

Landscape Visual Classification Using Land use and Contour Data for Tourism and Planning Decision Making in Cameron Highlands District

Hosni, N. and Shinozaki, M.

Abstract—Cameron Highlands is known for upland tourism area with vast natural wealth, mountainous landscape endowed with rich diverse species as well as people traditions and cultures. With these various resources, CH possesses an interesting visual and panorama that can be offered to the tourist. However this benefit may not be utilized without obtaining the understanding of existing landscape structure and visual. Given a limited data, this paper attempts to classify landscape visual of Cameron Highlands using land use and contour data. Visual points of view were determined from the given tourist attraction points in the CH Local Plan 2003-2015. The result shows landscape visual and structure categories offered in the study area. The result can be used for further analysis to determine the best alternative tourist trails for tourism planning and decision making using readily available data.

Keywords—Visibility, landscape visual, urban planning, GIS

I. INTRODUCTION

VIEWSHED analysis can follow several approaches each suitable for different applications [1]. Most quantitative approaches are based on either viewshed visibility analysis or on perspective computer simulations. Viewshed analysis determines which space is intervisible or areas visible from an observation point. This approach is applied to tasks such as identifying areas of scenic beauty, estimating the visual impact of landscape changes, or comparing the quality of different views. Previous works on viewshed analyses utilizing indicator of view quality and use of geographic information systems (GIS) generally have been restricted to small vistas and are based on small numbers of observations [3,4,13]. In such studies, one-scale landcover was obtained by digitizing aerial photos. Manual data approaches of this type are impractical for large sample sizes and for the large areas addressed in this study [13]. Furthermore, despite the increasing interest, however, the spatial analysis of structure and pattern of landscape visibility is given less attention in the study of rural landscapes, and standard methods for measuring the geographical distribution of scene composition in terms of land cover mixes are lacking [17]. As in the study the analyses involve large extent of viewshed within landscape although only few major viewpoints were selected for the assessment

with the computing technique within GIS. It demonstrates straightforward method on the understanding of landscape features in the local context with the concern on the visual composition of land use on the basis of visibility. The analysis conducted with the objective to understand and categorize the view types offered in the study area. Given a unique character of study area with undulating and complex of terrain features, rich of species and traditions and culture yet very limited data to utilize, a typology of the tourist attraction area analyzed using viewshed analysis. The visible area then were intersected with the land use data. In this paper the consideration is barely on selected major attractions points with the concern of views composition and visible area over large viewsheds landscape.

II. TOURISM PLANNING AND STRATEGIES

A. Cameron Highlands Background

During the British occupancy, the highland was appreciated for its cool climate and scenic sceneries. The highland served the British government officials as a retreat from the hot climate in the lowland. After the British occupancy in 1957, the highland has been promoted as a tourist destination. Since independence, there are policies that encouraged agricultural and resort developments for tourism, and recreation [15]. Agriculture is the largest land use (5,705.17 hectares) after forestry [18]. In relation to that, Leong also notes that since 1970's more holiday homes and hotels have been built.

Cameron Highlands has become a popular tourist destination to both local and foreign tourists [18]. The tourism industry has flourished significantly with the availability of public transportation and new access road. It is estimated that about 80% of the tourists are locals whose number has increased due to the opening of a new access road; Simpang Pulai-Lojing-Gua Musang road [20]. Tourists from Asian countries, Japan, Europe, Australia, Korea, and Middle East

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have made up 20% of the foreign tourists [20]. Cameron

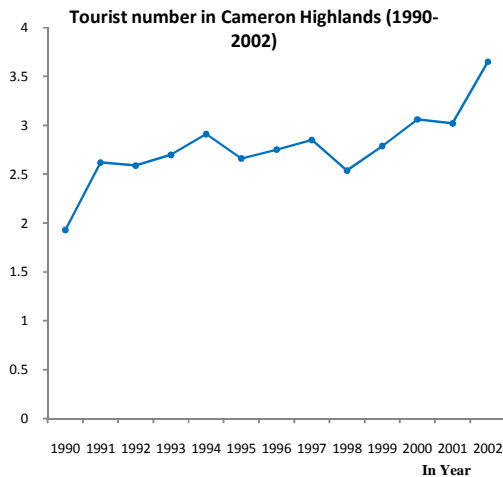


Fig. 1 Tourist Numbers in Cameron Highlands 1990-2002

*Source: Technical Report of Cameron Highlands Local Plan 2003-2015, Cameron Highlands Municipal

highlands in the Pahang State Structure Plan 2002-2020 has shown that location of the study area is far-off to the determined state main development corridor namely Kuantan. However the construction of the highway from Cameron Highlands to Kuala Lipis will link the area to Kuantan and further to Kuala Lumpur. As the area is remote from the core development corridor, the economics of the area is exceptionally dependent on the existing strength by improving and developing tourism industry as to support economic of the

area particularly in agriculture and services sectors as shown below in the Figure 1 the number of tourist has increased year by year.

