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VIRTUAL REALITY (VR) GEOGRAPHIC INFORMATION SYSTEM (GIS) MODEL TO PROMOTE RURAL TOURISM PRODUCT IN PERAK TENGAH DISTRICT

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Abstract

Perak Tengah District is not stated as an important tourism cluster in Perak. Nevertheless, Perak Tengah has tourism resources that need to be highlighted as an alternative for rural tourism. The main issue is that Perak Tengah district's tourism resources have not been effectively advertised or utilised, nor have there been any formal digital tourism marketing activities been put into place. The mixed method study was used to identify potential rural tourism products and to obtain the opinion of local operators on how to market the tourism products. The evaluation of rural tourism in terms of goods and destinations in Perak Tengah Districts is the main emphasis of this paper. The findings show that marketing and promotion have emphasised on strengthening local business environments and cultivating strong stakeholder ties. The adoption of Virtual Reality Geographical Information System (VRGIS) model by Perak Tengah District in developing the tourism roadmap or 'Peta Pelancongan' is to encourage communication and data exchange which are the essential elements for its success. For future research, the extension of developing a comprehensive application for rural tourism products in Perak Tengah District should be considered.

Keywords: Geographic Information System (GIS), Rural Tourism, Tourism Marketing, Tourism Product, Virtual Reality (VR)

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INTRODUCTION

Each state in Malaysia has created its own methods for marketing tourism-related goods, services, and attractions as a result of the country's growing domestic tourism industry. The local economy and the distinctiveness of some locations are, however, threatened by serious problems. Three key issues regarding tourism marketing and promotion are addressed in the study. In the current Geographic Information System (GIS) database, there are first and foremost gaps in the collection and management of tourism data (Harun & Mat Zin, 2018). Due to incomplete information provided to tourists and the general public regarding local attractions, effective promotion and marketing are hampered. In order to improve tourism advertising and presentation, new technology like Virtual Reality (VR) should be embraced. Even while some companies have started using digital platforms like TripAdvisor, the full potential of virtual reality and smart tourism has yet to be realised because smaller operators cannot afford to do so (Israel et al., 2019).

Finally, insufficient cooperation among tourist stakeholders makes it harder to promote tourism products effectively. Tourism products, particularly those in rural areas, are undermarketed due to a lack of cooperation and communication. Utilising VR and GIS technologies, the study's goal is to create a promotion system for travel-related goods in the Perak Tengah District (Perkins et al., 2020). Exploring a VR-GIS framework for tourism databases, identifying crucial elements for VR promotion, and suggesting an application architecture for Perak Tengah are some of the goals of the study. The theoretical contribution of the paper, which offers a fresh integrated VR-GIS framework for domestic travel in Malaysia, is what gives it its significance. This strategy may boost domestic tourism and revenue. In other words, the study can help local tourism authorities and business owners promote rural tourism and strengthen local economies. Academics, governmental, and industrial cooperation will advance knowledge and produce worthwhile results that will advance societal goals and meet government objectives.

LITERATURE REVIEW

This study focuses on the use of virtual reality (VR) in Malaysian tourist planning, management, and marketing using Geographical Information Systems (GIS). The report suggests a structure where local governments, businesses, and tourism organisations work together to gather and manage data. According to Muhammad Soffian et al. (2021), the GIS is used to construct attributes for research regions, such as location, place names, the category of tourism products, and addresses. Through the use of platforms like Esri's CityEngine, 3D

procedural modelling can be used to integrate VR and GIS (Sameeh El Halabi et al., 2019).

Despite the potential of virtual reality tourism, there hasn't been much study of this strategy in Malaysian tourism over the previous five years. The potential market for cultural heritage in tourism has, however, been recognised by studies carried out in European nations, such as Arnold's research (2005) on virtual tourism in cultural heritage. A few less well-known studies in Malaysia have concentrated on virtual reality or internet methods. For instance, Sharib (2009) used the Online Virtual Malaysia Walkthrough (MAWA) to investigate the utilisation of digital products and pictures. To display complicated data and offer access to Malaysia's remote and inaccessible cultural and natural heritage places, MAWA employs a team of experts in 3D graphics, instructional design, multimedia, and internet development. To study the significance of perceived immersion and physical visitor value in VR tourism, Vishwakarma et al. (2020) used a quantitative approach and the Value-Based Adoption Model (VAM). High Dynamic Range Imaging (HDRI) photography was used by Hashim & Jusof (2010) to document historical sites and analyse photographs.

