# Rapid Observational Assessment on Urban Forest Trails Established at UMS Peak of Universiti Malaysia Sabah

Lim Wing Shen[1], Syazwani Nisa Binti Anuar[2], and Andy Russel Mojiol[3]
*Forestry Office, Faculty of Science and Natural Resource,*
*Universiti Malaysia Sabah, 88400 Kota Kinabalu, Sabah.*
*[1]MS1821042T@student.ums.edu.my;*
*[2]MS1821041T@student.ums.edu.my; and*
*[3]andy@ums.edu.my*

## ABSTRACT

Universiti Malaysia Sabah housed a dense secondary forest that served as one of the urban forests and green lungs in Kota Kinabalu of Sabah, and this urban forest was known as UMS Peak. Few formal and informal trails were established within UMS Peak, and their conditions were yet to be properly evaluated since their establishments in 2009. Therefore, a preliminary assessment was required to assess existing conditions of these urban forest trails within UMS Peak. Two identified formal trails (Waterfall Trail and Chancellery Trail) and one informal trail (Kg. E Trail) were selected for rapid visual observation assessment. Distance from starting point, elevation, slope steepness, trail forest structure condition, visual value, and management condition for each trail were assessed at the sample posts established every 100 m along the trail. Surrounding plant community, facility and infrastructure, slope steepness, elevation, attractive scenic features, recreational impact, and ground cover were insignificant different, while trail visibility, trail width, soil compaction, forest layer, potential risk, surrounding scenic invisibility, and trail management condition were determined to be significantly different, between the three trails. Chancellery Trail suffered from worse recreational impact, and then Waterfall Trail was determined to be worse in trail condition compared to Kg. E Trail. Additionally, interior segments were discovered as main contributors to significant differences between trails. Therefore, further detailed evaluation on these informal and formal trails are required to obtain accurate information and much comprehensive understanding on factors with significant influences towards overall and segment conditions of these three different trails.

**Keywords:** *Urban Forestry, Trail Assessment, UMS Peak, and Universiti Malaysia Sabah.*

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## INTRODUCTION

Several urban forests were functioning as urban green spaces (USGs) for recreational uses by public in Kota Kinabalu of Sabah (Schipperijn, 2010; and Mojiol, 2018). These urban forest ecosystems were in fact part of the green lungs of this urban area, because they supplied vital cultural ecosystem services, which included the aesthetic, spiritual and recreational ecosystem services, to visitors and their respective surrounding communities (Cooper et al., 2016). Apart

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from public parks prepared by State Government of Sabah, Universiti Malaysia Sabah (UMS) housed a dense secondary forest that was known as UMS Peak and served as urban forest for public access as well (Sugawara et al., 2009). Despite that this urban forest was comprised of smaller trees, less wildlife and vegetation diversities, and poor-defined forest canopy structure, still it was vital in the provisioning of not only recreational opportunities to its visitors, but also habitats to local plant and wildlife communities (Majuakim et al., 2018; and Mojiol, 2018).

Natural trail or built-up trail is often found within an amenity forest, to provide accessibility for visitors in conducting recreational activities under a safer environment, along the designated trail (Oh & Hammitt, 2010; and Siti Noorbaizura Bookhari et al., 2014). Henceforth, recreational impact will be concentrated mainly onto these trails, as the mean to shield other parts of the amenity forest from facing ecological degradation (Wimpey & Marion, 2011). Nevertheless, high recreational usage by visitors was reported as a leading factor for ecological degradation of surrounding forest ecosystem along a particular trail (Soulard, 2017). Besides, formal trails were impacted severer compared to informal trails, due to higher usage by visitors for recreational purposes at formal trails compared to informal trails (Wimpey & Marion, 2011; and Pickering & Norman, 2017). Both formal and informal trails could be found established within UMS Peak, and then conditions of these trails were yet to be properly evaluated ever since their establishments within this urban forest in 2009. Henceforth, a preliminary assessment was commenced upon these trails to assess the existing conditions of urban forest trails that could be identified within UMS Peak.

