

# Utilization of Geographic Information Systems for Development of Effective Routes for Object Areas of Religious Tourism Destinations Nagari Batuhampar, Limapuluh Kota Regency

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**Abstract.** Geographic Information System has several benefits that can be used to answer problems that occur in the surrounding environment. Nagari Batuhampar has determined several locations/sites for the development of religious tourism. However, there are problems in development mapping and analysis, one of which is the effective route. This research is a survey research with an effective route analysis method using the QGIS application. The output of this study is the result of route analysis and an effective route map to the object of the Nagari Batuhampar religious tourism destination. The results show that existing objects can be reached from the City of Bukittinggi and the City of Payakumbuh, this is because Nagari Batuhampar is located between the two cities which are connected by a national road. Effective Routes from Bukittinggi City, several objects of religious tourism destinations can be reached by two-wheeled for 23 minutes and four-wheeled for 24 minutes, then if taken from Payakumbuh City by two-wheeled for 13.2 minutes and four-wheeled for 14 minutes. The road conditions are relatively good and the distance between religious tourism destinations is close together.

**Keywords:** Geographic Information System, Effective Route, Tourist Destination Objects

## 1 Introduction

Nagari Batuhampar is located in a strategic area through the causeway of Payakumbuh City and Bukittinggi City. This is also supported by the national road class that connects the City of Padang - Pekanbaru City (West Sumatra - Riau). So, the traffic that happens is quite heavy. Nagari Batuhampar is one of the villages in the district of fifty cities with very promising tourist destinations such as natural attractions, historical tourism, and cultural tourism. So, taking into account the location and the existing potential, the mayor, Mr. Romi

Suhardi, A.Md, and the Nagari stakeholders, have included the Nagari's strategic plan for the development of the Nagari Batuhampar religious tourism destination (Observation, 2020).

The tourism sector which will eventually lead to Gross Regional Domestic Product is one source of local revenue that has great potential at this time (Kapang et.al., 2019). In regional development, indicators of local revenue have a very strategic role, especially in building the independence and autonomy of the government in carrying out development (Muta'ali, 2015). Regional development for tourism must meet the elements in the environmental carrying capacity for tourism development in an area. Tourism carrying capacity is the number of tourists that can be accommodated with activities that can be supported sustainably by a location or tourist destination (Muta'ali, 2015). The carrying capacity of tourism is related to the biogeophysical, socio-economic, and socio-cultural aspects of a tourist location or site in supporting tourism activities without causing environmental quality and tourist satisfaction in enjoying tourist sites and sites. This is in line with the support of Mr. Zarwan Zed Dt Gindo Sanjato as a community leader (*ninik mamak*), supporting the concept of tourism development that is planned to support cultural preservation, such as going to *mangaji ka surau*, martial arts/*silek*, Minangkabau values and others (Observation, 2020).

In the opinion of another community leader, Ustad Bujang, hopes that the *Adat Syara', Syara' Basandi Kitabullah*, will still be firmly held by the community. Another thing was conveyed, namely, in the past, Nagari Batuhampar had been known to give birth to national figures such as Sheikh Muhammad Djamil (Bung Hatta's father/National Hero) and Prof. Mestika Zed (National Historian), then the development of religious tourism is expected to maintain Minangkabau values. Religious tourism is a type of tourism that is closely related to the religious side or has a special meaning for religious people, generally religious tourism has advantages in the form of historical, mythical, and architectural forms (Kurmanaliyeva, 2014). Religious tourism is also synonymous with intentions and goals in obtaining blessings with religious tourism, tourists can also enrich their horizons and deepen their spiritual sense (Chotib, 2015).

Geographic Information Systems (GIS) is currently growing rapidly. GIS is created using information from the processing of several data, namely geographic data related to images of the earth's surface. It is recognized that available GIS data collected from different sources may vary in terms of consistency, accuracy, and time (Forsyth et al., 2012a). Decisions made through GIS modeling include data sources, spatial units, and buffering methods and sizes, all of which have a significant impact on the results of effective route analysis (Ikeda et.al., 2018). The geographic information system is a computer-based system that is used to capture, store, examine, manipulate, analyze, and display data that is spatially referenced to the earth, to solve complex management problems. GIS can become a more useful tool for the tourism industry, providing a platform that brings products and services to tourists (Sharma., 2016).