Similar to this, Schiopu et al. (2021) combined perceived attractiveness elements using the Technology Acceptance Model (TAM) to create an alluring tourism mapping system. Harun and Mat Zin (2018) evaluated the potential of cultural heritage as a new tourism destination through a qualitative study that included observation, resource inventories, focus groups, and interviews. Rahmat et al. (2023) improved data collection and analysis by combining qualitative and quantitative methodologies, leading to the production of insightful findings. It is important to note that further proof is required of academics using their research on Malaysian VR tourism and using Geographic Information Systems (GIS) to create VR tourism models. Internet accessibility was identified by Rijal et al. (2023) as the largest obstacle to the use of information technology for tourism promotion. Therefore, traditional and modern technology should be applied in marketing campaigns for travel destinations.

The use of VRGIS in the tourism industry incorporates data from tourism planning, evaluation, and identification of important success elements. To comprehend the elements influencing technology acceptance, the research uses the Technology Acceptance Model (TAM) and the Technology, Organisation, and Environment (TOE) framework. Technology adoption is significantly predicted by perceived usefulness and simplicity of use (Chatterjee et al., 2021; Venkatesh et al., 2016). Business marketing and collaboration support issues have an impact on how well technology is accepted.

RESEARCH METHODOLOGY

Study Area

The district of Perak Tengah is situated in the middle of the state of Perak. The Perak Tengah district is surrounded by the districts of Kuala Kangsar to the north, Kinta, Kampar, and Batang Padang to the east, Hilir Perak to the south, and Manjung to the west. The two biggest localities are Seri Iskandar, a significant town managed by the Perak Tengah District Council, and Bota, the largest settlement in the region. The Perak Tengah District has a total of twelve mukims. Mukim Belanja, Mukim Bota, Mukim Lambor Kanan, Mukim Lambor Kiri, Mukim Kampung Gajah, Mukim Pasir Salak, and Mukim Pulau Tiga are the only tourist attractions in the research area. However, some mukim, like Mukim Layang - Layang, Mukim Jaya Baharu, Mukim Bandar, Mukim Pasir Panjang Hulu, and Mukim Kota Setia, do not have any tourism-related goods. The main industry in these areas is agriculture. It is, therefore, expected that the necessary data may be successfully gathered. Figure 1 depicts the study area and the location of the main towns in the Perak Tengah District.

