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Development of the South Java Coastal Crossroads (Case Study of the Legundi-Planjan Road Section, Gunungkidul Regency, Special Region of Yogyakarta Province)

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ABSTRACT

The performance of the Legundi – Planjan (LOT-4) road, Gunungkidul Regency, Yogyakarta Special Region Province, is a study conducted in one of the sections on the Southern Java Cross Coastal Line (PANSELA). The purpose of the research is to conduct: Traffic Volume Counting, Traffic Time Speed Calculations, Potential Analysis and discussion of Tourism and Fisheries, Vehicle Operating Cost Calculations, Value of Travel Calculations Travel Time Saving), Accident Cost Calculation.The research method is carried out with the stages of a Traffic Volume Enumeration Survey to determine the amount of traffic volume that passes through the location of the observation point manually according to the grouping of vehicle types within a certain time period. This survey was conducted by counting the number of motorized vehicles by vehicle type group in a period of 15 minutes for 16 hours, to determine the characteristics of traffic flow. Travel speed survey is to obtain information on the average travel speed of vehicles that pass certain roads at predetermined locations, the survey is carried out using the moving observer method. The data obtained is used to calculate vehicle operating costs classified into fixed costs (fixed costs) and variable costs (variable costs). Fixed costs are costs that must be paid even if the vehicle is not used, the amount is constant. While the variable costs of using the vehicle according to need. Calculations as developed by the Japanese PCI Consultants (Pacific Consultants Indonesia). The Travel time value observes an increase in travel speed and shorter roads, an increased time value means a travel time savings. Calculation of the cost of motor vehicle accidents is divided into: Accidents that cause fatalities, injuries without casualties and property damage. By comparing the calculation of accident costs with the upper control limit and upper control limit to determine the accident-prone area (black side). The results obtained are (Traffic Counting = 615 smp/hour), (Travel Time Speed = 38.36 km/hour), (Vehicle Operating Cost,Passenger Car = Rp.4.837,26; Truck = Rp.6.037.81; Bus = Rp.9.322.38), (Value of Travel Time Saving= for an average speed of 38.36 km/hou r= Rp.100.10), (Equivalent Accident Number = EAN in Panggang sub-district in 2018 = 198 above the Upper Control limit/UCL = 164 and BKA (Upper Control Limit = 197).

Keywords: traffic analysis of the Legundi-Planjan road section, discussion of tourism, fisheries in Gunungkidul Regency, direct road benefit costs.

INTRODUCTION

In the General Plan of the National Road Network, one of them is the South Coast of Java road network. In some sections of the road are still disconnected/(missing link), requiring realignment in several provinces including the Special Region of Yogyakarta Province. The South Coast of Java road network is useful for distributing growth that has always focused on the North Coast of Java. The government is trying to develop development to the south coast of Java as an effort to equalize the north coast of Java which is already quite saturated and densely populated. The existence of the South Coast of Java road network can generate economic potentials in the southern region of Java as a "trigger" in increasing accessibility, developing an economy that has not been optimally developed [1]-[5]. The Special Region of Yogyakarta Province, carries out the development strategy of the South Coast Area, becoming the gateway and front yard of the DIY Province as follows:

1. developing an airport integrated with the railway and road transportation system;

2. developing environmentally friendly tourism and creative economy in the South Coast Area;
3. developing fisheries activities and fisheries processing industry in the fisheries designated area; 4. preserving the Karst Landscape Area and the Barchan Sand Dune Area and developing it as a special interest tourism.

The sea trade route on the south coast is planned to be carried out by large ships with the following principles:

1. Multiple stops, where the cargo will be filled from several port points and this aggregation will help optimize the ship's cargo capacity.
2. Ship promotes trade, the existence of a pioneer route gradually builds the existence of the trade sector on the southern coast of Java. Building a culture of trading via sea routes (sea trade) [6]-[9].

The South Java Coastal Crossroad (Jalur Lintas Pantai Selatan Jawa) is a strategic transportation corridor intended to improve regional connectivity, reduce spatial inequality, and stimulate economic growth along the southern coastal regions of Java. Historically, development in Java has been concentrated in the northern corridor, where infrastructure, industry, and logistics networks are relatively well established. In contrast, southern Java has experienced limited accessibility due to challenging topography, insufficient road capacity, and underdeveloped supporting infrastructure [10], [11].

The development of the South Java Coastal Crossroads is expected to play a vital role in enhancing inter-regional mobility, supporting tourism destinations, facilitating agricultural and fisheries distribution, and strengthening disaster evacuation routes in coastal areas prone to earthquakes and tsunamis. However, the corridor’s development faces several challenges, including land acquisition issues, environmental sensitivity of coastal and hilly areas, geometric road constraints, traffic safety concerns, and the need for integration with regional spatial and transportation plans [12], [13].

Given these conditions, systematic research is required to evaluate the technical, economic, environmental, and social aspects of the South Java Coastal Crossroads development. Such research is essential to ensure that infrastructure investments are effective, sustainable, and aligned with long-term regional development goals [14], [15].

RESEARCH METHOD

Traffic Counting Survey.

