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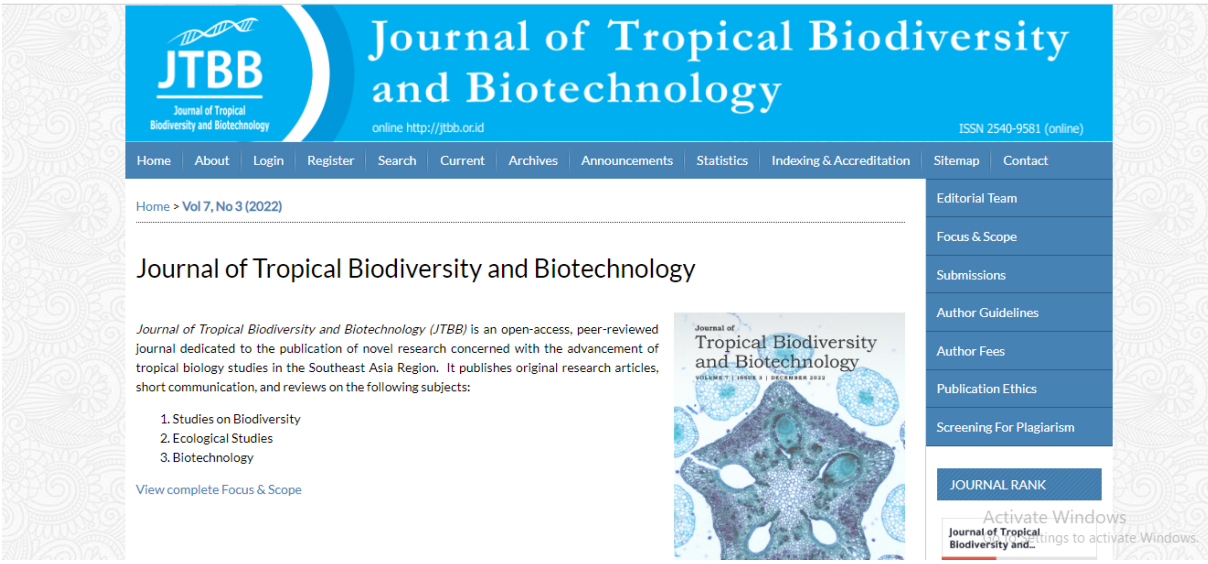


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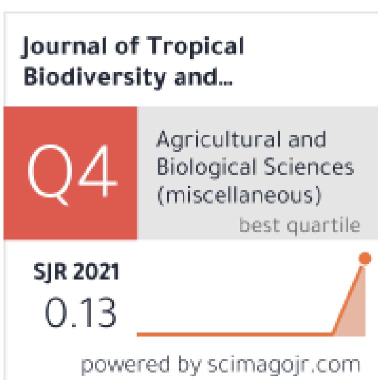


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Abdul Malik <abdulmalik@unm.ac.id>

# [JTBB] Article Review Request

**Liya Audinah** <liyaaudinah15@gmail.com> Fri, Sep 30, 2022 at 11:08 PM
To: Abdul Malik <abdulmalik@unm.ac.id>

Dear Abdul Malik,

I believe that you would serve as an excellent reviewer of the manuscript, "Combining moderate and high resolution of satellite images for characterizing suitable habitat for vegetation and wildlife," which has been submitted to Journal of Tropical Biodiversity and Biotechnology. The submission's abstract is inserted below, and I hope that you will consider undertaking this important task for us.

Please log into the journal web site by 2022-10-07 to indicate whether you will undertake the review or not, as well as to access the submission and to record your review and recommendation.

The review itself is due 2022-10-14.

Submission URL:
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Before accept or decline, please consider the following questions:
1. Does the article match your area of expertise? Only accept if you feel you can provide a high-quality review.
2. Do you have a potential conflict of interest? Disclose this to the editor when you respond.
3. Do you have time? Reviewing can be a lot of work – before you commit, make sure you can meet the deadline.

Thank you for considering this request.

Liya Audinah
Faculty of Biology, Universitas Gadjah Mada
liyaaudinah15@gmail.com

"Combining moderate and high resolution of satellite images for characterizing suitable habitat for vegetation and wildlife"

Abstract

Combining different resolution of remote sensing satellites become a unique approach for vegetation and wildlife habitat assessment study.  Remote sensing technology can reach land and water on the Earth's surface, and it can interpret signals from spectral responses. When these techniques are combined with Geographical Information Systems (GIS), land can be monitored in a variety of ways.  WorldView-2 and GeoEye-1 satellite image were pre-processes, processes, and classified to produce land use indicator in Sabah Softwoods Tree Plantation majoring Eucalyptus spp. tree planted in Tawau, Sabah.  Net Primary Productivity at monthly scale was also calculated and ranked the productivity for the suitability mapping. Climatic condition based on monthly precipitation and seasonality derived from ASEAN Specialized Meteorological Centre (ASMC) was employed for ranking its suitability value.  In this study, natural forest and oil palm plantation is tested to developed suitability map for vegetation and wildlife habitat to live with. All indicators were ranked 10 to 40 presenting benefit and usefulness of the indicator to vegetation and wildlife in the study area.  Then, final classification was made from accumulation of those indicators into 0 to 200 (Not suitable to Highly suitable).  The results showed 59.9% of the area classified as moderately

suitable, 36.9% highly suitable, 3.2% least suitable and no area was classified as not suitable. This type of study assists forest managers and policymakers for better managing of their forests for better life of trees and wildlife under their management.

