

Development of Transportation to Support the Tempe Lake Tourism Area, South Sulawesi

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Abstract: Lake Tempe is one of the lakes in Wajo Regency which has great potential. The diversity of the Tempe Lake area for tourism can attract tourists. Many tourism activities depend on transportation. Transportation is one of the main sectors in supporting the development of the Lake Tempe tourist area, South Sulawesi. Tempe lake tourism object does not yet have good facilities and infrastructure. Facilities and infrastructure that do not support this tourism will reduce the attractiveness of tourists to visit. This type of research is non-experimental and descriptive qualitative, namely analysing the pattern of movement of the number of tourists to tourist objects, analysing tourist transportation modes on tourist characteristics and compiling concepts for network development and modes of transportation supporting tourism in the Tempe Lake area and the surrounding rivers. The results of this study indicate that there are 12 patterns of tourist movement which are dominated by 3 main movement patterns, namely City trips - Paddupa Park, City - Tempe Lake, Paddupa Park - Tempe Lake, with a total of 57.1%. modes for water transportation using boats with a capacity of 5 passengers with facilities that are still not safe and comfortable, As for the dimensions and depth of rivers and lakes that meet the development of tourist transportation modes, the concept of tourism development is to increase accessibility between tours by making new trip routes and 2 docks, 3 bus stops and the provision of land transportation modes in the form of tourist shuttle buses and 2 river-lake transportations in the form of tourist boats.

Keywords: Tourism, River-lake transportation, Development concept

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I. Introduction

Indonesia as an archipelagic country has many resources and problems. Likewise with the existence of lakes and rivers that exist in regions in Indonesia which can sometimes be a problem but can also be beneficial for the region.

Each region is unique because it has different regional potentials. Therefore, a development policy that is appropriate to the conditions of the region is needed. Transportation is one of the basic needs of the community in carrying out their activities, including geographically separated areas such as rivers.

Many tourism activities depend on transportation and communication. Distance and time factors greatly affect people's desire to travel. Nowadays transportation causes very rapid tourism growth. The progress of transportation facilities encourages the progress of tourism and conversely the expansion that occurs in the tourism industry can create demand for transportation that can meet the needs of tourists.

Wajo Regency is known as an area that has a wealth of inland water resources. Lake Tempe is one of the lakes that has great potential. Administratively, it is located in 3 different administrative districts, namely Wajo Regency, Sidrap Regency and Soppeng Regency. The existence of Lake Tempe and the surrounding area has an important meaning for the people of Wajo Regency in general and the people who live in the area.

Apart from being a source of clean water, the Tempe Lake area is also a place for people to make a living, such as farming and gardening and looking for fish which is the livelihood of the people living in the area.

The Lake Tempe area is an area that has high wealth and diversity in various natural forms, historical structures, customs, cultures and various other resources. Natural wealth and the surrounding environment with a variety of high diversity such as riverbank areas that have attractive values that must be managed and developed for the welfare of the community through tourism, relax or just enjoy the view.

The natural tourism panorama of Lake Tempe is a very interesting thing for tourists who visit with the uniqueness and natural beauty that is presented, Lake Tempe is one of the very unique tourist objects owned by

the Indonesian people. But so far there has been no new breakthrough in the development of Lake Tempe tourism. Efforts to develop the Lake Tempe tourist area are carried out because it will have an impact on the economy of the population in the area.

Tourism potential is everything that is owned by an area as a tourist attraction and is useful for developing the tourism industry in the area [1]. One of the tourism potentials around Lake Tempe is the Walanae river area where there is Paddupa Park which is one of the tourist attractions around Lake Tempe.

A good tourist attraction area can attract tourists to visit the place both from inside and outside, although currently it has been visited by foreign and domestic tourists, development strategies must still be carried out to increase the number of visitors so that Lake Tempe tourist attraction can become a destination. tourism that attracts many tourists

Transportation is one of the main sectors in supporting the development of the Lake Tempe tourist area, South Sulawesi. The tourist attraction of Lake Tempe does not yet have good facilities and infrastructure, management of the area or the environment has not yet received development, and tourists visiting the area can only surround and see the activities of the Lake Tempe community. tourists to visit [2]

This study aims to analyse the pattern of movement of the number of tourists to tourist objects, analyse the modes of tourist transportation on the characteristics of tourists and develop the concept of network development and modes of transportation to support tourism in the Tempe Lake area and the surrounding rivers.