Traffic Volume Counting Survey is to determine the amount of traffic volume passing through the observation point location, according to the grouping of vehicle types in a certain time period. This survey is conducted by calculating the number of motorized vehicles according to vehicle type groups in a 15-minute period for 16 hours, to determine the characteristics of traffic flow. Traffic flow characteristics include the amount of traffic volume and fluctuations in traffic volume that reflect peak and off-peak periods, in the composition of traffic flow by vehicle type. In addition, it is also to determine the traffic volume per type of vehicle in order to show the characteristics of the distribution of road vehicles in an area. In conducting traffic volume calculations, it is done manually by involving several surveyors for each location and each direction of traffic movement.

Travel Speed Survey

Travel speed survey is to obtain information on the average travel speed of vehicles passing through certain road sections at predetermined locations. Within the scope of the Travel Speed Survey, the activities carried out are to record the time required by the average vehicle to travel on certain routes. The Travel Speed Survey is carried out using the moving observer method. The movement of survey vehicles uses a floating car approach and a manual form is prepared to observe the average speed of vehicles on predetermined routes. With this method, observer car drivers are instructed to drive at the average speed of vehicles in the traffic flow at that time. For each route, the survey was conducted three times: morning, afternoon, and evening. Travel time surveys were conducted using the sample vehicle method. The time recording surveyor was assigned to record the cumulative travel time when passing through the checkpoints that had been determined on the route map using a stopwatch. The travel distance was recorded from the test car's ordometer. Another surveyor

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recorded the stop time and the deceleration time, which is the period of time when the car was not moving or was moving very slowly on the survey route. The slow time was recorded only when the test car was moving slowly because there was a queue in front. The causes of stopping and deceleration were recorded by the surveyor.

Traffic Volume

For the Survey Location, the calculation of traffic volume was carried out in Girimulyo Village, Panggang District, Gunungkidul Regency, D.I. Yogyakarta Province. During the 3-day survey, the weather at the traffic volume calculation location was sunny.

The results of the Traffic Census Survey before the road project was carried out can be seen in the figure 1, figure 2, figure 3, figure 4, figure 5 below,

NO.	LOKASI	HARI SUVEY	ARAH			1	2	3	4	5	6	7	8	9	10	11	12	TOTAL	TOTAL
						Sepeda Motor,Roda tiga	Sedan, Jeep,Station Wagon	Angkutan Penumpang Sedang	Pickup, Micro Truck,Mobil Hantaran	Bus Kecil	Bus Besar	Truck Ringan 2 sumbu (2AS)	Truck Sedang,2 sumbu (2AS)	Truck 3 sumbu (3AS)	Truck Gandengan	Truck Semi trailer	Kendaraan Tidak Bermotor	Roda 4 atau lebih (2-11)	Seluruh Kendaraan (1-12)
7	TC-07 LOT 4, Girimulyo, panggang,Gunung Kidul, Daerah Istimewa Yogyakarta	HARI KERJA-1	A	Planjan	Legundi	3,591	93	367	155	12	-	89	85	-	-	1	13	815	4,406
		Selasa, 13-08-2019	B	Legundi	Planjan	3,306	81	285	134	12	-	86	58	-	-	-	10	666	3,972
		Total Dua Arah				6,897	174	652	289	24	-	175	143	-	-	1	23	1,481	8,378
		Persentase				82.3%	2.1%	7.8%	3.4%	0.3%	0.0%	2.1%	1.7%	0.0%	0.0%	0.0%	0.3%	17.7%	100%
		HARI KERJA-2	A	Planjan	Legundi	3,307	80	286	146	11	2	106	70	-	-	-	19	720	4,027
		Kamis, 15-08-2019	B	Legundi	Planjan	3,248	84	266	130	14	-	97	65	-	-	-	19	675	3,923
		Total Dua Arah				6,555	164	552	276	25	2	203	135	-	-	-	38	1,395	7,950
		Persentase				82.5%	2.1%	6.9%	3.5%	0.3%	0.0%	2.6%	1.7%	0.0%	0.0%	0.0%	0.5%	17.5%	100%
		HARI LIBUR	A	Planjan	Legundi	3,466	169	647	148	28	2	75	56	-	-	-	8	1,133	4,599
		Minggu,18-08-2019	B	Legundi	Planjan	2,973	145	479	106	20	1	71	43	-	-	-	7	872	3,845
		Total Dua Arah				6,439	314	1,126	254	48	3	146	99	-	-	-	15	2,005	8,444
		Persentase				76.3%	3.7%	13.3%	3.0%	0.6%	0.0%	1.7%	1.2%	0.0%	0.0%	0.0%	0.2%	23.7%	100%

Figure 1. Types of vehicles crossing the research location

Keterangan	1	2	3	4	5	6	7	8	9	10	11	12	TOTAL	TOTAL
	Sepeda Motor,Roda tiga	Sedan, Jeep,Station Wagon	Angkutan Penumpang Sedang	Pickup, Micro Truck,Mobil Hantaran	Bus Kecil	Bus Besar	Truck Ringan 2 sumbu (2AS)	Truck Sedang,2 sumbu (2AS)	Truck 3 sumbu (3AS)	Truck Gandengan	Truck Semi trailer	Kendaraan Tidak Bermotor	Roda 4 atau lebih (2-11)	Seluruh Kendaraan (1-12)
Planjan - Legundi	3,455	115	422	148	13	-	90	71	-	-	-	11	870	4,325
Legundi - Planjan	3,196	105	335	128	13	-	82	55	-	-	-	8	726	3,922
Total Kendaraan 2 Arah (Kend/16Jam)	6,651	220	757	276	26	-	172	126	-	-	-	19	1,596	8,247
Lalu Lintas Harian Rata-rata (Kend/jam)	**515**													