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**Abdul Malik <abdulmalik@unm.ac.id>**

# [JTBB] Article Review Acknowledgement

**Liya Audinah** <liyaaudinah15@gmail.com> Thu, Nov 10, 2022 at 11:08 PM
To: Abdul Malik <abdulmalik@unm.ac.id>

Dear Abdul Malik,

Thank you for completing the review of the submission, "Combining moderate and high resolution of satellite images for characterizing suitable habitat for vegetation and wildlife," for Journal of Tropical Biodiversity and Biotechnology. We appreciate your contribution to the quality of the work that we publish.

In addition, Journal of Tropical Biodiversity and Biotechnology is a partner of Publons; a company works with researchers, publishers, and research institutions to speed up science and research by harnessing the power of peer review. We encourage you to check our page in Publons (https://publons.com/journal/59779/journal-of-tropical-biodiversity-and-biotechnology) and add reviews that you have done for us.

Sincerely yours,

Liya Audinah
Faculty of Biology, Universitas Gadjah Mada
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# CERTIFICATE OF ACKNOWLEDGEMENT

UGM/BI/JTBB/02/X/2022

This is presented to

# Abdul Malik, S.T., M.Si., Ph.D.

for contributing as a reviewer for the Journal of Tropical Biodiversity and Biotechnology in volume 7 issue 3 December 2022

**Dr. Miftahul Ilmi**

Editor in Chief

Journal of Tropical Biodiversity and Biotechnology

# Combining moderate and ~~high~~ high-resolution ~~of~~ satellite images ~~for characterizing~~to characterize suitable habitats for vegetation and wildlife


## Abstract

Combining different resolutions of remote sensing satellites become~~ a unique approach for vegetation and wildlife habitat assessment studys~~ a unique approach to studying vegetation and wildlife habitat. Remote sensing technology can reach land and water on the Earth's surface~~, and it can~~ and interpret signals from spectral responses. When these techniques are combined with Geographical Information Systems (GIS), land can be monitored in a variety of ways. Meanwhile, changes in land use led to changes in vegetation on the ground, with natural vegetation being removed from natural forests, leaving a degraded forest. Normalized Difference Vegetation Index (NDVI) and Normalized Difference Water Index (NDWI) are derived from a mathematical equation ~~able to demonstrate intensity of greenness of~~demonstrating the intensity of green vegetation ~~green vegetation~~ in a particular area and time; and soil moisture availability~~availability of soil moisture~~, respectively. WorldView-2 and GeoEye-1 satellite images were pre-process~~se~~sed, process~~se~~sed, and classified to produce land use indicators in Sabah Softwoods Tree Plantation majoring Eucalyptus spp. tree planted in Tawau, Sabah. Net Primary Productivity at a monthly scale was also calculated and ranked the productivity for the suitability mapping. Climatic condition based on monthly precipitation and seasonality derived from ASEAN Specialized Meteorological Centre (ASMC) was employed for ranking its suitability value. In this study, natural forest and oil palm plantation is tested to develop~~ed~~ a suitability map for vegetation and wildlife habitat to live with. All indicators were ranked 10 to 40, presenting the benefit and usefulness of the indicator to vegetation and wildlife in the study area. Then, the final classification was made from the accumulation of those indicators into 0 to 200 (Not suitable to Highly suitable). The results


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**Commented [AM2]:** Writing an abstract should be started by demonstrating what is the gap in this research or why this research is important to do and then what is the objective of this research.

showed that 59.9% of the area was classified as moderately suitable, 36.9% as highly suitable, 3.2% as least suitable, and no area was classified as ~~not~~ unsuitable. This type of study assists forest managers and policymakers ~~for~~ manage~~better managing~~ ~~of~~ their forests for the better life of trees and wildlife under their management.

Keywords: High resolution satellite image, wildlife habitat, NDVI

## 1. Introduction

> **Commented [AM3]:** A good introduction provides some background of the research topic, reviews literature related to the topic, outlines the current situation and evaluates the current situation (advantages/ disadvantages) and identifies the gap in knowledge and the research problem, demonstrates that your research has not been done before and that the proposed project will really add something new (novelty), Identify the importance of the proposed research, and conclude the Introduction by mentioning the specific objectives of your research.

Remote sensing technology enable acquisition of satellite image for land monitoring based on different satellite resolution. For example, Landsat TM and Worldview satellite that carried 30-meter and 1.8 -meter multispectral image. In a recent study, the indices as indicator of vegetation productivity estimation as discovered by a study by (O'Neil et al., 2020) that can be derived by various satellite resolution. At global level, more study using a land cover change model to detect vegetation changes caused by human factor in China pasture, located in Wulagai River Basin (Chen et al., 2021). NDWI is as a significant index in forest fire study and found have good relationship in drought study as demonstrated in (Bowyer and Danson 2004 & Mohd Razali et al., 2015).

Therefore, there is a need in estimating land area with vegetation for wildlife human-conflicts translocation. Suitable land characteristics need to identify as a major criterion in ensuring security of the wildlife and sufficient land for live. This is important to solve the above problem by merging different satellite sensor resolution data and climatic data.

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> **Commented [AM5]:** Problem what? and why the solution is merging different sensor resolution data and climatic data? Please write the part of the introduction as structured!

Managing human and wildlife conflict is a tough task. Sabah Softwoods Berhad (SSB) a company that was experienced in mitigating human wildlife conflicts (Nathan 2016). In 2016, the report stated that the company primary activity are oil palm and tree plantation that make it about 60,000 hectares of land. The company adopt 7,000 of that area as reserve land for conservation, meanwhile about 3,000 hectares were earmarked for housing and infrastructure. With the allocation, the company was one of the earliest companies obtained certification for its palm oil operation for Malaysian Sustainable Palm Oil (MSPO) (MPOCC 2022). They managed to handle human-elephant conflicts with estimated two thousand Pygmy elephants that roam the landscape. The elephants get into human activities and the company using translocation and fencing the plantation.

