URBAN SPRAWL MAPPING FOR SPORT-BASED TOURISM SUITABILITY USING GIS-AHP MODEL

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DIPLOMA IN CIVIL ENGINEERING

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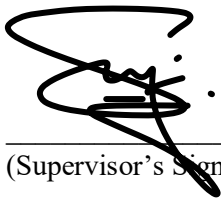

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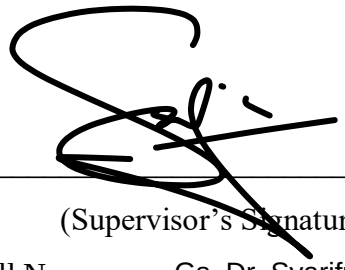

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ABSTRAK

Oleh kerana pengembangan kawasan bandar yang semakin meningkat dan peningkatan permintaan untuk pelancongan berasaskan sukan, perlu memilih tempat yang sesuai untuk aktiviti berkaitan sukan yang berlaku dalam persekitaran bandar. Untuk mencapai matlamat ini, alat perancangan dan membuat keputusan yang berkesan diperlukan. Kajian ini mencadangkan penggunaan Sistem Maklumat Geografi (GIS) bersempena dengan Proses Hierarki Analisis (AHP) apabila menilai dan memetakan potensi aktiviti pelancongan berasaskan sukan di kawasan bandar. Data dari Sistem Maklumat Geografi (GIS) digabungkan dengan metodologi AHP dalam model ini. Ini dilakukan supaya model dapat meramalkan laman web mana yang paling berpotensi untuk pengembangan pelancongan berasaskan sukan. Model ini mengambil kira pelbagai ciri, termasuk kualiti alam sekitar, aksesibiliti, corak penggunaan tanah, dan infrastruktur pengangkutan, untuk menamakan hanya beberapa daripadanya. AHP menyediakan penilaian perkaitan relatif untuk setiap komponen, dan GIS memungkinkan untuk melakukan analisis geografi dan membentangkan hasil kajian itu. Kaedah ini menyediakan maklumat penting bagi perancang dan pemaju bandar, yang menjadikan peruntukan sumber lebih mudah dan membantu meningkatkan pelancongan berdasarkan acara sukan. Konsep yang telah ditawarkan dapat membantu dengan pelbagai perkara, termasuk menjadikan bandar-bandar tempat yang lebih diingini untuk hidup, membantu ekonomi, membuat orang bahagia, dan melindungi alam sekitar.

ABSTRACT

Due to the increasing expansion of urban areas and the increased demand for sport-based tourism, it is necessary to choose appropriate venues for sports-related activities that take place within urban environments. In order to accomplish this goal, effective planning and decision-making tools are required. This study suggests using a Geographic Information System (GIS) in conjunction with the Analytic Hierarchy Process (AHP) when evaluating and mapping the potential for sport-based tourism activities in urban regions. The data from Geographic Information Systems (GIS) are combined with the AHP methodology in this model. This is done so that the model can predict which sites have the most potential for the expansion of sport-based tourism. The model takes into account a wide variety of characteristics, including environmental quality, accessibility, land use patterns, and transportation infrastructure, to name just a few of them. The AHP provides relative relevance ratings for each component, and the GIS makes it possible to perform geographical analysis and present the results of that study. This method provides essential information for the city planners and developers, which makes resource allocation easier and helps to enhance tourism based on sporting events. The concept that has been offered can help with a variety of things, including making cities a more desirable place to live, helping the economy, making people happy, and safeguarding the environment.

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CHAPTER 1

INTRODUCTION

1.1 Background of Study

Both the study of how sport influences population growth and the urban development of cities based on sports are experiencing recent increase. Recent population increase and rapid urbanisation in Kuantan have led to the development of a sizeable urban sprawl, which has had an unfavourable impact on the amount of open's pace that is currently available.

Places for recreational and sporting tourism activity. By employing GIS-AHP models in Kuantan to map urban sprawl for the suitability of sport-based tourism, it will be possible to assist in identifying locations that are appropriate for the development of sport-based tourism and to promote sustainable tourism in the region. The availability of unspoiled natural regions is of critical importance to the growth of a subset of the tourism industry that is currently experiencing fast expansion. It is possible that it will have an impact on the total number of visitors that come to the chosen location for sporting events, and the GIS-AHP model can be used to analyse this data. The use of GIS makes it feasible to undertake spatial studies and models, which, when applied to a variety of critical urban planning tasks, can be of great assistance.

GIS-AHP models for the suitability of sport-based tourism have been created in a variety of contexts, including ecotourism, mountain tourism, and coastal tourism. There are many different contexts in which GIS-AHP models for the suitability of sport-based tourism have been developed. Some of these contexts include mountain tourism, seaside tourist, and ecotourism. These models have been used to find good locations for a variety of sports, including skiing, hiking, surfing, and kayaking, based on a number of characteristics, including the topography, the weather, accessibility, and the quality of the surrounding environment. By allowing them to take into account a variety of factors, such as topography, accessibility, land use, and environmental quality, the use of GIS-AHP models can assist decision-makers in finding the best locations for the growth of sport-based tourism. This can help decision-makers find the best locations for the growth of sport-based tourism.

The incorporation of GIS-AHP models into existing land-use planning regulations and laws can, in addition to fostering the development of sustainable tourism in the region, assist in putting a stop to the urban expansion that is now occurring there. This plan has the potential to ensure that the expansion of tourism based on sporting events is carried out in a manner that is kind to the environment, enhances the standard of living for residents, and helps to preserve open areas. The promotion of ecologically responsible tourism practises and the aiding of host communities in the development of more environmentally friendly infrastructure are both potential benefits of sport-based tourism.

Utilizing GIS-AHP models for urban sprawl mapping in Kuantan, Pahang, with the goal of determining whether or not the area is suitable for sport-based tourism can provide valuable insights that can be applied to the development of sustainable tourism and land-use planning. This technique has the potential to help safeguard the environment, preserve open areas, and raise the standard of living for both people and tourists.

There is the potential for a nation-wide project of sport-based tourism to deliver major economic and social advantages, while also contributing to the achievement of sustainable development goals. Investing in sports infrastructure, hosting big sporting events, promoting local sports, collaborating with sports organisations, involving local communities, and encouraging sustainable practises are all ways a nation might establish a robust and sustainable sports tourism business.

1.2 Statement of the problem

Kuantan, which is a city in Malaysia that is expanding at rapid rate, has a significant problem with urban sprawl. The growth of the city has resulted in the destruction of natural habitats and open areas, which has a negative influence on both the local environment and the citizens' quality of life. At the same time, sport-based tourism is a significant economic activity in Kuantan, and there is a growing demand for facilities and services related to this industry.

The expansion of tourism based on sporting events is, on the other hand, being severely inhibited by urban sprawl, which is characterised by low-density development and the fragmentation of open spaces. Therefore, mapping the urban sprawl in a region can help in locating suitable places for the growth of sport-based tourism, which in turn can encourage sustainable tourism. Establish a hierarchy of importance for the development of sport-based

tourism in the most appropriate places. The GIS-AHP model will take into account a number of different variables, such as topography, accessibility, and the quality of the surrounding environment, in order to select the ideal areas for the growth of sports-based tourism. The use of this approach will help regional decision-makers plan for sustainable expansion in the tourism industry and put a stop to further urban sprawl.

Consequently, the statement of the problem is how to map urban sprawl in Kuantan and assess its impact on the suitability of areas for sport-based tourism by utilising a GIS-AHP (Geographic Information System-Analytic Hierarchy Process) model. The purpose of the study is to determine locations in which urban sprawl has encroached upon possible sites for sport-based tourism and to assess the appropriateness of the remaining areas for engaging in this kind of activity. A spatially explicit examination of the elements that influence the feasibility of sites for sport-based tourism will be provided by the GIS-AHP model. These characteristics include proximity to urban areas, accessibility, natural features, and infrastructure. The findings of the study can be utilised by policymakers and planners in Kuantan to make educated decisions regarding the management of urban growth and the development of sport-based tourism activities. These decisions can be made in an effort to improve the quality of life for residents of Kuantan as well as to preserve the natural environment.

1.3 Objectives of Study

1. To identify the pattern of urban sprawl area in Kuantan district from 2003-2023 using GIS.
2. To analyse suitability of sprawl area for sport-based tourism in Kuantan district through GIS-AHP model.

1.4 Scope of Study

The phenomenon known as urban sprawl, which is characterised by the growth of cities into the rural areas that surround them, has emerged as a key obstacle for urban planning and the establishment of sustainable communities. At the same time, the field of sport tourism has become an important contributor to both the expansion of the economy and the general wellbeing of communities. By mapping urban sprawl patterns with GIS (Geographic Information System) and

applying the AHP (Analytical Hierarchy Process) model, the purpose of this investigation is to determine whether or not urban areas are suitable for the development of tourism based on sporting events. This research aims to give urban planners, politicians, and other stakeholders in the tourist industry with significant information by conducting an analysis of the relationship between urban expansion, sport facilities, and the demand for tourism.

Previous research has investigated the usefulness of mapping techniques to the field of tourism studies and has focused on urban sprawl. The use of GIS as an effective tool for analysing the spatial patterns and shifts in land use that are linked with urban sprawl has been demonstrated. In addition, the AHP model has been utilised in a variety of tourism suitability studies, which have taken into consideration a variety of aspects including accessibility, infrastructure, and amenities. Research has also shown a favourable association between the availability of high-quality sporting facilities in urban areas and the growth of tourism that is based on sporting events.

The study region will be chosen based on how relevant it is to the phenomena of urban development and tourism driven by sporting events. Satellite images, municipal records, and tourism databases are some of the sources that will be utilised in the collection of spatial data in relation to urban sprawl, sport facilities, and tourism elements. In order to put the GIS-AHP model into action, we will first need to define the criteria and sub-criteria that will be used to evaluate appropriateness. These may include the closeness to various amenities, transportation networks, land use patterns, as well as environmental considerations. To determine the relative weight that should be given to each criterion, we will use the weighting and pairwise comparison processes that are included in the AHP model.

1.5 Importance of Study

Kuantan, Malaysia, is rapidly urbanising and sprawling. Growth challenges urban planning and sustainable development. Due to its natural attractions and infrastructure, Kuantan might become a sports tourist hotspot. This study emphasises the need of using the GIS-AHP model to map urban expansion and assess sport-based tourist potential in Kuantan. This study examines the relationship between urban sprawl, athletic facilities, and tourism demand to inform sustainable urban planning and tourism promotion.

GIS allows urban sprawl data analysis and visualisation. The GIS-AHP model maps urban sprawl in Kuantan using satellite imagery, urban records, and land use databases. This

mapping helps politicians and urban planners manage land use, infrastructure, and the environment in rapidly expanding places. Understanding urban sprawl patterns and trends is essential for sustainable growth and avoiding the negative effects of unrestrained expansion.