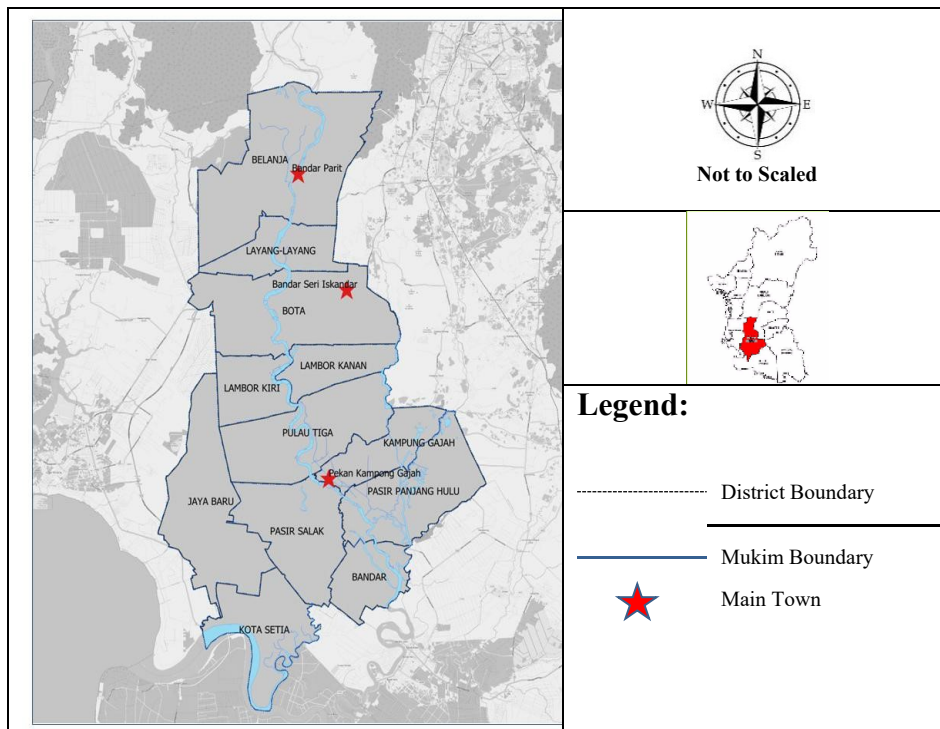


Figure 1: Study Area: The District of Perak Tengah
Source: Perak Tengah District Councils (2018)

Research Method

A mixed method approach was employed to collect data for the study. The qualitative approach used was an observation survey, while the quantitative approach used was a questionnaire survey, which was utilised to obtain the local business owners' perspectives on marketing tourism products.

Data Collection

The rural tourism products included in the study are restaurants, hotels and hostels, parks, tourism facilities, and historical areas and buildings. The list of tourism products was obtained from the Tourism Unit at Perak Tengah Local District and searched through Google Earth 2019 by setting more than 10 reviews. The first list provided has a total of 229 potential rural tourism products from all categories. The observation surveys had to be conducted first to ensure the existence and validity of the data on rural tourism products.

A questionnaire survey was conducted among the local tourism product operators after the verification of the listed rural tourism products. The objective of the survey was to determine the local operators' marketing methods for promoting their products.

ANALYSIS AND DISCUSSION

Verification and Validation of Rural Tourism Products

Based on the observation, there were 229 coordinate locations for commodities related to tourism, which were arranged into five main groups, which include Accommodation (56 units), Food and Beverages (85 units), Education and Institution (37 units), Places and Attractions (23 units), and Trade and Services (28 units). However, during the observation survey, it was found that the number of validated rural tourism products were as follows: Accommodation (17 units),

Food and Beverages (46 units), Education and Institution (40 units), Places and Attraction (31 units), and Trade and Services (35) units (Table 1).

Table 1: Listed Rural Tourism Products in Perak Tengah District

Num	Groups of Tourism Product	Listed Rural Tourism Products	Validated Rural Tourism Products
1	Accommodation	56	17
2	Food and Beverages	85	46
3	Education & Institution	37	40
4	Place and Attraction	23	31
5	Trade and Services	28	35
Total		229	169

From the listed rural tourism products, it was found that there are several mukims in the Perak Tengah Districts that sell a range of tourism

products. There are 132 units each at Mukim Bota, 31 units at Mukim Kampung Gajah, and 15 units at Mukim Belanja. However, some mukims have at least two types of tourism products. For example, Mukim Lambor Kanan has 13 units without accommodation, Mukim Lambor Kiri has two units of food and drinks and one unit of educational institution, Mukim Pasir Salak has 14 units without trade and services, and Mukim Pulau Tiga has four attraction places and heritage sites and four units of accommodation. There are also some mukims that only offer one specific type of tourism product, such as Mukim Bandar with one educational institution, Mukim Kota Setia with five food and beverage establishments, and Mukim Layang - Layang with one educational institution. However, as shown by Mukim Pasir Panjang Hulu and Mukim Jaya Baru, there is no unique tourism product which has been created. Refer to Table 2.

Table 2: Listed Rural Tourism Products by Mukim in Perak Tengah District

Area / Mukim	Listed Rural Tourism Products	Validated Rural Tourism Products
BP1-Belanja	21	22
BP2-Layang-Layang	1	1
BP3-Bota	132	99
BP4-Lambor Kanan	13	7
BP5-Lambor Kiri	3	3
BP6-Pulau Tiga	8	3
BP7-Kg. Gajah	31	28
BP8-Pasir Panjang Ulu	0	0
BP9-Pasir Salak	14	4
BP10-Bandar	1	2
BP11-Kota Setia	5	0
BP12-Jaya Baharu	0	0
Total	229	169

After the verification and validation from the survey, the actual numbers of tourism products found at the sites are not the same as the list provided. This is because the preliminary data of 229 coordinate locations were obtained from google earth in 2019, which was before the Covid-19 outbreak. After the Covid-19 epidemic subsided, many of these places were closed and no longer in operation. A total of 169 tourism products were used as the final data to be analysed further. Refer to Table 2 above.