## 2. Materials and methods

### 2.1. Study area

To test the site suitability, we examined a Sabah Softwoods Berhad plantation at Brumas, Tawau, Sabah. The site located at latitude 4°35'36" and longitude 117°45'31" retrieved from Google Map (Google 2022) (Figure 1). The plantation is located at 200 to 600 m elevation above sea level. The plantation area is approximately 18,000 hectares planted with *Eucalyptus pellita* and *F. moluccana* tree species. The *F. moluccana* tree species are planted in the conservation area in the plantation. The whole plantation area is characterized as Tanjung Lipat type (clay texture 25 percent to 35 percent) of soil type and also Kumansi type (>40 percent clay). Rivers of Sungai Umas, Sungai Landau, Sungai Indit and Sungai Umas-Umas are in the plantation, serves as source water to the plantation. The monthly mean temperature in Tawau in 2016 was a minimum of 24°C, a maximum of 31°C, and a mean of 28°C collected from www.worldweatheronline.com. Data for monthly precipitation referred from (Markos et al. 2018) was recorded as 50 mm in 2014. In the meantime, annual precipitation was collected from Malaysia Meteorological Station as shown in Figure 2.

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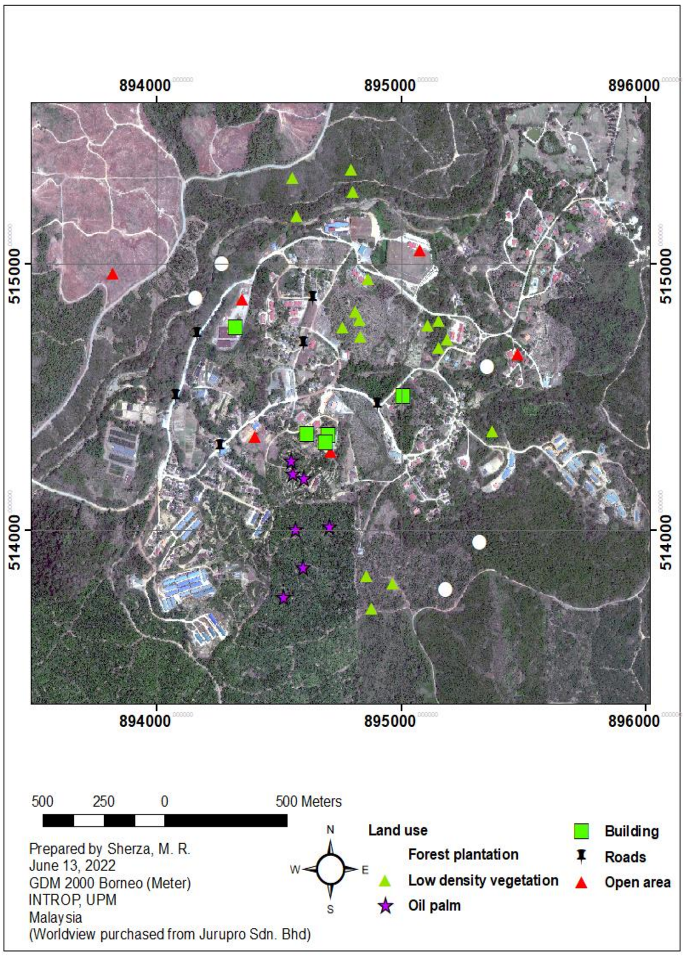


**Figure 1.** Map of the study area with location of various land use and land cover.

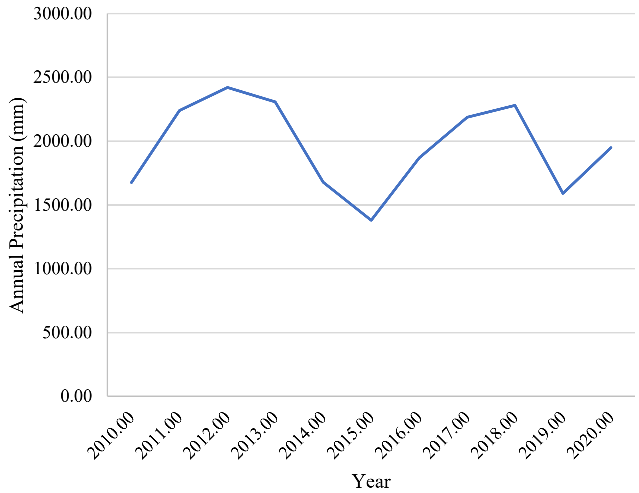


**Figure 2.** Annual precipitation of Tawau based on data from Malaysia Meteorological Department for 2010 – 2020.

2.2. Methods

The Sentinel and Landsat 8 data was obtained from Land viewer application purchased online. Before that, the image was atmospherically corrected using atmospheric correction wizard, which allows users to execute a variety of atmospheric corrections in the simplest and fastest method possible. The wizard automatically in most of the required parameters using image information and walks the user through each key step. The software's focus application was used to prepare data, and then ATCOR ground reflectance tools were used to analyse atmospheric correction.