The AHP model is useful for assessing sport-tourism venues. The AHP model compares and ranks characteristics such proximity to sports facilities, accessibility, hotel options, transit networks, and environmental quality. GIS spatial data and the AHP model are used to assess Kuantan's sports tourism potential. This assessment helps identify sport tourism hotspots and provide funding for infrastructure and facilities.

Urban sprawl mapping for sport-based tourist appropriateness in Kuantan using the GIS-AHP approach promotes sustainable urban development. First, it helps land use planners strategically place sports facilities to minimise environmental effect and maximise accessibility for tourists and locals. Second, it protects natural resources and ecological balance by designating high-quality environmental areas and limiting urban expansion in sensitive ecosystems. Finally, the model optimises infrastructure and resource consumption, minimising unsustainable development practises.

The GIS-AHP methodology can help Kuantan promote sports tourism. Policymakers and tourism stakeholders might focus on marketing and infrastructure improvements in sport tourism-friendly places. The model's examination of accessibility, accommodation alternatives, and closeness to sports facilities enhances the tourism experience, attracting local and international sports and recreation travellers. Sustainable sport-based tourism development may make Kuantan a unique and attractive destination, broadening its tourism options and boosting economic growth.

GIS-AHP urban sprawl mapping for sport-based tourist appropriateness in Kuantan, Pahang, is crucial. This method maps urban sprawl patterns, enabling sustainable urban development decisions. The methodology helps allocate resources, construct infrastructure, and promote sport-based tourism by identifying suitable regions. Kuantan can maximise sport-based tourism while being responsible by integrating GIS and the AHP paradigm.

CHAPTER 2

LITERATURE REVIEW

2.1 Introduction

A literature review is an analysis of studies that have covered subjects that are connected to this project. In this chapter, it contains the information about the explanation of urban sprawl mapping, and also urban sprawl mapping for sport-based tourism suitability by using GIS-AHP model. Identification of the ideal qualities is aided by a study of the works. The outcomes of various methodology used to gauge the requirements and viewpoints of the space's real users also shed some information on the desired qualities.

2.2 Population changes in Kuantan

Due to their immediate effects on the viability of the social, economic, and environmental systems, population fluctuations in the Kuantan district have attracted the attention of demographers and policymakers as a research issue. For efficient urban and regional planning, resource allocation, and policy-making, it is essential to comprehend the elements that lead to population changes in the Kuantan district. This can help in determining regions that are growing or declining, forecasting future demographic patterns, and assessing the efficacy of current programs. (Sowtali et al., 2021)

The Kuantan district's changing population also has an impact on public services like healthcare, transportation, and education. For instance, an increase in population could cause overcrowding or increased demand for certain services, while a drop in population might cause underutilization, which would influence the availability and caliber of these services. This makes addressing social and economic problems in the Kuantan district an essential part of population change research. (Yendraliza et al., 2020)

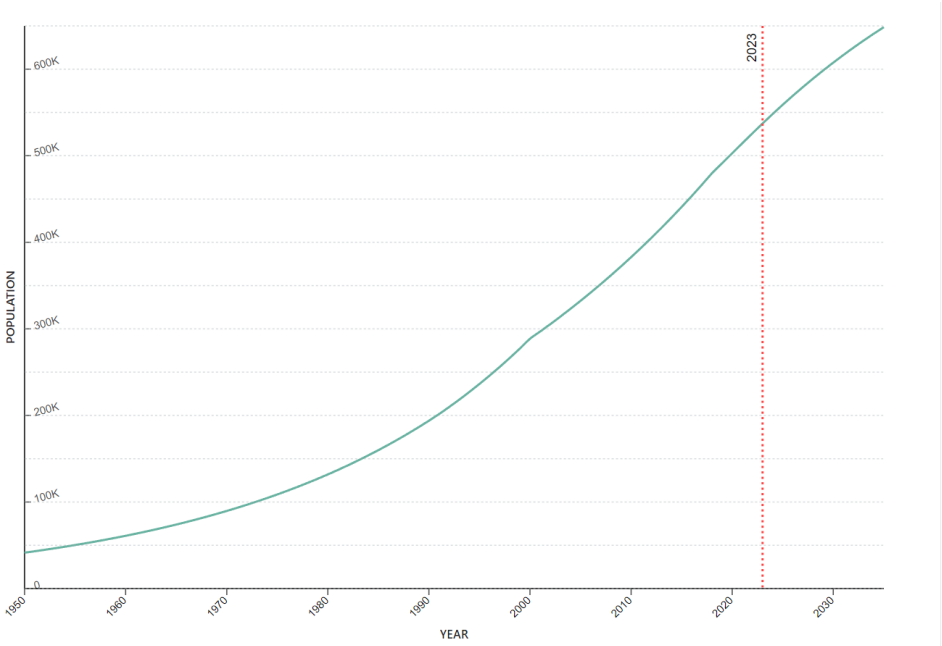


Figure 2.1: Graph population in Kuantan

Researchers and decision-makers have used a variety of techniques to better understand demographic changes in the Kuantan district. These techniques include population modelling and forecasting methodologies, census data analysis, and demographic surveys. These techniques can shed light on the population's size, makeup, and distribution through time in the Kuantan district. Furthermore, accurate demographic data can help shape governmental policies that influence the lives of people in the Kuantan area, such as those related to immigration and housing.

2.3 Tourism in Kuantan

Tourism is the act of traveling to different places for leisure, recreation, or business purposes. It is a multi-billion industry that has grown rapidly in recent years, with millions of people traveling to different parts of the world every year.

Tourism can be divided into several categories, including domestic tourism (travel within one's own country), inbound tourism (travel from other countries to a particular destination), and outbound tourism (travel from one country to another for leisure or business purposes). Tourists may also engage in different types of tourism, such as adventure tourism, cultural tourism, eco-tourism, medical tourism, and many others. (Satria et al., 2021)

A variety of activities and events that available in Malaysia's Kuantan area, which has grown to be a well-liked spot for sport-based tourism. The following are a few of the main sporting attractions in the Kuantan district:

1. Golfing: Kuantan district is home to several top-rated golf courses, including the Royal Pahang Golf Club and the Palm Garden Golf Club, which attract golf enthusiasts from around the world.

Figure 2.2: Golf in Royal Kampung Kuantan

2. Water Sports: Kuantan's beaches, including Cherating, offer a range of water sports activities, such as surfing, jet skiing, and parasailing.

Figure 2.3: Surfing in Cherating

3. Fishing: Kuantan is a popular destination for fishing enthusiasts, with plenty of opportunities for both freshwater and saltwater fishing.

4. Cycling: The district has several scenic cycling routes, such as the East Coast Expressway and the Kuantan-Pekan cycling trail, which offer visitors a chance to explore the beautiful countryside.

5. Hiking and Trekking: Kuantan district is home to several hiking and trekking trails, such as the Sungai Lembing trek and the Berkelah Falls hike, which offer stunning views of the district's natural beauty.

6. Motorsports: The Sepang International Circuit is located just a few hours' drive from Kuantan, and hosts several international motorsports events throughout the year.

7. Beach Volleyball: Kuantan hosts the annual FIVB Beach Volleyball World Tour, which attracts top athletes from around the world and is a major draw for sports enthusiasts.

Figure 2.4: Beach volleyball at Swiss Garden Resort

8. Darul Makmur Stadium: A stadium with many uses that is situated in Kuantan, Pahang, Malaysia. With a seating capacity of 40,000, football matches are the main purpose for it.

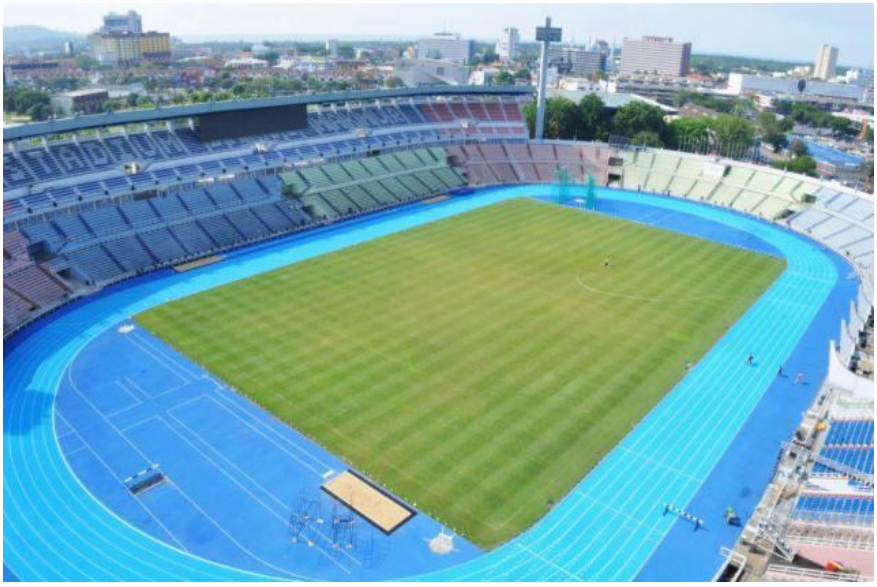


Figure 2.5: Stadiun Darul Makmur

9. Mokhtar Dahari National Football Academy: It developed as an ecosystem and sports center of excellence for students from all over the country and located in Gambang, Pahang.

Figure 2.6: Mokhtar Dahari National Football Academy

2.4 Urban sprawl mapping for Sport-based tourism

Finding appropriate places for sport-based tourist activities inside an urban region might be helped by urban sprawl mapping. Finding regions with a lot of athletic opportunities is one step in the process. Another is finding areas with easy access to transportation and lodging alternatives. (Smith, 2002)

First is might begin by listing all the sports facilities present in the urban area to develop a map of the appropriateness of the place for sport-based tourism. GIS software or other mapping tools can be used for this. Next, the facilities can be divided into groups according to the sports they accommodate, such basketball, volleyball, football, or tennis. Using this data, it is possible to locate locations with a significant number of facilities for a certain sport.

Other elements, such available lodging, transit alternatives, and nearby attractions, can be taken into account after the facilities have been established. For instance, locations that are readily reached by public transit and have a variety of housing alternatives close by may be better suited for sport-based tourism than those that are challenging to reach or have few lodging options nearby.

Urban planners and tourism authorities may pinpoint regions that are especially suitable for developing sport-based tourism by assessing these criteria and generating a map of sport-based tourism appropriateness. The creation of additional facilities and services, as well as marketing and promotional initiatives to draw tourists to the region, may be guided by this information.

Using satellite imagery or aerial photographs, information on the size and distribution of urban expansion is gathered to build a map of urban sprawl for sport-based tourism in Kuantan. Then, using geographic information system (GIS) software, this data is superimposed into a map. The location of parks, sports facilities, and other natural elements are among the sections of the map that are suited for sport-based tourism activities.

Overall, it is crucial to map urban sprawl for Kuantan's sport-based tourism in order to pinpoint potential development sites and draw attention to any problems that might have an impact on the experience of visitors. Insightful information may be gathered by using a GIS to generate and analyze the map, which can then be used to guide future planning and decision-making for sport-based tourism in Kuantan.