Elements of Perak Tengah Districts' Rural Tourism Products

The observation survey of rural tourism products was broken down into five categories based on the product's fundamental characteristics. Some of the factors at work include signage, accessibility, surrounding conditions, parking provisions and support facilities like restrooms and prayer rooms. Overall, it was discovered that rural tourism products have a moderate level of service. Based on the average mean, the highest element of rural tourism products, as shown in Table 3, is accessibility with $M=4.33$ and is considered to be at a good level. While the lowest element is supporting facilities with $M=3.52$ and is considered at moderate level. The findings show that the supporting facilities need to be improved. Meanwhile the details of the highest and lowest provision of each element at the rural tourism products are shown in Table 3.

Table 3: Elements of Rural Tourism Products in Perak Tengah Districts

Num	Elements	Item	%	Total	Mean	Rank
1	Signage	Very Clear	38.6	65	3.76	3
		Clear	29.3	50		
		Moderate Clear	13.8	24		
		Not Clear	6.5	11		
		Not Very Clear	11.8	20		
		Total	100	169		
2	Accessibility	Very Easy to Reach	56.5	95	4.43	1
		Easy to Reach	32.5	55		
		Moderate to Reach	7.7	13		
		Hard to Reach	3.3	5		
		Very Hard to Reach	0	0		
		Total	100	169		
3	Surrounding Condition	Very Good	56.3	95	4.33	2
		Good	22.5	38		
		Moderate	19.2	32		
		Bad	2	4		
		Very Bad	0	0		
		Total	100	169		
4	Parking Provision	Very Adequate	19.9	34	3.66	4
		Adequate	38.2	65		
		Moderate	30.5	51		
		Not Adequate	10.2	17		
		Very Not Adequate	1.2	2		
		Total	100	169		
5	Supporting Facilities	Very Adequate	13.8	24	3.52	5
		Adequate	40.7	69		
		Moderate	33.3	56		
		Not Adequate	8.1	14		

Num	Elements	Item	%	Total	Mean	Rank
		Very Not Adequate	4.1	7		
		Total	100	169		

Signages at tourist attractions are essential to guide the visitors and act as maps for them. Thus, the elements of signage which are important include accessibility, readability, and clarity. Additionally, guides and signs are necessary for some distant tourist spots located in off-the-beaten-path Promoting Perak Tengah as a tourist destination requires keeping tourist hotspots in good condition. Finally, support facilities, including parking lots, prayer rooms, and restrooms, are essential for visitors' convenience.

In order to obtain a pattern of promotion among local operators of rural tourism products, a total of 73 respondents were selected from a total of 169 rural tourism products. Based on 5 groups of tourism, only 4 groups are applicable for local tourism products which are Accommodation (10), Food and Beverages (38), Place and Attraction (11) and Trade and Services (17). Out of the 73 respondents, 60.3% were males (44) and 39.7% were females (29). The highest number of respondents were in the age range of between 35 – 44 years old while the lowest number were in the age range of 65 years old and above. Refer to Table 4.

Table 4: Respondent Profile Background

Variable	Sub-Variables	Frequency	%
Gender	Male	44	60.3
	Female	29	39.7
	Total	73	100
Age	18 -24 Years Old	5	6.8
	25 -34 Years Old	23	31.5
	35 - 44 Years Old	28	38.4
	45 -54 Years Old	8	11
	55 - 64 Years Old	6	8.2
	65 Years Old and Above	3	4.1
	Total	73	100

Based on the questionnaire survey conducted among local operators for the purpose of obtaining information of their preference in promoting and marketing their products, the majority or 64.7% (66) of them are using website and social media and very few of them, 8.8% (9) are using radio and mass media. It shows that people nowadays prefer using technology instead of conventional methods. Refer to Table 5.