The NDVI and NDWI data was run a year time series analysis. Inclusion of dry and wet season in Sabah. NDVI and NDWI was calculated for both of the satellites. Based on theory, NDVI was calculated based on the approach that, using the index vegetation status can be identify as healthy and full vegetation coverage of from higher that 0.5 to 0.9. The index very suitable to be used in tropical area, which a study by (Braswell et al., 2003) found NDVI not to use in too dry condition like Iran and other area with similar condition. In the meantime, a study by (Pujiono et al., 2013) employed NDVI for monitoring mangrove forest in Indonesia. Continuously, a year after that (Darmawan and Sofan 2012) using Enhanced Vegetation Index (EVI) and NDVI to detect changes in tropical forest in Indonesia. Elsewhere, many years ago (Bhuiyan, Singh, and Kogan 2006) used NDVI for assessing vegetation stress in vegetative and agriculture land in India. NDVI showed increasing trend of vegetation change which caused by anthropogenic factor (Chen et al., 2021). The equation for the index was as referenced to the study by (Rouse et al., 1973):

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$$NDVI = (\rho NIR - \rho Red) / (\rho NIR + \rho Red) \quad ...(1)$$

Meanwhile, NDWI was found very applicable to use in detection of water-stress forest such as in mangrove (Vidhya et al. 2014). Again it was applied by (Mohd Razali et al., 2015) in monitoring vegetation drought in West Malaysia. NDWI measured sensitivity to changes in liquid water content (Gao 1996). NDWI showed a good relationship with plant stress, which was used by a study of (Vidhya et al. 2014) in classification of mangrove heath status. A recent study of (Caturegli et al. 2020) tested NIR at two wavelength of 1240 µm and 2130 µm. The study tested NDWI without water on Bermuda grass in Italy. Based on theory, the index was calculated based on below equation (Gao 1996):

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$$NDWI = (\rho NIR - \rho SWIR3) / (\rho NIR + \rho SWIR3) \quad ...(2)$$

In details, the time series started from June 2017 until April 2022. About 39 samples were collected between the time frames. The study hypothesized that the distribution of

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Sentinel and Landsat for NDVI and NDWI indices were similar across categories of wet season influenced by Northeast monsoon in Sabah region.

Worldview satellite image for 2016 was derived to calculate NDVI as comparison with the 2021 and 2011 NDVI data. Inadequate spectral properties in Worldview image of shortwave to calculate NDWI for the comparison. This is because the availability for comparison make use of previous data for related study (Razali and Lion 2021). Overall flowchart of the study is presented below (Figure 3).

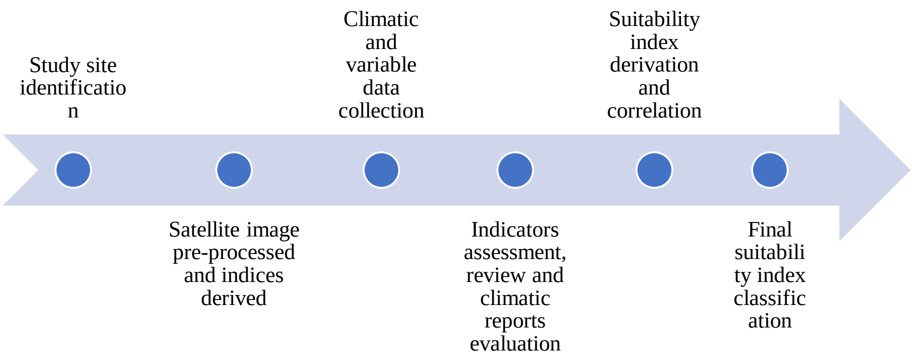


**Figure 3.** Overall flowchart of the study.

2.2.1. Land use mapping

The study employed PCI for mapping the land use. Land use map was developed by using object-based image analysis (OBIA) using Catalyst Professional software, formerly known as PCI Geomatics. Worldview 2 satellite image was pre-processed the process employed Atmospheric Correction wizard (ATCOR), which allows users to execute a variety of atmospheric corrections in the simplest and fastest method offer (PCI Geomatics Enterprise 2021). The focus of the application was to prepare data, and then ATCOR ground reflectance tools were analysed the atmospheric correction. Overall flow of the land use mapping is shown in figure below (Figure 4).

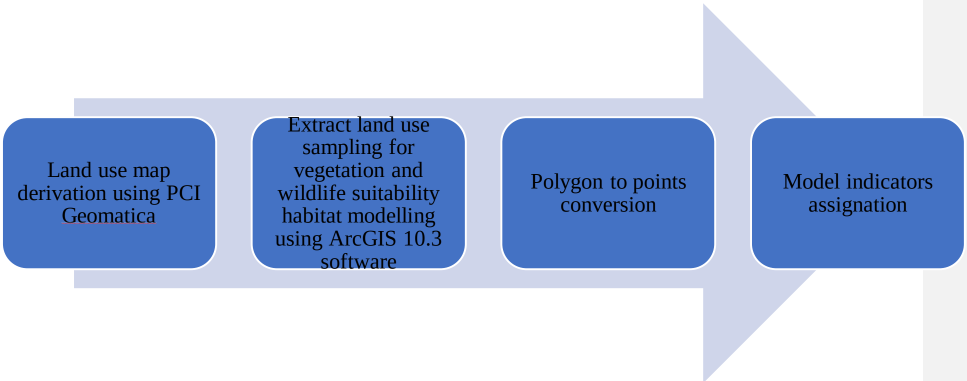


**Figure 4.** Overall flowchart of land use mapping.

2.2.2. NPP estimation

In this study, the NPP was derived from GPP that was based on (Xiao et al., 2004). This is because GPP is the rate of $CO_2$ fixation by photosynthesis in the forest canopy. Therefore, GPP is calculated as below:

$$GPP = fAPAR \times PAR = \varepsilon \times APAR \ldots (1)$$

Where, the ε is Light Use Efficiency (ε), that LUE have known as an important element of the radiation regime for tree growth, incoming photosynthetically active radiation (PAR) ($gMJ^{-1}\ m^{-2}$), and the fraction of PAR intercepted by foliage (Fraction of photosynthetically active radiation of fAPAR).