The study area offers three main tourism types as identified in the Cameron Highlands Development Plan 2003-2015 1)agro-tourism; 2) eco-tourism and; 3) Cultural and heritage tourism.

Previous works in Cameron Highlands indicated that tourists are attracted to ecotourism activities which are trekking in the jungle, watching flora and fauna in the jungle, visit orang asli villages and visit natural countryside surroundings [12]. As referred to the CH local Plan, under tourism sector has outlined the strategy to strengthen the synergy between agriculture and natural setting with tourism activities in which touch on the importance of view to integrate the agriculture and natural setting for tourism purposes.

III. CAMERON HIGHLANDS PHYSICAL CHARACTERISTICS

Cameron Highlands has a complex terrain and mountainous landscape located at the Titiwangsa Alps ranging from 100 to 2031 meters above sea level. Due to that, its climate is pleasant with an average temperature of 18 degree Celsius. Its population is derived from diverse ethnic groups; Chinese is the biggest group, followed by Malays, Indians, aborigine, and foreigner.

The study area is the smallest district which is located at West-South of Pahang State in Peninsular Malaysia. Cameron Highlands district shares its boundary to Kelantan state at the Northern part and Perak State at East-South part. CH district area only covers 2% of Pahang State with a total area 72, 218

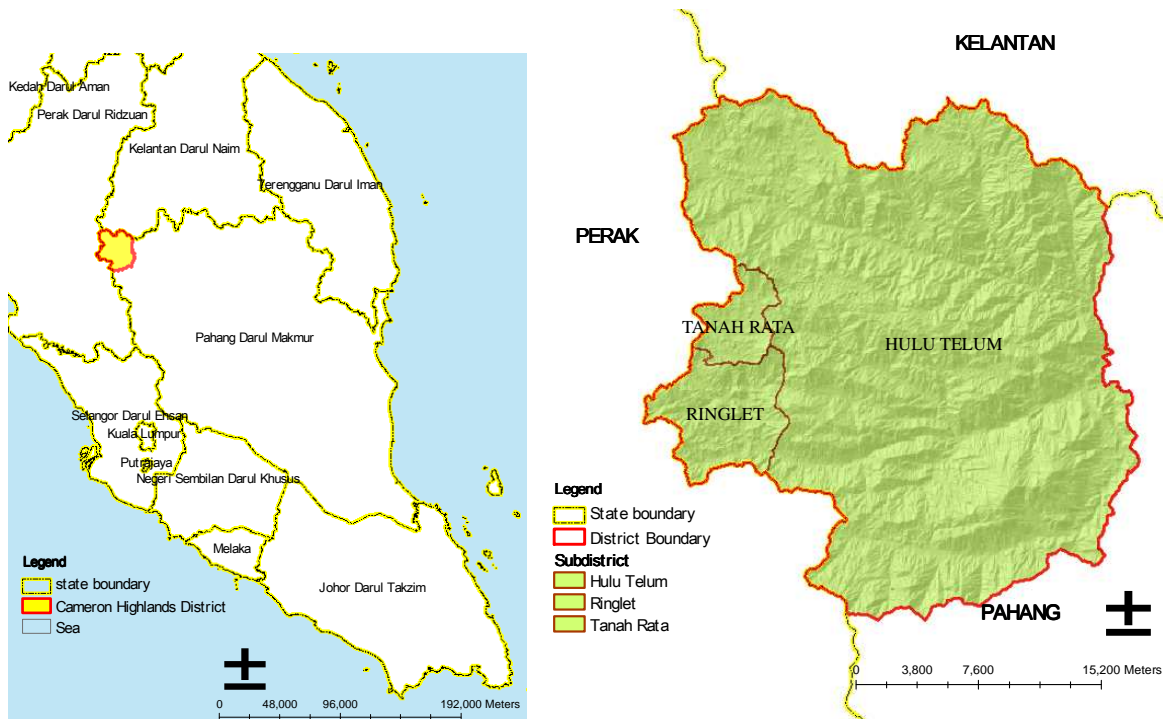


Fig. 2 Location Map and Study Area

hectares. There are three main road that link CH district to the other district and state boundaries 1) North –South Highway and Federal highway II through Tapah; 2)Simpang Pulai road to Lojing and 3)Lembah Bertam Road to Kuala Lipis.

Cameron Highlands is active in agricultures and tourism activities. In general land use types in this area were divided into settlement, commercial, determined development, quarry, institutions, recreation and green area, infrastructure and utility. There are three small main urban centres in this area namely Ringlet, Tanah Rata and Brinchang. Given a limited area for growth, town centre area is located alongside of main federal road in which each town centre plays different roles. As Ringlet town play a major role to commercialize vegetables and actively with transit activities, Tanah Rata town consists of government and main facilities buildings. Brinchang town supports commercial facilities and hotel.