II. Materials And Methods

Location and type of research this research is located in Lake Tempe, Sengkang, South Sulawesi. Research is descriptive qualitative.

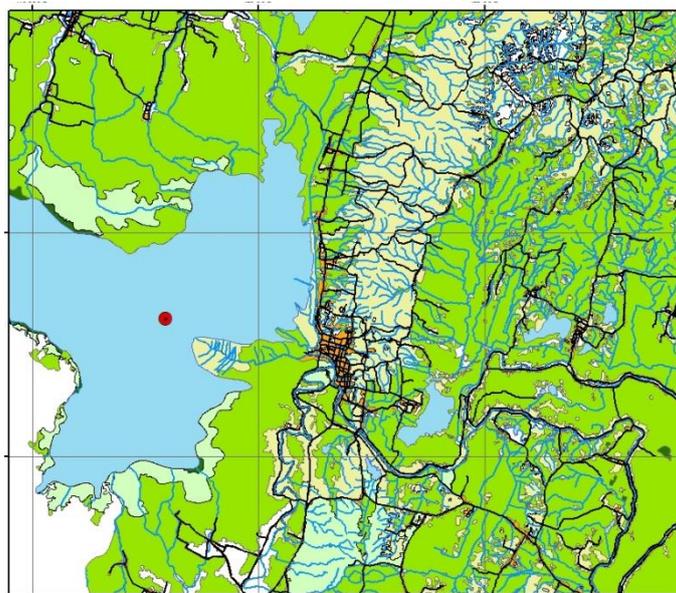


Figure 1. Research Location

Source: Developed from Indonesia Geospatial Portal

Types and Sources

Primary data was obtained from the research location through observation, interviews and questionnaires distributed to respondents, and made visual observations. Secondary Data Secondary data is sourced from the Department of Public Works of South Sulawesi Province, the Office of Spatial Planning and related agencies. Types and sources of data can be seen in Table 1.

Table 1. Types and Sources of Data

Variable	Indicators	Data type	Data source	Data analysis
number of tourists	Generation Nodes (Housing, Hospitality, Terminals, Piers)	Number of Tourists (Person/Location), Characteristics of Tourist Groups (Person / Group)	Primary Data Questionnaire	Quantitative descriptive
Movement pattern	Origin (Housing, Hospitality, Terminal, Pier) and Destinations (Floating House, Fisherman's Housing, Artificial	- Trip Generation (Person/Origin and Destination) - Trip Length (km)	Primary Data Questionnaire	Quantitative descriptive

	Island, Bugis Silk Craft Center, Paddupa Park			
Transport Modes of Transport	Type of Transport Origin - Boat - Bus - Four-wheel vehicle - Tricycle - Two Wheeled Vehicles Type of Transport Aim - Boat	- Total (Unit) - Parking Area (m2) - Passenger Queue Area (m2) - Mode Capacity according to passenger characteristics (Person/Mode) - Mode capacity according to physical lakes and rivers (ton-water depth)	Primary Data Questionnaire	Quantitative descriptive
Physical Condition of Lakes and Rivers	- River width - River depth - Lake Depth - River length - ups and down - Wind velocity	<ul style="list-style-type: none"> • The widest distance of the river in meters • The smallest distance of a river in meters in meter in meter in meter <ul style="list-style-type: none"> • Highest water tide in meters • Lowest tide in meters In meters/second	Secondary Data/Documents from the Public Works Service or Government Agencies	Descriptive
Transportation Development Concept	-Tourist Transportation Line - Mode of Transportation	Efficiency and Economic Safety, Comfort, Sustainable	Document	Descriptive

III. Method of Collecting Data

Data were obtained by direct observation and observation, detailed measurements of the physical river and observations of ongoing phenomena, questionnaire data distributed directly to respondents, record/literature-based data (Record Analysis), namely historical records and current records, as well as company records. or private written and printed from the government or related agencies.

Data Analysis

The analytical method for research purposes 1 (first) uses descriptive qualitative analysis with, the pattern of movement of the number of tourists to tourist objects in and around Lake Tempe and rivers in the Wajo Regency for the purpose of research 2 (second) uses an analysis of the watershed function and the physical condition of the river, an analysis of the dimensions of the water transportation mode by calculating the water discharge, water level, river width, river length, river border conditions and the condition of the people who are active around the river and for analysis purposes 3 (third) uses a sustainable concept approach for the development of tourism transportation which is categorized into 2, namely land transportation and river-lake transportation. The planning concept approach prioritizes the convenience and safety of users for changing modes of transportation.