Moreover, this study estimated PAR from 50% of incoming solar radiation as a results of solar radiation data collected from (Sukarno et al., 2017) study. Instruments were allocated

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in top-roof of building in Universiti Malaysia Sabah (UMS), Kota Kinabalu, Sabah on 17 March 2016. The study derived the value for absorbed fraction of photosynthetically active radiation (APAR) ($gMJ^{-1}$) by multiplying the two most important elements of radiation, fAPAR and PAR (Coops et al., 2010). In this study, to calculate the LUE, [18] equation was referred to as:

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$$LUE = 0.8932 + TMonth + 0.0015(PRECIPMonth)-0.002(GDD)..(2)$$

Meanwhile, fAPAR was based on of a study by [21], which is derived as:

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$$fAPAR = 1.25 \times NDVI - 0.025 \ldots(5)$$

The NDVI was derived by using two bands in the satellite image as shown below, as referenced to the study by [23]:

$$NDVI = (\rho NIR - \rho Red) / (\rho NIR + \rho Red) \ldots(6)$$

Where, $\rho NIR$ is the reflectance of the WorldView image at 0.77 – 0.895 nm (Near-infrared band) and $\rho Red$ is the reflectance of the satellite image at 0.63 – 0.690 nm (red band). The NPP ($gCM^{-2}$ $month^{-1}$) was therefore, derived by applying 50% of GPP.

## 3. Results and Discussion

**Commented [AM14]:** I suggest to improve the quality of your paper. Please in discussion part, interpret your findings and then might address the comparison of your result to previous studies, and update the literature review that validates your findings. Moreover, at the end of this part, conclude your study and the significance of your research.

### 3.1 Vegetation of water-stress

The study conduct correlation scatter plots for NDVI and NDWI of the Sentinel and Landsat satellite. Figure 6 shows the comparative analysis of the Brumas plantation features from April 2-21 to April 2022. From $R^2$ values, the NDVI in Sentinel was 0.95, whereas $R^2$ for Landsat was 0.99. These results, showed that the NDVI had a good indicator to predict forest productivity, assessing forest health and biomass changes over time. It is potential for drought and post-fire recovery in Eucalyptus forest such as demonstarted by (Caccamo et al., 2011, 2015).

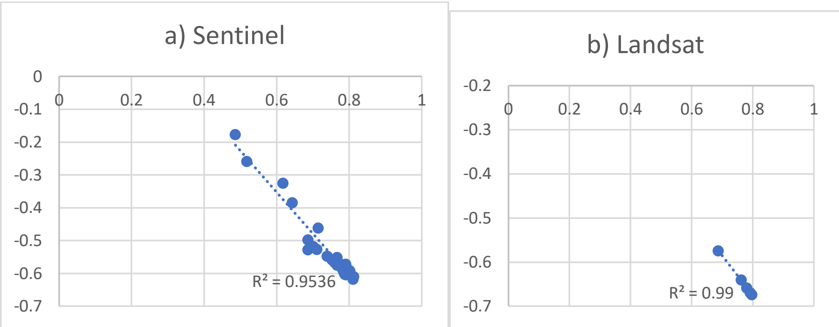


**Figure 5.** Correlation between NDVI and NDWI (a) Sentinel and (b) Landsat.

It can be seen, based on the two indices, that the NDVI very useful for application in vegetation community is broadleaved and evergreen. Changes on the season scale was also anticipated that higher NDVI values, pursue NDWI to be lower, due to plant capability to maintain water supply for biomass accumulation, hence no water stress was recorded. Some studies define NDWI as Land Surface Water Index (LSWI), whereby as the LSWI served similar indicator. The study showed the fortnightly percentage increase of LSWI and NDVI from the previous fortnight for 2002 and 2005, for a few typical districts of Andhra Pradesh (Chandrasekar et al., 2010). In (Penuelas et al., 1997), Water Index (WI) have good agreement with NDVI (NDVI vs WI, $R^2 = 0.66$) and improved when rationing WI with NDVI (WI/NDVI=0.71).

### 3.2 Vegetation and wildlife habitat indicator

NDVI for 2016 that was overlaid with land use map showed NDVI > 0.8 is located on Eucalyptus plantation area. Whereas NDVI of > 0.7 is located on mostly on oil palm plantation.

Meanwhile, NDVI > 0.6 can be found located in Eucalyptus forest plantation but with presence of oil palms features (light green). The oil palm features have a high agreement with ground data with 100% of accuracy assessment, however, is very uncertain to found oil palm features in Eucalyptus plantation. The features could be misclassified with low growth in the forest plantation. This making forest plantation have lower NDVI than found in full covered forest. NDVI scale for the analysis is tabulated as in Table 1.