A. Topography

The study area is renowned with natural landscape and physical characteristics. The undulating land of Cameron highlands with various height size, average 100 meter at the eastern part and 2,031 meter at the western part. Distribution of slope class and elevation of study area is showed in the table below.

TABLE I
SLOPE CLASS DISTRIBUTIONS

Class	Slope degree	Percentage (%)	Total area(h)
Class I	<15	30.31	21,539.56
Class II	16-25	28.75	20,444.39
Class III	26-35	32.11	22,952.06
Class IV	>35	8.82	6,281.99
Total		100.00	72,218.00

*Source: Cameron Highlands Local Plan, 2003-2015.

TABLE II
ELEVATION CLASS DISTRIBUTIONS

Class	Slope degree	Percentage (%)	Total area(h)
Class I	<15	30.31	21,539.56
Class II	16-25	28.75	20,444.39
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Class IV	>35	8.82	6,281.99
Total		100.00	72,218.00

*Source: Cameron Highlands Local Plan, 2003-2015.

B. Soil

Based on the Paramanathan (1997) in *Local Plan, Cameron Highlands, 2003-2015* showed soil of study area consists of Spodosol, Ultisol and iceptisol at the river valley of Ringlet and Kamud with all soil types is sandy clay and sandy clay loam. All these types are suitable for plantation and vegetation.

C. Hidrology and drainage

There are three main rivers in study area namely Bertam, Telom and Mensun river. These main streams are flowing directly to the Pahang River. These river plays as an important water catchment of the study area.

Cameron Highlands district own dam area which is the only lake and the largest water body in the district for public uses.

D. Natural vegetation

Natural forest area covers about 54% of study area. The forest types in the study area are divided into five categories which is based on the height of landform. The table shows as below.

TABLE III
FOREST TYPES IN CAMERON HIGHLANDS

Forest types	Characteristics
Lower diptrocarp	100-300m height including valley area mostly in Ulu Telom subdistrict
Hilly diptrocarp	300-750 meters height
Upper diptrocarp	750-1200 meters height mostly in Ringlet subdistrict
Lower montane	1200-1500meters height around Brinchang and Tanah rata area.
Upper montane	Located at 1500meters height above at peak of Brincang mountain.

*Source: Cameron Highlands Local Plan, 2003-2015.

Rare flora species can be found mostly at upper montane area including wild orchid, *periuk kera*, *paku gajah*, *rodhodendron* and *paku pakis* which is also listed as threaten species (Technical Report, Cameron Highlands Local Plan 2003-2015).

IV. METHOD

A. Basic Approach

The methodology of this paper is divided into three steps. First typology of the attraction area was identified using the contour map 1:50,000 with the contour lines had an equidistance of 100m to derived TIN data. Selected main attraction tourist points map are chosen based on the Cameron Highlands Local Plan 2003-2015 (*refer to Table 4*). The existing attraction points map and existing road map 1: 6336 are used to deploys 1km viewpoints. These observation points are determined at the 1.5m above the surface. No constraints on distance, heights and direction were set. Then both data were used to generate a viewshed analysis. The analysis shows the visible area of the point.

Second, for further understanding the points were buffered in 3 distances; short view distance, middle view distance and long view distance. The determined distances are carried out on basis of the rain forest treetops height to the ideal vision of three categories [14]. The short distance view to the middle distance view is 60 times size of the object. The middle view to long distance view is 1,100 times the size. In case of Malaysia, we take the average tropical rain forest treetop height. An intermediate zone (*canopy*) of continuous foliage is 9 to 18 meters (30 to 60 ft)

Thirth, the viewshed result and land use data was overlaid to the buffered area. The land use types are categorized into 12 landscape elements and attributes.