2.5 GIS-AHP technology for mapping

GIS-AHP model is a decision-making tool that combines Geographic Information Systems (GIS) and Analytic Hierarchy Process (AHP) techniques to solve spatial problems. It is a widely used method in urban and regional planning, environmental management, and other fields that require complex decision-making involving multiple criteria. (Hashim et al., 2011)

The GIS component of the model provides a framework for organizing and analyzing spatial data, while the AHP component enables the decision-maker to weigh the relative importance of different criteria and alternatives. The AHP is a mathematical technique used to prioritize multiple criteria and alternatives by breaking down the decision-making problem into a hierarchy of factors, sub-factors, and alternatives.

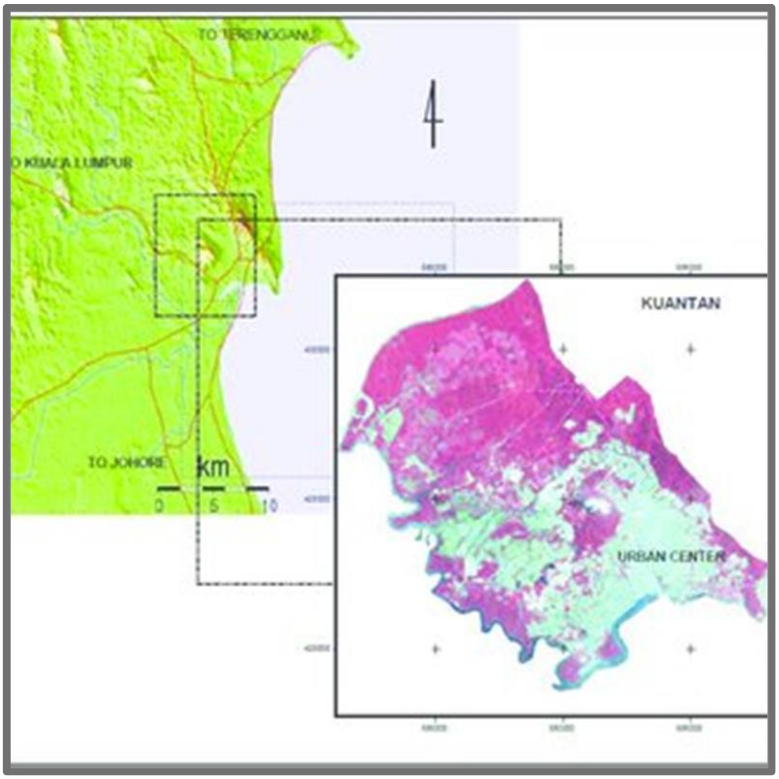


Figure 2.7: Sprawl mapping in Kuantan

In the GIS-AHP model, the decision-making problem is first represented spatially using GIS, with different layers representing different criteria such as land use, population density, accessibility, and environmental quality. Each criterion is then broken down into sub-criteria,

which are ranked using pairwise comparisons in the AHP.(Noor & Rosni, 2013) The AHP allows decision-makers to compare the relative importance of each sub-criterion and to assign weights to each one based on their importance.

Once the criteria and sub-criteria have been ranked and weighted, the GIS-AHP model combines them to create a composite index or map that reflects the overall suitability or desirability of different alternatives. The model can then be used to evaluate different scenarios or alternatives, such as identifying the best location for a new development or selecting the most appropriate land use for a particular area.

Overall, the GIS-AHP model provides a systematic and transparent approach to decision-making, which enables decision-makers to consider multiple criteria and alternatives and to weigh their relative importance. By combining GIS and AHP, it offers a powerful tool for solving complex spatial problems and making more informed and effective decisions.

2.5.1 Advantages of using GIS-AHP for urban sprawl in Kuantan

Analytical Hierarchy Process (AHP) and Geographic Information Systems (GIS) are two potent techniques that have been extensively employed in a variety of sectors, including urban planning, environmental management, and transportation studies. (Ergen, 2016) When used together, these two technologies can offer a more precise and effective way to address the problem of urban sprawl in cities like Kuantan.

First of all, the analysis and visualisation of the spatial patterns of urban sprawl in Kuantan can be aided by the use of GIS in conjunction with AHP. For managing and analysing vast amounts of geographical data, including land use, population density, and transportation networks, GIS offers a strong platform. As a tool for making decisions, AHP enables the inclusion of various criteria and stakeholder viewpoints during the analysis process. Urban planners may produce maps and visualisations that give a complete picture of the situation of urban sprawl in Kuantan by combining these two technologies.

Second, the application of GIS-AHP can assist urban planners in determining the reasons behind the forces that are driving Kuantan's urban sprawl. Urban sprawl is caused by a variety of variables, including population increase, poor transportation infrastructure, and unsustainable land use policies. AHP can be used to construct a set of criteria and indicators that can be used to

assess each of these factors. Then, these elements can be mapped using GIS to pinpoint the region's most vulnerable to urban sprawl. With the use of this knowledge, specific policies and interventions can be created to deal with the underlying causes of urban sprawl.

Thirdly, using GIS-AHP can assist urban planners in assessing the success of various policy initiatives for reducing urban sprawl in Kuantan. AHP can be used to develop a set of evaluation standards and metrics for evaluating the efficacy of various policy alternatives, such as zoning restrictions, transit enhancements, and the preservation of open space. The impact of these treatments can then be mapped using GIS to show how effective they were visually. This data can be used to improve and modify policies over time to make sure they are producing the desired results.

Finally, the use of GIS-AHP can encourage participation from stakeholders and the general public in the urban planning process. AHP offers a methodical way to include stakeholder priorities and viewpoints in the decision-making process. Using GIS, stakeholders can explore various scenarios and offer comment on suggested policies and actions by using interactive maps and visualisations. This can promote stakeholder confidence and support while ensuring openness and inclusivity in urban planning decisions.

2.5.2 Disadvantages of using GIS-AHP for urban sprawl in Kuantan

GIS-AHP has its limitations and potential drawbacks, just like any other instrument. There's a few of the drawbacks of utilising GIS-AHP to monitor urban sprawl in Kuantan.

First, the expensive expense of gathering and maintaining the required data and software is a possible drawback of employing GIS-AHP. The expense of acquiring and maintaining this technology may be prohibitive for some towns and organizations due to the high cost of GIS software and data. Additionally, additional training and staffing expenditures may be necessary due to the expertise needed to use these products efficiently.

Furthermore, there is a chance for data and analytical mistakes while employing GIS-AHP. For reliable analysis and decision-making, data quality is crucial. Results that are erroneous or misleading may be the consequence of mistakes or discrepancies in the data intake or processing. The AHP model's complexity also raises the possibility of mistakes in the weighing of the criterion and sub-criteria, which could bias the outcomes.

Last but not least, using GIS-AHP may not always result in better urban planning outcomes. Although GIS-AHP offers a systematic way for making decisions, it cannot ensure that the policies or interventions created will be successful or result in the anticipated results. The availability of financing, political will, and public support are only a few of the many variables that affect how well urban planning interventions are received.

2.6 Impact urban sprawl on city development by sport tourism

Urban sprawl can have a big impact on a city's growth, which might affect sport tourism opportunities. metropolitan sprawl is the unchecked expansion of metropolitan areas outside of their established bounds. This growth may have a number of detrimental repercussions, such as lowered quality of life, worsened traffic, restricted access to public services, and loss of open space. Each of these elements may have an effect on a city's potential for sport tourism.

2.6.1 Positive impacts:

To begin with, urban sprawl might result in the construction of new sports facilities an infrastructure. New facilities are frequently required when cities grow to accommodate the expanding populations. This can include brand-new arenas, sports stadiums, and practise facilities. Major sporting events and competitions may be drawn to these new venues, resulting in a considerable increase in tourism and local economic activity.

Second, urban growth may open up new possibilities for outdoor enjoyment. It is frequently necessary to protect green spaces and natural areas for recreational use as cities grow. Parks, wildlife preserves, and other outdoor recreation sites can be included in this. These areas are suitable for a range of sporting pursuits, including cycling, hiking, and water sports. This could draw tourists and sports fans interested in outdoor activity, which would be advantageous for the community's economy.

Thirdly, urban sprawl may open up new possibilities for neighbourhood sports initiatives. New community sports programmes frequently need to be created when cities grow in order to serve the expanding population. These initiatives could be developed to encourage social interaction, community building, and healthy living. This could enhance the city’s overall quality of life and foster a sense of belonging among its citizens.

2.6.2 Negative impacts:

Urban sprawl has a detrimental effect on sport tourism in the form of increased costs associated to sprawl. Construction of new roads, water and sewage systems, and other utilities may be necessary to support the development of new sports facilities and infrastructure. These expenses are frequently passed on to taxpayers, which raises taxes and lowers the standard of living for locals.

Another detrimental effect of urban growth on sport tourism is social dislocation. People may be uprooted from their homes and communities when metropolitan regions grow. This may result in a loss of feeling of communal identity and social cohesiveness. The quality of life for locals may suffer as a result of these changes, and tourists who enjoy sports may be discouraged from travelling to the area.

Finally, urban sprawl has a detrimental effect on sport tourism due to increased energy consumption. As people may have to travel further to access sporting events and other recreational activities, urban sprawl can increase energy consumption. Climate change and environmental deterioration may result from this.

2.7 Summary

According to the literature study on "Urban Sprawl Mapping for Sport-based Tourism Suitability using GIS-AHP model," this methodology has gained more and more popularity over the past few years. This further emphasizes the significance of taking into account elements related to sustainability in the process of developing sporting and tourism facilities. The incorporation of environmental, social, and economic issues into the decision-making process can assist assure the long-term viability and profitability of sport-based tourism facilities. Sustainability factors include aspects such as the environment, society, and the economy.

As a whole, this demonstrates that the Urban Sprawl Mapping for Sport-based Tourism Suitability using GIS-AHP model is a promising methodology. It has the potential to assist decision-makers and stakeholders in the tourism industry in making informed decisions about where to develop sport-based tourism facilities in urban areas, while taking into consideration a variety of factors related to sustainability.

CHAPTER 3

METHODOLOGY

3.1 Introduction

The Urban Sprawl Mapping for Sport-Based Tourism Suitability Using GIS-AHP Model is a system that identifies ideal locations for sport-based tourism in urban settings by combining the use of Geographic Information Systems (GIS) with the Analytic Hierarchy Process (AHP). This technique was developed with the intention of assisting those decision-makers and stakeholders in the tourism sector who are tasked with determining where to establish sport-based tourism facilities in metropolitan areas to make educated judgements.

The process consists of a few different steps, the first of which is the detection and mapping of urban sprawl regions through the use of GIS methods. The next step is to determine whether or not each location is suitable for the development of a tourism industry centred on sporting events by using a set of criteria such as ease of access, the presence of necessary infrastructure, and the standard of the surrounding environment. After that, the AHP model is applied to the process of weighing and ranking the criteria in order to determine which areas are best suited for sport-based tourism.

