Satellite Image Analysis along the Kuala Selangor to Sabak Bernam Rural Tourism Routes

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Abstract. This research focuses on the analysis of land cover map using satellite imagery along the rural routes. The aim of this research is to study the landscape features that can be seen by the tourists around the rural routes. The objectives of the study are twofold: (i) to analyse the land cover types along the rural routes and (ii) to create a tourist map along the rural routes. The method adopted was to use Supervised Classification by creating multiple polygons to ensure that each information is sufficient to create appropriate spectral signatures. The finding shows that 80% of the landscape features along the Point of Interest (POI) are paddy field. According to the analysis using the indicators criteria for choosing the rural routes, this research shows that this area has the potential to be part of a tourism area because it has many historical and cultural elements that can be exposed to tourists. Future research will be a factor analysis on the significance of the criteria to rural tourism attraction.

1. Introduction

Tourism is one of the largest and most rapidly expanding industries in Malaysia. Tourism has considered an effective catalyst of rural socio-economic development and revival (Sharpley, 2002). Tourism can be divided into several types of tourism: rural tourism, cultural tourism, tourist theme routes, religious tourism, and eco-tourism. Tourism corridor is a tourism mechanism that encourage a movement from a core of the township to the periphery of the boundary. The rural tourism activity will encourage regional economic development by giving tourists an experience of homestay, attractive landscape, and heritage. Thus, maintaining and upgrading the landscape scenery and attractions of the rural areas is necessary in order to enrich the tourist experience of the area.

The landscape character of a rural area plays an important role in attracting tourists. Preserving nature could contribute to the rural tourism at rural areas (Amir, Ghapar, Jamal, & Ahmad, 2015). The attractions should have a setting that can attract tourists to the area while offering them an experience that is unique and memorable. In rural tourism, the setting of the rural area (such as traditional villages, agriculture, local culture, and the natural scenery) becomes the main identity that set the rural area apart.
from the urban landscape. As mentioned by Rosley, Lamit, and Rahman (2013), a liveable village could be produced by an aesthetic landscape that could attract people to visit the village. The rural landscape in Malaysia has high potential because it is prominent with the natural landscape of forest and coastal areas with the agriculture such as paddy fields, coconut groves, rubber plantations and palm oil (Mizukami et al., 2012).

In addition, the scenic quality, sense of place, and tranquility of the rural area could be enhanced with natural landscape features such as landform, land cover, and cultural elements that could furnish as the landscape character (Jaal & Abdullah, 2012). The landscape character in Malaysia needs to be preserved because it carries (1) recreational, ecological, and natural values, (2) historical heritage, and (3) socio-cultural experience to the local and tourists (Clark & Hashim, 2010). The values that may attract the tourists to visit the rural area therefore need to be conserved and preserved by the local community with the support from the government and stakeholders.

Most of the current generations have never experienced the natural landscape character at their own country, especially those who grew up in the urban and suburban areas. Preserving the rural landscape may attract the local tourists especially the young generations who want to experience and learn about their culture and traditions. The landscape character could provide the traditional foods and fruits (Mizukami et al., 2012). The local plantation, for example, coconut trees, could produce variety of products from their leaves, trunk, fruits, and others, which could be the source of income for the local people. The diminishing rural traditions have made these resources more valuable today than ever before.

The rural tourism could promote the local industry and get the community involved at the same time hence promote the country to the world (Amir et al., 2015). This advantage is also an opportunity for the local community to promote their local products. Visitors can experience the rural lifestyle and culture by looking at the local communities’ daily lifestyle, such as agriculture activities, farming, and fishing as performed in the traditional ways. As mentioned by (Tudor, 2014), a landscape character can provide agriculture, fishery, cottage industry, and informal activities which can garner income to the local people and the country’s economy. Table 1 shows the indicators criteria for choosing the rural routes according to the Rural Tourism Master Plan.