IV. Results And Discussion

The natural tourism panorama of Lake Tempe is a very interesting thing for tourists who visit. With a variety of uniqueness and natural beauty that is presented, Lake Tempe is one of the very unique tourist attractions owned by the Indonesian people. Tourist attractions in the Tempe Lake area are floating houses, paddupa gardens, silk craftsmen's villages and fishing villages.



Figure 2. Tourist Attractions in the Tempe Lake Area.
Source: Developed from Indonesia Geospatial Portal

Movement Patterns

In the tourist area of and Tempe there are 2 (two) transportation nodes, namely Sengkang Terminal which is in the city center and TPI 45 which is on the coast of the Walanae river, as for the tourist flow can be seen in table 2.

Table 2. Number of Tourists according to movement patterns to tourist sites in the Tempe Lake Area (online questionnaire in 2020)

No.	Trip	Number of tourists	%
1	City- Padduppa Park	122	19.46
2	City- Tempe Lake	124	19.78
3	Padduppa Park - Tempe Lake	112	17.86
4	Padduppa Park - Silk Craft Village- Tempe Lake	102	16.27
5	Padduppa Park - Silk Craft Village- Fisherman's Village - Tempe Lake	69	11
6	Padduppa Park - Silk Craft Village	54	8.61
7	Silk Craft Village	8	1.28
8	Fisherman's Village - Tempe Lake	11	1.75
9	Padduppa Park - Silk Craft Village - Fisherman's Village	8	1.28
10	Silk Craft Village- Kampung Nelayan Fisherman's Village - Tempe Lake	4	0.64
11	Silk Craft Village- Tempe Lake	3	0.48
12	Padduppa Park - Fisherman's Village - Tempe Lake	10	1.59
Total		627	

In the Tempe lake area there are 627 tourists with 12 trip flow patterns, which are dominated by 3 main trips, namely City trips - Paddupa Park, City - Tempe Lake, Paddup Park - Tempe Lake, with a total number of 57.1%. The trip pattern can be seen in the picture below this.

The Lake Tempe tourist area has 4 tourist destinations, namely Paddupa Park, Tempe Lake, Fisherman's Village, and Silk Craft Village. Based on Table 4.3, there are 627 tourists who travel with different trip paths. However, there are only 6 flows of tourist movement as shown in Table 3.

Table 3. Number of Tourists according to movement patterns to tourist sites in the Tempe Lake Area (online questionnaire in 2020)

No.	Tourism Flow	Number of Tourist Movement
1	City - Padduppa Park	477
2	Padduppa Park- Silk Craft Village	233
3	Silk Craft Village - Tempe Lake	186
4	City- Tempe Lake	133
5	Padduppa Park- Danau Tempe Tempe Lake	122
6	Kota - Silk Craft Village	15
Total		1166

The largest movement of tourists is the movement from the City to Paddupa Park, which is 477 tourist movements, and then the second largest movement is the movement from Paddua Park to the Silk Craft Village of 233 movements. The pattern of tourist movement can be seen in Figure 3..

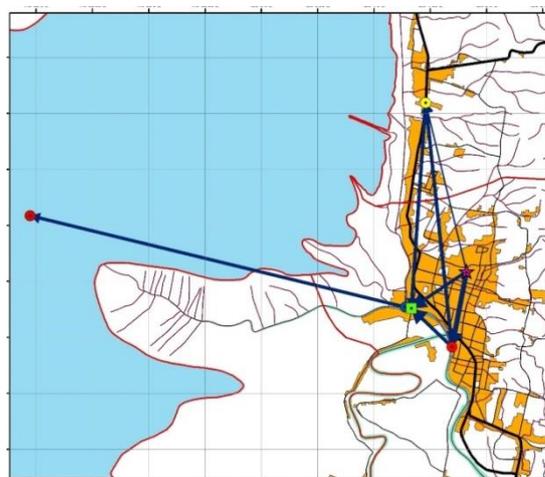


Figure 3. Existing Trip Path for Lake Tempe Tourism Area
Source: Developed from Indonesia Geospatial Portal

Tourism Transport Modes and Physical Conditions of River-Lake

Currently there are several boats that are used on this river for tourism, but the boat is also used as a means of public transportation for the people on the banks of the Walanae river, the capacity of the boat is 5 people with seating facilities, life jackets, raincoats. The boat is a motorboat. Diesel engine with a length of 5 meters by a width of 1.2 meters made of wood. For land transportation modes can be seen in Table 4.