## SITE STUDY

Universiti Malaysia Sabah is comprised of about 404.0 ha of land cover in Kota Kinabalu, in which 29.7 % area (120.0 ha) of this university campus is occupied by UMS Peak (Majuakim et al., 2018). Mixed-matrices of disturbed secondary forest and open canopy areas have shaped the present look of UMS Peak, and then existing native plants there are belonged to the lowland and mangrove forests of Sabah. The entire area of UMS Peak is comprised of flat area and steep hill, and then the highest peak is situated at 6° 2'52.77"N and 116° 7'6.20"E and 190.0 m above sea level (a.s.l). Additionally, this urban forest is hot and humid throughout the year, with annual rainfall and ambient temperature reach about 2,700 mm and 28.0$^{o}$C in average. Since the official establishment of Universiti Malaysia Sabah in 1994, rehabilitation was noticeable at the urban forest through the passing of 25 years, and certain species of wildlife were discovered inhabiting UMS Peak, due to sufficient food resource and space available for the wildlife to survive and reproduce as times passed (Majuakim et al., 2018). Nowadays, hiking, jogging and jungle-trekking are often conducted by local students and surrounding community along Waterfall Trail, Chancellery Trail (formal trails) and Kg. E Trail (informal trail) that are identified within this urban forest, and these trails are named after certain features that could be seen either at the starting point or along the trail in question. Waterfall Trail is the longest trail that has been established within the urban forest (1.45 km ± 0.5), followed by Kg. E Trail (1.35 km ± 0.5) and lastly Chancellery Trail (0.75 km ± 0.5). Each of these trails starts from various locations within the university campus, yet connected near to the summit of UMS Peak as shown in below Figure 2.1. Formal trails were designed by university authority and equipped with basic infrastructure and facility, whereas the informal trail was established by visitors without proper planning and design (Newsome & David, 2009; Wimpey & Marion, 2011).

informal trails in UMS Peak for two consecutive days in October, 2016. Point sampling was applied, where sample posts were established and sampled every 100 m, from starting until ending of respective trails (Cole, 1983; and Marion & Leung, 2001). Parameters that were assessed and recorded at each sample post included distance from starting point, elevation, and trail conditions.