### Table 1. Indicators Criteria for Choosing Rural Routes
(Rural Tourism Master Plan, 2001)

| Criteria                                      | Indicator(s)                                      |
|-----------------------------------------------|--------------------------------------------------|
| Quality of scenery                            | Mountains, lakes, rivers, coastline, panoramic views |
| Strength of attractions                       | Number of attractions x quality of each           |
| Potential for recreational activity           | Trekking trails, fishing locations, amenities, activities |
| Potential for product clustering              | Combined number of attractions, amenities, activities |
| Range of accommodation options                | Number of different types of accommodation category |
| Range of tourism amenities                     | Forest recreation area, agricultural parks        |
| Distinctive culture and heritage              | Number of museum, cultural events, historic links |
| General services and infrastructure           | Dinning, shopping facilities, TICs, road quality, water |
| Quality of environment                        | Absence of litter, water pollution, attractive streetscape |
| Support from official agencies                | Previous tourism investment, efforts to organize tourism |
| Active community organisation                 | Local development projects undertaken, sustained effort |
| Tourism marketing track-record                | Promotional brochures, booking systems, publicity effort |
| Accessibility to main tourism centres         | Within 3 hours travelling time                   |
| Proximity to international entry points       | Within half a day’s travelling time               |

In addition, the history and heritage of an area could be reflected by the image of traditional structures such as traditional houses, shops, bridges, religious institutions, and others that produce the
sense of place at the rural area (Diti, Torreggiani, & Tassinari, 2015). The local and traditional built environment could help to enlighten the rural landscape as the rural tourism. Therefore, it could attract the tourists to visit the rural areas and experience the new view and sightseeing at the villages. Recent studies had done on the multi-decision analysis using remote sensing and GIS to designed the tourist route in each particular study area (Juodkiene, 2014; Zhang & Yang, 2014).

Thus, the objectives of the study are (i) to analyse the land cover types along the rural routes and (ii) to create a tourist map along the rural routes. Integrated method are used in order to fulfil the objectives, by using remote sensing technology to create a land use map and analysing the existing features available in the study area with the indicators explained in the literature review. This paper is organized as follows. Section 2 presents the related application of GIS in tourism planning. In section 3, the study area of this research is elaborated. Further section will elaborate the method used and the analysis of the result. Finally, our work for this paper is summarised in the last section.

2. Application of GIS in Tourism Planning

GIS mapping is one of the common tools used in built environment and tourism studies to document and analyse places. Reviews have attested that GIS mapping is an extensive technological tool used in tourism studies. A geospatial site selection method was used to select the sites of rural tourism by identifying criteria analysis (Calado et al., 2014). Another research adopted the GIS by establishing a tourist database along the thematic routes in Hajdu-Bihar country, Romania (Varga & Turi, 2014). It is important to distinguish the main rural tourism development resources in a particular area, for example, whether they are suitable for leisure (the picturesque landscape, forests, waters and other natural resources), and cultural heritage and recreational needs (towns having cultural heritage, villages, areas with valuable individual objects and living culture events) (Juodkiene, 2014). A different use of GIS (US AID, 2006) is to create a detailed GIS map that features accommodations, camping sites, biking trails, and other tourist attractions. One study used the analytic hierarchy process (AHP) analysis to catalogue rural buildings for restoration or reuse of the buildings by public organisation or individual (Cano, Garzón, & PJ, 2013). In one study on Cinque Terre, Italy, the GIS and CAD functions of (geo-referred) digital cartography data treatment were combined with attributed data to update and organise built heritage and the cultural landscape of the location (E.U. Program Culture, 2000) and a study using remote sensing and GIS had done in West Bengal to assess the spatial distribution of transport network accommodation facility that can improve the eco tourisms development in the study area (Bhya & Chakrabarty, 2016).