Figure 2. Average Daily Traffic (Vehicles/Hour)

Keterangan	1	2	3	4	5	6	7	8	9	10	11	12	TOTAL	TOTAL
	Sepeda Motor,Roda tiga	Sedan, Jeep,Station Wagon	Angkutan Penumpang Sedang	Pickup, Micro Truck,Mobil Hantaran	Bus Kecil	Bus Besar	Truck Ringan 2 sumbu (2AS)	Truck Sedang,2 sumbu (2AS)	Truck 3 sumbu (3AS)	Truck Gandengan	Truck Semi trailer	Kendaraan Tidak Bermotor	Roda 4 atau lebih (2-11)	Seluruh Kendaraan (1-12)
Faktor SMP	**1**	**1**	**1**	**2.4**	**2.4**	**2.5**	**5**	**5**	**5**	**5**	**5**	**0**		
Total Kendaraan (SMP/16 Jam)	6,439	314	1,126	610	115	8	730	495	-	-	-	-	3,398	9,837
Jumlah kendaraan (SMP/Jam)	**615**													

Figure 3. Average EKR/Hour Vehicle Volume

From the results of the survey that was conducted for three days, the total number of vehicles was 4,860 smp/16 hours and the number of vehicles per hour was 615 smp/hour.

NO. RUTE / NAMA RUAS JALAN	TIPE LAJUR	JUMLAH LAJUR	LEBAR JALUR (KR)	LEBAR JALUR (KN)	LEBAR JALUR LL TOTAL (m)	LEBAR PER LAJUR (m)	LEBAR JALUR LL EFEKTIF (m)	FAKTOR LEBAR JALUR LL EFEKTIF (m)	LEBAR BAHU Kr (m)	LEBAR BAHU Kn (m)	LEBAR BAHU EFEKTIF : WS (m)	KELAS HAMBATAN SAMPING	FAKTOR PENYESUAIAN HAMBATAN SAMPING (BAHU)	TIPE ALINYEMEN	FAKTOR PENYESUAIAN KAPASITAS DASAR (C0)	Co : KAPASITAS DASAR : (smp/jam)		Faktor Penyesuaian Untuk Kapasitas			KAPASITAS C (smp/jam) : Co X FCw X FCPA X FCHS
																PERLAJUR/TOTAL UNTUK 2 ARAH	Co	LEBAR JALUR FCw	PEMISAH ARAH FC_{PA}	HAMBATAN SAMPING FCHS	
Lot-4 TC-07	2/2 UD	2	2.25	2.25	4.50	2.25	4.50	2/2 UD4.5	1.00	1.00	1.00	R	2/2 UDR1	B	2/2 UDB	3,000	3,000	0.69	0.94	0.950	1,849

Figure 4. Road Capacity at Survey Location TC-07

LOT	Lokasi	KAPASITAS C (smp/jam) : Co X FCw X FCPA X FCHS	Skr/Jam (Q) Rata - Rata	DJ = Q/C	Skr/Jam (Q) Rata - Rata Hari Kerja	DJ = Q/C	Skr/Jam (Q) Rata - Rata Hari Libur	DJ = Q/C	Batas Mulai Jenuh
4	TC-07	1,849	615	0.33	649	0.35	615	0.33	0.75

Figure 5. Degree of Saturation

The theoretical degree of saturation cannot be more than 1 (one), but if the degree of saturation has reached 0.75, the road has started to become saturated. At the survey location above, namely the TC-07 survey location, it can be seen that:

1. At the TC-07 location, the average workday and holiday degree of saturation is 0.33 Still not saturated, no need to add lanes.
2. At the TC-07 location, the average workday degree of saturation is 0.35 Still not saturated, no need to add lanes.
3. At the TC-07 location, the average holiday degree of saturation is 0.33 Still not saturated, no need to add lanes.

Vehicle Growth in,

2017: 17.65%
2018: 7.97%
2019: 7.19%
So that the total vehicle growth in the three years is 32.18% and the average is 10.94%
Calculation with Compound interest formula
Qn = Qo (1+r)n (1)
Forecasting growth for the medium term 1-15 years

Based on formula (3-1), the prediction of the number of vehicles until 2034 is obtained as seen in the table above. Prediction in the 8th year or 2027 (figure 6, Prediction/forecast of vehicle flow) the road has experienced traffic congestion, the flow is approaching unstable, so road improvements are needed.