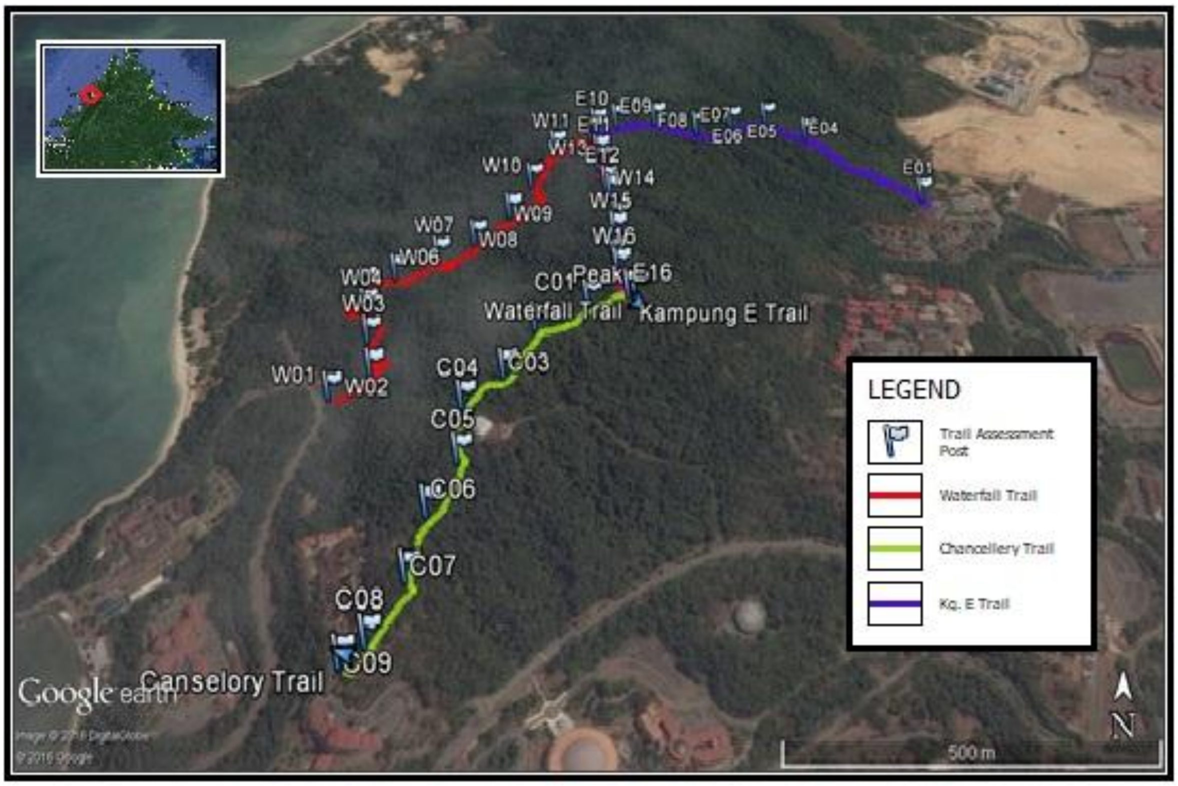


Figure 1 Three identified trails located at UMS Peak in Universiti Malaysia Sabah. *Source: Google Earth, 2019.*

## METHODOLOGY

Rapid observation assessment was conducted along the identified formal and

Sectional trail assessment was applied in present study (Marion & Leung, 2011), in which each trail was segmented into interior (50.0 % at the centre portion) and exterior segments (25.0% upper and lower

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portions), based on the distance of each sample post from the starting point at respective trails, as shown in below Table 1.

statistical analyses was commenced by using IBM SPSS Statistics ver. 20.0 (IBM Corp, 2011), with confidence interval level fixed at 95.0 % (p<0.05).

Table 1 Interior and exterior segments for Waterfall Trail, Chancellery Trail and Kg. E Trail.

| **Trail Assessment Parameter** | **Informal Trail** | **Formal Trail** | |
|---|---|---|---|
| | **Kg. E Trail (KT)** | **Chancellery Trail (CT)** | **Waterfall Trail (WT)** |
| **Sample Post (n)** | 15 | 9 | 16 |
| **Position of Segment in Trail (m)** | | | |
| Exterior | | | |
| • Lower | 0 – 350 (**4**) | 0 – 200 (**3**) | 0 – 325 (**4**) |
| • Upper | 1050 – 1400 (**3**) | 600 – 800 (**2**) | 1075 – 1500 (**4**) |
| Interior | 350 – 1050 (**8**) | 200 – 600 (**4**) | 325 – 1075 (**8**) |

Note: *n* = number, and; *m* = meter.

Differences in conditions within each trail was assessed and found insignificant (p>0.05), hence present study focused on comparing overall and segment conditions between trails. Different classification system and condition scale were applied for respective parameters employed in present study, based on the positivity and negativity of influence of a particular parameter towards the trail in question (Ólafsdóttir & Runnström, 2013), as shown in below Table 3.2. Significant differences in overall and segment trail conditions were analysed using Kruskal-Wallis One-way Analysis of Variance (ANOVA) test with Mann-Whitney U test selected for post-hoc analysis. Then, Kendall's Tau Coefficient Analysis was applied in determining relationships between trail condition parameters in influencing overall and segmented trail conditions (Mutanga et al., 2017). These

## RESULTS

Kg E Trail was an informal trail with generally about 10$^o$ to 20$^o$ steep, and then its exterior segment reached about 20$^o$ to 30$^o$ in steepness. Interior segment was looser, narrower, and less visible than exterior segment, and then surrounding scenic visibility, noticeable forest layer and attractive scenic feature, recreational impact, and provided infrastructure and facility were lesser compared to exterior segment. However, the entire Kg. E Trail was generally unmanaged, posing high risk, surrounded by different type of vegetation and covered by grass, stone and leaf litter. As for the two formal trails, Waterfall Trail was determined to have

Table 2 Classification system and condition scale applied for assessing the entire trail and each segment of trail in question.