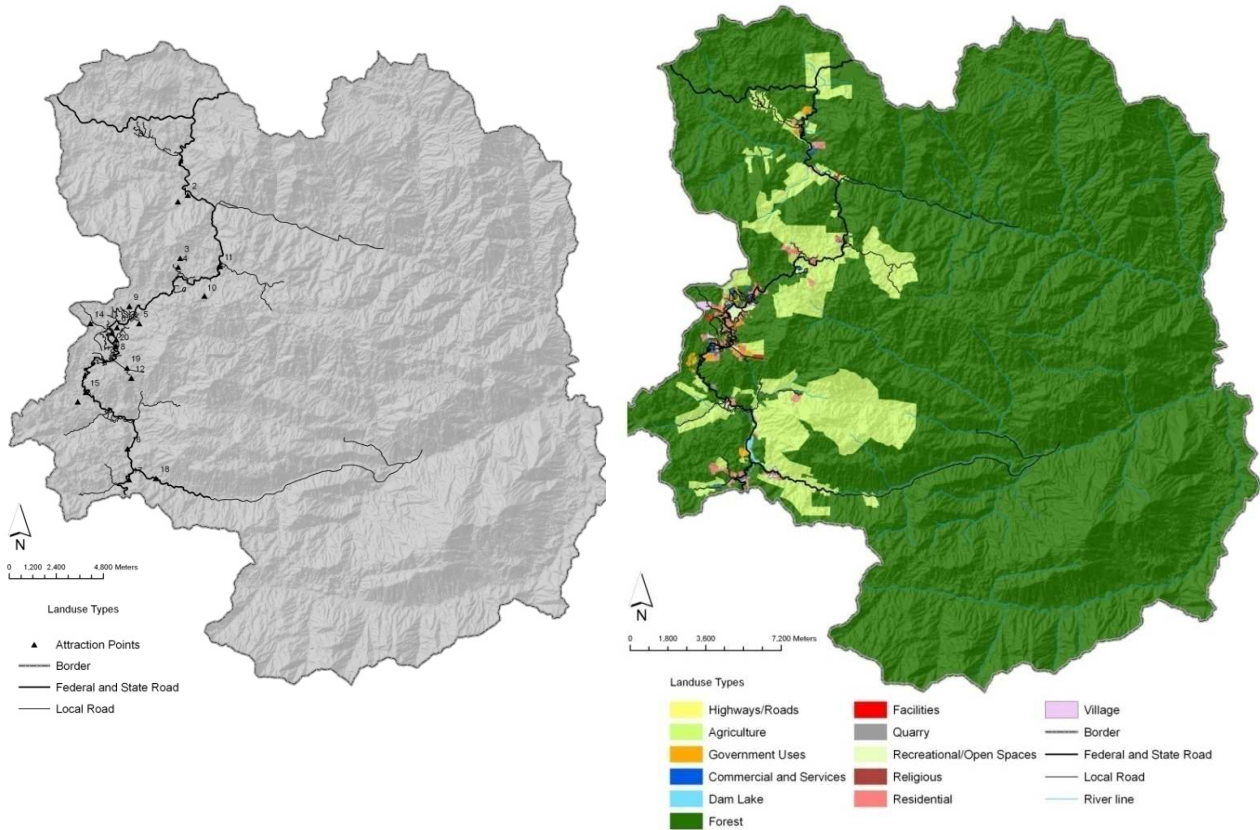


Fig. 3 (1) Attraction points and topography (Digital model with hillshade) of Cameron Highlands (Source: Topographical map, Pahang State Mapping Department (1995) 1:50,000) (2) Land use in Cameron Highlands: Attraction points and topography (Digital model with hillshade) of Cameron Highlands (Source: Topographical map, Pahang State Mapping Department (1995) 1:50,000)

TABLE IV
THE EXISTING OF MAIN TOURIST'S ATTRACTION AREA

No.	Name	Activities
1	Cameron Bharat Tea Plantation	Tea plantation, tourist site visit location
2	Cameron Bharat Tea House	Tea plantation, processing factory Kiosk & café commercial
3	Sg. Palas Estate	Tea plantation, processing factory Tourist site visit location
4	Sg. Palas Boh Tea Centre	Tea plantation , processing factory Kiosk & café commercial
5	Sam Poh Temple	Religious, chinese community gathering and traditional culture activities, tourist site visit location
6	Cameron Golf Course	Sports & Recreation centre Community activities, Tourist site visit location
7	Ye Old Smoke House	Tourist site visit location
8	All Souls Church	Religious, tourist site visit location
9	Cactus Valley	Flowers farm , agriculture transition, tourist site visit location
10	Kea Farm	Mixed vegetations, agriculture transition, tourist site visit location
11	Rose Valley	Flowers farm Commercial Tourist site visit location
12	Robinson Waterfall	Forestry/Water catchment area Sports & Recreational activities
13	Cameron Bharat Tea Plantation	Tea plantation Agriculture transition Tourist site visit location
14	Cameron Bharat Tea House	Kiosk & cafe Tourist site visit location
15	RPS - Kg. Sungai Ruil	Aborigine settlement with traditional culture lifestyle agriculture (small scale), collect minor forest product and services such as rattan, bamboo, resins, ivory, and other animal parts, traditional Craft, tourist site visit location
16	Lake House Hotel	Accommodation which is hotel with significant architectural building
17	Kg.Baru Ringlet	Chinese culture settlement, vegetation activities, homestay
18.	Taman Chrisentemum	Chinese culture settlement, vegetation activities, homestay
19.	Taman Teknologi Agro Mardi	Plantation, Agrotourism
20	Taman Sedia	Malay settlement, vegetation and potted Strawberry, homestay

B. Categorization

Before go into detail categorization the presence of each types of land uses in the overlapping land use data with the visible area was constructed in the matrix tables as shown in Table 5, 6 and 7. The presence of land use types and specific features such mountains and rivers were included as well. The matrix tables are constructed in three distances; short view distance (foreground), middle view distance (middle ground) and long view distance (background).