The application of this methodology will result in the production of a map that identifies the urban areas that are best suited for sport-based tourism. Those in charge of making decisions can put this information to use to design and construct sport-based tourism facilities in a way that is both sustainable and efficient, so mitigating the negative effects of urban sprawl as much as possible.

3.2 Flowchart of urban sprawl mapping for sport-based tourism

The flowchart for the study can be seen illustrated in Figure 3.1. To begin, there were various kinds of data that may match the requirements for urban sprawl mapping. Some examples of these kinds of data include satellite data, road data, demographic data, topography data, and questionnaires from field visits. In our research, we solely employed satellite data, demographic data, and questionnaires from locals as sources of information for AHP modelling. These three forms of data are described below. Our fieldwork yielded these data, which were then entered into GIS using a keypad in order to be compiled and used for AHP modelling. The application of a weighted pair-wise comparisons approach within AHP produces a numerical fundamental scale ranging from 1 to 10, which leads to an outcome indicating whether or not the location is suited for tourism. If this is not the case, the AHP modelling in GIS will need to be performed until it reaches a level of suitable; alternatively, if the modelling was successful in reaching a level of suitability in the first place, the final findings of urban sprawl mapping for beach tourist suitability in Kuantan District will be acquired.

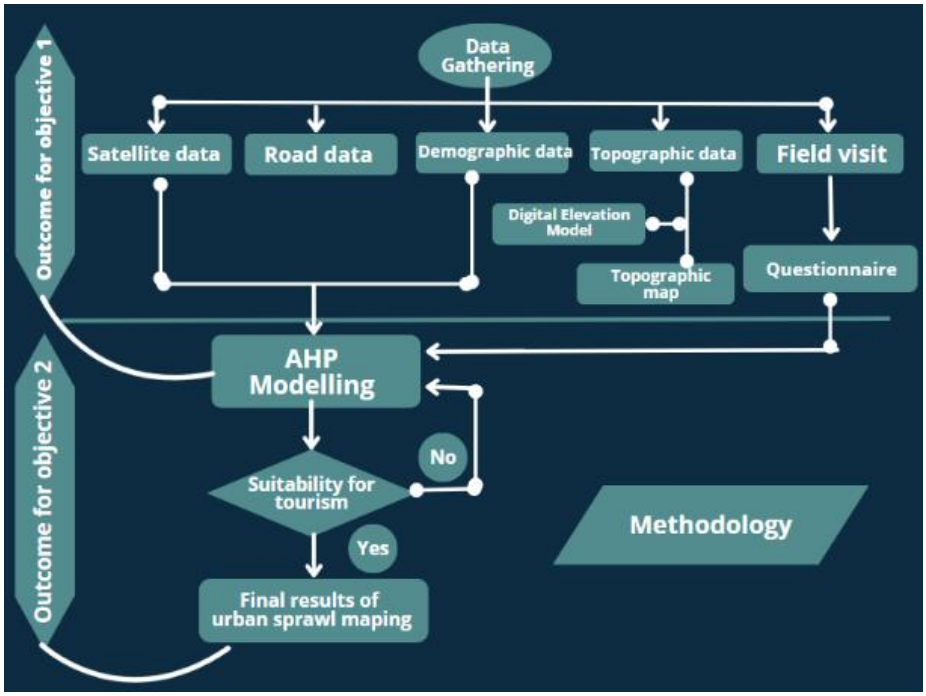


Figure 3.1: Methodology flow chart

3.3 Field data collection

Due to the fact that conducting research on location is necessary in order to acquire specific information regarding tourism activities and infrastructure, it is essential to carry out field data collecting for sport-based tourism in close proximity to the sport sites located within the Kuantan district. In light of the findings and inferences that were drawn from the analysis of the field data, provide some suggestions. There are a number of potential results that could result from such proposals, including strategies for enhancing tourism focused on sports, improving facilities, extending infrastructure, or offering better experiences for visitors. Field research is essential for gaining first-hand knowledge of and insights into sport-based tourism in the area surrounding the sport areas in the Kuantan district. Interviewing tourists, visitors, and other stakeholders in the tourism business is a great way to supplement the research methodologies that are already in place and acquire a more comprehensive image of the local tourism industry.

Figure 3.2: Fieldwork at golf sport

Figure 3.3: Fieldwork at motorsport

3.3.1 Satellite GPS for coordination

The following image provides a visual representation of the GPS (Global Positioning System) coordinates that were utilised in the course of our fieldwork. This GPS system locates a receiver on the ground by employing satellites that orbit the Earth. GPS receivers calculate the user's position on Earth by combining the information received from a number of satellites. This information is often presented in the form of latitude and longitude coordinates. The GPS receiver is able to triangulate the user's position on Earth with a high degree of accuracy by measuring the distances to several satellites. Every sporting facility that was checked out had its coordinates logged, and those records were kept. After that, these coordinates will need to be entered into a GIS in order to validate urban sprawl using AHP modelling.

Figure 3.4: GPS coordinate at the court volleyball

Figure 3.5: GPS coordinate at the court futsal

3.3.2 Questionnaire

The images illustrate various locations that were visited as part of the local survey. We believe questionnaire is crucial as it gives more accurate information from locals. Several questions concerning urban sprawling, particularly as it relates to sport tourism, were posed to the respondents. These questions inquired about their thoughts on the density of visitors to sporting facilities, tourism activities at the court, problems that arose as a result of those activities, the benefits of tourism activities to local communities, and suggestions to prevent urban sprawl from getting out of hand. We learned a variety of residents' points of view, and we saw that as a reflection of the breadth of people's knowledge and experience. Through the use of AHP modelling in GIS, these data and information become key instruments for accuracy assessment, which can then be used to analyse and classify urban sprawl.

Figure 3.6 & 3.7: Interview with someone at the facility

3.4 Data analysis by using QGIS

In order to acquire results while using QGIS for mapping urban sprawl and conducting an examination of the feasibility of sport-based tourism, it is required to follow these general steps. The gathering of data. Collect all of the necessary spatial data that pertains to your research area (Kuantan, Pahang), such as satellite imaging, data on land use and land cover, the locations of sporting facilities, transport networks, tourist data, and any other datasets that may be applicable.

First of all is data preparation. Input all of the gathered information into QGIS. If necessary, preprocess the data by doing things like reprojecting the layers to a single coordinate system and making sure all of the data is compatible with each other. Analysing the extent and patterns of urban sprawl in Kuantan can be done with the help of satellite imagery and data on land use and land cover. Identifying regions where urbanisation is occurring can be accomplished through the use of image classification methods or change detection algorithms. Create statistical outputs or thematic maps that show the trends of urban sprawl.

Next is the criteria of the AHP and their weighting. The criteria and sub-criteria for assessing the suitability of a location for sport-based tourism, such as the closeness to sport facilities, the availability of transit, the lodging alternatives, the quality of the environment, and so on. Applying the AHP pairwise comparison method will allow you to assign relative weights to the criteria based on how important they are. Expert judgement or surveys of relevant stakeholders are both viable options for accomplishing this goal.

Besides, suitability analysis. Conduct an analysis using the predetermined criteria and weights to determine which areas of Kuantan are best suited for the promotion of sport-based tourism. To integrate and evaluate the spatial relationships between the criteria and to develop a suitability index or score for each place, use tools and techniques offered by GIS, such as proximity analysis, network analysis, and overlay analysis.

It is crucial to remember that the particular methods and tools available within QGIS may differ from one instance of the programme to another depending on the data and analytic requirements of the study you are conducting. The methods that have been outlined above provide a general framework; however, depending on the unique research objectives and datasets that you have, you may need to investigate other QGIS plugins, algorithms, or customization choices.

3.5 GIS-based AHP

The purpose of this section of the study was to determine the important criteria that influence the assessment of suitable areas for urban sprawl by drawing on prior studies and expert opinions. Density, distance, height, and other factors relevant to the viability of urban development informed the creation of each and every map. GIS technologies such as Euclidean distance, reclassification, conversion, union, raster calculator, and model builder were used extensively in this study. Scores should be given to each factor in a GIS-AHP suitability analysis based on how well it supports urbanization. Saaty's nine-point scale for determining relative weights was employed in a pairwise comparison matrix for this purpose. After the pairwise

comparison matrix was constructed, factor weights were calculated. The next step is to calculate the Consistency Ratio (CR), which is a metric for gauging how much agreement there is among the experts. Consistency in pairwise comparisons is considered satisfactory when the Consistency Ratio (CR) is less than 0.10. In contrast, values of CR > 0.10 indicate contradictory assessments.

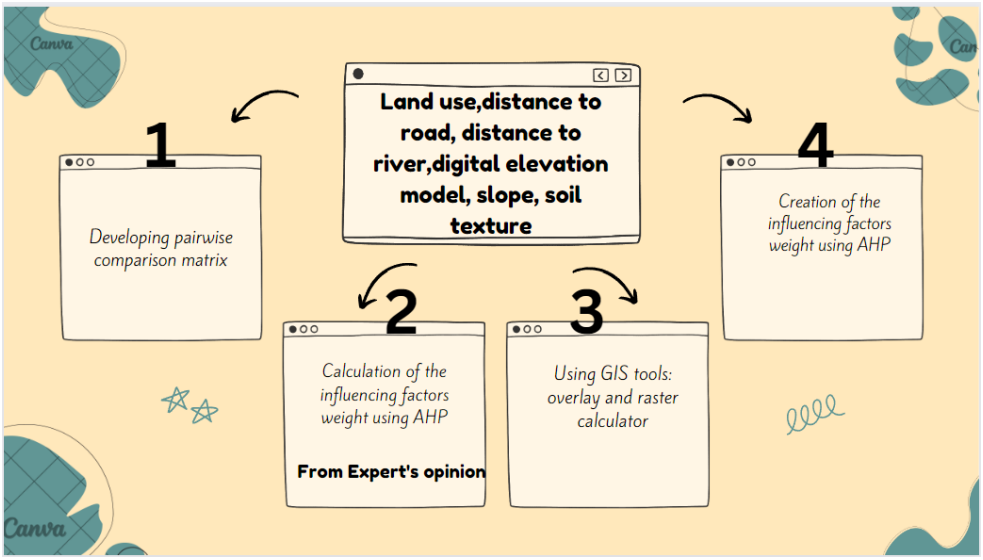


Figure 3.8: Stepwise of GIS-AHP for developing final land suitability map of urban sprawl