| Trail Assessment Parameter | Classification System | Condition Scale |
|---|---|---|
| **Elevation (m)** | 0-20m, 20-40m, 40-60m, 60-80m, 80-100m, 100-120m, 120-140m, 140-160m, 160-180m, 180-200m | 1 to 10 with increasing in elevation. Determined with Handheld GPS. |
| **Slope steepness (°)** | <10°, 10°-20°, 20°-30°, 30° < | 1 to 4 with increasing in slope steepness. Measured using clinometer. |
| **Trail Visibility** | Undetectable, hardly visible, low visibility, visible, highly visible, clear sighting. | 1 to 6 with increasing in trail visibility. Field observation. |
| **Trail Width (cm)** | < 10cm, 10-30cm, 30-60cm, 60-90cm, 90-120cm, 120-150cm, 150-180cm, 180-210, 210cm < | 1 to 9 with increasing in trail width. Measured using measuring tape. |
| **Soil Compaction** | Easily eroded, very loose, loose, moderately compacted, compacted, highly compacted | 1 to 6 with increasing in soil compaction. Field observation. |
| **Ground Cover** | Soil erosion, bared, paved, stony, grassy, sandy, leaf litter cover | Soil erosion and bared = 0, and; paved, stony, grassy, sandy and leaf litter cover = 3. Field observation. |
| **Surrounding Plant Community** | No plant, grass, bushy, shrub, mixed shrub and large tree, medium-large tree, large tree | No plant = 0, and; + 1 value for each plant type presented at the sample post. Field observation. |
| **Forest Layer** | Ground cover layer, understorey layer, canopy layer, emergent layer | +1 value for each forest layer presented at the surrounding of sample post. Field observation. |
| **Recreational Impact** | Rubbish, tree vandalism, sapling damage, trail erosion, wildlife disturbance, land slide | + 1 value for each type of recreational impact found at the sample post. Field observation. |
| **Potential Hazard** | Sloppy, landslide, slippery, erosion, dead wood, rocky, and etc. | + 1 value for each type of potential hazard found at the sample post. Field observation. |
| **Facility and** | Non-provided, signage, gazebo, knot | Non-provided = 0, and; +1 for each facility |

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steeper, narrower, more infrastructure and facility provided, higher soil compaction, less managed and visible attractive scenic feature, lower trail and surrounding scenery visibilities, posing more potential risk and less recreationally impacted, when compared to Chancellery Trail, especially between exterior segments. Although both formal trails were actually surrounded by similar types of vegetation and forest layer, still Waterfall Trail was discovered to only be covered by leaf litter, unlike Chancellery Trail that was covered by both grass and leaf litter. Table 3 and Table 4 display the descriptive information on overall and segment conditions respectively for the three trails, and then the elevation profile for respective trails were plotted as shown in Figure 2, in which each trail started at different elevations, but eventually ended at the peak of UMS Peak.

Table 3 Descriptive information on the informal and formal trails assessed in present study.

| **Trail Assessment Parameter** | **Informal Trail** | **Formal Trail** | |
|---|---|---|---|
| | **Kg. E Trail (KT)** | **Chancellery Trail (CT)** | **Waterfall Trail (WT)** |
| **Elevation (m)** | 20-200 | 80-200 | 60-200 |
| **Slope Steepness (°)** | 10-20 | 10-20 | 20-30 |
| **Trail Visibility** | Hardly visible | Highly visible | Visible |
| **Trail Width (cm)** | 10-30cm | 90-120cm | 60-90cm |
| **Soil Compaction** | Moderately compacted | Compacted | Highly Compacted |
| **Ground Cover** | Grass, stone and leaf litter cover | Grass and leaf litter cover | Leaf litter cover |
| **Surrounding Plant Community** | Mixed shrubs, trees, bush and grass | Mixed shrubs, trees, bush and grass | Mixed shrubs, trees, bush and grass |
| **Forest Layer** | Understorey and canopy layers | Understorey and ground cover layers | Understorey and ground cover layers |
| **Recreational Impact** | High impact. | High impact | Low impact |
| **Potential Hazard** | High risk | Medium risk | Very high risk |
| **Facility and Infrastructure** | Lacks in facility and infrastructure | Lacks in facility and infrastructure | Staircase provided |
| **Surrounding Scenic Invisibility (%)** | 50-75% Invisibility | 25-50% invisibility | 50-75% invisibility |
| **Attractive Scenic Feature** | Flora and fauna | Flora, ocean, mountain, and island | Flora and waterfall |
| **Trail Management Condition** | Unmanaged | Poorly-managed | Unmanaged |

Note: *cm* = centimetre; *m* = metre; *°* = degree, and; % = invisibility percentage.