The main components in the matrix tables are land use types, mountain points and river lines. The land use are categorized into 12 types based on the Land use Code 2007 prepared by Malaysian Town and Regional Planning Department in the level 1 categorization.

In this case, educational buildings, cemetery and government buildings were set under institutional/government uses. Water tank, substation, solid waste and public facilities are grouped in facilities land use type. Furthermore, to improve and simplify the understanding of character on the presence of the components, all the built up and manmade components are group into urban land uses.

Then the categorization of visual types by the land use are calculated based on the overlapping presence of forest, residential, urban uses, water body and agriculture and mountain in the determined 3 distances. Each of the presence at the 3 distances were given different value. The example

shows as below:

The presence of forest:
 Short distance (S)=1
 Middle Distance (M)=3
 Long Distance (L)= 5

Therefore
 S+M=4;
 M+L=8;
 S+L=6 and
 S+M+L= 9

*notes: no presence at any distance is equal to 0

The total up of each value by each presence will show the types of visual by land composition in the study area.

VI. DATA ACQUISITION

We use 1:50,000 contour map in 1995, 1:6336 land use data in 2005, road map and attraction points, river lines and mountain points in 2005 and secondary reports e.g. Technical Report of Cameron Highlands Development Plan 2003-2015 and Technical Report of Cameron Highlands Landscape Master Plan 2005-2015.

TABLE V
 THE PRESENCE OF LAND USE COMPONENT AT SHORT DISTANCE VIEW BASED ON THE EXISTING ATTRACTION POINTS.

Attraction Point	At 1	At 2	At 3	At 4	At 5	At 6	At 7	At 8	At 9	At 10	At 11	At 12	At 13	At 14	At 15	At 16	At 17	At 18	At 19	At 20
Landuse																				
Forest	0	1	0	1	1	1	1	1	1	0	1	1	1	1	1	1	0	0	1	1
Tea plantation	1	1	1	1	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0
Other agriculture	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1	1
Waterbody(lake)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0
Government building	0	0	0	0	0	1	1	1	0	0	0	0	0	0	0	1	0	1	1	1
Religious building facilities	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0
Recreational/Open space	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	1	0
Quarry	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Village	0	1	0	1	0	0	0	0	0	0	1	0	0	0	1	0	1	0	0	1
Residential	0	0	0	0	1	1	1	1	0	0	0	0	0	0	0	0	0	1	1	0
Highways/Roads	0	0	0	0	1	1	1	1	0	0	0	0	0	1	0	1	0	1	1	1
Mountain presence	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0
Water presence (river)	1	1	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	1	1	0

V. RESULT

When observing the visible area with the overlapping distances, it is shown a significant different of land use categories and components. The paper demonstrates an interesting landscape character offered in the study area. The analysis demonstrates some of the specific and non specific character in the attraction points.

The results are produced by calculating the presence of each component constructed in the matrix table in the three distances as refer to Table 5,6 and 7. The sum of overlapping each distances provides specific values that represent the location as to assist to characterize the attraction points. The calculated value of each component in the given attraction points can be seen in the Table 8.

As refer to Table 4, the activities of the main attraction points possibly will represent the land use types in the visible area particularly at the foreground and middle ground scene.

The analysis at the short distance view demonstrates more explicit character in the scene as refer to area that is visible to observer. Elements that are visible in this distance are discernable as individual units.

Attraction points 1 to 4 in the table 4 shows the activities of the area is tea plantation and factory processing. Result of land use composition in the table 5 shows only attraction points 2 and 4 have a presence of tea plantation uses as well as village and forests. The presence of these components creates cohesive visual variety of tea area and village scene. Moreover, attraction points 1 illustrates the additional quality of the scene with the presence of positive element –river. The attraction point 6 and 7 also give more information of the foreground view in the area. The point 6 is a golf course with recreation and community

activities. Close to the point is Ye Old Smoke House, a rest house with a historical building. As in the table 5 shows point 6 and 7 share the same visible land use components through foreground view. The components are government uses, recreational area-golf course and residential area. Another example is tourist points 18 and 20 with similar activities. Both are having active activities on agriculture and homestay. However the analysis has shown through a short distance view the visible components in point 20 encompasses variety and richness compared to point 18 with the presence of forests, agricultures and government uses. The variety through short distance view in the point 20 offers an attractive visual, yet too much variety will reduce the definition and understanding of the area. Point 15 demonstrates a comforting visual with the presence of village and forests surrounded by mountain. Observing in this scene can develop a special sense of

TABLE VI
THE PRESENCE OF LAND USE COMPONENT AT MIDDLE DISTANCE VIEW BASED ON THE EXISTING ATTRACTION POINTS.