No	Qo dalam smp	r	tahun	Qn dalam smp	C dlm smp/jam	Q/C	LOS
1	615	10,94 %	2020	682,28	1849	0,37	B
2	615	10,94 %	2021	756,92	1849	0,41	B
3	615	10,94 %	2022	839,73	1849	0,45	C
4	615	10,94 %	2023	931,60	1849	0,50	C
5	615	10,94 %	2024	1.033,51	1849	0,56	C
6	615	10,94 %	2025	1.146,58	1849	0,62	C
7	615	10,94 %	2026	1.272,01	1849	0,69	C
8	**615**	**10,94 %**	**2027**	**1.411,17**	**1849**	**0,76**	**D**
9	615	10,94 %	2028	1.565,55	1849	0,84	D
10	615	10,94 %	2029	1.736,82	1849	0,94	E
11	615	10,94 %	2030	1.926,83	1849	1,04	F
12	615	10,94 %	2031	2.137,63	1849	1,16	F
13	615	10,94 %	2032	2.371,49	1849	1,28	F
14	615	10,94 %	2033	2.630,93	1849	1,42	F
15	615	10,94 %	2034	2.366,65	1849	1,28	F

Figure 6. Potential for Development of the Gunungkidul Regency Area

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Tourism Potential

Tourism has the meaning of a journey from one place to another, which is temporary, which is done individually or in groups, is an effort to find harmony and happiness with the environment, in social, cultural, natural and scientific dimensions. So that tourism is a complex phenomenon in society, which includes activities such as: hotels, tourist attractions, souvenir businesses, tour guides, tourist transportation, travel agencies, restaurants. It can be stated that: Tourism is a combination of symptoms of relationships arising from the interaction of tourists, businesses, governments, hosts, host communities in the process of attracting and serving tourists and other visitors. Several types of tourism can be mentioned: cultural tourism, health tourism, sports tourism, commercial tourism, industrial tourism, political tourism, convention tourism, social tourism, agricultural tourism, maritime / coastal tourism, nature reserve tourism, hunting tourism, pilgrim tourism and honeymoon tourism.

Tourism that has developed in Gunungkidul Regency along with the number of tourists from 2015 to 2019, as follows:

Table 1. Location and Number of tourist visits in Gunungkidul Regency

No	ODTW
1.	Baron Beach Area - Seruni Beach
2.	Siung Beach Area, Purwodadi Tepus2 (in 2019, it became Siung Beach, Nglambor Beach, and Ogan Beach)
3.	Wedi Ombo Beach Area, Jepitu, Girisubo (in 2019, it became Wediombo Beach, Jungwok Beach, Watu Lumbung Beach, Nampu Beach, Sedahan Beach, Greweng Beach, and Mount Batur)
4.	Sadeng Beach
5.	Ngerenehan Beach Area, Kanigoro, Saptosari (in 2019, it became Ngrenehan Beach, Ngobaran Beach, and Nguyahan Beach)
6.	Cerme Cave Area, Giritirto, Purwosari
7.	Mount Gambar, Kampung,
8.	Ngawen
9.	Tourist villages in Gunung Kidul Regency
10.	Watu Lumbung Beach - Mount Batur, Balong
11.	Ngeden Beach Area, Krambilsawit, Saptosari (2018 Data Collection)
12.	Watugupit, Giricahyo-Girijati, Purwosari areas plus the Gembirowati site, Beji spring, Langse cave, and Tapan cave (2019 Data Collection)
13.	Batara Sriten reservoir area (2018 Data Collection)
14.	Nglanggeran ancient volcano area (2019 Data Collection)
15.	Bleberan area (2019 Data Collection)
16.	Kalisuci area (2019 Data Collection)
17.	Gua Pindul beach area (2019 Data Collection)
18.	Timang beach area (2019 Data Collection)
19.	Gesing beach, Buron beach, and Kesirat beach areas (2019 Data Collection)
20.	Gedangsari Green Village area (2019 Data Collection)
21.	Mount Gentong area (2019 Data Collection)
22.	Forest area Wanasadi (2019 data collection)
23.	Bejiharjo (2019 data collection)
24.	Jonge Raya (2019 data collection)
25.	Ngingrong Karst Valley (2019 data collection)
26.	Turunan (2019 data collection)

Source: Tourist Visit Data to Tourist Attractions from the Regency/City Government

Tourist Growth to Gunungkidul Regency

Tourism is not only a source of income that is highly anticipated by the community because almost all of the community's economic activities are related to these natural factors. The tourism

sector is a leading sector because this sector has contributed to the high level of regional growth. In addition, it absorbs a high workforce when compared to other sectors.

As an illustration of the amount of original regional income (PAD) from the tourism sub-sector in Gunungkidul Regency in 2015-2019.

Fishery Potential

The economic potential in the southern part of Gunungkidul is located in the coastal area, namely fisheries and environmental services (tourism sector). The coastline in Gunungkidul Regency reaches around 65 km of the 113 km of the southern coast of Java, with a sea area of 518.56 km^2 so that the fishing area is wider than fishermen in other areas such as Bantul and Kulonprogo Regencies. This can be utilized for economic activities of the community and region in the form of increasing consumption needs and community welfare.

The fisheries sector activities that are developing in southern Gunungkidul are marine fisheries. This area has an important role in marine fisheries production in the province of the Special Region of Yogyakarta (DIY), amounting to 83.3%, so that marine fish production in DIY comes from the sea of Gunungkidul Regency. Marine fish production in this district reached 4,485.56 tons in 2014 [16]. This number is the highest compared to other districts in DIY that have a southern coastline, namely Bantul Regency and Kulonprogo Regency. The value of Gunungkidul's marine fish production is also the highest in DIY, in 2014, which was 29 billion or 60% of the total production value. The large production value should have an impact on regional economic activities. The fisheries sub-sector has the potential to be a trigger for development in the southern part of Gunungkidul Regency which includes the districts of Purwosari, Panggang, Saptosari, Tanjungsari, Tepus and Girisubo.