Table 4. Types of Land Transportation Modes for Tourists in the Tempe Lake Region (online questionnaire for 2020)

No.	Trip	Number of trips	Moda	
			Two wheels	Four wheels
1	City - Tempe Lake	16	9	7
2	City- Padduppa Park	27	12	15
3	Padduppa Park- Tempe Lake	13	8	5
4	Padduppa Park- Silk Craft Village - Tempe Lake	10	3	7
5	Padduppa Park- Silk Craft Village - Fisherman's Village - Tempe Lake	8	2	6
6	Padduppa Park- Silk Craft Village	8	1	7
7	Fisherman's Village - Tempe Lake	2	0	2
8	Padduppa Park- Fisherman's Village - Tempe Park-	1	1	0
9	Padduppa Park- Silk Craft Village - Fisherman's Village	2	2	0
10	City - Silk Craft Village	3	2	1
11	Silk Craft Village - Fisherman's Village - Tempe Lake	1	0	1
12	Silk Craft Village - Tempe Park	1	0	1
Total		92	40	52

Type The four-wheeled mode of transportation is used more than the two-wheeled mode of transportation.

The Walanae River is the largest river in the Walanae - Cenranae WS, with an average river width of 100 meters and a watershed area of 3,170 km². The Walanae River with several tributaries flows from the mountainous area in the south to the north for approximately 100 km and is connected to the Cenranae River in Sengkang City (Wajo Regency) which then flows eastward towards the sea in the Bone strait [3].

The capacity of the Walanae river reaches 400 m³/sec – 2,300 m³/sec, but only 450 m³/sec – 500 m³/sec can flow downstream, due to the backwater to Lake Tempe. Meanwhile, for the tourist route of the Tempe Lake Area, which passes through the banks of the Cenranae River, the Cenranae River flows from Lake Tempe to the east towards the estuary in Bone Bay, with a length of approximately 69 km. The river which is the only outlet of the river system in Lake Tempe has a total watershed area up to the estuary of 7,380 km². The area of the watershed calculated from the Tampangeng water level measuring station to its estuary is 1,180 km² [3].

On the Cenranae river, a sluice gate (Bendung Gerak) was built which will function as a regulator of water regulation in Lake Tempe to maintain the water level at a certain level. The Cenranae River as the outlet of Lake Tempe, flows water towards the east of the lake to the Bone Bay along 70 km with a catchment area of 1,155 km². The Cenranae River is a single river system which has a base area of 30-80 m and a surface width of 100-150 m. While the depth of the river varies from 5 – 8 m. The slope of the Cenranae River is very gentle, namely 1/10000 in the upstream area and 1/300000 in the downstream area with a flow capacity of 250-500 m³/sec[4].

For the Cenranae river border area, the ±900 m long tourist route starting from the TPI 45 pier is dominated by fishermen's houses, riverside stalls, mosques and suspension bridges.

Lake Tempe gets water input from 23 large and small rivers. However, there is only one outlet, namely the Cenranae River which has a length of about 70 km and empties into Bone Bay., The area of the Tempe lake is 28 286.43 km² [5]. Along the tourist route of the Tempe Lake area there is potential for fauna and flora that being in Lake Tempe and fishing activities.

The Lake Tempe area is relatively dry, with an average monthly rainfall of less than 100 mm. This area is a transitional area between the western climate and the eastern climate in South Sulawesi. In the dry season, Lake Tempe only has an area of 10,000 ha with water depths between 0.50 – 2.00 m. While in the rainy season the area reaches 28,000-43,000 ha with an average TMA in the range of 6.0-9.0 m dpl [4].

The average temperature during the day ranges from 34-35 °C with humidity around 85-90%. Thus this region is a relatively dry area with high humidity [6].