Attraction Point	At 1	At 2	At 3	At 4	At 5	At 6	At 7	At 8	At 9	At 10	At 11	At 12	At 13	At 14	At 15	At 16	At 17	At 18	At 19	At 20
Landuse																				
Forest	I	I	I	I	I	I	I	I	I	O	I	I	I	I	I	I	I	I	I	I
Tea plantation	I	I	I	I	O	O	O	O	O	O	O	I	I	I	O	O	O	O	O	O
Other agriculture	I	O	O	O	I	I	O	O	I	I	O	O	O	O	O	O	O	O	I	I
Waterbody(lake)	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	I	O	O	O	O
Government building	O	O	O	O	I	I	I	I	I	O	O	O	O	O	O	O	O	O	O	I
Religious building facilities	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O
Recreational/Open space	O	O	O	O	O	I	I	O	O	O	O	O	O	O	O	O	O	O	O	I
Quarry	O	O	O	O	O	O	O	O	O	O	O	O	I	O	O	O	O	O	O	O
Village	O	O	O	I	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O
Residential	O	O	I	O	I	I	I	I	I	O	O	O	O	O	I	I	O	I	I	O
Highways/Roads	O	O	O	O	I	I	I	O	O	I	O	I	I	O	O	I	O	I	I	I
Mountain presence	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	I	O	O	I	I
Water presence (river)	I	I	O	O	O	O	O	O	O	O	O	I	O	I	O	O	O	I	O	O

TABLE VII
THE PRESENCE OF LAND USE COMPONENT AT LONG DISTANCE VIEW BASED ON THE EXISTING ATTRACTION POINTS.

Attraction Point	At 1	At 2	At 3	At 4	At 5	At 6	At 7	At 8	At 9	At 10	At 11	At 12	At 13	At 14	At 15	At 16	At 17	At 18	At 19	At 20
Landuse																				
Forest	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I
Tea plantation	O	O	I	I	O	O	O	I	O	I	O	O	I	O	O	O	O	O	O	O
Other agriculture	I	I	I	I	I	I	I	O	I	I	O	I	I	I	I	I	I	I	I	O
Waterbody(lake)	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O
Government building	I	O	O	O	I	O	I	I	I	O	O	O	I	O	O	O	O	I	I	I
Religious building facilities	O	O	O	O	I	I	I	O	I	O	O	I	I	O	O	O	O	O	O	O
Recreational/Open space	I	I	O	O	I	I	O	O	O	O	O	O	I	O	O	O	O	O	O	O
Quarry	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O
Village	O	O	O	I	I	O	I	O	O	O	O	O	O	O	O	O	O	O	O	O
Residential	I	O	O	O	I	I	O	O	I	O	O	I	I	I	O	O	O	O	O	I
Highways/Roads	I	O	O	O	I	I	O	O	O	O	O	I	O	O	O	I	O	O	I	I
Mountain presence	I	I	O	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I
Water presence (river)	O	I	O	O	O	O	O	O	O	O	O	I	O	O	O	I	O	O	O	O

closeness to nature.

Table 6 shows point 4 experiences identical visual components in short and middle distance view with the presence of forests, tea plantation and water features. Attraction Point 20, a Malay village shows similar scene at this distance except the presence of mountain dominates the view. As for other points the variety and complexity in visual component are reduced in this distance. A Chinese cultural village with agriculture activities marked as point 17 shows only single component-forests present at middle ground view. Cameron Bharat Tea House as point 2 shows no presence of village area as it presents in short distance view (see *Table 5*). Forests and tea plantation are only presents at this point.

The middle distance views form a texture of the visible surface [14]. The analysis exhibits more than half of the attraction point experiencing the increased of richness and variety in visual components in middle ground view. Point 1, Cameron Bharat tea plantation area shows the presence of cohesive components; natural settings, tea plantation and other agriculture. As Cameron Highlands has undulating terrain and mountainous landscape, the presence of these components

background. Therefore it should be overlooked in defining the character of the area.

develop more fascinating view with a variations of texture, color and shape of terrains.

The analysis also shows additional components that are visible in point 13. Though the presence of quarry and highways in this distance give a significant negative impact to the area.

