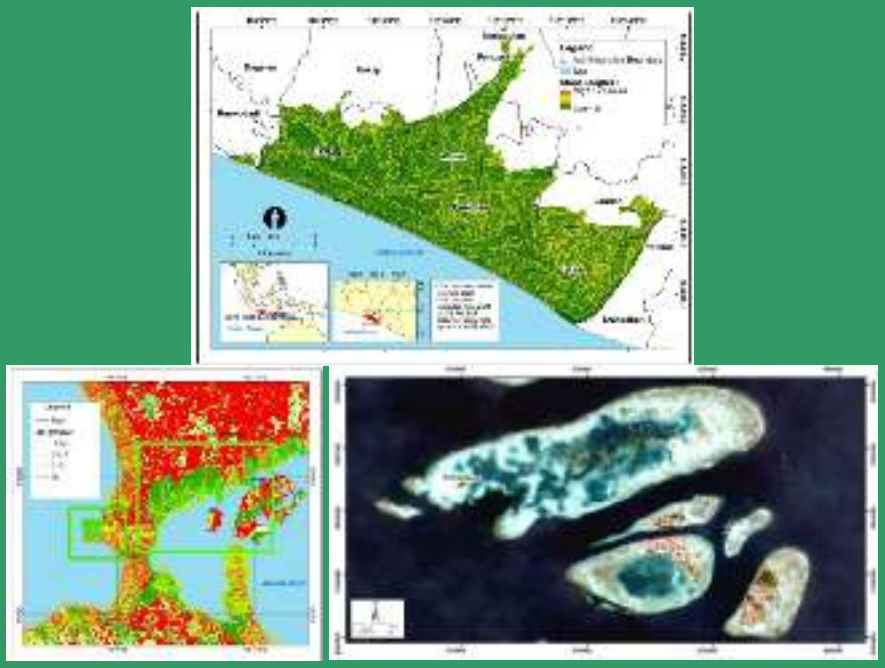
Vol. 19 No. 2 December 2022

P-ISSN 0216-6739; E-ISSN 2549-516X
Accreditation No. 30/E/KPT/2018

International Journal of Remote Sensing and Earth Sciences



Vol. 19 No. 2 December 2022

P-ISSN 0216-6739; E-ISSN 2549-516X
Accreditation No. 30/E/KPT/2018

Published by
Indonesian National Institute of Aeronautics and Space
(LAPAN)

International Journal of Remote Sensing and Earth Sciences

Published by
Indonesian National Institute of Aeronautics and Space
(LAPAN)

Editorial Committee Preface

Dear IJReSES Readers,

We sincerely thank you for reading the International Journal of Remote Sensing and Earth Sciences Vol. 19 No 2, December 2022. In general, this journal is expected to enrich the serial publications on earth sciences. In particular this journal is aimed to present improvement in remote sensing studies and its applications on earth sciences. This journal also serves as the enrichment on earth sciences publication, not only in Indonesia and Asia but also worldwide.

This journal consists of papers discussing the particular interest in remote sensing field. Those papers are having remote sensing data for image processing, geosciences, oceanography, environment, disaster, mining activities, etc. A variety of topics are discussed in this seventeen edition. Briefly, the topics discussed in this edition are the studies of remote sensing data processing issues such as bathymetri, tsunami disaster risk, water resource, flood disaster areas, weathers, and peatland. There some new methods, new analysis, and new novelties on this edition.

Finally, enjoy your reading of the IJRESES Vol. 19 No. 2 December 2022, and please refer this journal content for your next research and publication. For editorial team members and the journal secretariat, thank you very much for all big supports for this volume publication.

Editor-in-Chief,

Dr M. Rokhis Khomarudin.