Transportation Development Concept

The development of tourist transportation routes is carried out based on the characteristics of tourists and the existing tourist trip flow patterns, where based on the results of the questionnaire analysis it is known that each tourist spot has a large enough attraction. This of course can be utilized by making shuttle bus lines. Special tourist docks located in Paddupa Park and Silk Craft Village, this is based on the pattern of tourist trip flows where Paddupa Park Tourism has the largest trip route, in addition to moving the tourist pier can speed up travel time to tour the area around Lake Tempe, namely tourism Tempe Lake and fishing village tour.

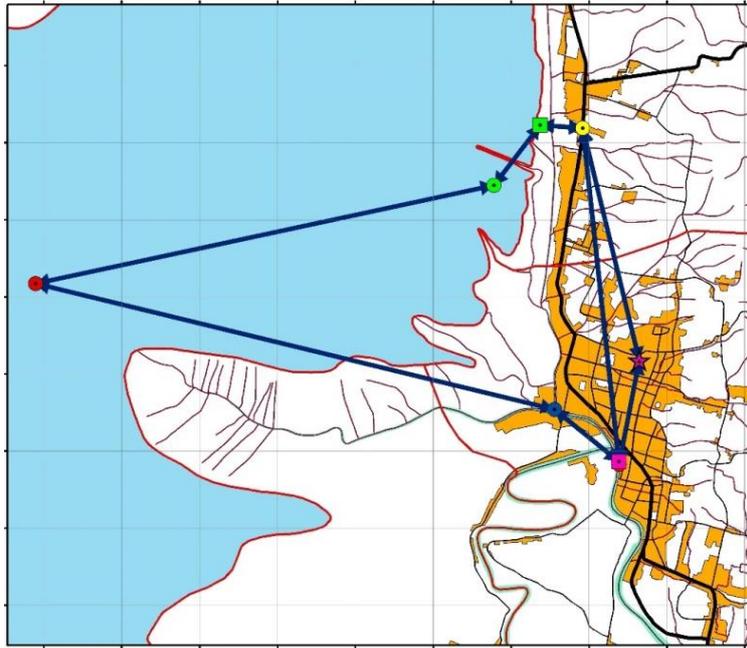


Figure 4. Trip Flow of Tempe Lake Tourism Area Development
Source: Developed from Indonesia Geospatial Portal

The concept of Land Transport itself is in the form of providing a Tourist Shuttle Bus, namely the Taman Paddupa – City – Silk Craft Village route as shown below Figure 4.26 Tourist Shuttle Bus Route for the Development of the Tempe Lake Tourism Area.

Shuttle bus routes are Paddupa Park - Callacu Sengkang Terminal - Tempe Market - Tugu Juang Park 45 - Sutera Craft Village. The tourist bus used is a bus with priority on comfort during the trip with tourist support facilities. Along the Bus Route, you will pass several iconic and historical places in Sengkang City, namely the Adipura Sengkang Monument, Nurul As'adiyah Callaccu Mosque, Fisherman Monument 45, Al-Manar Tempe Grand Mosque, Shrimp Monument, Heroes Cemetery Park, Tugu Juang Park 45.

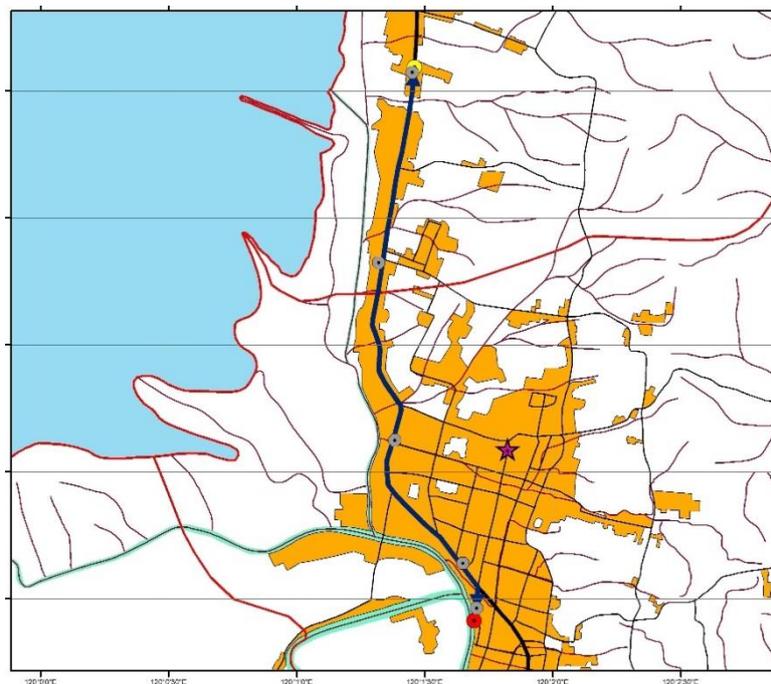


Figure 5. Tourist Shuttle Bus Route Development of Tempe Lake Tourism Area
Source: Developed from Indonesia Geospatial Portal