Table 4 Descriptive information on the exterior and interior segments of Kg. E, Chancellery and Waterfall Trails assessed in present study.

| **Trail Assessment Parameter** | **Kg. E Trail (KT)** | | **Chancellery Trail (CT)** | | **Waterfall Trail (WT)** | |
|---|---|---|---|---|---|---|
| | **Exterior** | **Interior** | **Exterior** | **Interior** | **Exterior** | **Interior** |
| **Elevation (m)** | 20-120, 120-200 | 100-200 | 80-120, 180-200 | 120-180 | 60-120, 180-200 | 60-200 |
| **Slope Steepness (°)** | 20-30 | 10-20 | 10-20 | 20-30 | 20-30 | 20-30 |
| **Trail Visibility** | Low visibility | Hardly visible | Highly visible | Highly visible | Visible | Visible |
| **Trail Width (cm)** | 30-60 | 10-30 | 90-120 | 90-120 | 60-90 | 60-90 |
| **Soil Compaction** | Moderately compacted | Loose | Compacted | Compacted | Highly compacted | Highly compacted |
| **Ground Cover** | Grass, stone and leaf litter cover | Grass, stone and leaf litter cover | Grass cover | Grass and leaf litter cover | Leaf litter cover | Leaf litter cover |
| **Surrounding Plant Community** | Mixed shrubs, trees, bush and grass | Mixed shrubs, trees, bush and grass | Mixed shrubs, trees, bush and grass | Mixed shrubs, trees, bush and grass | Mixed shrubs, trees, bush and grass | Mixed shrubs, trees, bush and grass |
| **Forest Layer** | Understorey and canopy layers | Understorey layer | Understorey and ground cover layers | Understorey layer | Understorey and ground cover layers | Understorey layer |
| **Recreational Impact** | Campsite waste and lianas | Leftover rubbish | Leftover rubbish, soil erosion and vandalisme | None | Soil erosion | Soil erosion |
| **Potential Hazard** | High risk | High risk | Medium risk | Low risk | Very high risk | Very high risk |
| **Facility and Infrastructure** | Staircase provided. | None. | Signage and staircase provided | None | Staircase and knot marking provided | Staircase provided |
| **Surrounding Scenic Invisibility (%)** | 25-50% invisibility | 75-100% invisibility | 25-50% invisibility | 25-50% invisibility | 75-100% invisibility | 50-75% invisibility |
| **Attractive Scenic Feature** | Mountain, flora and fauna | Flora and fauna | Flora, fauna, ocean, island, and mountain | Flora and forest | Flora | Flora, river and waterfall |
| **Trail Management Condition** | Unmanaged | Unmanaged | Poorly-managed | Poorly-managed | Unmanaged | Unmanaged |

Note: *m*= metre; *cm* = centimetre; $^{o}$ = degree, and; % = invisibility percentage.