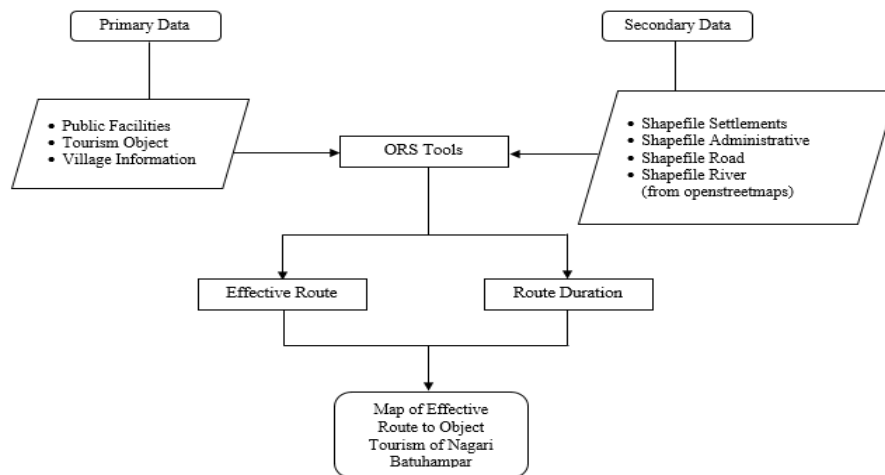
## **2 Research Method**

This research is a survey mapping research with an effective route analysis method. The research area is Nagari Batuhampar, Limapuluh Kota Regency, West Sumatra. Primary data obtained include data on public facilities, tourist destination objects, and information about

Nagari. The secondary data obtained are the Nagari Batuhampar Administration map, and the BaseMap distribution of settlements, roads, and rivers obtained from open street map data. The data that has been obtained is input material and then processed by effective route analysis using the ORS Tools plugin in the QGIS 3.16 application (Hannover). Openrouteservices Tools or ORS Tools is one of the plugins available online in the QGIS application that can be obtained by downloading and installing it on the QGIS plugin server. ORS Tools is connected to the OpenStreetMap, so information about the accessibility of a place can be identified directly by ORS Tools through the OpenStreetMap server. ORS Tools provides access to most of the functionality of openrouteservice.org, based on OpenStreetMap. The tool set includes route analysis and travel time calculations, either interactively on the map canvas or from point files in the processing framework. Extensive attributes are set for the output file, including duration, length, and start/end location. The output of this process is an administrative map and an effective route for a tourist destination.

### 3 Result and Discussion

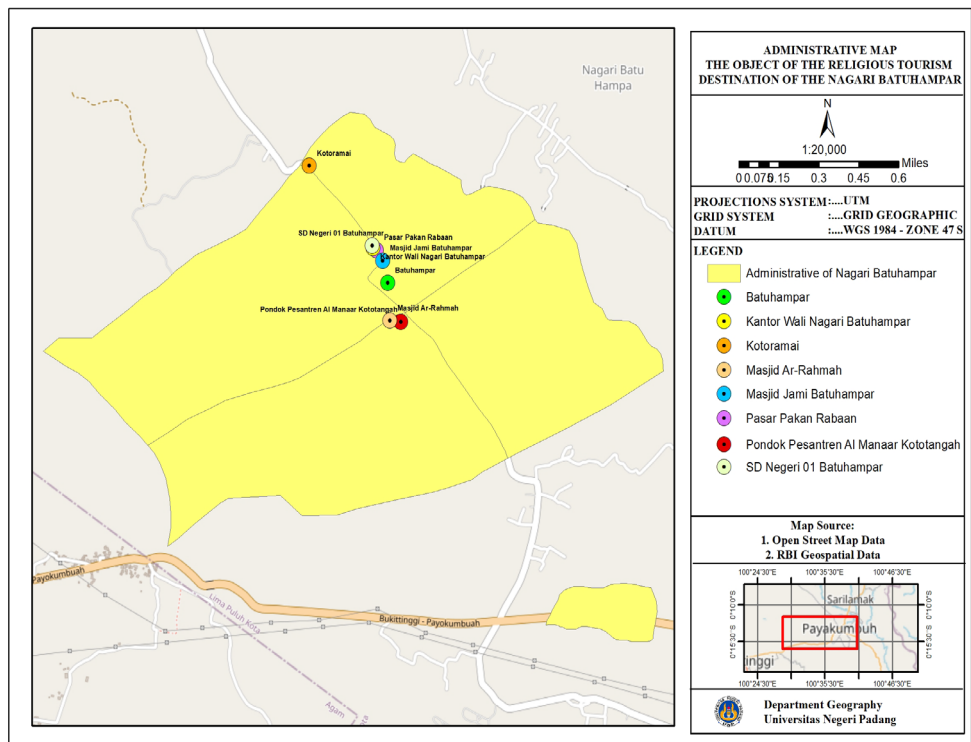
The research was conducted by taking into account the scientific stages. This is a reference in paying attention to the systematics and flow of good research. The research can be briefly seen through the flow chart as follows.



