

## CHARACTERISTICS AND LANDSCAPE AESTHETICAL VALUES OF HEATH FOREST

*(CIRI DAN NILAI ESTETIKA LANDSKAP HUTAN KERANGAS)*

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### **Abstract**

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Heath forest is a unique ecosystem different from any other type of forest; however, its preservation has not yet been given attention even when facing a serious extinction problem. The character of this ecosystem should be studied deeper to uncover ways to prevent its extinction. Thus, integrating the heath forest characteristics in an urban area may increase awareness and appreciation of this valuable ecosystem. The main goal of this research study is to explore the uniqueness of heath forests' intrinsic values as potential attributes to be implemented in an urban context. To achieve the aim, observation of two areas of heath forest in Terengganu has been conducted to identify the characters and landscape aesthetical value. Results of the study have shown that there are many unique characteristics of heath forests that can be found despite the small scale of the study area. The characteristics can be categorised into three categories: aesthetic values according to the basic landscape elements, aesthetical values according to the landscape principle, and nature art of heath forest.

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**Keywords:** Heath Forest, Intrinsic values, landscape ecology, biomimicry, landscape heritage

### **Abstrak**

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*Hutan kerangas ialah ekosistem unik yang berbeza daripada mana-mana jenis hutan lain; namun, pemeliharaannya masih belum diberi perhatian walaupun menghadapi masalah kepupusan yang serius. Karakter ekosistem ini harus dikaji dengan lebih mendalam bagi mencegah kepupusannya. Oleh itu, penyepaduan karakter hutan kerangas di kawasan bandar boleh meningkatkan kesedaran dan penghargaan terhadap ekosistem yang berharga ini. Matlamat utama kajian penyelidikan ini adalah untuk meneroka keunikan nilai intrinsik hutan kerangas sebagai atribut yang berpotensi untuk dilaksanakan dalam konteks bandar. Bagi mencapai matlamat tersebut, pemerhatian ke atas dua kawasan hutan kerangas di Terengganu telah dijalankan bagi mengenal pasti karakteristik dan nilai estetika landskap. Hasil kajian telah menunjukkan bahawa terdapat banyak ciri unik hutan kerangas yang boleh ditemui walaupun kawasan kajian berskala kecil. Ciri-ciri tersebut*

*boleh dikategorikan kepada tiga kategori: nilai estetik mengikut elemen asas landskap, nilai estetik mengikut prinsip landskap, dan seni alam hutan kerangas.*

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***Kata kunci:*** Hutan kerangas, Nilai intrinsik, ekologi landskap, biomimikri, warisan landskap

## INTRODUCTION

Malaysia is a country that has many types of forest ecosystems such as lowland forest, hill forest, mixed dipterocarp forest, mangrove forest and peat swamp forest. However, many did not know about another unique ecosystem: the heath forest. A tropical heath forest is a forest that develops on acidic, leached sandy soils that are very insufficient in nutrients ((Mestre et al. 2017; Garbutt 2006). Heath forest is strikingly different in its physiognomic features, tree characteristics, habitants flora, and structure compared with other evergreen rain forests (Whitmore 1988; Hazimah et al. 2015). This special and rare forest habitat is extremophiles due to extreme ecological conditions (Syuharni et al. 2014).

Unlike the other ecosystems found in quite large areas in Malaysia, the heath forest is an increasingly rare tropical forest ecosystem. Heath forests can be found particularly on Borneo Island and on the Indonesian islands such as Belitung and Bangka (Syuharni et al. 2014). There are very few heath forests in Peninsular Malaysia, such as Pahang, Perak, and Terengganu. Nowadays, heath forest is experiencing a major loss of their area and face a serious extinction issue due to negative impacts from human involvement. The World Bank has predicted that heath forests in Borneo will face extinction in 2010, and it is proven when there is only 48% of 66 882 km<sup>2</sup> of heath forest remains today (Rashidi & Ruzaimi 2013). The threats to heath forests in Peninsular Malaysia are greater because of the small-scale coverage than in heath forests in Borneo.