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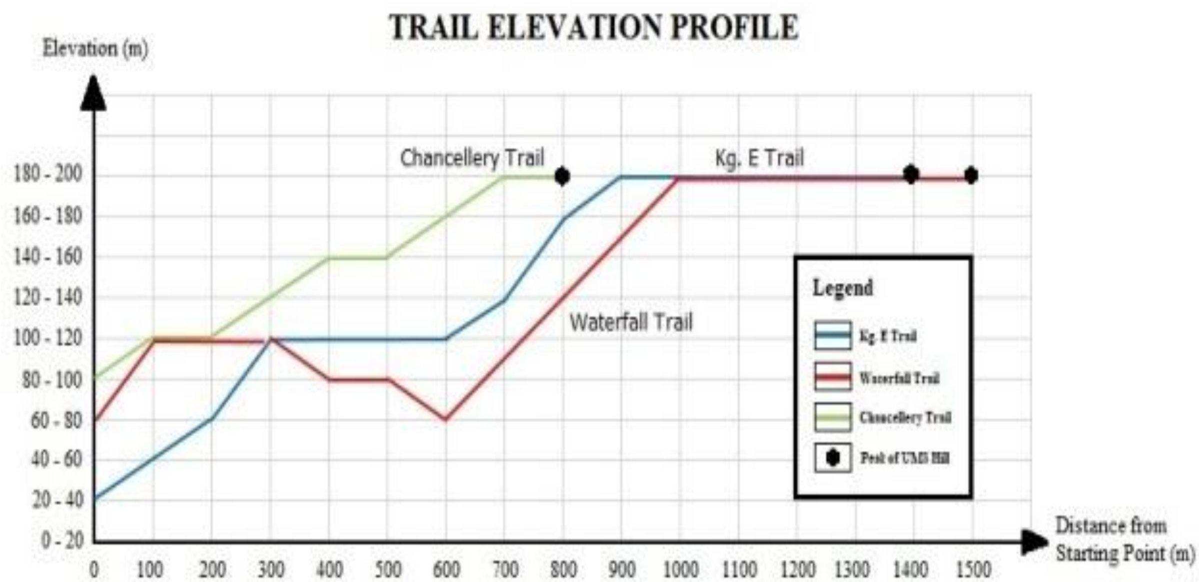


Figure 2 Elevation profiles for Kg. E, Chancellery and Waterfall Trails assessed in present study

Due to various dissimilarities between trails, further comparison between formal and informal trails were commenced and analysed statistically, in which insignificant differences in surrounding plant community, facility and infrastructure, elevation, slope steepness, recreational impact, ground cover, and attractive scenic features were discovered between Kg. E, Chancellery and Waterfall Trails ($p>0.05$), which were listed out as shown in below Table 5 and Table 6.

There were very significant differences in trail visibility, trail width, soil compaction, forest layer, potential risk, surrounding scenic invisibility, and trail management condition between trails ($p<0.01$), with interior segments contributed more than exterior segments to the significant variations between trails ($p<0.05$). Chancellery Trail was determined with significantly wider trail (90-120cm) than Kg. E and Waterfall Trail (30-60cm and 60-90cm respectively), while Waterfall trail consisted of significantly higher compacted soil than the other trails ($p<0.05$). Wider trail was very significantly associated with higher soil compaction ($\tau=0.362$, $p<0.01$), and then presences of more forest layers and higher potential risk were significantly correlated at high compacted soil region along a particular trail ($p<0.05$). Relationships between parameters with significant influences over overall, interior and exterior trail conditions were ascertained as well, which was tabulated as shown in below Table 7.

Table 5 Comparison in overall trail condition between Kg. E, Chancellery and Waterfall Trails.

| Trail Assessment Parameter | p(KT vs CT) | p(KT vs WT) | p(CT vs WT) | p(CT vs WT vs WT) |
|---|---|---|---|---|
| Elevation | - | - | - | - |
| Slope steepness | - | - | - | - |
| Trail Visibility | ** | - | ** | ** |
| Trail Width | ** | * | * | ** |
| Soil Compaction | ** | ** | ** | ** |
| Ground Cover | - | - | - | - |
| Surrounding Plant Community | - | - | - | - |
| Forest Layer | - | ** | - | ** |
| Recreational Impact | - | - | - | - |
| Potential Hazard | - | ** | ** | ** |
| Facility and Infrastructure | - | - | - | - |
| Surrounding Scenic Invisibility | ** | - | ** | ** |
| Attractive Scenic Feature | - | - | - | - |
| Trail Management Condition | ** | - | - | ** |

Note: *KT* = Kg. E Trail; *CT* = Chancellery Trail; *WT* = Waterfall Trail; - = no significant; *$p$<0.05 = significant, and; **$p$<0.01 = very significant; Kruskal-Wallis Test (Mann-Whitney post-hoc test).