Natural wealth or resources in an area can be a driver of economic development [17]. It is one part of the internal factors for regional development. The criteria for natural resources that can be a driver of the regional economy are: (1) having an important contribution at the regional level; (2) having a relationship with other sectors, and; (3) having a multiplier effect. Marketing orientation also reflects the economic potential of a commodity. The sector that is the mainstay of exports in a region illustrates its important role in the regional economy. The types of fish that are widely caught in Gunungkidul are Stingray, Tuna, Mackerel, Pomfret, Layur and Skipjack [16]. The production of these fish in Gunungkidul is the highest compared to other districts. Skipjack from Gunungkidul contributes 93% of the total DIY, Skipjack (96%), Stingray (71%), or Anchovies (69%). Lobster is also found on the south coast. Lobster commodities are a favorite of fishermen because they have the highest price compared to other types of fish. The beaches in Gunungkidul, some of which are in the form of steep cliffs, are a habitat for lobsters. Fishery production on the south coast is not only in the form of fish for consumption but also ornamental fish and seaweed. The physical characteristics of some beaches support the development of ornamental fish and seaweed. Some beaches have terraces or shallow areas so that they can be used for seaweed cultivation because the sun can still penetrate the water. The types of ornamental fish caught in Gunungkidul include Butterfly, Blue Stone, Tragger and Scorpion [16].

Seaweed in Girisubo sub-district (14,400 kg) and Tanjung sari (29,616 kg) from total production in Gunung Kidul 59,202 kg. Has the highest production compared to other sub-districts in the southern part of Gunungkidul Regency. This is because most of the beaches in the 2 (two) sub-districts have a wave erosion coast typology. This type is a beach that has several features such as marine terraces, coastal areas or separate islands [18]. The terrace or coastal area is suitable for seaweed cultivation.

The diversity of marine production in the southern part must be utilized as well as possible for economic development. Some marine products are processed by traders in the same location. Processing and marketing are the mainstay in utilizing the potential of fishery products which are then sold to tourists in various forms such as grilled/fried fish, seaweed chips or fish. This will increase the added value of marine production and extend the shelf life of the product. The greater the added value, the greater the multiplier effect of the fisheries sector ([19]. This condition has a broad impact on the economy of the community and the region.

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The regional and central governments have built several Fish Landing Bases (PPI), consisting of 3 groups, namely fishermen groups, auctions and fish processing traders in the southern part of Gunungkidul, Bantul and Kulon Progo. This aims to facilitate fishermen's activities and maximize marine fisheries production. The designated fisheries area consists of: Capture fisheries areas and aquaculture areas.

The fishing area along the southern coast of the Special Region of Yogyakarta is 0 (zero) to 12 (twelve) miles from the coastline and is supported by its development, for Gunungkidul Regency the arrangement is as follows:

1. Development of the minapolitan area in Sadeng, Gunungkidul Regency
2. Baron Fish Landing Base in Tanjungsari District
3. Drini Fish Landing Base in Tanjungsari District
4. Gesing Fish Landing Base in Panggang District
5. Ngandong Fish Landing Base in Tepus District
6. Siung Fish Landing Base in Tepus District
7. Ngrenehan Fish Landing Base in Saptosari District
8. Sadeng Beach Fishing Port in Girisubo District, where fishermen unload their catch at Sadeng Port.
9. Nampu Fish Landing Base in Girisubo District

All of them are managed by the Gunungkidul Regency Marine and Fisheries Service through the Arghamina Fish Auction Place UPT.

The aquaculture area is located in the Minapolitan area of Playen District and Ponjong District.

Fisheries Problems in Gunung Kidul Regency:

1. Fisheries facilities and infrastructure
2. Human resources that still use traditional methods
3. Fish processing and marketing

Handling efforts

1. Improving fisheries facilities and infrastructure. Preparation of the Masterplan and DED PPI Gesing which can be used to anchor fishing motorboats > 5 GT, capable of operating in coastal waters up to the EEZ. Increase the number of outboard motorboats, motorboats and their fishing gear
2. Conducting training and mentoring for fishermen and fish farmers. Starting with the cadre formation of fishermen
3. Conducting continuous mentoring from the Gunungkidul Marine and Fisheries Service (DKP) with a fish processing development program to process raw materials into consumption and marketing

Another problem of zoning between tourism and fisheries activities requires good spatial planning, so that it does not become a conflict. Coordination is needed involving all stakeholders who are synergistic in the management and utilization of natural resources in the southern coastal area (coastal zone management) based on a green economy.