Malaysia is currently undergoing rapid development and urbanisation, creating a harsh environment. The extremophiles nature of the heath forest's inhabitants makes them very potential to be applied in the urban environment to create awareness and exposure to the heath forest ecosystem. This paper provides a deeper understanding of heath forests' character and landscape aesthetical values. It discusses the suitable preservation methods that can be implemented in the urban context of Malaysia.

### **Ecosystem In Malaysia**

In the aspect of Malaysia's flourishing and diversified species, Malaysia is recognised as one of the twelve megadiverse countries in the world and also known as 'hot spots' that require particular observation to limit habitat loss (Myers 1998; Hezri & Nordin 2006). RankRed (2015) also claimed that Malaysia is included in seventeen megadiverse countries on earth that inhabit many endemic species. The existence of the rainforest ecosystem is crucial, and it is also impossible to replace if lost and damaged.

In Malaysia, the tropical rainforest consists of many types of forest ecosystems. The major forest types commonly found are upper hill dipterocarp forest, hill dipterocarp forest, lowland dipterocarp forest, ericaceous mountain forest, mangrove forest, and peat swamp forest. Additionally, a few forests exist on a small scale, such as freshwater swamp forest, limestone forest, and heath forest.

Each type of forest has its role and importance in preserving a balanced environment. According to Chan (2002), the forest holds a crucial role in maintaining climatic and environmental stability, biodiversity conservation, and source of clean water and timber. Therefore, awareness of the forest landscape values is essential in expanding and applying land management policy and reducing the problems regarding forest resources (Tarrant et al. 2003).

### ***Intrinsic Landscape Aesthetical Value Of Malaysia Tropical Rainforest***

The intrinsic value of the rainforests must be preserved, quite simply because they are there. Meaning that people treasure the natural rainforest ecosystem because of its beauty and diversity, which is undamaged by human activities. Mulvaney, Robbins, & Downie (2011) mentioned that many people believe that nature possesses intrinsic value. Intrinsic value is the value that exists within a component of nature itself (Nordstrom 1993). Therefore, the intrinsic value of a forest can be understood as the existing natural value that belongs to the forest that happens most naturally without human intervention.

Landscape aesthetical value has a close connection to the scenic beauty of the forest. Scenic attraction evaluates the scenic importance according to human perceptions of the intrinsic value of landform, water characteristics, and plants' patterns (Thomas 1995). A combination of these attributes makes up the natural scenic beauty. Hence, the landscape aesthetical values of tropical rainforests can be evaluated in many aspects and forms.

#### **Heath Forest**

Other than the dipterocarp forest, there is another forest known as a heath forest that should be highlighted and concerned as to how people are valuing dipterocarp forest. The small-scale heath forest is very unfamiliar to most Malaysian. It is very different from any other forest type because of its unique characteristics. In Borneo, the heath forest, known as "kerangas forest", originated from an Iban word that brings the meaning of barren land that cannot be used to plant rice (Brunig 1974; Din et al. 2015; Maimunah et al. 2019).

Unlike any other evergreen forests that grow on fertile soils, heath forest grows on unhealthy and infertile soils. This type of forest can be found on podzolized siliceous sands (spodosols), which are drained by a black water stream (Katagiri 1991). Spodosols are grey acidic soils with a heavily strained surface layer (Sellan 2019; Sellan et al. 2020). Heath forests grow on highly acidic soils, whereby the hydrogen ion toxicity prevents the growth of unsuitable species (Syuharni et al. 2014).

As an effect of the low nutrient type of soils in heath forests, the vegetation that inhibits heath forest is limited only to those that can adapt to that harsh condition. These forests are different from the dipterocarps and other lowland forests because of the huge contrast in the species diversity and the external morphology (Syuharni et al. 2014; Rashidi & Ruzaimi 2013).