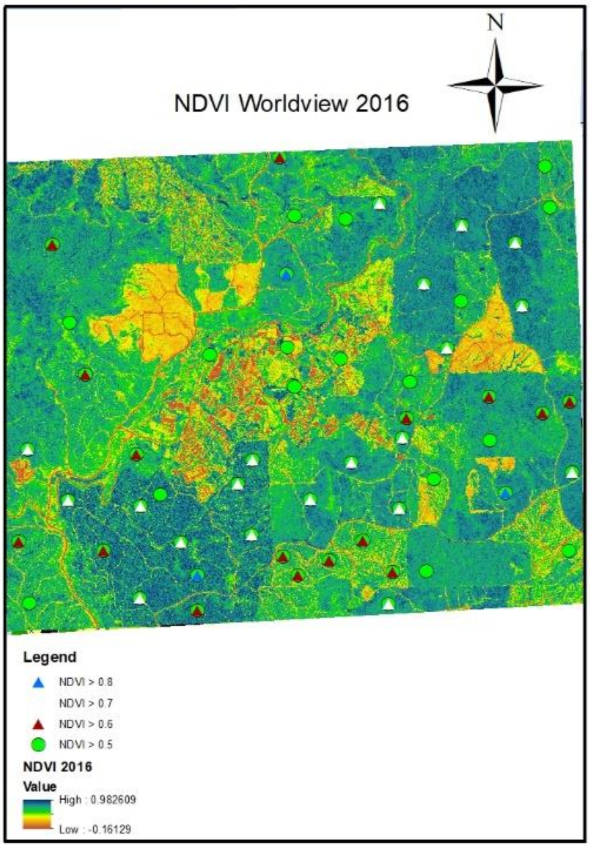


**Figure 5.** NDVI of the study area.

**Table 1.** NDVI scale and suitability index value for analysis.

| NDVI scale | Suitability index |
|---|---|
| NDVI > 0.8 | 40 |
| NDVI > 0.7 | 30 |
| NDVI > 0.6 | 20 |
| NDVI > 0.5 | 10 |

### 3.3 Land use

The land use accuracy was:

- Producer's accuracy for Eucalyptus plantation, buildings, low-density vegetation, oil palm, open area and roads were, 100%, 81.25%, 94.12%, 100%, 100% and finally 25%, respectively.
- User's accuracy was, 94.12%, 61.90%, 100%, 76.92% and finally 80%, respectively.

Each of the class was rank according to its priority for wildlife to live within the removal of forest to a forest plantation. Higher forest coverage is ranked higher whereas lower forest cover or vegetation cover is ranked as lower (Table 2).

**Table 2.** Land use type and suitability index.

| Land use | Suitability index |
|---|---|
| Forest plantation | 40 |
| Oil palm | 30 |
| Low density vegetation | 20 |
| Open area/Buildings/Roads | 10 |

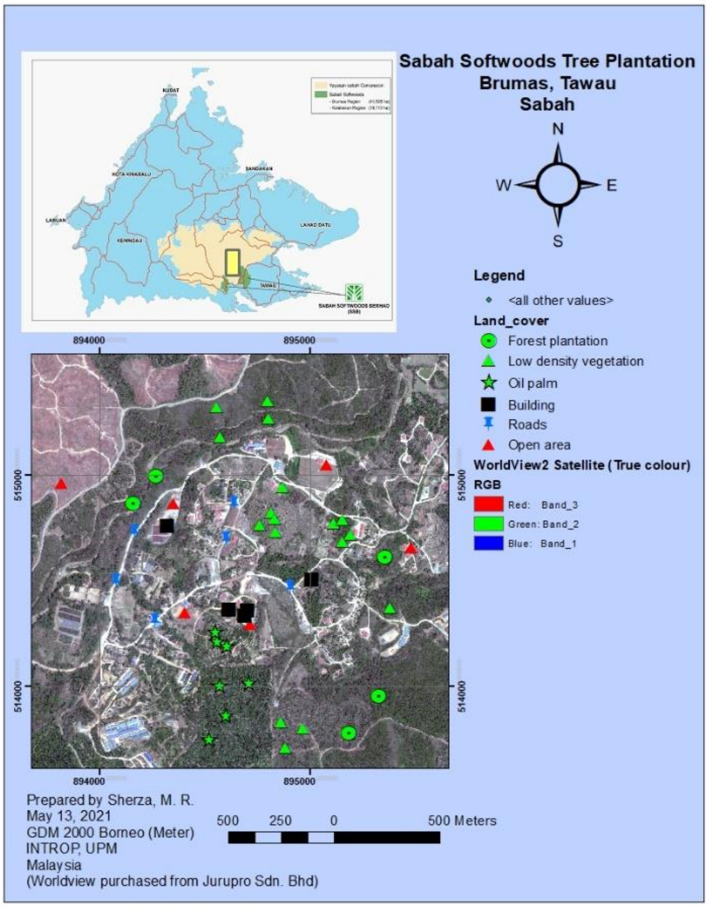


**Figure 6.** Land use produces from the land use mapping.

### 3.4 Precipitation

In general, Sabah and Sarawak are influenced by Northeast monsoon which November to April approximately bringing heavy rain to east coast area, that including Tawau area. In 2015, a study by (Ng et al. 2019) found Tawau recorded 207.0 mm ±92.98 of monthly precipitation. This making Tawau is the highest precipitation than districts of Sabah, namely, Kota Kinabalu,

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Beufort, Kudat and Keningau. For additional information the value similarly recorded by Sandakan area which is located far much northern area. Finally, precipitation rank is shown in Table 3.0.