Table 7 shows the result of visible visual component at long distance view. In long distance view, only major features can be seen such as valley and clustery distribution of trees. The variation in texture and colour is not explicitly recognized. The prominent view at this distance is the outline of the mountains again the sky wherein functions as a background. Based on table 7, all the attraction area has a presence of mountain in the background except point 3. It is found also the presence of varied components in most of the attraction points. Point 1 shows the presence of forests, agriculture, government uses, recreational area, residential area and roads. Even so, the presence of this manmade component except forests gives no significant impression in the background.

TABLE VIII
OVERLAPPING OF LAND USE COMPONENT IN THREE DISTANCES.

Attraction Point/ Score	At 1	At 2	At 3	At 4	At 5	At 6	At 7	At 8	At 9	At 10	At 11	At 12	At 13	At 14	At 15	At 16	At 17	At 18	At 19	At 20
Forest	8	9	8	9	9	9	9	9	9	5	9	9	9	9	9	9	8	8	9	9
Presence of Urban land uses more than 3 types	5	0	0	0	9	9	4	1	5	0	0	5	5	0	0	0	0	1	4	5
Tea plantation	4	4	9	9	0	0	0	5	0	5	0	3	9	4	0	0	0	0	0	0
Other agriculture	8	5	5	5	8	8	8	0	8	9	3	5	5	5	5	5	5	8	4	9
Village	0	1	0	9	5	0	5	0	0	0	1	0	0	0	1	0	1	0	0	4
Lake (dam)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	0	0	0	0
Mountain	5	5	0	5	5	5	5	5	5	5	5	5	5	5	5	8	5	5	8	8
River	4	9	0	0	0	0	0	0	0	0	0	9	0	3	0	5	1	4	1	0

Based on table 8, attraction point 2 has shown the tea plantation area which can be viewed from short and middle distance with the presence of forest at all distance. It can be seen that the scenery is enhanced by the presence of the mountain as a background. The presence of the other agriculture landscape through a long distance view (marked as number 5) can be cart away as it is not significant in the scenery. The same task goes to the river existence which is more significant through a short and middle distance view only. The same character can be seen at attraction point 14. Another landscape character in the study area is attraction point 15 which shows a village area surrounded by a natural setting with the mountains at the foreground and background. The village area is significant at this point as it plays as a foreground scene and the forests present at all distance. It is noticeable that the mountain dominates the area. The presence of mountain with forests develops an extraordinary sense of closeness to nature. If we observed from the East as shown in *Figure 4*, the mountain becomes the background of the scenery. The other agriculture presents at long distance view and offers no specific and significant impact at the

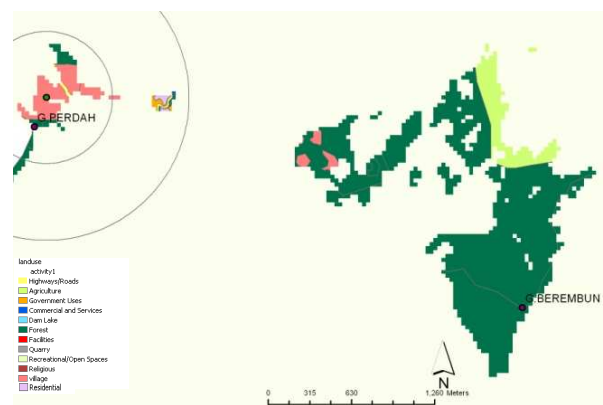


Fig. 4 The example of overlapping land uses and other components in the visible area in three distance for Attraction Point 15.

Other appealing character with great significance settings-lake, forests and mountains can be seen at attraction 16. We can see the view of lake at foreground with the mountains as the middle and background and the forests surround the area.

The presence of both river and other agriculture are not significant in the scenery (as marked in value 5 as a background).

At attraction point 7 shows a visual character of town centre area surrounded by a natural setting, agriculture landscape and green mountains. As shown in the given value in Table 8, the urban land uses as a foreground and middle ground in the area and complement by forest and agriculture area at middle ground and background. Attraction point 19 shows the distinctive of visual character with a significant mix uses of urban land use and agriculture activities present at short and middle distance with significant existence of mountain particularly at middle distance view.

VII. CONCLUSION

By using limited data, we have implemented a simple method to assess and understand the visual and spatial structure of rural landscape features with basis of land use data. The information resulted from the analysis can be used for the decision making process in planning as for this case for the tourism strategic planning. This paper has evaluated the existing attraction area and identified common types of visual rural landscape offered in this site as to well utilize the existing natural resources bestowed in this site.

From this paper, it is demonstrated that by using land use data and additional supportive data from local agencies the landscape character of the area can be understood easily. The results have shown landscape features and components of visible area in the attraction points. The result may be used to further demonstrate continuity of the visual of the tourist trail in the study area. Approach from the attraction points may not represent all the components and character of landscape features offers in the study area. The consideration along the existing roads should be taken into account. Furthermore the distance and available components were judged on the overall visible area where as one direction of view's perspective is not taken into account to prove the determined character defined by the component presence can be viewed at same direction or on the other way around. The qualitative analysis on the viewpoints may foresee. It is also found there is a need to consider on the quantitative composition as determining the significance of the land use types presence in the each distances.