According to Rashidi & Ruzaimi (2013), fauna such as wild animals, insects and 'unggas' is unproductive in the heath forest habitat. In the watery part of the heath forest, there are limited fish species, and most of them are the detritivore community that lives by eating dead plant wastes. They further pointed out that this detritivore community, such as insects, cladocerans, annelid, rotifer, nematode, protozoa, mollusc, algae, and zooplankton, are very rare to be found in this habitat.

The beauty, uniqueness, and aesthetic value of a healthy forest are priceless and irreplaceable. Particularly in terms of composition, structure, texture, and colour, in which every heath forest stands out as distinctive from other forest ecosystems. Heath forests have a homogeneous, thin, and shaded tree canopy. The low shrubs produced fine texture, while the trees provided coarse texture. The bark layer appears to have been stripped from the structure, and the canopy appears to be incredibly intricate and detailed. The two layers' differences produce a voluminous beauty that gives the appearance of being out of balance. The unique character of *M. cajaputi* has evolved into one of the dominant elements of the heath forest.

## **Integration of Forest Attributes in Urban Context**

According to the Department of Statistics Malaysia (2010), urban areas is defined as development area that can be determined with a population of at least 10,000 people and at least 60% of the population aged 15 years and above, are not involving in agricultural activities (Rahamat 2013). An urban forest is a concept that encompasses a city's landscape and vegetation. As cities grow in size and population, there will be a greater need to preserve and manage the existing landscape, which will necessitate additional maintenance. When used in urban environments, urban forestry can provide a wide range of environmental and material benefits (Lee et al. 2004).

The integration of forest attributes into an urban context adds certain appealing landscape scenery. For instance, the arrangement of the ground cover, bushes, and trees in the heath forests shows both unity and contrast. The colourful ground beneath trees offers a backdrop that is accentuated by the contrast between the tree leaves' colour and that of the shrubs' foliage. The selection of plants that have a character like the Gelam tree's topiary provides an interesting natural sculpture, distinct form and structure, and stunted growth that mimics bonsai. The use of specific heath forest species that are highly resistant to harsh conditions would help in maintaining the overall urban forest environment in the long run, at the same time benefiting the health of the city-dwellers.

## **METHODOLOGY**

The methodology is conducted according to the two objectives of this research study. Observation is made to study the physical characteristic and landscape aesthetical value of a heath forest in two of the case study areas in Rantau Abang and Marang, Terengganu. These areas are chosen as they are of the heath forests that still possess the scenic beauty of a heath forest. Furthermore, these locations are tourist attractions in Terengganu. The observation method has been done by observing the physical characteristics of the heath forest and other peculiar attributes such as the colour combination of the vegetation, the tree pattern and the texture of the tree barks. A list of the criteria for observation is prepared.

Document analysis has been done to find further information regarding the character and landscape aesthetical value of heath forests and their implementation in an urban context. This method also includes other research that has a correlation that might help the study, especially in the character and implementation of forest attributes in the urban context of Malaysia.

## **RESULTS AND DISCUSSION**

Heath forest characteristics were discovered based on the observation conducted at the heath forest of Marang and Rantau Abang, Terengganu. Heath forest is mostly formed on the ridges along the coast where the soil condition is sandy. The character of heath forests is also determined by the physical and chemical properties of the soil. For instance, vegetation leaves in the heath forest are usually small due to low nitrogen levels. Trees in heath forest habitats can grow as tall as 20 meters with a small diameter. There are about four species of dominant vegetation that have been observed in the case study areas (Figure 1). Characteristics in terms of form, texture, arrangement, variety, and detailing of the nature arts have been observed and recorded.