Table 2. Fisheries Production in Gunung Kidul Regency

No.		**Capture Fisheries**						
1	**Year 2014**	**Marine Fisheries**	**General Fisheries**					**Quantity (tons)**
		4.480,54	5,02					**4.485,56**
			Cultivation					
		Fishponds	Ponds	Cages	Ponds	Minapadi	Floating Nets	**Quantity (tons)**
		24.200	6.491,861	0	101.888	0	0,9	**6.618,849**

								Total (tons)
								11.104,409
		Capture Fisheries						
2	Year 2015	Marine Fisheries	General Fisheries					**Quantity (tons)**
		3.103,32	35,95					**3.139,27**
		Cultivation						
		Fishponds	Ponds	Cages	Ponds	Minapadi	Floating Nets	**Quantity (tons)**
		12.110	7.187,259	0,880	0	0	0,110	**7.200,359**
								Total (tons)
								10.339,629
		Capture Fisheries						
3	Year 2016	Marine Fisheries	General Fisheries					**Quantity (tons)**
		717,13	0					**717,13**
		Cultivation						
		Fishponds	Ponds	Cages	Ponds	Minapadi	Floating Nets	**Quantity (tons)**
		9,67	9.271,26	0	323,73	4,05	2,62	**9.611,34**
								Total (tons)
								10.328,47
		Capture Fisheries						
4	Year 2017	Marine Fisheries	General Fisheries					**Quantity (tons)**
		3.85,01	5,93					**3.900,94**
		Capture Fisheries						
		Fishponds	Ponds	Cages	Ponds	Minapadi	Floating Nets	**Quantity (tons)**
		4,30	11.373,65	266,48	323,73	4,05	2,62	**11.651,10**
								Total (tons)
								15.552,04
		Capture Fisheries						
5	Year 2018	Marine Fisheries	General Fisheries					**Quantity (tons)**
		4,613	27					**4.640,0**
		Capture Fisheries						
		Fishponds	Ponds	Cages	Ponds	Minapadi	Floating Nets	**Quantity (tons)**
		10,75	9.903,299	0	321.503	0,835	0	**10.236,387**
								Total (tons)
								14.876,387
		Capture Fisheries						
6	Year 2019	Marine Fisheries	General Fisheries					**Quantity (tons)**
		3.283,26	108,49					**3.391,74**
		Capture Fisheries						

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		Fishponds	Ponds	Cages	Ponds	Minapadi	Floating Nets	**Quantity (tons)**
		2,1	12.705,29	0	0	1,01	0	**12.708,40**
								Total (tons)
								16.100,14
		Capture Fisheries						
	Year	Marine Fisheries	General Fisheries					**Quantity (tons)**
7	2020	3.452,05	94,75					**3.546,80**
		Capture Fisheries						
		Fishponds	Ponds	Cages	Ponds	Minapadi	Floating Nets	**Quantity (tons)**
		1,72	10.031,73	0	15,38	0,98	0	**10.049,80**
								Total (tons)
								13.596,60

Direct Road Benefit Costs

Direct road benefit costs include:

Vehicle Operational Costs

These costs are classified into fixed costs and variable costs. Fixed costs are costs that must be paid even if the vehicle is not used, the amount is constant. While variable costs start from zero, when the vehicle is not used, until the vehicle is used according to needs.

In calculating Vehicle Operational Costs using the vehicle speed variable, as developed by Japanese Consultant Pacific Consultan Indonesia (PCI)

Time Value Cost

The value of time is the amount of money provided by someone that is spent to save travel time. The value of time increases proportionally with a person's income, the greater the per capita income, the greater the value of time.

With increasing travel speed and shorter roads, the value of time decreases which means savings in travel time.

Accident Costs

A traffic accident is an unexpected and unintentional event involving a vehicle with or without other road users, which results in human casualties (minor injuries, serious injuries, death and property losses).

Calculating the number of accidents is by using the EAN (Equivalent Accident Number) method [20], which is a weighting of the equivalent number of accidents referring to the cost of traffic accidents.

Calculation of Vehicle Operational Costs (BOK) with the method developed by PT. Pacific Consultant Indonesia (PCI) is based on speed

The formulation for fixed cost components is as follows

Table 3. Formulation of fixed cost components

No.	**Component Type**	**Vehicle Type**		
		Passenger Car	**Bus**	**Truck**
1.	Depreciation	Y= 1/(2,5S +125)	Y= 1/(6S+300)	Y= 1/(6S+300)

No.	Component Type	Vehicle Type		
		Passenger Car	**Bus**	**Truck**
2.	(per 1,000 km) of vehicle value	No, the driver is also the owner of the vehicle	Y= 1000/S	Y= 1000/S
3.	Driver and conductor travel time	Y= 38/(500 S)	Y=60/(2571,42857S)	Y= 61/(1714,28571S)
4.	Capital Interest	Y= 150/(500 S)	Y=150/(2571,4285S)	Y=150/(1714,28571S)

The formulation for variable cost components is as follows:

Table 4. Formulation of variable cost components

No.	Component Type	Vehicle Type		
		Passenger Car	**Bus**	**Truck**
1.	Fuel Consumption (Lt/1000 km)	Y= 0,05693 S^2 -6,42593 S +269,18567	Y= 0,2162 S2 -24,15490 S +954,78624	Y= 0,21557 S2 -24,17699 S +947,80862
2.	Engine Oil Consumption (Lt/1000 km)	Y= 0,00037 S2 -0,04070 S +22,0405	Y= 0,00209 S2 -0,24413 S +13,29445	Y= 0,00186 S2 -0,22035 S +12,06486
3.	Maintenance Per 1000 km	Y= 0,0000064 S +0,0005567	Y= 0,0000332 S +0,0020891	Y= 0,0000191 +0,00154
4.	Mechanic (hours/1000 km)	Y= 0,000362 S +0,36267	Y= 0,02311 S +1,97733	Y= 0,01511 S +1,212
5.	Vehicle Tires	Y= 0,0008848 S +0,0045333	Y= 0,0012356 S +0,0065667	Y= 0,0015553 S +0,0059333