3. Methodology

The study area is located in the boundary of Selangor along Jalan Kuala Selangor. Site visit was conducted along the Federal Route 5 from Kuala Selangor to Sabak Bernam for a total distance of about 60 km. This route is selected as the KS – SB route meets all the criteria for rural tourism route; villages, traditional houses, agriculture, natural resources, history, culture, local food and good accessibility. This route is located on the west coast of the state of Selangor, which connects to the state of Perak. Along the route, significant landscape features and points of interest were mapped using GPS tool and photographs. The GPS tool used was GPSmap 60CSx that important to ascertain the position of tourist attractions which were then transferred to a GIS desktop and then to the map. For each transect, the identified points will be categorised into four areas: landscape character, settlement, built environment and heritage.

As for the remote sensing image, it was downloaded from the USGS website (U.S. Geological Survey, 2017) dated March 29, 2016. This image was used due to its good quality of image, referring to its minimum cloud cover (3.61%) during the image was captured. This study is conducted using ArcGIS software. The supervised classification used was Maximum Likelihood Classification Algorithm for the land cover map generation. The spectral signatures was selected as training areas. Hundred numbers of polygon were selected as the training areas that can help to differentiate different signatures. Then, the computer algorithm used the selected spectral signatures to classify the whole image. Further process
was conducted are to generate signature file and classification. Fig. 1 shows the process for supervised classification. Using the image, the indicators of criteria for choosing rural routes was used in order to look into the land cover as stated in Table 1 was used to verify the existing criteria for rural tourism route.

![Processing image using supervised classification](image)

**Figure 1.** Processing image using supervised classification

4. Results

A land cover map of Landsat image that was captured on July 20, 2016, was analysed. Accuracy assessment was carried out and an overall accuracy of 93.33% was obtained. The overall Kappa coefficient is 0.9204. This number meets the 80% accuracy standard of the National Park Service (NPS) in the United States (Summer & Nordman, 2008), that showed that a good accuracy of classification was achieved for the land cover classification. The land cover types are divided into several categories: green area, forest area, bare land, buildings, roads, water bodies, and paddy field.

This map (Fig. 2) shows the land cover distribution along the Kuala Selangor route. This route is just located around 2 to 4 kilometres from the coastal area. The study area is covered with a linear route and is categorised into five segments of areas: Kuala Selangor, Tanjung Karang, Sekinchan, Sungai Besar, and Sabak Bernam.

Our visit on May 1, 2017, shows there are many attractions for tourism visits, mainly on the landscape feature, the rural houses, agricultural areas, local food, natural attractions, and historical landmarks. Most of the attractions are already highlighted by the Tourism Malaysia, such as the historical attractions on Bukit Malawati, Taman Alam Kuala Selangor, and the fireflies in Kampung Kuantan. All these major attractions are located in Kuala Selangor. Other attractions along the route are the fisherman village by the river, the coastal area in Tanjung Karang, the paddy fields and Malay traditional homestays in Sekinchan, the local food, the beach in Sungai Besar, and the rural Chinese in Sabak Bernam. As observed, most of these attractions are shaped by the geographical setting and landscape features of the area.

In the rural route of Kuala Selangor, the most obvious area is the Selangor River which has the potential to be a tourist attraction. Along the route, the river is covered with mangroves that are important
to the sustainability of the area. Obviously the rural pattern is covered with green and forested areas. Many places for eat are also located close to the road.

![Image](image-url)

Figure 2 shows the land cover distribution in the study area.

Majority part of the areas (80%) are paddy fields, therefore information on the variety of paddy field season is an important element that needs to be informed to the tourists. For instance, according to the locals in the area, the paddy fields will give a green panoramic view during the month of October onwards after the new plots have been planted. As shown in the map, the nice view of green paddy fields are exactly on the right side of the main road to Sekinchan, if tourists were to travel north from Kuala Selangor. The views towards the paddy fields are mostly visible from the roadside. However, at spots where houses, institutions, and shops are built adjacent to the road, tourists would have to drive into the inner roads in order to access the larger view of the paddy fields. It should be noted that the rice transplanting season is in March and September every year. In addition, the harvesting season is in June and December every year. For those tourists who are interested to see a greenery view of paddy field, they can visit during the harvest season. Along the route, the view from the roadside is mostly towards the oil palm plantations which are located intermittently among the houses, towns, and other small-scale fruit orchards.