**Fig. 1.** Research flow chart

Primary data were obtained from public facilities, and location object points, and additional information was obtained from *Wali Nagari, Ninik Mamak, and Cadiak Pandai*. While the secondary data needed is data from administrative areas, settlements, road data, and river data obtained from OpenStreetMap. Openrouteservices Tools is an online platform that provides spatial information, especially road network data sourced from OpenStreetMap and Openrouteservice.org (Idris et.al., 2021). By leveraging online routing platforms, third-party routing providers process, and update road network data, making it more comprehensive than

relying on authoritative road network data (Wang and Xu 2011; Huber and Rust 2016). Then using ORS Tools, the output is an effective route map and a duration route map (QGIS, 2022). This is one part of the publication and development of WebGIS Objects for Religious Tourism Destinations in Nagari Batuhampar.



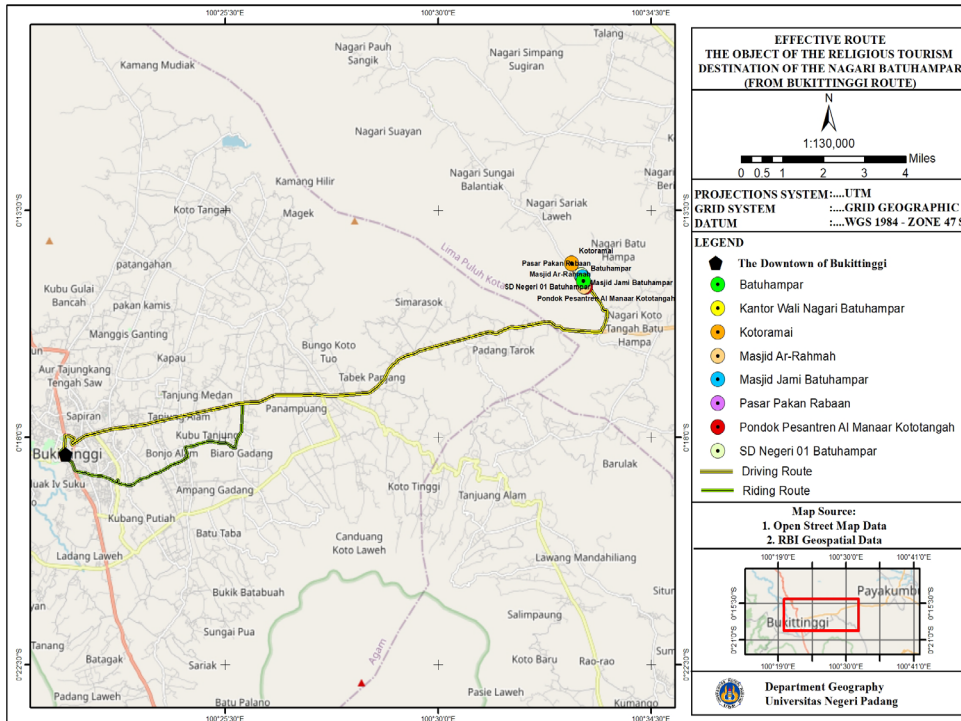
**Fig. 2.** Administrative Map The Object of The Religious Tourism Destination of The Nagari Batuhampar

Nagari Batuhampar is one of the villages located in Akabiluru District, Limapuluh Kota Regency. Nagari Batuhampar has five *orong*/hamlets including the Great Tower, Beringin Indah, Simpangganti, Koto Ramai, and Koto Baru. Jorong Koto Baru is an exclave area that is separated from other Nagari. This is due to the expansion of the region and differences of opinion between *ninik mamak*, community leaders, and clever people in the past.