URAIAN BIAYA OPERASIONAL KENDARAAN / km tiap LOT

No.Lot	Propinsi	Nama Project	Pekerjaan Jalan	Panjang jalan dlm Km.	Perhitungan biaya tidak tetap			Perhitungan biaya tetap			BIAYA OPERASIONAL KENDARAAN		
					BTT dalam Rp/km			BT dalam Rp./km			dalam Rp./ km. BOK=BTT+BT DITAMBAH OVERHEAD 10%)		
					MP	TRUK	BUS	MP	TRUK	BUS	MP	TRUK	BUS
4	DI Yogyakarta	Legundi-Planjan	Pelebaran Jalan	4.7	Rp957.86	Rp4,041.65	Rp4,539.24	Rp3,439.65	Rp1,447.26	Rp3,935.65	Rp4,837.26	Rp6,037.81	Rp9,322.38

Figure 7. Description of Vehicle Operational Costs/km

Cost Benefit Value of Travel Time

The value of time is the amount of money provided by someone that is spent to save travel time. The value of time increases proportionally with a person's income, the greater the per capita income, the greater the value of time.

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Speed Survey Recapitulation						
Lot 4 TS-04		Day, Date : Thursday, August 15, 2019				
No.	Remarks	Distance (km)	Morning (Km/hour)	Noon (Km/hour)	afternoon(Km/ hour)	Average (Km/hour)
4A	***Route Girisekar Village Boundary - Intersection of 3 Pejaten Giriwungu***					
	Speed (Km/Jam)	7.24	39.25	39.19	37.56	38.67
	Travel time (hour:mnt:sec)		0:11:04	0:11:05	0:11:34	0:11:14
	Resistance Stop (hour:mnt:sec)		0:00:00	0:00:00	0:00:00	
	Resistance Slow (hour:mnt:sec)		0:00:03	0:00:04	0:00:03	
	Total Resistance		0:00:03	0:00:04	0:00:03	
4B	***Route Intersection of 3 Pejaten Giriwungu - Girisekar Village Boundary***	7.24	Morning (Km/hour)	Noon (Km/hour)	Afternoon (Km/hour)	Average (Km/hour)
	Speed (Km/Jam)		36.25	40.47	37.39	38.04
	Travel time (hour:mnt:sec)		0:11:59	0:10:44	0:11:37	0:11:27
	Resistance Stop (hour:mnt:sec)		0:00:00	0:00:00	0:00:00	
	Resistance Slow (hour:mnt:sec)		0:00:08	0:00:08	0:00:12	
	Total Resistance		0:00:08	0:00:08	0:00:12	

Figure 8. Results of speed survey calculations

The higher the speed of vehicles that can pass through the road, the lower the value of time cost (VOT is getting lower)

Road accident costs

Traffic Accident Data in Gunungkidul Regency

Calculating the number of accidents is by using the EAN (Equivalent Accident Number) method [20], which is a weighting of the equivalent accident number referring to the cost of traffic accidents.

JUMLAH KECELAKAAN LALU LINTAS KABUPATEN GUNUNG KIDUL TAHUN 2016										
NO	KECAMATAN	JUMLAH LAKA	MD	LB	LR	KERMAT	Angka Kecelakaan EAN	C	BATAS KONTROL ATAS (BKA)	UPPER CONTROL LIMIT (UCL)
1	WONOSARI	25	3	0	29	Rp 7,013,000	123			161
2	PATUK	23	3	0	28	Rp 6,693,000	120			160
3	SAPTOSARI	28	4	0	34	Rp 8,160,000	150			163
4	GEDANGSARI	21	3	0	27	Rp 6,335,000	117			160
5	PONJONG	33	4	0	41	Rp 9,702,000	171			164
6	PALIYAN	18	3	0	23	Rp 5,396,000	105			159
7	SEMANU	34	5	1	42	Rp 10,074,000	192			166
8	TANJUNGSARI	22	3	0	28	Rp 6,652,000	120			160
9	KARANGMOJO	25	3	0	32	Rp 7,439,000	132	140	176	161
10	PURWOSARI	23	3	0	28	Rp 6,666,000	120			160
11	RONGKOP	26	4	0	32	Rp 7,756,000	144			162
12	NGAWEN	15	2	0	18	Rp 4,334,000	78			157
13	GIRISUBO	30	4	0	37	Rp 8,791,000	159			163
14	PANGGANG	31	4	0	39	Rp 9,274,000	165			164
15	SEMIN	25	3	0	31	Rp 7,328,000	129			161
16	NGLIPAR	23	3	0	29	Rp 6,859,000	123			161
17	PLAYEN	33	5	1	41	Rp 9,785,000	189			165
18	TEPUS	33	5	1	41	Rp 9,743,000	189			165
	JUMLAH	468	64	3	580	Rp 138,000,000	2526	140	176	2915