IJReSES Secretariat
Indonesian National Institute of Aeronautics and Space (LAPAN)
Jl. Kalisari No. 8, Pekayon, Pasar Rebo, Jakarta 13710, INDONESIA
Telp. (021) 8710065, Fax. (021) 8722733
www.jurnal.lapan.go.id

Published by:
National Institute of Aeronautics and Space of Indonesia
(LAPAN)

INTERNATIONAL JOURNAL OF
REMOTE SENSING AND EARTH SCIENCES
Vol. 19 No. 2 December 2022
P-ISSN 0216-6739; E- ISSN 2549-516X
Accreditation No. 30/E/KPT/2018

Contents

International Journal of
Remote Sensing and Earth Sciences
P-ISSN 0216 – 6739; E- ISSN 2549-516X Vol. 19 No. 2 December 2022
Accreditation No. 30/E/KPT/2018

ABSTRACT

PLATFORM REEF LAGOON DETECTION FROM SENTINEL-2 IN PANGGANG ISLAND AND SEMAKDAUN ISLAND/ Wikanti Asriningrum, Azura Ulfa, Kholifatul Aziz, Kuncoro Teguh Setiawan, Dyah Pangastuti
IJRESES, 19 (2) 2022: 101-118

Processing of satellite image data for the detection of platform reef lagoons is intended as one of the geo-physical parameters of the reef landform. Panggang Island and Semakdaun Island were chosen to make the detection model because they are ideal for lagoon reef landforms and tapulang court reefs. This model is only valid in the continental shelf area and the back arc and small island tectonic type. Determination of this location is done to improve the accuracy of spectral-based data processing. Platform reefs are one of four classes of reef landforms. Sentinel-2A data with a spatial resolution of 10m, blue, green, red, and near infrared bands were selected to investigate their ability to detect lagoons. Processing of data by calculating the Optimum Index Factor (OIF) to produce a composite image and drawing transect lines to produce pixel values and spectral graphics of the lagoon. The results of data processing in the form of graphs, composite images and pixel values were built to realize a digital lagoon detection model. These results are used for lagoon growth stage analysis for the classification of three reef platform landforms, visually and digitally interpretation. This digital and visual detection system design is useful for monitoring coral reef ecosystems.

Keywords: *Sentinel-2, lagoon, platform reef, Panggang Island, Semakdaun Island*

DETECTION OF WATER-BODY BOUNDARIES FROM SENTINEL-2 IMAGERY FOR FLOODPLAIN LAKES/ Azura Ulfa, Fajar Bahari Kusuma, A. A. Md. Ananda Putra Suardana, Wikanti Asriningrum, Andi Ibrahim, Lintang Nur Fadlillah
IJRESES, 19 (2) 2022: 119-132

The impact of climate and human interaction has resulted in environmental degradation. Consistent observations of lakes in Indonesia are quite limited, especially for flood-exposure lake types. Satellite imagery data improves the ability to monitor water bodies of different scales and the efficiency of generating lake boundary information. This research aims to detect the boundaries of flood-exposure type lake water bodies from the detection model and calculate its accuracy in Semayang Melintang Lake using Sentinel-2 imagery data. The characteristics of water, soil, and vegetation objects were investigated based on the spectral values of the composite image bands from the Optimum Index Factor (OIF) calculation, to support the lake water body boundary detection model. The Object-Based Image Analysis (OBIA) method is used for water and non-water classification, by applying the machine learning algorithms random forest (RF), support vector machine (SVM), and decision tree (DT). Model validation was conducted by comparing spectral graphs and lake water body boundary model results. The accuracy test used the confusion matrix method and resulted in the highest accuracy value in the SVM algorithm with an Overall Accuracy of 95% and a kappa coefficient of 0.9. Based on the detection model, the area of Lake Semayang Melintang in 2021 is 23392.30 ha. This model can be used to estimate changes in the area of the flood-exposure lake consistently. Information on the boundaries of lake water bodies is needed to control the decline in the capacity and inundation area of flood-exposure lakes for management and monitoring plans.