Using the criteria for selecting this rural routes as the discussed in the literature review (Table 1), below is the analysis for suitability of this area to be selected as a rural route tourism. First, the quality of scenery for the Kuala Selangor to Sabak Bernam route can be considered unique because in Malaysia, views of paddy fields are more synonymous to the northern region. In Selangor, this route is the only route that provides a scenic view of the paddy fields and a rural setting. Along the route at the right hand side there will be a paddy field scenery (Fig. 2). Some part of the area will need us to cross over the bridge, therefore we can see a nice view of rivers (Selangor River and Tengi River).

Secondly, the strength of attraction of this area is good because along the way from Kuala Selangor to Sabak Bernam, there are small stalls selling local food such as *mentarang* (a type of shellfish), *kerepek* (local chips made from banana and tapioca), and fresh seasonal fruits (mango, banana, and corns). Tourists who visit this area have the opportunity to see and experience not only the rural landscape but also the well-conserved natural attractions, which are the mangrove and the rivers. On top of that, the tourists can also enrich their experience by visiting Malawati and learning about its
historical significance to Selangor, as well as walking to the highest point in the area to the light house at the top of the hill. The light house and Bukit Malawati are important in the state history they among the major shipping routes in East Asia. From the hill, we can see the stunning panorama of the rural surrounding area with a short trekking trail, thus a potential for recreational activities. Less than 2 kilometres at the left hand side from Kuala Selangor to Sabak Bernam, there is a coastal area that can serve as a spot for activities such as swimming and fishing. Lembaga Kemajuan Ikan Malaysia (LKIM) is also just beside the river. Fresh fish and seafood is part of the local resource of the area which has become an attraction to visitors from Kuala Lumpur. The geographical and environmental setting of this area shows a potential for product clustering due to several attractions in each particular area. For example, at Kuala Selangor, there are religious institutions that have become the local landmark (masjid and temples), and there are also river activities where visitors can observe fireflies at night. The local fish market and a historical golf club can serve as supporting attractions and as an extension from the route. The golf club, which aged more than 100 years, sports large trees of the same age. Many old and interesting pictures of the club owner can be seen here. In terms of accommodation, several lodging can be found along the way to Sabak Bernam. Hotels and homestays are located just near to the road thus are easily accessible. Many tourism amenities can be found here, such as parks and wetland, which can also provide an educational experience to the tourists. Many visitors or tourists can also pass by and enjoy stopping in Kuala Selangor. They can buy relatively cheap fresh fish, eat in the restaurant to enjoy the seafood, buy fruits, take a look at the fireflies, and get to feed eagles along their route.

In terms of general services and infrastructure, many restaurants (see Fig 2) can be seen along the route. In fact many restaurants can be seen in the commercial areas of each segment. In terms of shopping facilities, many small lots of traditional chips and fruits can be seen. For the section of the quality of environment, there are no obvious littering and water pollution, which implies that this particular rural area is away from industrial pollution. Last year (2006), Jelajah FT Roadpedia was launched by Jabatan Kerja Raya to encourage the people in Malaysia to experience using the federal road, including the Kuala Selangor to Sabak Bernam route. This promotional effort by the government showed the high potentials of the federal routes or the rural routes to be integrated and planned as a wider network of tourism routes in Malaysia. Essentially, attractions in the rural areas do not work individually, but as a system that integrates the landscape character, physical setting, culture and history, and activities that people can do while visiting. Tourists seek for a unique experience, therefore these aspects that make the rural areas attractive need to be sustained and managed.

5. Conclusions
This research is the preliminary findings on the potential of rural tourism route along Jalan Kuala Selangor, from Kuala Selangor to Sabak Bernam. The study has shown that this area has the potential to be part of a tourism area because it has many historical and cultural elements that can be exposed to tourists. The area can also be further planned for activities to have an integrated programmes on promotion for tourist attraction.

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