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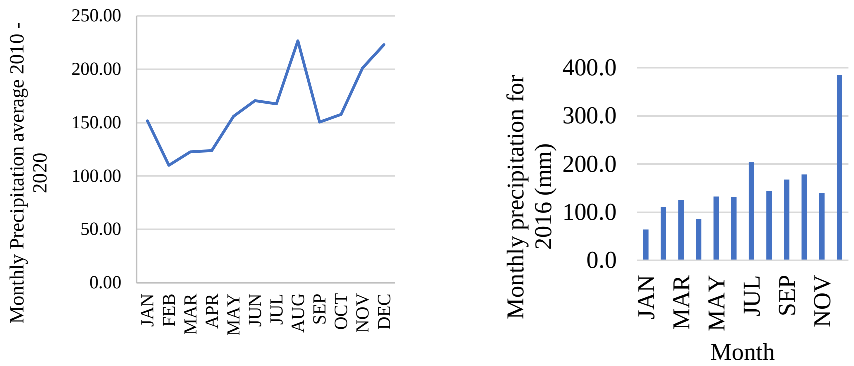


(a) (b)

**Figure 7.** Monthly (a) and annual precipitation for the study area (b).

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**Table 3.** Mean monthly precipitation and suitability index.

| Mean monthly precipitation (mm) of Year 2016, Tawau, Sabah | Suitability index |
| --- | --- |
| 0 – 80 | 40 |
| 80 – 160 | 30 |
| 160 – 280 | 20 |
| 280 – 340 | 10 |

## 3.5 Seasonal

Seasonal data was assessed based on ASEAN Specialized Meteorological centre (ASMC) report. The comprehensive report comprising data of ASEAN information on haze situation which rank as in Table 4.0.

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**Table 4.** Indication of seasonal parameters derived from ASMC report and suitability index.

| ASEAN Specialized Meteorological Centre (ASMC) based on Worldview satellite image acquired March 2016 | Suitability index |
|---|---|
| March to May 2020 | 40 |
| December – January 2016 – 2017 | 30 |
| September - November 2020 | 20 |
| Unidentified | 10 |

**3.6 NPP productivity**

Using the tools in ArcGIS Spatial Analyst, the NPP was interpolated to map the distribution of NPP on ground data, as depicted in Figure 7.

**3.7 Final suitability index**

The final index was developed based on accumulation of all indicators suitability index value that was calculated using ArcGIS 10.8 software attribute table. Table 5 showed overall indicators that employed for the index based on below equation:

$$\text{Habitat Wildlife Indicator} = \text{VEG} + \text{LU} + \text{NPP} + \text{PREP} + \text{SEAS}$$

Vegetation and wildlife habitat indicator = VEG

Land use indicator = LU

Net Primary Productivity = NPP

Precipitation indicator = PREP

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Season = SEAS

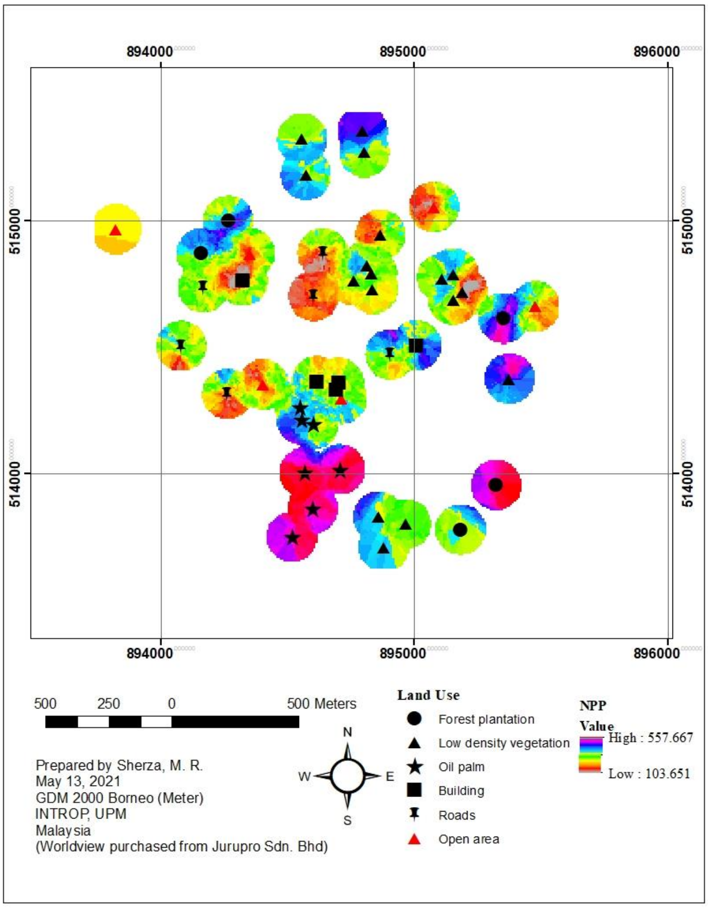


**Figure 7.** Overall NPP value interpolated on land use layer with points marked showed major area of the land use type.

**Table 5. Indication of NPP scale and rank value.**

| NPP scale (650 gCm-2 month-1) | Suitability index |
|---|---|
| NPP > 500 | 40 |

| | |
|---|---|
| NPP > 300 | 30 |
| NPP > 200 | 20 |
| NPP > 100 | 10 |

**Table 6.** Indication of accumulation of vegetation and wildlife habitat suitability index.

| No. | Indicator/Scale | Description | Suitability index | Source of References |
|---|---|---|---|---|
| 1. | Vegetation and wildlife habitat indicator | | | Rock/Sand/Snow: Value approaching zero, 0.1 < X < 0.1 |
| | Biomass | | | |
| | NDVI > 0.8 | Adequate biomass | 40 | Greenness/Vegetation: |
| | NDVI > 0.7 | Moderate biomass | 30 | Value low positive, 0.1 < |
| | NDVI > 0.6 | Low biomass | 20 | *X* < 0.4 |
| | NDVI > 0.5 | Inadequate biomass | 10 | Tropical rainforest value approaching 1, X→1 |
| | | | | Hanset et al., (2017) |
| 2. | Land use indicator | | | |
| | Habitat | | | |
| | Forest plantation | Natural habitat | 40 | |
| | Oil palm | Plantation | 30 | Field observation and |
| | Low density vegetation | Degraded land | 20 | author experienced |