It was found that 30.1% (22) of the local operators carried out their promotion and marketing every day. Meanwhile, 26% (19) carried out their promotion and marketing 2-3 times per week, 21.9% (16) did it once a week and the remaining 21% (16) did not specify the frequency of their promotional activities. This shows that the local operators are aware of the importance of promotion and marketing. Refer to Table 6.

Table 5: Promotion and Marketing Type by Local Operator

Type of Promotion and Marketing of Tourism used	Frequency	%
Paper based - Brochure, newspaper, and flyers	12	11.8
Websites and social media	66	64.7
Radio and Mass Media	9	8.8
Collaboration within Travel Agencies and Local Operator	15	14.7
Total	102	100

Table 6: Promotion and Marketing Type by Local Operator

Frequency of Promotion	Frequency	%
Everyday	22	30.1
2-3 Times per week	19	26
1 Time per week	16	21.9
Others	16	21.9
Total	73	100

PROPOSED VIRTUAL REALITY (VR) USING GEOGRAPHIC INFORMATION SYSTEM (GIS) MODEL FOR RURAL TOURISM PRODUCTS IN PERAK TENGAH DISTRICT

The VR is an interactive map in the GIS application we created to show the icons, locations, brief information, categories, photos and videos of rural tourism products. Utilising the QGIS 3.26 programme, the validated rural tourism products data gathered from the observation survey are documented as coordinate points. These interactive maps are also linked with Google Street so that the location of the rural tourism products is shown in 3D. There are five categories of rural tourism products which are accommodation (56 units), food and beverages (85 units), education and institutions (37 units), places and attractions (23 units), and trade and services (28 units). This paper discusses only one category of rural tourism products, which is food and beverages. An example of the QGIS data attribute of food and beverages is shown in Figure 2.

fid	id	Nama	Alamat	Jenis	Waktu	Tarikan	No Tel	BP	Gambar	Video	Rating	Hari	A
1	1078	D Parit Cafe	NULL	Food & Bevera...	12.00 pm – 9.00...	Mee Hailam	60104632204	Belanja	1078_D'Parit Ca...	NULL	NULL	NULL	NULL
2	1079	Mee Hailam Pe...	NULL	Food & Bevera...	10.00 a.m – 5.00...	Mee Hailam	60122487455	Belanja	NULL	NULL	NULL	NULL	NULL
3	1080	Kedai Shamyut...	NULL	Food & Bevera...	8.00 a.m – 3.00 ...	Sarapan Pagi d...	NULL	Belanja	1080_Kedai Sha...	1080_Kedai Sha...	3	NULL	NULL
4	1089	Restoran Rizzul...	NULL	Food & Bevera...	10.00 a.m – 5.00...	Makanan Tenga...	NULL	Bota	1089_Rizquillah	1089_Rizquillah ...	NULL	NULL	SIBC
5	1090	Restoran Redan...	No 90	Food & Bevera...	10.30 a.m – 5.00...	Makanan Tenga...	60195479661	Bota	1090_Redang P...	1090_Redang P...	NULL	NULL	SIBC
6	1092	D'krabi Tomya...	No 308	Food & Bevera...	5.00 p.m – 11.0...	Makanan Mala...	60116525273	Bota	1092_D'Krabi To...	1092_D'Krabi To...	NULL	NULL	SIBC
7	1093	MASTERGRILL	No 380 & 381, 14	Food & Bevera...	4.30 p.m – 12.0...	Makanan Barat	60199999062	Bota	NULL	NULL	NULL	NULL	SIBC
8	1094	Botalleft Restaur...	No 255	Food & Bevera...	4.30 p.m – 12.0...	Makanan Mela...	60133397782	Bota	NULL	NULL	NULL	NULL	SIBC
9	1095	Stalista Street's ...	No 254	Food & Bevera...	4.00 p.m – 12.0...	Makanan Mela...	60162380547	Bota	1095_Stalista Str...	1095_Stalista Str...	NULL	NULL	SIBC
10	1097	Restoran Seri Ik...	No 499	Food & Bevera...	8.00 a.m – 6.00 ...	Makanan Mela...	60125414770	Bota	1097_Restoran ...	1097_Restoran ...	NULL	NULL	SIBC
11	1098	Mokti's Gula A...	486, Persiaran S...	Food & Bevera...	10.00 a.m – 6.00...	Aiskrim Gula A...	60194467641	Bota	1098_Mokti's G...	1098_Mokti's G...	NULL	NULL	SIBC
12	1101	Che'ou Cafe. R...	No 411 & 410	Food & Bevera...	3.00 p.m – 11.0...	Makanan Ala T...	60194334310	Bota	1101_Che'ou C...	1101_Che'ou C...	NULL	NULL	SIBC