Keywords: *Lake; Floodplain; Remote Sensing; OBIA; Water Bodies*

International Journal of
Remote Sensing and Earth Sciences
P-ISSN 0216 – 6739; E- ISSN 2549-516X Vol. 19 No. 2 December 2022
Accreditation No. 30/E/KPT/2018

ABSTRACT

SPATIAL MACHINE LEARNING FOR MONITORING TEA LEAVES AND CROP YIELD ESTIMATION USING SENTINEL-2 IMAGERY, (A Case of Gunung Mas Plantation, Bogor)/ Dini Nuraeni, Masita Dwi Mandini Manessa
IJRESES, 19 (2) 2022: 133-142

Indonesia's tea production and export volume have fluctuated with a downward trend in the last five years, partly due to the increasingly competitive world tea quality. Crop yield estimation is part of the management of tea plucking, affecting tea quality and quantity. The constraint in estimating crop yields requires technology that can make the process more effective and efficient. Remote sensing technology and machine learning have been widely used in precision agriculture. Recently, big data processing, especially remote sensing data, machine learning, and deep learning have been carried out using a cloud computing platform. Therefore, we propose using GeoAI, a combination of Sentinel-2A imagery, machine learning, and Google Collaboratory, to predict ready for plucking tea leaves at optimal plucking time at Gunung Mas Plantation Bogor. We used selected bands of Sentinel-2A and extracted more features (i.e., NDVI) as a training set. Then we utilized the tea blocks boundary and tea plucking data to generate labels using Random Forest (RF) and Support Vector Machine (SVM). The classification results were further used to estimate the production of crop tea yield. The RF classifier is able to achieve overall accuracy at 51% and SVM at 54%. Meanwhile, accuracy at optimally aged tea blocks is able to achieve at 75.62% for RF and 52.88% for SVM. Thus, the SVM classifier is better in terms of overall accuracy. Meanwhile, the RF classifier is superior in predicting ready for plucking tea at optimally aged tea blocks.

Keywords: *GeoAI; Sentinel-2; machine learning; crop tea yield estimation.*

ENHANCING COASTAL DISASTER MITIGATION MEASURES: VEGETATION BASED FEASIBILITY STUDY FOR SOUTHERN JAVA, INDONESIA/ Adiguna Rahmat Nugraha, Jason R. Parent
IJRESES, 19 (2) 2022: 143-152

Indonesia is a country that is prone to disaster especially earthquake and volcanic eruption because its located in the ring of fire. The type of disasters can produce another type of disaster which is: tsunami. Â The nature of tsunamis that were hard to predict and arrive with little warning, Indonesians can minimize the effect of tsunami by creating coastal protection. In this study we look for the location to create the coastal forest as an enhancement of the mitigation effort. We conducted our study in the Pangandaran district as were a severe tsunami in the 2006 that caused more than 400 deaths. We conducted a suitability analysis to identify tsunami prone area based on the following criteria: should be had elevation <10m, slope gradient <2%, within proximity of 500m from coastline, and <100m from river and should be settlement or urban area. The creation of vulnerability map was using map algebra to calculate the weighted parameter from each class. Based our analysis using GIS analysis, the most vulnerable area in the Pangandaran district is the bay area, where we founded 1,419 acres of coastal area for which coastal forests could be planted to enhance protection against tsunamis.Â

Keywords: *tsunami, coastal protection, Pangandaran District, mitigation*

International Journal of
Remote Sensing and Earth Sciences
P-ISSN 0216 – 6739; E- ISSN 2549-516X Vol. 19 No. 2 December 2022
Accreditation No. 30/E/KPT/2018

ABSTRACT

MAPPING THE AIR MOISTURE CHANGE IN UNDER CANOPY TREES USING A HEMISPHERICAL AND AERIAL PHOTOGRAPH BASED ON MACHINE LEARNING APPROACHES/ Mochamad Firman Ghazali
IJRESES, 19 (2) 2022: 153-166