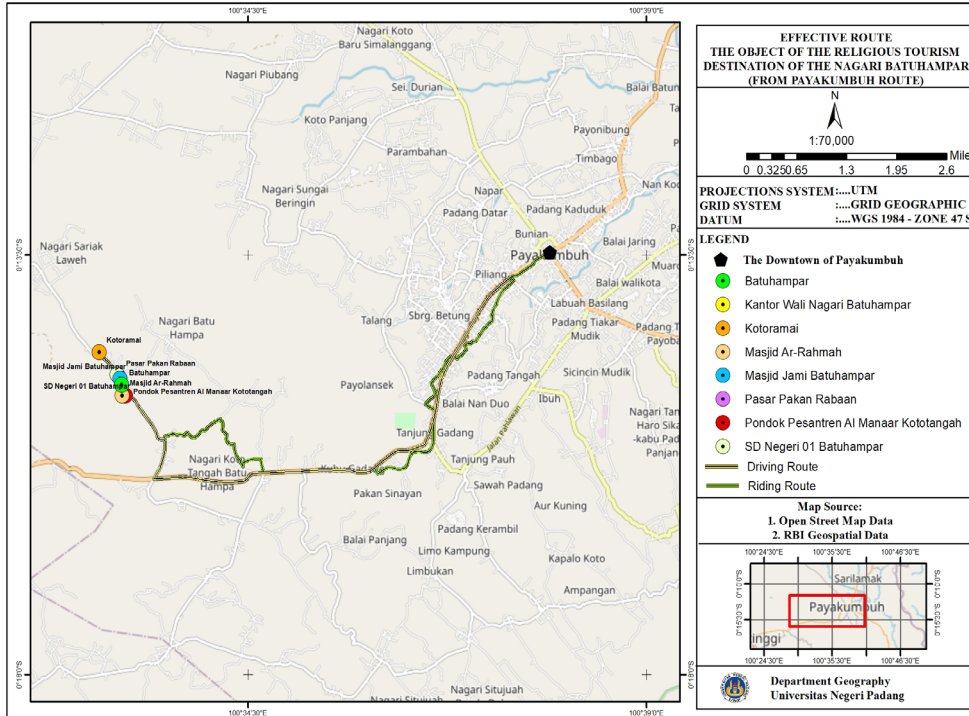
**Fig 3.** Menara Mosque/Al Manaar (left) was built in 1926 and the Heroes' Cemetery, Syekh Mohd Djamil (father of the Indonesian National Hero Proclaimer Bung Hatta) (right) which are several religious tourism objects in Nagari Batuhampar

Nagari Batuhampar has a thick cultural and religious wealth. This is evidenced by the existence of an old mosque, Minangkabau culture "*mangaji ka surau*". An old mosque that still maintains the tradition of "*mangaji ka surau*" for Muslim youths who have reached puberty (adolescents of approximately 12 years), read and study the Koran in *Surau* (mosque) and stay there. Some of the great figures who were born from this Nagari include, Mr. Syekh Muhammad Djamil (father of the Proclaimer Hero Bung Hatta) that Nagari Batuhampar is no exaggeration in the strategic plan of the Nagari, including the development of religious tourism in addition to improving the economy but also preserving Minangkabau culture and values.



**Fig. 4.** Effective Route Map of The Object of The Religious Tourism Destination of The Nagari Batuhampar (From Bukittinggi City)

Based on the map above, the effective route that can be traversed by four-wheeled vehicles from downtown Bukittinggi to the Nagari Batuhampar religious tourism object is represented by a yellow line. The route is traversed from downtown Bukittinggi via the Bukittinggi-Payakumbuh highway to Nagari Batuhampar with an average distance of 25.68 km. Then the effective route that can be passed by two-wheeled vehicles from downtown Bukittinggi to the Nagari Batuhampar religious tourism object is represented by a green line. The route is passed from downtown Bukittinggi via Jalan Sutan Syahrir then continues east to Jalan Tigobaleh then follows Jalan Raya Ampang Gadang and continues to Jalan Raya Bukittinggi-Payakumbuh Nagari Biaro. The average distance for this route is 26.94 km.



**Fig 5.** Effective Route Map of The Object of The Religious Tourism Destination of The Nagari Batuhampar (From Bukittinggi City)

Based on the map above, the effective route that can be traversed by four-wheeled vehicles from downtown Payakumbuh to the religious tourism object of Nagari Batuhampar is on Jalan Raya Payakumbuh-Bukittinggi to Nagari Batuhampar for 13 km. Then for an effective route that can be traversed by wheeled vehicles from downtown Payakumbuh to the religious tourism object of Nagari Batuhampar through several local roads and Jalan Raya Payakumbuh-Bukittinggi to reach Nagari Batuhampar along 15.4 km.