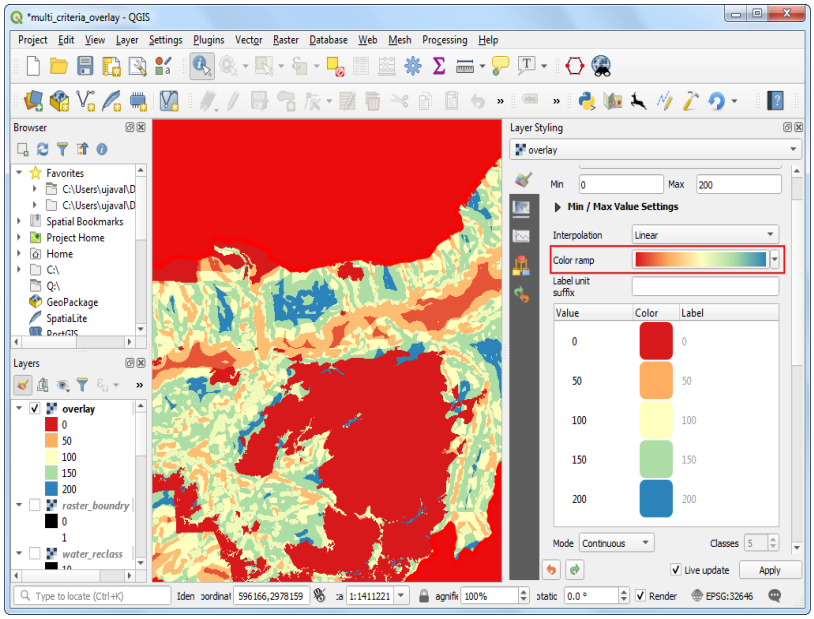


Figure 3.9: Result of overlay in QGIS application

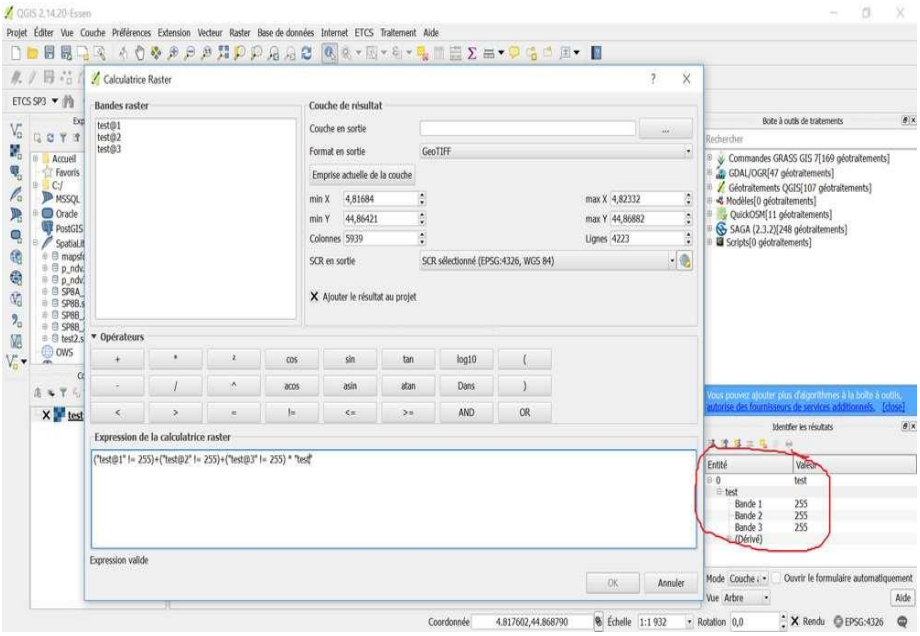


Figure 3.10: Raster Calculator in QGIS application

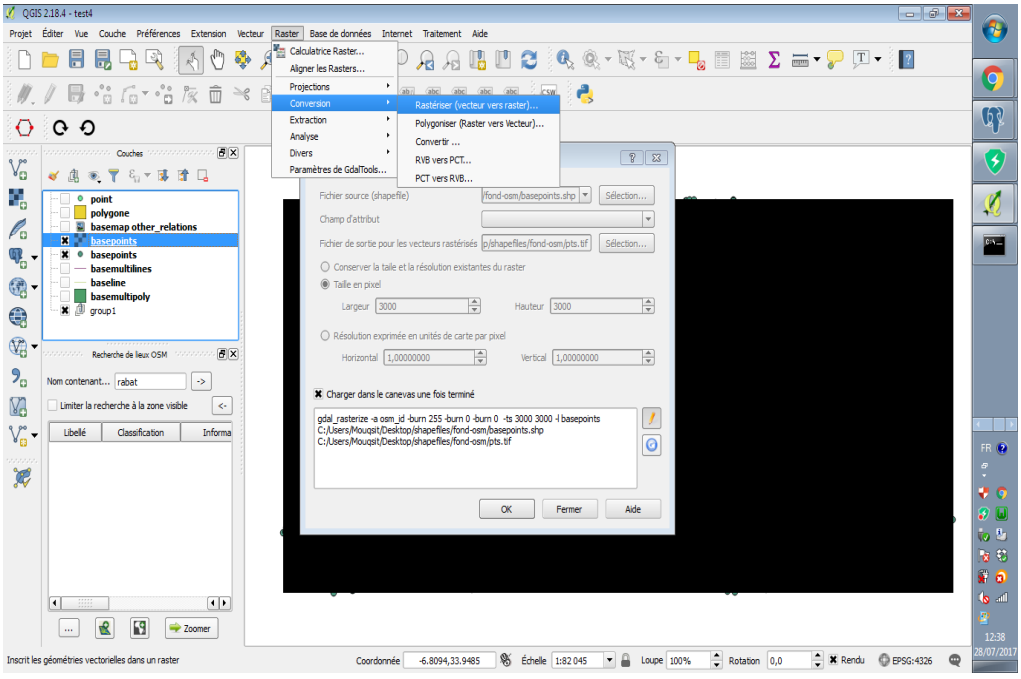


Figure 3.11: Vector to Raster

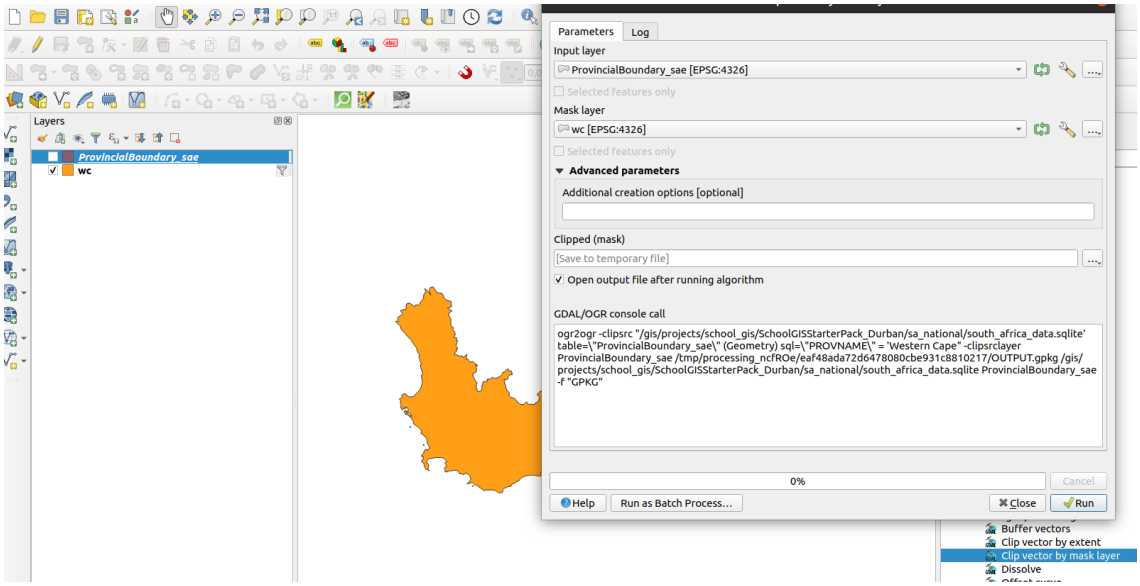


Figure 3.12: Clipping tools in QGIS for Layers

Several tools exist in QGIS for clipping or deleting spatial data inside a certain region. Clipping a piece of a vector layer along a specified line couldn't be easier than with the Clip tool. The input layer is cut to the same shape as the clipping layer, and only the features that lie within the clipping region are retained. You may get the Clip tool from the Geoprocessing Tools submenu of the Vector menu. Extract from the Masque: This program allows you to reduce raster data with the help of a vector layer. The specified mask layer is used to generate a new raster layer with the same coverage, but with only the masked pixels' values preserved. The Raster > Extraction > Clipper menu is where you'll find the Extract by Mask option.

3.6 Expected Outcomes

First, as the investigation progresses, we gain a deeper understanding of urban development from a sporting viewpoint. It is important to include the direct and indirect effects of urban spread on social interactions, local identity, sports infrastructure, sports

facilities, and environmental consciousness while studying the correlation between urban sprawl and sports. By studying these elements and their interplay, researchers can gain understanding of how urbanization influences the functioning of culture within communities.

Second, to be able to show how Kuantan's surroundings have changed due to urban growth from the viewpoint of sports. Although urban expansion brings problems like increased traffic, environmental concerns, and pressure on resources, seeing these problems through the lens of sport allows us to appreciate Kuantan's expanding and altering character. It's evidence of the city's resilience and progress, as well as its willingness to embrace sport diversity.

Being attuned to the sport tourism potential of the Kuantan area and equipped with the means to detect, study, and comprehend urban sprawl mapping. We would require knowledge of GIS and urban planning, cooperation from local officials, and access to relevant data in order to conduct this kind of study. Community members, tourism groups, and government agencies in the Kuantan area should be consulted to ensure that the study is tailored to the region's unique needs and goals and to gain valuable insights.

3.7 Summary

In conclusion, the purpose of this chapter was to simply explain the type of methodologies that were utilised to collect urban sprawl data and information specifically for this study focused on the adequacy of sport-based tourism in the Kuantan District. We are able to see the flow of the data collection process through the use of this methodology, which enables us to complete the requirements of GIS-AHP modelling for beach tourist appropriateness. It is thought that our fieldwork to acquire satellite data and local survey will become crucial parts to prove the beach tourism suitability of urban sprawl in the Kuantan District. When conducting research, determining the validity of information as well as the specifics of that information is highly crucial.

CHAPTER 4

RESULTS AND DISCUSSION

4.1 Introduction

The findings of using the GIS-AHP model to urban sprawl mapping in Kuantan, Pahang, for the purpose of determining the feasibility of the location for sport-based tourism would be contingent on the particular criteria and data utilised in the analysis. One of the possible outcomes could be an analysis of the urban sprawl. The geographic information system study would produce a visual representation of the amount and patterns of urban sprawl in Kuantan, bringing to light areas that are experiencing significant increase. In addition to it, there is also something called a Suitability Assessment. Using factors including closeness to sporting facilities, ease of access, variety of lodging options, availability of public transportation, and overall environmental quality, the AHP model would determine which areas of Kuantan are best suited for the development of a tourism industry centred on sporting events. This evaluation would identify regions that have a significant amount of untapped potential for the expansion of sport-based tourism.