*Melaleuca cajuputi*



*Eleocharis ochrostachys*



*Hanguana malayana*



*Lepironia articulata*

Figure 1. Plant species found in heath forest

### Aesthetical Value of Heath Forest According to Landscape Elements and Principles

1. Form: A few forms have been identified in the heath forest. The dominant tree species, *Melaleuca cajuputi*, grows tall and creates a vertical form while the spreading shrubs such as *Hanguana malayana* and *Lepironia articulata* create a horizontal form (Figure 2).



Figure 2. Different form is created by each of the plant species in heath forest

2. Texture: Heath forest is emphasised with vegetation's coarse and fine texture (Figure 3). The plants create a very contrasting character to the heath forest. Coarse texture came from the tree, while fine texture can be seen in the low shrubs.



Figure 3. Different textures of vegetation

3. Repetition: Repetition in heath forests is formed due to the arrangement of only one dominant tree species inhabiting the ecosystem (*Melaleuca cajuputi*) (Figure 4).



Figure 4. Repetition in term of the plant species and arrangement

4. Focalisation and Emphasis: The arrangement of matured *Melaleuca cajuputi* clustered at an area creates the focal point. In addition, the spreading tree structure and shape enhance the focalisation and emphasise the area (Figure 5).



Figure 5. The clustered trees with outstanding structure along the water body create a really nice view

5. Variety: Variation is less noticeable due to the lack of vegetation diversity (Figure 6). The most noticeable variation is its vegetation shape diversity (Figure 7).



Figure 6. The variations in the plant species

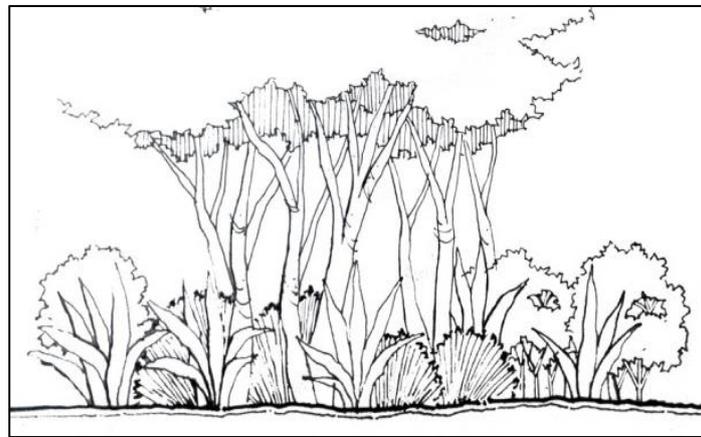


Figure 7. Illustration of different species of plant that create the character of variation.

### Aesthetic Value of Heath Forest According to Nature Art

1. Explosion: The unique pattern of *Melaleuca cajuputi* looks like they exploded (Figure 8). The tree branches and twigs radiate outwards from the centre of the main tree bark, and the pattern diminishes as the twigs and branches grow longer.



Figure 8. Character of explosion showcased by the trees in heath forest

2. Intricacy: *Melaleuca cajuputi* look very detailed and intricate, whereas the bark layer looks torn from the structure (Figure 9).



Figure 9. The details of tree that look very intricate

3. **Mystique and Mystery:** The environment in the heath forest appears dark and gloomy, forming the character of mystique and mystery. This is due to the combination of the clear dark brown water body and the unique character of *Melaleuca cajuputi* (Figure 10).



Figure 10. The unique plant structure and dark colour of water is the main contributor to this character

4. **Topiary:** The tree's physical appearance looks distorted and looks like the huge version of the ornamental bonsai tree formed due to the harsh environment in the ecosystem (Figure 11).

