. The levels of O<sub>2</sub> in this island is very high with average 20.9%. The relationship ( $R^2$ ) between the O<sub>2</sub> content and EVI was 0.2236. These results indicated low correlation between them. The low correlation because the research conducted during dry season. Therefore, the vegetation in the area of Gili Iyang was in a poor condition. The low correlation was also shown in relation between DEM and Oxygen content ( $R^2 = 0.1962$ ). It means the elevation level did not affect the O<sub>2</sub> content in Gili Iyang.

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