4.2 Identification of the pattern urban sprawl area in Kuantan district from 2003-2023 using GIS.

Urban sprawl is the rapid urbanisation of rural or underdeveloped terrain. It affects land usage, infrastructure, sustainability, and social well-being. This paper examines urban expansion in Malaysia's fast rising Kuantan District over 20 years. The study uses statistical analysis and remote sensing. Land-use data, satellite imagery, and aerial photographs from different time periods will be utilised to map and analyse urban expansion in the Kuantan District. Statistics will reveal urban growth patterns, trends, and dispersion. This section discusses Kuantan District urban growth's historical and socioeconomic elements. Key events, legislation, and economic activity have influenced the region and led to urbanisation. This section maps urban expansion in Kuantan District from 2003 to 2023 using remote sensing data. It tracks urban sprawl, development hotspots, and urban expansion. Urban sprawl changes land use patterns. It studies the urbanisation of farms, forests, and other natural regions. Discussed are ecosystem

services, biodiversity, food security, and environmental issues. It stresses the necessity for integrated and sustainable urban planning and proactive steps to reduce urban sprawl. This study will inform decision-making and help build resilient and liveable cities.

4.3 Suitability of sprawl area for sport-based tourism in Kuantan district through GIS-AHP model.

Sports-tourism integration is becoming a potential driver of local economic development and tourist attraction. This research discusses sport-based tourism and its benefits, emphasising the importance of sprawl area assessments. It describes the study's goals and methods. The GIS-based study uses the AHP model to assess sprawl regions for sport-based tourism. Data collection, processing, and analysis are explained here. It discusses the AHP model's criteria, weights, and suitability map generation method. The investigation examined spatial data on sprawl, infrastructure, accessibility, natural features, and cultural attractions. It covers data gathering, integration, and geographical analytic preparation.

The AHP model needs identifying and weighting sub-criteria. The selection procedure involves expert opinions and stakeholder engagement. It shows criteria hierarchies and pairwise comparison weight calculations. This section maps sprawl areas' sport-tourism potential using GIS software. It shows suitability maps and criterion overlay. Results are categorised into high, moderate, and poor suitability zones. It emphasises integrating GIS and the AHP model in decision-making to provide informed and targeted interventions. Policymakers and stakeholders are advised to improve sport-based tourism in the district.

4.4 Results Images of sprawl in Kuantan by using QGIS

The geographical patterns of urban sprawl in Kuantan, Pahang, are depicted in the images that were generated using QGIS as the findings. The photos offer a clear visualisation of the regions that are undergoing considerable expansion as well as the level of urban development that can be found within the research area.

The urban sprawl map displays the various urban regions that have been mapped out in Kuantan, each of which is denoted by a unique colour or pattern. The map identifies the areas within the city that have seen urban growth and makes it possible to do a comparative examination of the expansion trends in each of the city's distinct neighbourhoods.

The representation of urban growth, which is color-coded, gives a very clear sense of the extent and density of urban development. Greater levels of urbanisation are represented by areas with darker colours or patterns that are more densely packed together, whilst less developed or non-urban areas are shown by areas with lighter shades or patterns that are more sparsely packed together.

When looking at the photographs of the results, it is clear that the majority of Kuantan's urban sprawl has developed around important transportation routes, metropolitan centres, and places with considerable economic activity. The photographs show the growth of residential, commercial, and industrial regions within the city, which is an indication of the urbanisation tendencies now taking place there.

Not only do the photos of the results provide a visual portrayal of the patterns of urban sprawl, but they also serve as essential tools for legislators, urban planners, and scholars. They provide essential insights into the spatial distribution of urban expansion, which enables informed decision-making regarding the planning of land use, the development of infrastructure, and the conservation of environmental resources.

Additionally, the resultant photos may be used to compare and monitor urban sprawl over time, which makes it easier to evaluate the efficacy of policies on urban planning and highlights places that need focused intervention for sustainable urban growth.

It is essential to keep in mind that the specific interpretation and analysis of the results photographs may differ from one another depending on the methodology, data sources, and research aims that were utilised in the study. The findings images of urban sprawl in Kuantan that were generated using QGIS will be easier to interpret and have more of an impact if particular information about the context is provided, and if reference is made to the criteria and data that were utilised in the analysis.

4.4.1 Identification of influencing factors

In this section of the research, we are going to discover the important aspects that have an effect on Urban Sprawl Mapping for sport. In addition, the local level of influential elements was identified based on statements obtained from local experts working in associated government authorities such as town planning departments, local councils, and federal planning departments. These statements were used to identify the local level of influencing factors. In order to accomplish the purpose of this study, we decided to use these six primary criteria. The most important criteria that were considered in this investigation were slope, DEM, soil texture, distance to river, distance to road, and land use.