**Table 1.** Travel Time from Bukittinggi City to Batuhampar Nagari Tourism Destination Objects

Destination Objects	Time Travel (Car) (hour)	Time Travel (Ride) (hour)	Distance (car) (km)	Distance (ride) (km)
Pakan Rabaa Market	0.42	0.38	25.828	26.995
Wali Nagari Batuhampar Office	0.42	0.38	25.85	27.017
Batuhampar 01 Junior High School	0.42	0.38	25.862	27.029
Batuhampar Great Mosque	0.41	0.38	25.758	26.929

Al Manaar Kototangah Boarding School	0.41	0.37	25.31	26.518
Ar-Rahmah Mosque	0.41	0.38	25.429	26.637
Kotoramai	0.43	0.40	26.445	27.612
Batuhampar	0.42	0.40	25.6	26.808

Based on the table above, the travel time required for four-wheeled vehicles from downtown Bukittinggi to each religious tourism object in Nagari Batuhampar is on average 0.41 hours or about 24 minutes. Then the travel time required for two-wheeled vehicles from downtown Bukittinggi to each religious tourism object in Nagari Batuhampar is an average of 0.39 hours or 23 minutes.

**Table 2.** Travel Time from Payakumbuh City to Batuhampar Nagari Tourism Destination Objects

Destination Objects	Time Travel (Car) (hour)	Time Travel (Ride) (hour)	Distance (car) (km)	Distance (ride) (km)
Pakan Rabaa Market	0.23	0.22	13.309	14.64
Wali Nagari Batuhampar Office	0.23	0.22	13.331	14.662
Batuhampar 01 Junior High School	0.23	0.22	13.343	14.674
Batuhampar Great Mosque	0.22	0.21	13.239	14.574
Al Manaar Kototangah Boarding School	0.22	0.21	12.791	14.163
Ar-Rahmah Mosque	0.22	0.21	12.91	14.282
Kotoramai	0.24	0.23	13.926	15.258
Batuhampar	0.23	0.22	13.081	14.453

Based on the table above, the travel time required by four-wheeled vehicles from downtown Payakumbuh to each religious tourism object in Nagari Batuhampar is on average 0.23 hours or about 14 minutes. Then the travel time required for two-wheeled vehicles from downtown Payakumbuh to each religious tourism object in Nagari Batuhampar is an average of 0.22 hours or about 13.2 minutes.

The development of Indonesian tourism needs to be supported by various kinds of resources (Damanik, 2013). This is one of them with a scientific approach, such as a geographic information system, the results of research by Rahayuningsih et al (2016) GIS can



be used for monitoring and analyzing natural tourism in Bogor. In line with the research results of Techane et al (2022), the use of an effective route method with a GIS approach for the implementation of the effectiveness of the distribution of electricity networks. The same analysis can also be used for transportation in urban areas for effective routes (Minh et al, 2022). So, based on this, the same analysis is tried to be used in the development of religious tourism in Batuhampar, which can be a reference and promotion media for the ease of accessibility to objects of religious tourism destinations located on the Bukittinggi national road traffic lane (West Sumatra Province) - Payakumbuh - Pekanbaru (Riau Province).

In conducting an effective route analysis in the development of religious tourism in Batuhampar, there is a slight difference in the duration of travel time and the effective distance between two-wheeled and four-wheeled vehicles, where four-wheeled vehicles take a shorter route than two-wheeled vehicles, but have a slightly longer travel time. than two-wheeled vehicles, as reported in the study of Harrison et.al., (2014) who reported that there were differences in distance and use of high-traffic roads among tourists traveling on foot, by motorbike, and by car. This happens because it is influenced by several environmental factors (Dessing et.al., 2016), one of which is congestion pressure (Giles-Corti et al., 2011; Oliver et al., 2015a). Four-wheeled vehicles are more likely to be stuck in traffic because they pass through the main Payakumbuh-Bukittinggi highway, and two-wheeled vehicles are more directed to local road routes and avoid highways (Ikeda et.al., 2018) and two-wheeled vehicles are easier to pass through narrower roads. traffic jams thereby reducing the risk of getting stuck and reducing travel time from the city center to Batuhampar.

#### **4 Conclusions**

Nagari Batuhampar has several tourist destination sites. The development of religious tourism with a geographic information system approach, one of which can use effective route analysis. The tourist destination which is located between two cities namely Bukittinggi City and Payakumbuh City on the national strategic road (West Sumatra - Riau) can be reached by two wheels or four wheels or more. The average travel time from Bukittinggi City using two wheels is 23 minutes with a distance of 25 kilometers, if using four or more wheels it takes 24 minutes for the same distance. The average travel time from Payakumbuh using two wheels is 13 minutes with a distance of 14 kilometers, if using four or more wheels it takes 14 minutes for the same distance. The travel time is almost the same due to the relatively good road conditions and the distance between adjacent objects.

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