Table 6 Comparison in interior and exterior segment conditions between Kg. E, Chancellery and Waterfall Trails.

| Trail Assessment Parameter | Exterior Segment | | | | Interior Segment | | | |
|---|---|---|---|---|---|---|---|---|
| | p(KT vs CT) | p(KT vs WT) | p(CT vs WT) | p(KT vs CT vs WT) | p(KT vs CT) | p(KT vs WT) | p(CT vs WT) | p(KT vs CT vs WT) |
| Elevation | - | - | - | - | - | - | - | - |
| Slope Steepness | - | - | - | - | - | - | - | - |
| Trail Visibility | - | - | - | - | ** | * | ** | ** |
| Trail Width | - | - | - | - | ** | ** | - | ** |
| Soil Compaction | * | ** | * | ** | ** | ** | - | ** |
| Ground Cover | - | - | - | - | - | - | - | - |
| Surrounding Plant Community | - | - | - | - | - | - | - | - |
| Forest Layer | * | * | - | ** | - | ** | * | ** |
| Recreational Impact | - | - | - | - | - | - | - | - |
| Potential Hazard | - | - | - | - | - | * | * | * |
| Facility and Infrastructure | - | - | - | - | - | - | - | - |
| Surrounding Scenic Visibility | - | - | ** | * | ** | - | * | ** |
| Attractive Scenic Feature | - | - | - | - | - | - | - | - |
| Trail Management Condition | * | - | - | * | - | - | - | - |

Note: *KT* = Kg. E Trail; *CT* = Chancellery Trail; *WT* = Waterfall Trail; - = no significant; *$p$<0.05 = significant, and; **$p$<0.01 = very significant; Kruskal-Wallis Test (Mann-Whitney post-hoc test).

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Table 7 Correlations between parameters with significant influences over overall, exterior and interior trail conditions in present study

| | E | SS | TV | TW | SC | GC | SPC | FL | RI | PR | F&I | SSI | ASF | TMC |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **TV** | - | - | | | | | | | | | | | | |
| **TW** | - | - | **0.875**** | | | | | | | | | | | |
| **SC** | - | - | - | 0.362** | | | | | | | | | | |
| **FL** | - | - | - | - | **0.530**** | - | - | | | | | | | |
| **PR** | - | - | - | - | 0.288* | - | - | 0.430** | - | | | | | |
| **SSI** | - | - | -0.291* | -0.311* | - | - | - | - | - | - | - | | | |
| **TMC** | - | - | 0.323* | 0.322* | - | - | - | - | - | - | - | -0.344* | - | |

Note: *E* = Elevation; *SS* = Slope Steepness; *TV* = Trail Visibility; *TW* = Trail Width; *SC* = Soil Compaction; *GC* = Ground Cover; *SPC* = Surrounding Plant Community; *FL* = Forest Layer; *RI* = Recreational Impact; *PR* = Potential Risk; *F&I* = Facility and Infrastructure; *SSI* = Surrounding Scenic Invisibility; *ASF* = Attractive Scenic Feature; *TMC* = Trail Management Condition; - = no significant; **p*<0.05 = significant, and; ***p*<0.01 = very significant; Kendall's Tau Coefficient Analysis.

There were no significant differences between Kg. E Trail and Waterfall Trail in trail and its surrounding scenic visibilities (p>0.05), but then the interior segment of Chancellery Trail and its surrounding scenery were significantly more visible than those of interior segments of Waterfall Trail and Kg. E Trail (p<0.05). Better trail management resulted in significantly wider trail and higher surrounding scenic visibility (p<0.05), which led to significant increasing in trail visibility of interior segment of Chancellery Trail when compared to those of Waterfall and Kg. E Trails. Nevertheless, forest layer and potential risk were very significantly different between interior Kg. E and Waterfall Trails, in which presences of more forest layers resulted in higher potential risk at interior Waterfall Trail than interior Kg. E Trail (τ=0.430, p<0.01). Even though there was significant difference in the forest layer between exterior segments of these two trails (p<0.05), still the potential risk posed at the exterior segments were found insignificant, unlike their respective interior segments. Interior segment of Chancellery Trail was discovered with significantly lower potential risk than that of Waterfall Trail, at the same time exterior segment of this trail was found significantly well-managed and different in forest layer than exterior Kg. E Trail (p<0.05).