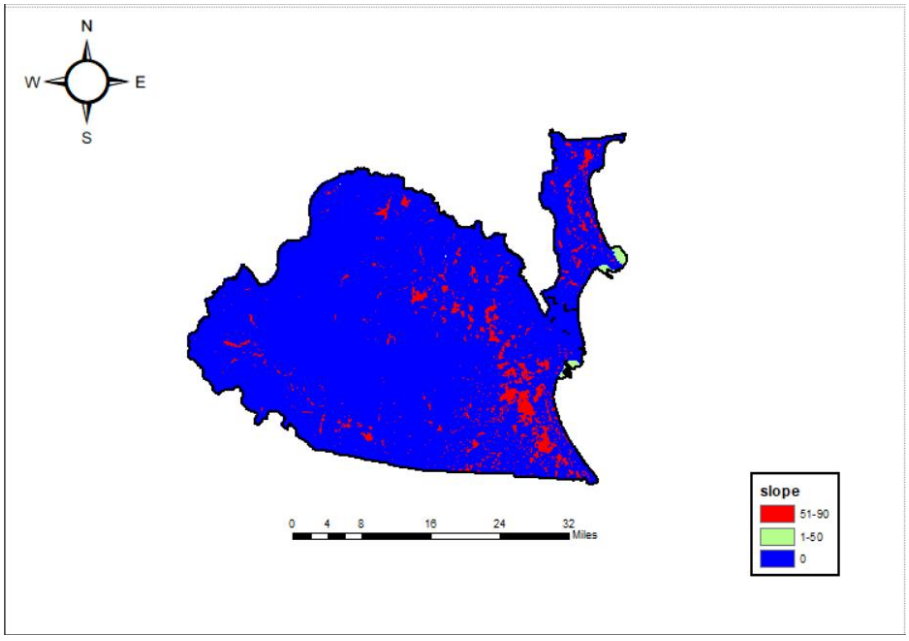


Figure 4.1: Data of Slope

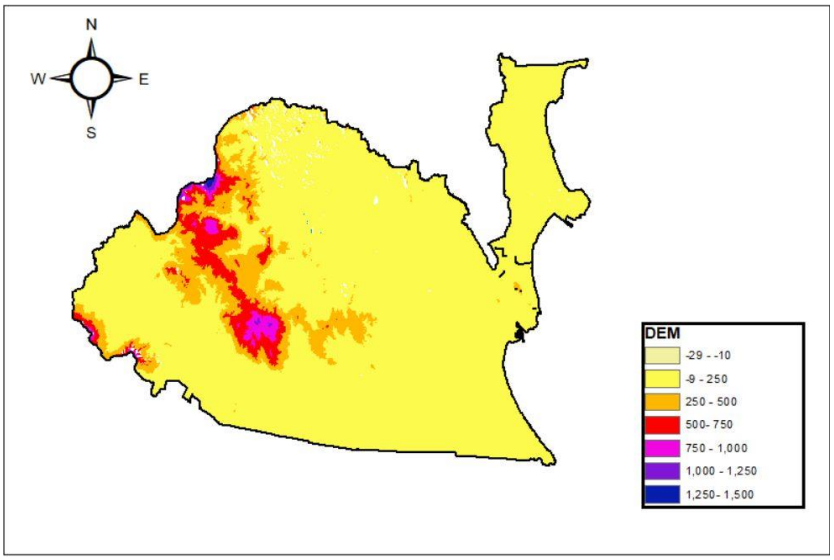


Figure 4.2: Data of DEM

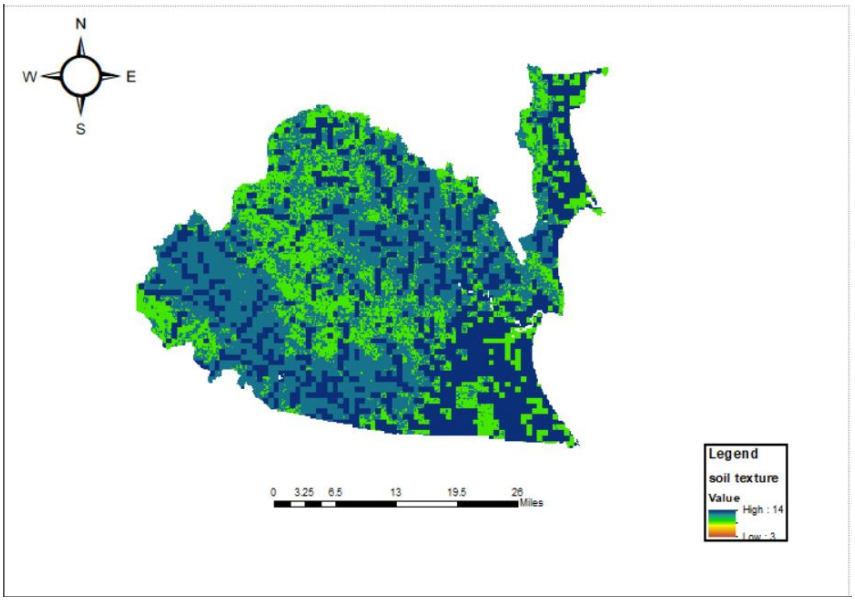


Figure 4.3: Data of Soil Texture

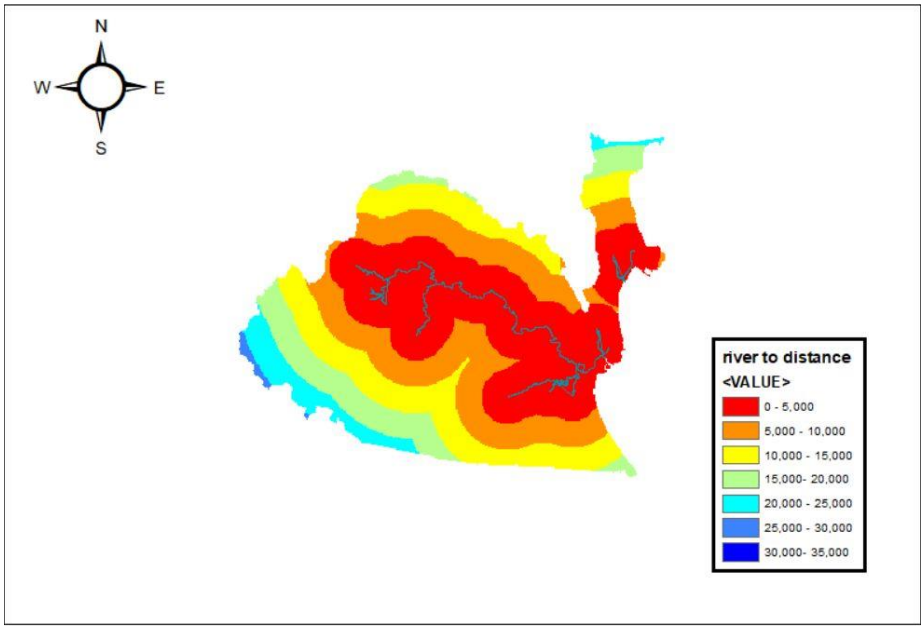


Figure 4.4: Data of Distance to the river

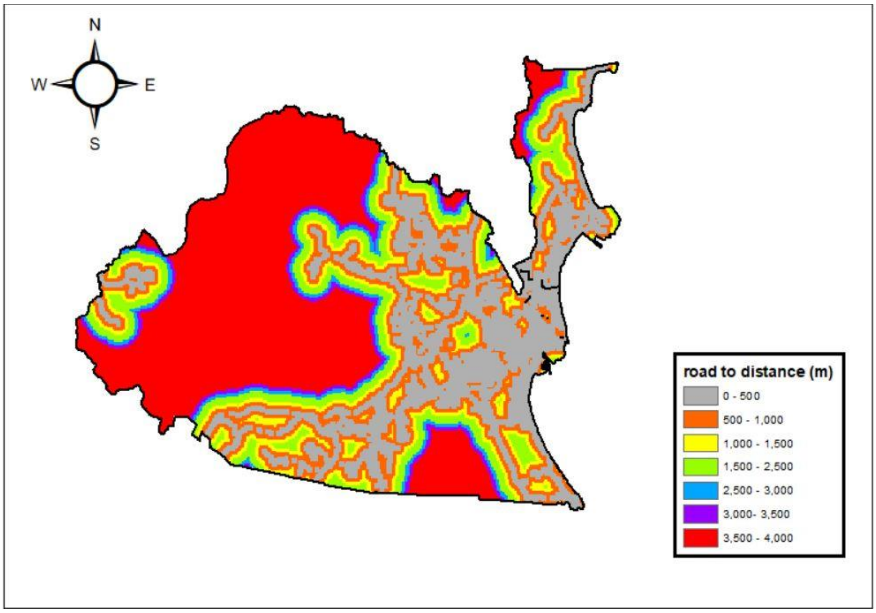


Figure 4.5: Data of Distance to the road

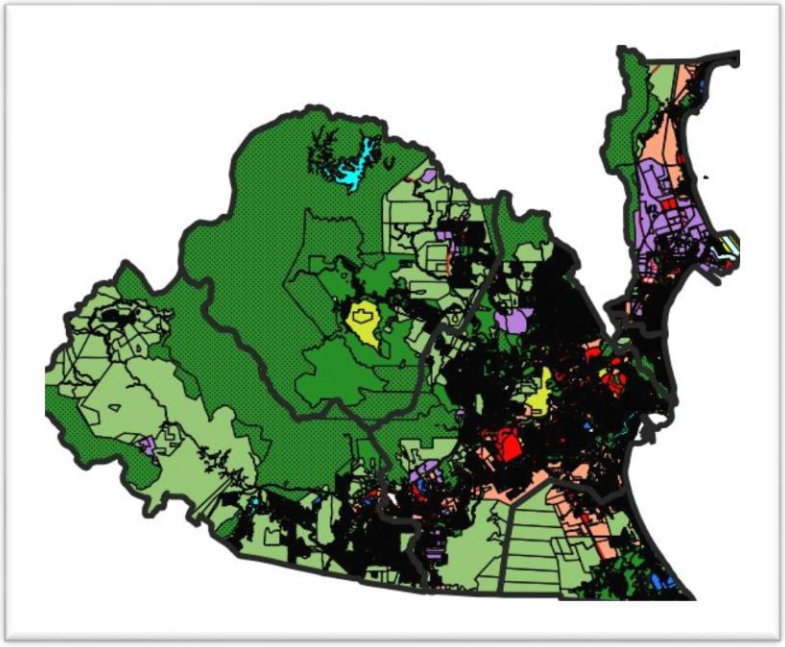


Figure 4.6: Data of Land Use

4.5 Development of the pairwise comparison matrix

With the help of the primary considerations, a pairwise comparison matrix was designed and built. The normalisation of the major factor occurred with the invention of the ratio matrix. After that, the relative weights of each factor were determined by using the pairwise comparison approach to the calculation. From Table 2 We can decide the Scale for Pairwise Comparison. So, we can get result at Table 3.

Table 1: Table for The Fundamental scale for Pairwise Comparison

The Fundamental Scale for Pairwise Comparisons		
Intensity of Importance	**Definition**	**Explanation**
1	Equal importance	Two elements contribute equally to the objective
3	Moderate importance	Experience and judgment moderately favor one element over another
5	Strong importance	Experience and judgment strongly favor one element over another
7	Very strong importance	One element is favored very strongly over another; its dominance is demonstrated in practice
9	Extreme importance	The evidence favoring one element over another is of the highest possible order of affirmation
Intensities of 2, 4, 6, and 8 can be used to express intermediate values. Intensities of 1.1, 1.2, 1.3, etc. can be used for elements that are very close in importance.		

Table 2: Matrix for Pairwise Comparison.

PARAMETERS	Distance to river	Distance to road	DEM	Slope	Land use	Soil texture	PRIORITIES	RANKING
Distance to river	1	1/7	1/5	1/2	5	3	0.011	6
Distance to road	1/5	1	5	7	5	5	0.419	1
DEM	5	1/5	1	1/2	1/5	1/7	0.046	4
Slope	1/5	1/7	1/2	1	1/5	1/7	0.092	3
Land use	5	7	1/2	5	1	1/5	0.398	2
Soil texture	1/9	1/7	1/5	1/7	1/5	1	0.034	5
							Total = 1	

4.6 Calculation of Consistency Ratio

The CR is important for identifying whether the study's comparisons are consistent. Condition 1: λ must be equal or greater than the number of factors used. The value of λ in this study = 4.1, which means that it satisfies this condition. Computation of consistency index (CI) is done using equation (1):

$$I = (\lambda - n)(n - 1)$$
$$CI = (4.1 - 4)(4 - 1) = 0.033$$

Computation of consistency ratio (CR):

$$CR = \frac{0.033}{0.9} = 0.4 * 100 = 4\%$$

Condition 2: Consistency ratio, CR (0.04) <0.10, refers to the reliable level of consistency in the pairwise comparisons. Thus, the CR value meets the requirement of condition 2, indicating that the weights obtained are accepted.

4.7 Generation of final land suitability map for aspect of sport.

All six-factor shapefiles were converted into a raster format. Therefore, a score can be identified for each pixel. Next, all factor maps were combined and overlaid, and a final location suitability map was generated (Figure 4) using the following formula:

Land suitability map= (slope*0.077+ DEM*0.089 + soil texture*0.029 +distance to river*0.065 + distance to road*0.12 +land use*0.307)

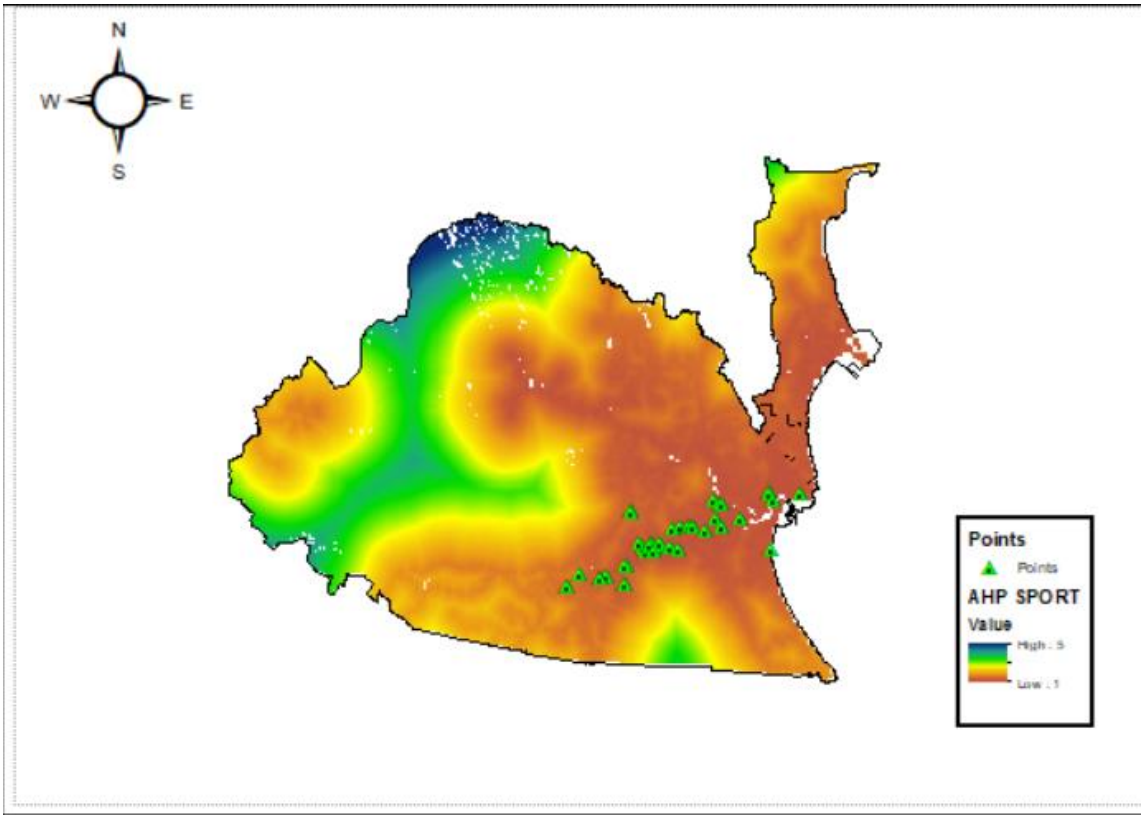


Figure 4.7: The land suitability for sport place

According to the land's potential use as a venue for sporting events, Kuantan can be broken down into seven distinct types of use. This result demonstrates that there are several locations near Kuantan that are ideal for cultural venues. The following diagram illustrates some of the cultural places that already exist in Kuantan and sites that are appropriate for cultural places in the future according to the factors that were employed in this project. These cultural places may be found in the figure below.