Figure 2: Food and Beverages in QGIS 3.26

As the first step, an extension of the use of the VR rural tourism product for promotional purposes, the 2D QGIS map was used to publish promotional materials on the website. A tourism website was launched by the research team in collaboration with the Perak Tengah District Council. The tourism website is part of the smart city initiatives by Perak Tengah District Council. This initiative not only can help the local council but also tourism operators to promote their tourism products which are available in the Perak Tengah District. Figure 4 shows an example of tourism roadmap or ‘Peta Pelancongan’ smart city initiative of QGIS 2D Map for Food and Beverages published in the tourism website. By clicking the tourism categories, then clicking the tourism product icon, all the information related to the product, photos and videos will be displayed on the screen. The data in QGIS will be updated from time to time to make sure that the tourism website is always up-to-date. The tourism roadmap or ‘Peta Pelancongan’ website is still under construction and is not yet open for public access. This ‘Peta Pelancongan’ is also linked with the Google Street so that the location of the rural tourism products can be seen in 3D.

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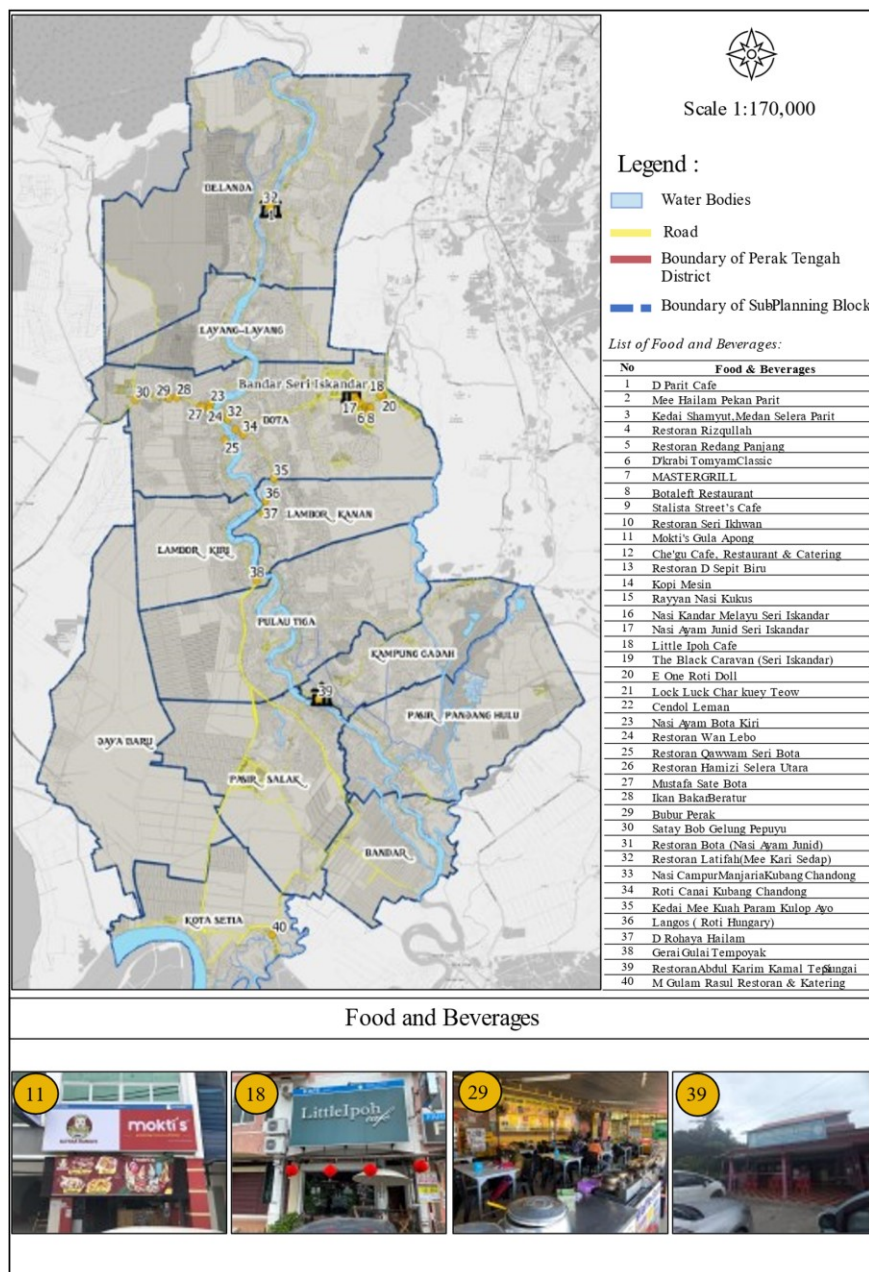