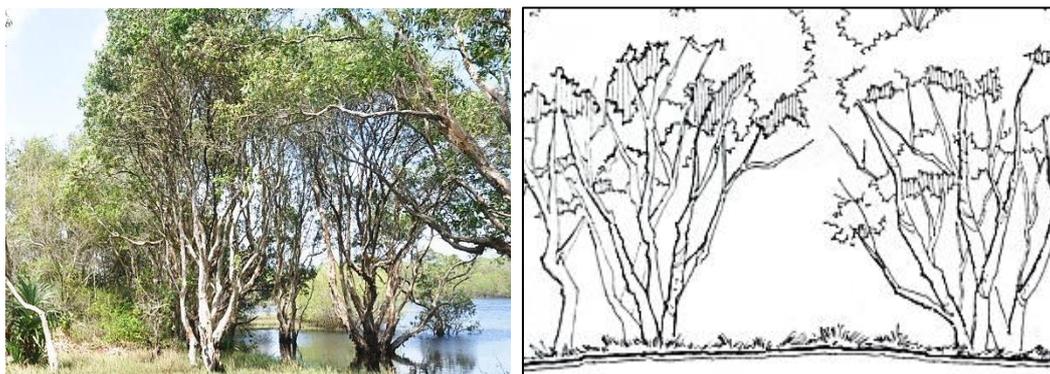


Figure 11. Natural topiary of heath forest that is formed by the unique tree character.

5. **Camouflage:** Unique tree bark and branches combined with a dark brown water body and a forest floor covered with dead leaves create a natural camouflage that can protect the ecosystem and avoid it from danger (Figure 12).



Figure 12. Natural camouflages that is formed by the unique character of trees

6. Nature Sculpture: Heath forest is dominated by tree species of *Melaleuca cajuputi*, and this tree has a special physical appearance that looks like a sculpture (Figure 13).



Figure 13. Nature sculpture of heath forest

### Design Recommendation

These design recommendations are intended to preserve the ecosystem of heath forests. This research focuses on the implementation of the forest characters and values in an urban area, and so the recommendations are proposed focusing only on the urban context:

#### a) Implementation of Heath Forest Attributes in Street Planting Design

Street planting is one of the most important elements in urban areas as roads and streets are the main transportation routes utilised by most urban dwellers. It is recommended to use vegetation that inhabits heath forests as plantings selection for street planting (Figure 14). This is to expose the values of heath forests to the public so that more people are interested in understanding the ecosystem.

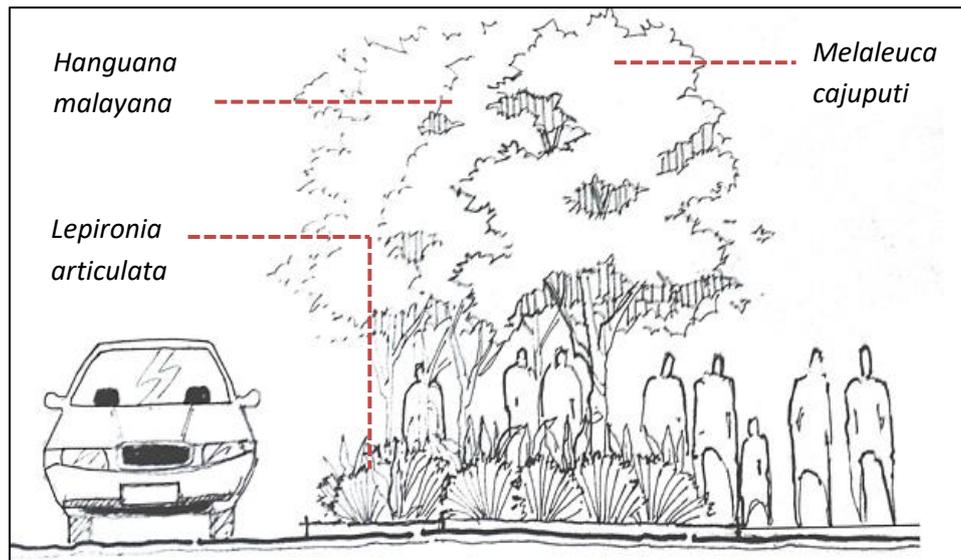


Figure 14. Example of street planting with heath forest attributes.