REFERENCES

- [1] Arthur, L.M., Daniel, T.C., Boster, R.S., Scenic assessment: an overview. *Landscape Planning*. 4, 1977, pp. 109-129
- [2] Allen, D.M., "Cameron Highlands. Malaysia's Coolest Hill Resort". Sunspot Productions Malaysia.,2005
- [3] Bishop, I.D., Wherret, J.R. and Miller, D.R., *Assessment of path choices on a country walk using virtual environment*. *Landscape and Urban Planning* 52,2001, pp. 225-237
- [4] Bishop, I.D., 1996. *Comparing regression and neural net based approaches to modelling of scenic beauty*. *Landscape Urban Planning* . 34, 1996, pp. 125-134.
- [5] Bishop, I.D., Hull IV, R.B., *Integrating technologies for visual resource management*. *J. Environ. Manage.* 32, 1991, pp. 295-312.
- [6] Bishop, I.D., Hulse, D.W., *Prediction of scenic beauty using mapped data and geographic information systems*. *Landscape Urban Planning* 30, p1994, p. 59-70.
- [7] Bishop, I.D., Leahy, N.P.A., *Assessing the visual impact of development proposals: the validity of computer simulations*. *Landscape J.* 8, 1996, 92-100.
- [8] Brown, T., *Conceptualizing smoothness and density as landscape elements in visual resource management*. *Landscape Urban Planning* 30, 1994, 49-58.
- [9] Burmil, S., Daniel, T.C., Hetherington, J.D., *Human values and perceptions of water in arid landscapes*. *Landscape Urban Planning* 4, 1999, pp. 99-109.
- [10] Chan Ngai Weng, *Ecotourism: Issues and Challenges*. In the: Norizan H.M.N., *Tourism in Malaysia: Prospect and Challenges of Ecotourism*, Universiti Sains Malaysia Publication, 2004, pp.34-44
- [11] Crawford, D., *Using remotely sensed data in landscape visual quality assessment*. *Landscape Urban Plann.* 30, 1994, pp. 71-81.
- [12] Deardon, P., *A statistical technique for the evaluation of the visual quality of the landscape for land-use purposes*. *J. Environ. Manage.* 10, 1980, pp. 51-68.
- [13] Fauziah C.H., Mohd H.I., Nasir N. and Yazid S., *Cameron Highlands: An analysis of Internal Tourism Location Market*. Proceedings of National Geography Seminar, 2007
- [14] Germino, M.J., Reiners. W.A., Donald Mcleod, B.J and bastian, C.T., 2001. *Estimating Visual Properties of Rocky Mountain Landscape Using GIS*. *Landscape and Urban Planning* 53, 2001, 71-83
- [15] Higuchi T., *The Visual and Spatial Structures of Landscapes*, Trans. by Charles S. Terry, MIT Press, Cambridge, MA, 1984, pp. 1-85.
- [16] Laurie, I.C., *Aesthetics factors in visual evaluation*. In: Zube, E.N., Brush, R.O., Fabos, J.G. (Eds.), *Landscape Assessments: Value, Perceptions and Resources*. Dowden Hutchinson and Ross, Stroudsburg, 1975, p.103
- [17] Leong, Y.K., *Conservation and Development of Cameron Highlands*. Hill.Development Proceedings of the Seminar, 1992, pp. 20-32.
- [18] Marjanen, S., Antrop, M., *Settlement models, land use and visibility in rural landscapes: Two case studies in Greece*. *Landscape and Urban Planning* 80, 2007, pp. 362-374
- [19] Miller, D. 2001. A method for estimating change in the visibility of land cover. *Landscape and Urban Planning* 54, 2001, pp. 91-104
- [20] Report on Development of Cameron Highlands. Cameron Highlands District Council, 2006.
- [21] State Government of Pahang, Interim Report, Pahang State Structure Plan 2002-2020. Kuala Lumpur: Pejabat Projek Kuantan, Federal Department of Town and Country Planning (*Unpublished*), 2008
- [22] State Government of Pahang, *Technical Report of Cameron Highlands Development Plan 2003-2015*. Cameron Highlands Municipal, Department of Planning and Landscape Development (*Unpublished*), 2008
- [23] Steiner, F., *The Living Landscape – An Ecological Approach To Landscape Planning (2nd Edition)*. Mc Graw Hill Inc, New York, 1998
- [24] Zube, E.H., J. L. Sell, and J.G. Taylor, *Landscape perception: Research, application, and theory*. *Landscape Planning*. Vol. 9, Issues 1, July 1982, pp. 1-33.