Figure 3: Example of QGIS data and 2D Map for Food and Beverages

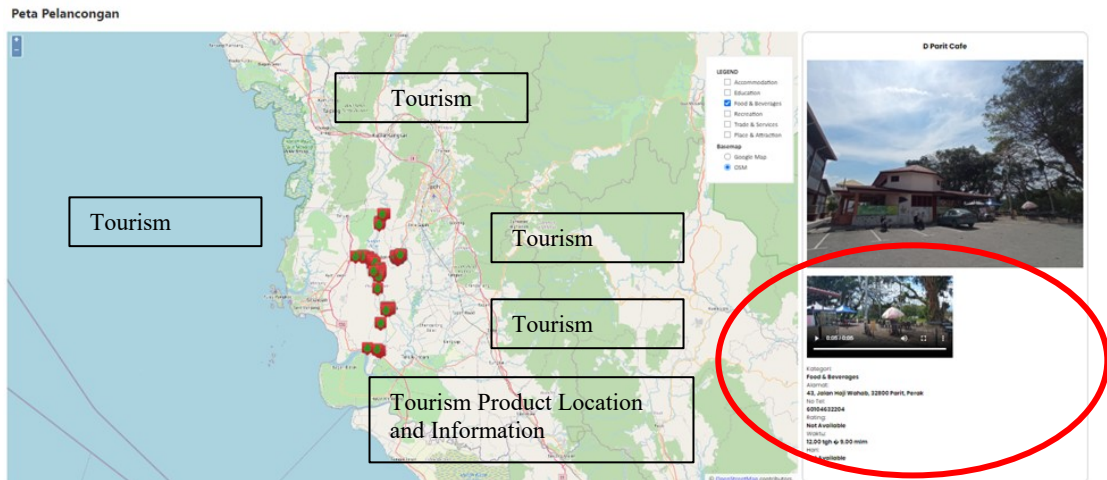


Figure 4: Example of QGIS 2D Map for Food and Beverages Publish in Tourism Website and also Linked with 3D Google Street

CONCLUSION

According to the distribution of rural tourism products in Perak Tengah District there are five categories of tourism products available in the area which are 1) place and attraction, 2) accommodation, 3) trade and services, 4) education and institution, and 5) food and beverages with 169 validated rural tourism products. It can be concluded that based on the five provision elements, which are signages, accessibility, surrounding conditions, parking provision and support facilities, most of the rural tourism products are rated between moderate to good levels. The element which received the highest ranking is accessibility. With regard to the opinion of 73 rural product operators on the promotional and marketing channel preference, the majority of them prefer to use the website and social media.

Since many local operators are using websites and social media to promote their products, the researchers' proposed framework of incorporating VR in local tourism promotional activities in collaboration with Perak Tengah District Council is timely. The collaboration entails the researcher providing the QGIS 2D mapping data to the Perak Tengah District Council while the council is responsible in establishing the tourism roadmap called 'Peta Pelancongan'. The 'Peta Pelancongan' is an integrated website that has all the information about the rural tourism products in Perak Tengah District and is also linked with Google Street so that the rural products can be seen in 3D. The website will be opened for public access soon. For future research, it is proposed that the website be made accessible through an application that provides easier access to the website, for example, using a mobile phone.

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