## DISCUSSIONS

Present study provided preliminary assessment on the existing condition of two formal trails and one informal trails identified at UMS Peak. Based on significant differences between trails and segments, trail visibility, trail width, trail management condition, potential risk, forest layer, soil compaction, and surrounding scenic invisibility were determined as parameters with significant influences over the overall and segment trail conditions. Generally, trail width, trail depth and trail condition liked ground cover, surrounding forest condition and soil condition, were concerned as crucial parameters in rapid survey (e.g.: Marion et al., 2006; Knapp & Ducey, 2009; and Siti Noorbaizura Bookahri et al., 2014). In present study, rapid observational assessment conducted on the three selected trails and their respective segments was completed within two consecutive days, and then gathered information was analysed and revealed significant differences between trails and segments. Management could be the main influencing factor here, as Waterfall Trail was found worse in trail condition than Kg. E Trail, with Chancellery Trail exhibited the best of trail condition than other two trails.

Besides, high recreational impact detected along Chancellery Trail was sign of high visitor usage, possibly due to higher visual value as perceived by visitors, compared to Kg. E and Waterfall Trails. This condition was in agreement with findings of Ólafsdóttir & Runnström (2013), in which visitors preferred over trails with high visual value during hiking in Iceland, and eventually led to increase in severity of the degradation of surrounding trail area, due to the increased site recreational impact intensity. In present study, significant differences between trails were found clustered within interior segments of these trails, and then only few vivid differences could be determined within their exterior segments. This finding was aligned with that of Monz et al. (2010), in which certain regions were more sensitive than other parts of a particular trail, hence these areas were easily affected and degraded by worsening recreational impact and poor management effort. Soil compaction was among the leading causes for increased soil erosion occurred at a wide trail without ground cover protection (Wimpey & Marion, 2011), which was why Waterfall Trail was discovered suffering from severe soil erosion along wider trail region with highly compacted soil.

Steep and high elevation areas were highly vulnerable for ecological degradation along a trail (Ólafsdóttir & Runnström, 2013), however these parameters shown insignificant influences towards trail and segment conditions of Kg. E, Chancellery and Waterfall Trails, probably because the usage of categorical-based generalized data in present study. Trail facility and infrastructure were evaluated qualitatively to determine current conditions of that particular facility or as indicator for a given trail (Wimpey & Marion, 2011), unlike in present study, where this parameter was assessed quantitatively and lack of accurate assessment on the current condition of these examined facilities. Additionally, surrounding vegetation of trail was assessed and found similar between trails and segments, possibly due to these trails were established within disturbed secondary forest of UMS Peak, which could in fact be insensitive towards high visitor usages along the trails, hence agreed with research findings of Pickering and Norman (2017). As for other previous studies, trails were established along different sensitive forest types, such as heath forest and sparsely vegetated land of Iceland (e.g.: Ólafsdóttir & Runnström, 2013), as well as the dipterocarp forest and montane forest of Malaysia (Siti Noorbaizura Bookhari et al., 2014). In fact, high visitor usages caused dramatic changes to vegetation composition surrounded these trails, when compared to the native forest condition at respective destinations.

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## CONCLUSIONS

Present study managed to evaluate and determine existing conditions of three different trails that were identified being established within UMS Peak, through rapid observational assessment. Chancellery Trail was suffered from worse recreational impact, possibly due to its ability to supply higher visual value and least potential risk to visitors than Waterfall and Kg. E Trails. Likewise, Waterfall Trail was determined to be worse in trail condition than Kg. E Trail.

Additionally, interior segments were discovered as main contributors to significant differences between trails, hence assumption could be made, in which interior segments were more sensitive than exterior segment for these trails. However, limitations in time and resource resulted in rapid observational assessment applied in present study lacked precision and accuracy. Categorical-based generalized data collected in present study might be the reason behind certain evaluated parameters became insignificant in influencing trail condition. The lacking in accuracy could affect the precision of data analysis and ultimately present finding. Therefore, further detailed evaluation on these informal and formal trails are required to be conducted in coming days, in order to obtain accurate information and much holistic understanding on the factors that can create significant difference among these trails, especially their long-term influences towards respective trail and segment conditions in UMS Peak.

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