Shrubs such as *Hanguana malayana* and *Lepironia articulata* can create a buffer and separate road and pedestrian pathways. At the same time, *Melaleuca cajuputi* trees can provide shade and improve the aesthetic of streets.

#### b) "Dry Creek" at Parking Area with Heath Forest Plants

This design recommendation is to apply heath forest attributes to parking areas in an urban context. It will create a more natural design with the vegetation of the heath forest. This dry creek is supposed to be dry with no water during the dry season, but it will be like a natural drain containing rainwater when it comes to the rainy season. Besides, it is suitable for the high adaptation of the vegetation in the watery area (Figure 15).

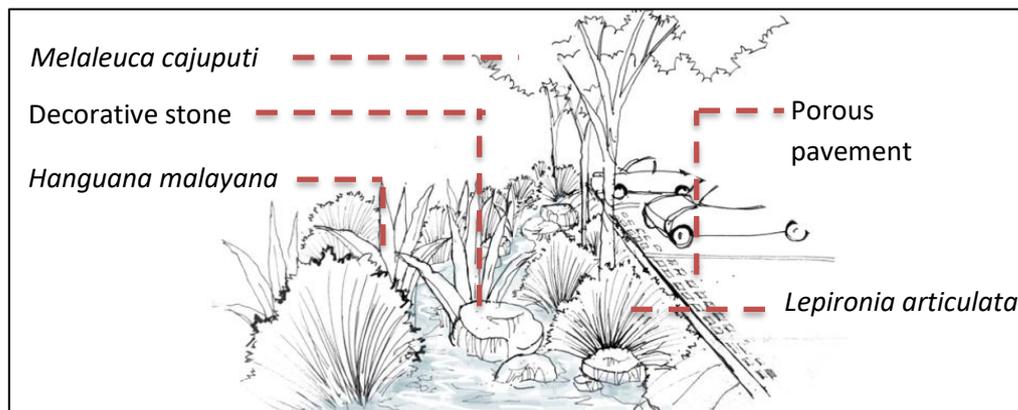


Figure 15. Illustration of the design idea for dry creek at parking area with water flowing during rainy days

#### c) Canopy-layer and Understory Plants Composition

The understory is an essential element of forest ecosystems that influences biodiversity, nutrient cycling, energy flow, and regeneration potential (Mestre et al. 2017). Additionally, the understory responds quickly and acts as an ecological indicator to anthropogenic and natural disturbances, preventing erosion and creating favourable microenvironments for the growth of other species. Urban forest ecosystems should stand out as unique, especially in terms of composition, structure,

texture, and colour. The arrangement of the ground cover, shrubs, and trees should exhibit both unity and contrast. The distinctive shape and structure of the tree topiary would add unique features to the urban forest landscape, thus balancing the visual effect of the "concrete jungle" area. The structure of the urban forest will not only benefit biodiversity and the ecosystem but also promote tourism and improve the liveability of cities as it offers a sense of tranquillity, relaxation, and natural beauty.

## CONCLUSION

This research investigates the intrinsic values of heath forests and the possibilities of applying such values to an urban setting hence aiming to raise public awareness about the importance of heath forests and so help prevent their extinction. Forest ecosystems should be preserved for the benefit and well-being of humankind. However, the preservation strategies require knowledge and awareness of the importance and values of the forest. Heath forests can be seen as a country's national landscape assets and biological legacy that must be safeguarded and protected from the current rapid development and modernization. Besides, the heath forest's natural beauty and aesthetic value are undeniably priceless and irreplaceable.