The concept of River Transportation Development itself underwent a change in flow due to the displacement and addition of piers in Paddupa Park and Silk Craft Village with the tourist route of Paddupa Pier - Fisherman's Village - Tempe Lake - Fisherman's Village Pier. Tempe – Fisherman Village Pier.

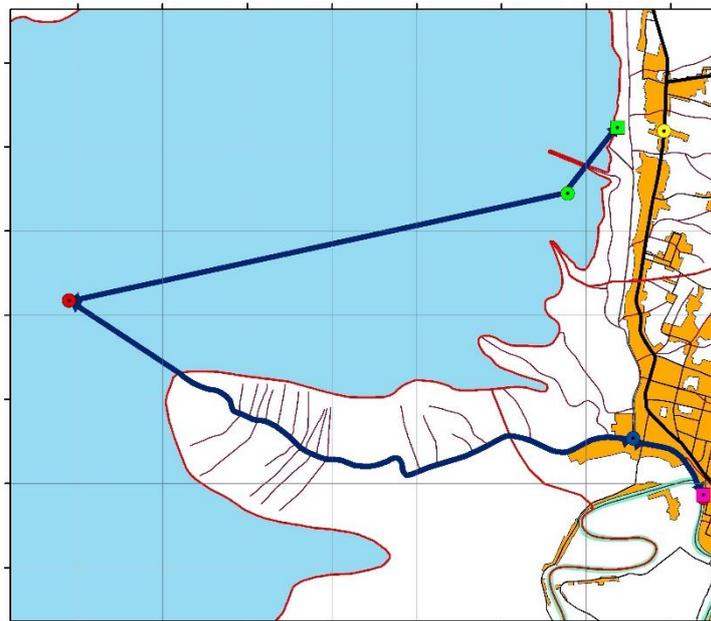


Figure 6. Tourist Boat Route for the Development of the Tempe Lake Tourism Area Source: Developed from Indonesia Geospatial Portal

Tourist transportation uses 2 types of transportation modes, namely:

1. Tour boat with a capacity of 10 people with specifications according to the table below;

Table 5. Description of Tour Boats Capacity of 10 Passengers

No.	Explanation	Total	Unit
1	Long	9.30	Meter
2	Wide	3.20	Meter
3	Tall	1.00	Meter
4	Full of water	0.30	Meter
5	Capacity	10	Person
6	Power	2 x 85	HP

Source: PT Maju Bangkit Indonesia Group

2. Tour boat with a capacity of 5 people with specifications according to the table below

Table 6. Description of Tour Boats Capacity of 5 Passengers

No.	Explanation	Total	Unit
1	Long	6.00	Meter
2	Wide	2.10	Meter
3	Tall	1.00	Meter
4	Full of water	0.35	Meter
5	Capacity	5	Person
6	Power	2 x 40	HP

Source: PT Maju Bangkit Indonesia Group

This pier was built specifically for tourists in the Lake Tempe tourist area which is located in two locations, namely; Paddupa Park Pier (in the Paddupa Park Tourist Area), and Pier Silk Village (in the Craft Village Tourist Area).



Figure 7. Example of a Marginal Type Pier

V. Conclusions

In the Lake Tempe Tourism area, there are 12 patterns of tourist movement which are dominated by 3 main movement patterns, namely City trips - Paddupa Park, City - Lake Tempe, Paddupa Park - Lake Tempe, with a total of 57.1%. for water transportation using a boat with a capacity of 5 passengers with facilities that are still not safe and comfortable, as for the dimensions and depth of the rivers and lakes to meet the development of tourist transportation modes.

The concept of tourism development is in the form of increasing accessibility between tours by making new trip routes and 2 docks, 3 bus stops as well as providing land transportation modes in the form of tourist shuttle buses and 2 river-lake transportations in the form of tourist boats.

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