The essential roles of trees in controlling the local climatic variation, such as air moisture, are still interesting to observe. Therefore, this study must deliver knowledge of the benefits of growing trees and enhance people's awareness of climate change adaptation. Here, the analysis requires several data fields such as hemispherical photography, an aerial photograph of a UAV, and air temperature collected using a wet and dry bulb thermometer, which has converted to air moisture. All these are considered to understand the air moisture change under the trees' canopy during a day observation. The hemispherical photography and aerial photograph of a UAV are processed to measure the tree's canopy size and then used together with interpolated air moisture to map the variation in air moisture distribution in under-canopy trees using random forest (RF) and Artificial Neural Network (ANN). The result shows that hemispherical photography describes the ability to control the air moisture change. As its size increases, the air moisture level tends to be higher. It was maintained at more than 70% compared to the area with lower canopy cover. This characteristic is similar to the pattern shown by the RF and ANN. However, the SVM has better results as it can separate air humidity in vegetated and non-vegetated areas.

Keywords: *hemispherical photography; trees canopy; air humidity; spatial distribution; aerial photograph*

DIFFERENCES OF COASTALLINE CHANGES IN THE AREA AFFECTED BY LAND COVER CHANGES AND COASTAL GEOMORPHOLOGICAL SOUTH BALI 1995 - 2021/ Muhammad Dimyati, Muhamad Rafli, Astrid Damayanti
IJRESES, 19 (2) 2022: 167-176

The South Bali coast is prone to abrasion due to its geographical position facing the Indian Ocean. High sea waves and currents in the south of Bali will erode beaches whose lithology and morphology are prone to abrasion. Land cover conditions that do not support coastal protection will also affect the high abrasion of the southern coast of Bali. This study aims to analyze the shoreline changes in South Bali from 1995-2021. The analytical method used is the Digital shoreline analysis system (DSAS), with data from Landsat 5 TM, Landsat 7 ETM+, Landsat 8 OLI/TIRS, and Sentinel 2A. The analysis results show that the area directly facing the waves is relatively high, with volcanic rock formations, and there is no mangrove as coastal protection. The lack of good coastal management shows the area with the highest abrasion. It was found in the western part of Tabanan Regency, eastern Gianyar, and southern Badung. Meanwhile, the average coastal accretion was relatively high in the neck of South Bali, in areas where the land cover was mangrove and adjacent to river mouths, which experienced much sedimentation.

Keywords: *shorelines, digital shoreline analysis system, land cover change, volcanic morphology*

International Journal of
Remote Sensing and Earth Sciences
P-ISSN 0216 – 6739; E- ISSN 2549-516X Vol. 19 No. 2 December 2022
Accreditation No. 30/E/KPT/2018

ABSTRACT

TEA PLANT HEALTH RESEARCH USING SPECTROMETER/ Dwi Hastuti, Masita Dwi Mandini Manessa, Mangapul Parlindungan Tambunan
IJRESES, 19 (2) 2022: 177-184

Tea leaves are the most important part for consumption. Leaves that are healthy have a distinct color, while leaves that are not healthy have a color that is very different from the original. Chlorophyll in leaves effects the reflection of infrared light, allowing healthy plants to reflect more infrared light than unhealthy plants. Leaf color and chlorophyll have an important role in showing the growth and health of tea plants. Remote sensing consists of collecting information about objects and features without contacting the equipment. The Normalized Difference Vegetation Index (NDVI), one of the first remote sensing analysis products used to simplify the complexity of multispectral imaging, is now the most commonly used index for botanical assessment. inconsistencies in NDVI depending on sensor-specific spatial and spectral resolutions. Different parts of the leaf have discolored spots due to health conditions or nutritional stress, so there are different spectral values on different parts of the leaf. Unhealthy tea leaves have low NIR values due to disease, insects, and sunburn, which damage the chloroplast structure of the leaves, weaken the absorption of the appropriate band, and increase reflectance. There is a difference between the measurement results of the NDVI spectrometer and the sentinel image. This is due to the fact that the Sentinel-2 image can only retrieve image pixels with a resolution and not diseased leaf parts, as with the use of a spectrometer, which directly extracts the value of the infected area from the normal part of the plant.