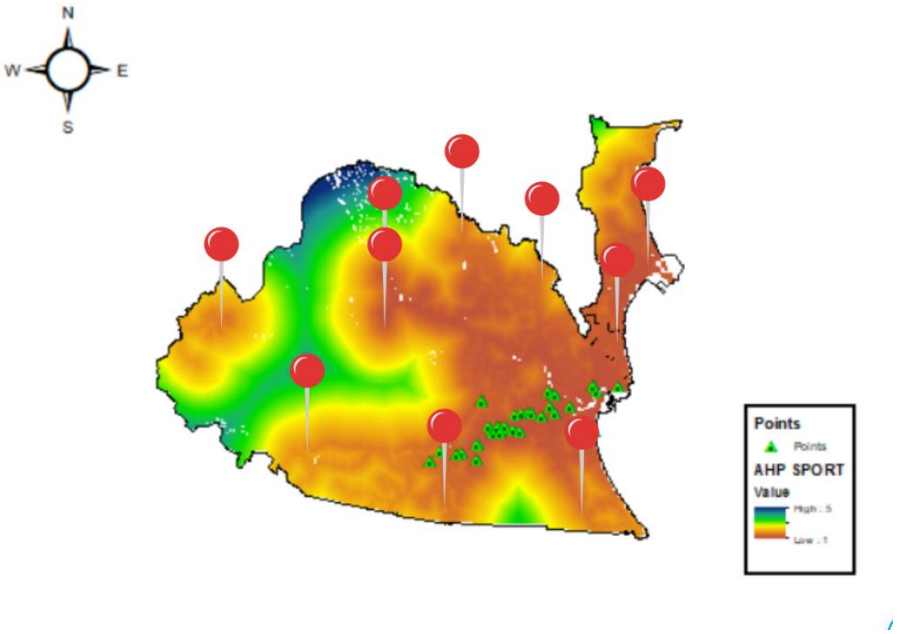
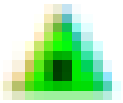


Figure 4.8: Sport places

Symbols 4.1: Symbols for sport places

	• Sports places that already exist in Kuantan
	• Sports places that are suitable for sports facilities

4.8 Discussion

The GIS-AHP model study offers extremely helpful insights into the extent to which sprawl regions located within the Kuantan District are suitable for engaging in tourism activities based on sporting events. The created suitability maps highlight discrete zones with varying levels of suitability, specifically high, moderate, and low suitability zones. These zones can be broken down into three categories: high, moderate, and low. These findings provide a spatial view on the regions that hold favourable conditions for promoting tourism based on sporting events and activities.

The topic of debate is the criteria that determine whether or not a location is suitable for sport-based tourism and sprawling development. Accessibility, infrastructure, natural features, and cultural attractions are all components that fall under this category. According to the findings of the study, locations that have a strong transport network, are located in close proximity to sports facilities, have a well-developed infrastructure, and have an abundance of natural resources are better suited for sport-based tourism. In addition, regions that contain cultural heritage assets and attractions contribute to the attractiveness of those regions as destinations for tourism centred on sporting events.

There would be substantial repercussions for the growth of tourism in the Kuantan District as a result of the identification of extremely ideal places for sport-based tourism in areas designated for sprawl. The findings can serve as a reference for tourism planners and policymakers in the process of identifying viable areas for the construction of infrastructure, sporting facilities, and tourist amenities. By concentrating on these aspects, the municipality has the potential to increase its allure as a destination for sports tourism and to entice people who are interested in participating in activities connected to sports.

It is absolutely necessary for the procedures of urban planning to include an assessment of the feasibility of sport-based tourism if sustainable development is to occur. When it comes to making decisions on how land should be utilised, zoning regulations, and development plans, the discussion highlights how important it is to take into account the suitability zones that have been determined. Urban planners will be able to ensure that the growth of sprawl regions coincides with the aims of sustainable tourist development, the preservation of natural resources, and the minimization of negative environmental consequences if they take into account these findings and incorporate them into their work.

The conversation underlines how important it is for stakeholders to work together when putting the results of the GIS-AHP model analysis into action. It is absolutely necessary for successful implementation to involve the local populations, those with a stake in tourism, and the relevant authorities. Through collaboration, one can make it easier to identify local perspectives, ensure the inclusion of various voices, and generate support for sustainable tourist development activities in areas that have been determined to be suitable for such endeavours.

It is essential to be honest about the restrictions that were placed on the study and to locate potential new lines of inquiry. The discussion discusses potential constraints such as the subjectivity of the AHP model's criteria weighting, the availability of data, and the veracity of the data. In the future, research might be focused on enhancing the model by adding new criteria, taking into account temporal shifts, and carrying out on-site evaluations to validate the suitability maps created by the GIS-AHP model.

This study gives significant insights into the viability of sprawl areas for sport-based tourism in the Kuantan District by combining the power of GIS technology with the analytical skills of the AHP model. This study was carried out by the Kuantan District Tourism Development Corporation. The conversation highlights how essential it is to make use of integrated approaches like these in order to educate decision-making, encourage environmentally responsible tourism practises, and improve the district's general liability.

4.9 Summary

An integrated GIS-AHP model was used in this research project to carry out a Land Suitability Analysis (LSA), which aimed to identify the areas in Kuantan that would be most suitable for urban sprawl. The findings demonstrate that the GIS-AHP model is an effective methodology for the field of urban planning. In addition, so as to accomplish the second purpose, by making use of the variables, we are able to obtain the appropriate location to evaluate the district of Kuantan's potential for tourism. When we look at the location of the pin in the picture of the results, we can see that there are many more locations that we can construct based on the six qualities to attract tourists. As a result, it will not solely be centred in the heart of the city of Kuantan.

CHAPTER 5

CONCLUSION

5.1 Introduction

In the final analysis, the Urban Sprawl Mapping for Sport-Based Tourism appropriateness using GIS-AHP model offers a helpful framework for evaluating and mapping the appropriateness of urban areas for the participation in sport-based tourism activities. The model allows for the identification of regions that have the greatest potential for the development of sport-based tourism while taking into consideration a variety of spatial parameters and the preferences of stakeholders. This is accomplished by merging Geographic Information Systems (GIS) with the Analytic Hierarchy Process (AHP).

5.2 Conclusion

In a nutshell, the model takes into account important aspects such as the distance from the location to which sporting facilities are located, the ease with which they can be accessed, the patterns of land use, the transportation infrastructure, and the quality of the surrounding environment. To ensure that the review process is exhaustive, the AHP methodology assigns weights to these considerations and ranks them in order of importance according to the opinions and preferences of various stakeholders. The Geographic Information System (GIS) component enables spatial analysis and visualization of the data, which in turn enables decision-makers to identify potential places for sport-based tourism activities and provides input for urban planning and development initiatives.

Cities and urban planners are able to make educated decisions regarding the distribution of resources, the development of sports facilities, and the promotion of sport-based tourism when they use the Urban Sprawl Mapping for Sport-Based Tourism Suitability using GIS-AHP model. This strategy not only increases the desirability of metropolitan areas as a whole but also contributes to the expansion of the economy, the improvement of social conditions, and the preservation of the natural environment.

5.2.1 Conclusion on identify the pattern of urban sprawl area in Kuantan district from 2003-2023 using GIS

In conclusion, using GIS to analyse Kuantan's urbanization from 2003 to 2023 is a worthwhile and significant goal. The spatial dynamics and changes in the urban landscape throughout the chosen era can be understood by a thorough examination using Geographic Information Systems (GIS).

The purpose of this research is to examine the patterns and trends of urban sprawl by following the development and growth of urban areas in the Kuantan district. Satellite imagery, land use/land cover data, and demographic information are just some of the geographical data sources that may be integrated using GIS technology to provide a more complete picture of urban growth.

This research is able to locate and map Kuantan's urban expansion because it makes use of geographic information system (GIS) technologies and methodologies. In addition, it can shed light on the causes of and responses to urbanization, as well as its consequences for the local ecosystem and economy.

The results of this research may have far-reaching consequences for Kuantan area urban planning and policy. Local authorities and stakeholders can benefit from better land use planning, infrastructure development, and resource allocation if they have a thorough understanding of the patterns of urban sprawl. It can also help in the quest for sustainable urban development, the protection of natural areas, and an enhanced quality of life for city dwellers.

In result, determining the Kuantan district's urban sprawl pattern from 2003 to 2023 using GIS is an important step in comprehending the dynamics of urbanization and its effects on the region. The research may yield useful information for the area's sustainable development, resource management, and urban planning.

5.2.2 Conclusion on analyse suitability of sprawl area for sport-based tourism in Kuantan district through GIS-AHP model

The results of this study show that using a Geographic Information System (GIS)-AHP (Analytic Hierarchy Process) model is essential for determining the viability of sprawl regions for sport-based tourism in the Kuantan district, which has far-reaching consequences for the future of the tourism industry.

This research intends to evaluate and identify places in the Kuantan district that are appropriate for sport-based tourism by merging GIS technology with the AHP model. Accessibility, closeness to facilities, land use characteristics, and natural features are just few of the elements that may be analysed in a spatial context using the GIS component.

The AHP model provides a methodical process for ranking the importance of many factors that affect the viability of a sport-based tourism venture. It enables decision-makers to prioritize and prioritize differently depending on the importance and relevance of different factors. The study is able to offer a thorough and impartial evaluation of the feasibility of sprawl regions for sport-based tourism since the AHP model is used within the GIS framework.

The results of this research may have far-reaching consequences for the future of tourism in the Kuantan area. Stakeholders, such as local authorities, tourism agencies, and investors, can make more educated decisions about resource allocation, infrastructure development, and marketing of tourism activities when high-potential regions for sport-based tourism are identified and mapped.

In addition, the research can help guarantee the most efficient use of resources and the least detrimental effects on the environment and local people, both of which are essential to the long-term success of sport-based tourism. It can also help with the diversification of tourism offers, bringing in more visitors with an interest in sports and the outdoors and improving the Kuantan area as a whole as a tourist destination.

In conclusion, the GIS-AHP model's goal of examining sprawl regions' feasibility for sport-based tourism in the Kuantan district has considerable potential for tourist planning and development. Taking an interdisciplinary approach, the research can shed light on how to best allocate limited resources, improve visitors' overall experiences, and encourage environmentally responsible tourism in the area.

5.3 Suggestions

To begin, the data should be updated and refined. It is absolutely necessary to continually update and improve the data that is used if one wishes to obtain accurate and trustworthy results. In order to make the model more accurate, the most recent geographical datasets should be incorporated into it. These should include data on land use, transportation networks, and sports facility inventories.

In addition to this, take timing considerations into account. Include temporal aspects, such as variations based on the time of year, event scheduling, and crowd dynamics. This will provide a more dynamic and thorough assessment of the suitability of sport-based tourism over the course of time and will allow for the identification of opportune periods for the promotion of tourism.

Furthermore, there is stakeholder engagement. Participation from important stakeholders, such as sports groups, tourism boards, urban planners, and local communities, should be encouraged throughout the process of developing the model and making decisions. This will aid in capturing different points of view and ensuring that the models.

The Urban Sprawl Mapping for Sport-Based Tourism Suitability using GIS-AHP model has the potential to be further improved and to serve as an invaluable resource for urban planners, policymakers, and stakeholders who are engaged in the process of developing sport-based tourism. This potential can be realized by putting these suggestions into action.

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APPENDICES

Appendix A: Looking for sport places or facility to get the coordinate

Appendix B: Interview at the facility asking about the sports tourism