| | | | | |
|---|---|---|---|---|
| | Open area/Buildings/Roads | Infrastructure and non-vegetated land | 10 | |
| 3. | Net Primary Productivity | | | NPP evaluated for the plantation is 650 gCm-2 month-1 (Sheriza et al., 2022). NPP from WorldView-2 particularly valuable if applied to temporal NDVI data to assess the monthly NDVI for the study area (Sheriza et al., 2022) |
| | NPP > 500 | Adequate biomass | 40 | |
| | NPP > 300 | Moderate adequacy biomass | 30 | |
| | NPP > 200 | Low adequacy biomass | 20 | |
| | NPP > 100 | Inadequate biomass | 10 | |
| 4. | Precipitation indicator | | | |
| | Mean monthly precipitation (mm) | | | 200 mm during June and July<br>350 mm in November and December (climateknowldegeportal.worldbank.org) |
| | 280 – 340 | High | 40 | |
| | 160 – 280 | Moderate | 30 | |
| | 80 – 160 | Low | 20 | |
| | 0 – 80 | Very low | 10 | |
| 5. | Seasonal indicator | | | |
| | ASEAN Specialized Meteorological Centre (ASMC) | | | |

| | | | |
|---|---|---|---|
| September - November 2020 | Wetter | 40 | ASEAN Specialized Meteorological Centre (ASMC) report (2016) |
| December – January 2016 - 2017 | Wetter than average | 30 | |
| March - May 2020 | Wetter and drier effects are averaged | 20 | |
| Unidentified | Unidentified | 10 | |

The study was successfully mapping suitability index for vegetation and habitat in Sabah Brumas, Tawau Eucalyptus and oil palm plantation. Habitat and vegetation classification derived after each of the pixels accumulated based on its suitability index. An index approaching 200 classified and highly suitable for the wildlife and vegetation to live and sustain its live for a long term. A value less than 50 indicate not suitable habitat for wildlife and vegetation to be in the area (Table 7).

**Table 7.** Indication of vegetation and wildlife habitat classification for the study.

| Rank | Suitability Index | Habitat & Vegetation classification |
|---|---|---|
| 1 | 150 - 200 | Highly suitable |
| 2 | 100 - 150 | Moderately suitable |
| 3 | 50 - 100 | Least suitable |
| 4 | 0 - 50 | Not suitable |

Area of the habitat and vegetation classification pixels were classified based on Equal interval and Natural Breaks classifier. Based on the methods, percentage of the area classification derived and shown in Figure 8.

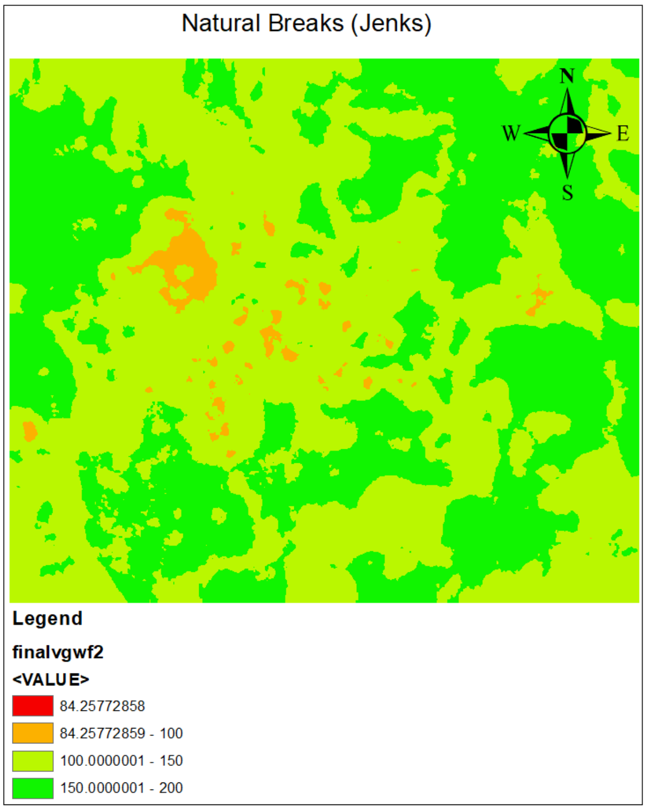


**Figure 8.** Final index classification for the study area.

## 4. Conclusion

**Commented [AM20]:** I suggest the conclusions offer a clear interpretation of the findings in a way that emphasizes the importance of your study or describes the consequences of your arguments by justifying to your readers why your arguments matter. A conclusion must be broader and more comprehensive than specific or limited findings, and in the same vein, several findings may be combined into a single conclusion

Most of the study area which is about 59.9% was under moderately suitable habitat for vegetation and wildlife. The variable employed for the study covered land use, climatic condition presented by precipitation, NPP and seasonal variation of the study area showed overview of year 2016 condition of the study area. The condition of the study area as plantation area is very suitable for natural habitat to live.

## Author contribution

Sheriza Mohd Razali design the methods and employed ArcGIS for all the analysis. Whereas Zaiton Samdin provides research materials and research allocation. Marryanna Lion improve the manuscript write up.

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## Conflict of Interest

There are no conflicts of interests.

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