Keywords: *healthy tea, spectrometer, NDVI, Sentinel-2*

TSUNAMI HAZARD MODELING IN THE COASTAL AREA OF KULON PROGO REGENCY/ Dwiana Putri Setyaningsih, Hubertus Ery Cantas Pratama Sutiono, Amelia Rizki Gita Paramanandi, Ernani Uswatun Khasanah, Tri Wahyuni, Bernadeta Aurora Edwina Kumala Jati, Muhammad Falakh Al Akbar, Wirastuti Widyatmanti, Totok Wahyu Wibowo
IJRESES, 19 (2) 2022: 184-196

Kulon Progo Regency is located in the southern part of Java Island, one of Indonesia's areas that is prone to tsunami disasters. Kulon Progo Regency is prone to tsunamis because it faces a subduction zone in the Indian Ocean. Therefore, it is necessary to model tsunami inundation and map the tsunami hazard zone in the Kulon Progo coastal area. This study aims to model tsunami inundation and produce a tsunami hazard map with a tsunami height scenario of 5 meters and 10 meters. The method used in modeling tsunami inundation is using a mathematical calculation developed by Berryman-2006 using the parameters of the coefficient of surface roughness, slope, and the height of the tsunami at the coastline. The estimated tsunami inundation area is classified into a tsunami hazard index using the fuzzy logic method resulting in an index of 0 – 1, which is then divided into three hazard classes. The results of the tsunami hazard mapping with the 5 meters scenario are 15 villages in 4 sub-districts included in the hazard zone with a total area of 20672,34 Ha affected. The results of the tsunami hazard mapping with a 10 meters scenario are 26 villages in 4 sub-districts with a total area of 53042,66 Ha affected. The results of this research can be used as basic information for disaster mitigation.

Keywords: *tsunami; inundation; hazard; Kulon Progo; GIS.*

International Journal of
Remote Sensing and Earth Sciences
P-ISSN 0216 – 6739; E- ISSN 2549-516X Vol. 19 No. 2 December 2022
Accreditation No. 30/E/KPT/2018

ABSTRACT

COMPARISON OF MACHINE LEARNING ALGORITHMS FOR LAND USE AND LAND COVER ANALYSIS USING GOOGLE EARTH ENGINE (CASE STUDY: WANGGU WATERSHED)/ Septianto Aldiansyah, Randi Adrian Saputra
IJRESES, 19 (2) 2022: 197-210

Human population growth and land use and land cover (LULC) change have always developed side by side. Considering selection of a good Machine Learning (ML) classifier algorithm is needed considering the high estimation of LULC maps based on remote sensing. This study aims to produce a LULC classification of Landsat-8 and Sentinel-2 images by comparing the accuracy performance of three ML algorithms, namely: Classification and Regression Tree (CART), Random Forest (RF), and Support Vector Machine (SVM). Dataset comparison ratios were also explored to find the LULC classification results with the best accuracy. Sentinel-2 is better than Landsat-8 regarding Overall Accuracy (OA) and Coefficient Kappa. The comparison ratio of the training and testing datasets with a good level of accuracy is 70:30 on both images with the average OA Landsat-8 and Sentinel-2 being 92.09% and 94.21%, respectively. The RF algorithm outperforms CART and SVM in both types of satellite imagery. The mean OA of the CART, RF, and SVM classifiers was 92.03%, 94.74%, 83.54% on Landsat-8, 93.14%, 96.15%, and 93.34% on Sentinel-2, respectively.

Keywords: *Google Earth Engine; Land Use Land Cover; Classification and Regression Tree; Random Forest; Support Vector Machine*