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## REFERENCES

- Brunig, E.F. 1974. *Ecological Studies in the Kerangas Forest of Sarawak and Brunei, Borneo*. Kuching, Malaysia: Literature Bureau for the Sarawak Forest Department.
- Chan, L.H. 2002. The impact of present forest policies on sustainable forest management in Malaysia. Forest Policy Workshop Kuala Lumpur, Malaysia, 22-24 January.
- Garbutt, N. & Prudente, C. 2006. *Wild Borneo: the Wildlife Scenery of Sabah, Sarawak, Brunei and Kalimantan*. UK: MIT Press.
- Din, H., Metali, F. & Sukri, R.S. 2015. Tree Diversity and Community Composition of the Tutong White Sands, Brunei Darussalam: A Rare Tropical Heath Forest Ecosystem. *International Journal of Ecology* 1–10.
- Hazimah, D., Faizah M. & Rahayu, S.S. 2015. Tree diversity and community composition of the Tutong white sands, Brunei Darussalam: A rare tropical heath forest ecosystem. *International Journal of Ecology* 807876.
- Hezri, A.A., & Mohd. Nordin Hasan. 2006. Towards sustainable development? The evolution of environmental policy in Malaysia. *Natural Resources Forum* 30(1): 37-50.
- Lee, Y.F., Ligonjangan, J. & Yong, S.C. 2004. *Urban Forestry and its Relevance to Tourism Development in Sabah*. Sabah, Malaysia: Forestry Department.
- Maimunah, S., Capilla, B., Armadiyanto & Harrison, M. 2019. Tree diversity and forest composition of a Bornean heath forest, Indonesia. *IOP Conference Series: Earth and Environmental Science* 270(1): 012028.
- Mestre, L., Toro-Manríquez, M., Soler, R., Huertas-Herrera, A., Martínez-Pastur, G., & Lencinas, M.V. 2017. The influence of canopy-layer composition on understory plant diversity in southern temperate forests. *Forest Ecosystems* 4(1).
- Mulvaney, D., Robbins, P. & Downie, D.L. 2011. *Green politics: An A-to-Z Guide*. Politics Faculty Book and Media Gallery. Retrieved from <https://digitalcommons.fairfield.edu/politics-books/38>
- Myers, N. 1988. Threatened biotas: "hot spots" in tropical forests. *The Environmentalist* 8: 187-208.
- Nordstrom, K.F. 1993. Intrinsic value and landscape evaluation. *Geographical Review* 83(4): 473-476.
- Rahamat, B.Y. 2013. *Urban Development Challenges in the Malaysian Context*.
- RankRed. 2015. *17 megadiverse countries in the world*. Internet, Technology, Knowledge. Retrieved from <http://www.rankred.com/top-10-megadiverse-countries-in-the-world/>
- Rashidi, O. & Ruzaimi, M.R. 2013. *Hutan heath*. Kuala Lumpur: Yamani Angle Sdn. Bhd.

- Katagiri, S., Takuo, Y., & Seng, H.L. 1991. Properties of soils in kerangas forest on sandstone at Bako National Park, Sarawak, East Malaysia. *Southeast Asian Studies* 29(1): 35-48.
- Sellan, G. (2019). Ecological responses of a Bornean heath forest (kerangas) to experimental lime and nitrogen addition. Doctoral thesis, Manchester Metropolitan University.
- Sellan, G., Thompson, J., Majalap, N., Robert, R., & Brearley, F.Q. 2020. Impact of soil nitrogen availability and pH on tropical heath forest organic matter decomposition and decomposer activity. *Pedobiologia* 80.
- Syuharni, A. W., Hakeem, K.R., Faridah Harun, I., Alias, M.S., & Ozturk, M. 2014. Ecology of the coastal heath forest, a case study from Terengganu Malaysia. *Emir. J. Food Agric* 26(12): 1114-1123.
- Tarrant, M.A., Cordell, H.K., & Green, G.T. 2003. PVF: a scale to measure public values of forests. *J. For.* 101: 24-30.
- Thomas, J.W. 1995. *Landscape Aesthetics: a Handbook for Scenery Management*. United States: Department of Agriculture.
- Whitmore, T.C. 1988. *Tropical Rain Forests of the Far East* (2nd ed). New York: Oxford University Press.

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