Figure 9. Number of traffic accidents in Gunung Kidul Regency in 2016

JUMLAH KECELAKAAN LALU LINTAS KABUPATEN GUNUNG KIDUL
TAHUN 2017

NO	KECAMATAN	JUMLAH LAKA	MD	LB	LR	KERMAT	Angka Kecelakaan EAN	C	BATAS KONTROL ATAS (BKA)	UPPER CONTROL LIMIT (UCL)
1	WONOSARI	23	4	0	28	Rp 10,828,020.00	134			162
2	PATUK	22	4	0	27	Rp 10,337,775.00	129			161
3	SAPTOSARI	27	5	0	33	Rp 12,597,165.00	157			163
4	GEDANGSARI	21	4	0	25	Rp 9,783,585.00	120			160
5	PONJONG	32	6	1	39	Rp 14,984,445.00	192			166
6	PALIYAN	18	3	0	22	Rp 8,334,165.00	104			159
7	SEMANU	33	6	1	41	Rp 15,559,950.00	201			166
8	TANJUNGSARI	22	4	0	27	Rp 10,273,830.00	128			161
9	KARANGMOJO	25	4	0	30	Rp 11,488,785.00	143			162
10	PURWOSARI	22	4	0	27	Rp 10,295,145.00	129	146	182	161
11	RONGKOP	25	5	0	31	Rp 11,979,030.00	148			163
12	NGAWEN	14	3	0	17	Rp 6,692,910.00	82			157
13	GIRISUBO	29	5	0	35	Rp 13,577,655.00	168			164
14	PANGGANG	30	6	0	37	Rp 14,323,680.00	177			165
15	SEMIN	24	4	0	29	Rp 11,318,265.00	139			162
16	NGLIPAR	23	4	0	28	Rp 10,593,555.00	133			161
17	PLAYEN	32	6	1	39	Rp 15,112,335.00	193			166
18	TEPUS	32	6	1	39	Rp 15,048,390.00	192			166
	JUMLAH	454	82	4	554	Rp 213,128,685.00	2477	146	182	2760

Figure 10. Number of traffic accidents in Gunung Kidul Regency in 2017

JUMLAH KECELAKAAN LALU LINTAS KABUPATEN GUNUNG KIDUL
TAHUN 2018

NO	KECAMATAN	JUMLAH LAKA	MD	LB	LR	KERMAT	Angka Kecelakaan EAN	C	BATAS KONTROL ATAS (BKA)	UPPER CONTROL LIMIT (UCL)
1	WONOSARI	26	5	0	30	Rp 18,243,000.00	150			163
2	PATUK	25	4	0	29	Rp 17,417,000.00	134			162
3	SAPTOSARI	30	5	0	35	Rp 21,250,000.00	165			164
4	GEDANGSARI	23	4	0	27	Rp 16,483,000.00	130			161
5	PONJONG	36	6	1	42	Rp 25,245,000.00	203			166
6	PALIYAN	20	4	0	23	Rp 14,041,000.00	118			160
7	SEMANU	37	7	1	43	Rp 26,215,000.00	220			167
8	TANJUNGSARI	25	6	0	29	Rp 17,309,000.00	158			163
9	KARANGMOJO	27	5	0	32	Rp 19,356,000.00	156			163
10	PURWOSARI	25	4	0	29	Rp 17,345,000.00	134	159	197	162
11	RONGKOP	29	5	0	33	Rp 20,182,000.00	160			163
12	NGAWEN	16	3	0	19	Rp 11,276,000.00	92			158
13	GIRISUBO	32	6	1	38	Rp 22,875,000.00	191			166
14	PANGGANG	34	6	1	40	Rp 24,132,000.00	198			166
15	SEMIN	27	5	0	31	Rp 19,069,000.00	154			163
16	NGLIPAR	25	4	0	29	Rp 17,848,000.00	136			162
17	PLAYEN	36	6	1	42	Rp 25,461,000.00	204			166
18	TEPUS	36	6	1	42	Rp 25,353,000.00	204			166
	JUMLAH	509	91	6	593	Rp 359,100,000.00	2703	159	197	2776

Figure 11. Number of traffic accidents in Gunung Kidul Regency in 2018

From traffic accident data in Panggang District for three consecutive years, in 2016 and 2017 the EAN figures were above the average accident (C) and UCL and in 2018 above UCL and BKA, it has become an accident-prone area, traffic safety needs to be improved especially to anticipate traffic growth in the coming year. Meanwhile, accident-prone areas in 2016, 2017 and 2018 were in the districts: SEMANU; PLAYEN and TEPUS because the EAN figures were above UCL and BKA.

CONCLUSION

Development of the southern coastline, Legundi - Planjan road section (LOT-4), Gunung Kidul Regency, Special Region of Yogyakarta Province. Can be done with the construction and improvement of infrastructure on the Legundi - Planjan road section, there is a generated traffic flow. Traffic growth has a significant impact on regional growth. This will be influenced by:

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population growth, economic growth and growth in existing vehicle ownership. 1) analysis of potential in Gunung Kidul Regency for Tourism and Fisheries, 2) travel time value for an average speed of 38.36 km/hour = Rp.100.

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