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The Impact Analysis of the Construction of the Indrapura - Kisaran Toll Road in Asahan Regency

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Abstract

This study investigates the impact of toll road construction on society, with economic, social, and environmental variables. Using interview methods and questionnaires to 398 respondents in seven affected sub-districts, the data collected was analyzed using the Smart-PLS (Partial Least Square) and Analytic Network Process (ANP) methods. The results of the study show that the construction of toll roads has a significant positive impact on economic and social aspects, while the impact on environmental aspects is negative but not significant. The construction of toll roads also increases job opportunities and income for the surrounding community. Based on the hypothesis, economic and social aspects have a positive effect on the impact of development, while environmental aspects show a negligible negative influence. In conclusion, the construction of the Indrapura-Kisaran toll road brings significant economic and social benefits to the people of Asahan Regency, although more attention is needed to the environmental impact caused.

Keywords: *Toll Road Development, Economic Impact, Social Impact, Environmental Impact, Partial Least Square, Analytic Network Process.*

Introduction

In terms of public infrastructure development, land transportation is a priority to support the regional economy in the future. One of the most prominent public infrastructures for various economic activities and community mobility is the construction of toll roads. Optimizing land transportation through toll road construction is expected to support economic potential with long-term regional economic growth targets by bringing about an increase in the rate of economic growth. This result suggests that infrastructure investment spurs economic growth because it reduces the cost of doing business, reduces transaction costs, increases the marginal product of labor, and increases economic efficiency. The impulse response analysis showed that shocks to infrastructure spending had a positive and persistent impact on economic growth (Fosu & Twumasi, 2022).

The construction of the Trans Sumatra Toll Road (JTTS) began with the construction of a toll road section that crossed Bakauheni City to Tebanggi Besar. The construction of this toll road is also an initial milestone in the construction of the Trans Sumatra Toll Road (JTTS) which connects Lampung Province to Aceh Province for 2,770 km. The construction of the Trans Sumatra Toll Road (JTTS) is the right and long-term step for the economy of Sumatra Island. The Trans Sumatra Toll Road (JTTS) map can be seen in Figure 1. Furthermore, in line with the construction of the Kuala Namu International Airport, the 61.80 km long Medan - Kuala Namu - Tebing Tinggi (MKTT) Toll Road has been built since 2015 and has been fully operational since March 25, 2019. The MKTT Toll Road is part of the Trans Sumatra Toll Road (JTTS) which was then followed by the construction of a toll road connecting Tebing Tinggi City - Indrapura - Kisaran which is part of the 8 (eight) JTTS sections.

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Fig. 1 Map of the Trans Sumatra Toll Road with Red and Blue Trajectories

Source: Open data from the Ministry of Public Works and Spatial Planning

Guided by (Presidential Regulation Number 109 of 2020) concerning the Acceleration of Implementation of National Strategic Projects in the attachment, it is stated that in Asahan Regency 2 (two) toll road sections will be built, namely the Kisaran - Tebing Tinggi toll road section and the Rantau Prapat - Kisaran toll road which is part of the Trans Sumatra Toll Road (JTTS). According to PT. Hutama Karya as the implementer of the construction of the Trans Sumatra Toll Road, the construction of the Kisaran - Tebing Tinggi toll road section starts from a stretch of toll road from Indrapura - Kisaran measuring ± 47.15 km.

Toll roads are also seen as a factor to facilitate the flow of raw materials or distribution in the industrial sector, some others view toll roads as infrastructure that unravels congestion, even though in fact the construction of toll roads has a function that is more than the previous interpretations (Sumaryoto, 2010). The impact of toll road construction had a relatively bad impact on the economic condition of the population whose income decreased after land acquisition became large, this was because farmers were forced to buy replacement land whose prices had skyrocketed and the replacement land was not as large as the land (Dewitasari, 2016). The economic condition has changed a lot, the income has decreased because their agricultural land is used for toll road construction, so that the productivity of the agricultural land decreases and affects income (Intanni, 2016).

The negative impact of toll road construction found is a significant reduction in MSME actors due to going out of business due to the lack of visitors that had been predicted by many parties before the MKTT toll road was operational and an unconscious factor, namely the Covid-19 Pandemic (Butarbutar & Rahayu, 2023). The construction of the Trans Sumatra Toll Road in Jatimulyo Village, with an area of ±495,355.66 was converted to build a toll road as a result of which the community's land was reduced and the population settlement was increasingly dense. In addition, the transfer of residential land used in the construction of the Trans Sumatra Toll Road resulted in the distance or space between residents' houses due to the existence of a bridge plus a lack of lighting around the bridge which resulted in 100 residential settlements becoming vulnerable (Fuadi & Nasrudin, 2022). The government still does not pay attention to the social aspects of the people whose areas are affected by the project. They are only farmers so even though they are given reimbursement funds, they will still struggle because that is all their expertise (Djoko, 2007).

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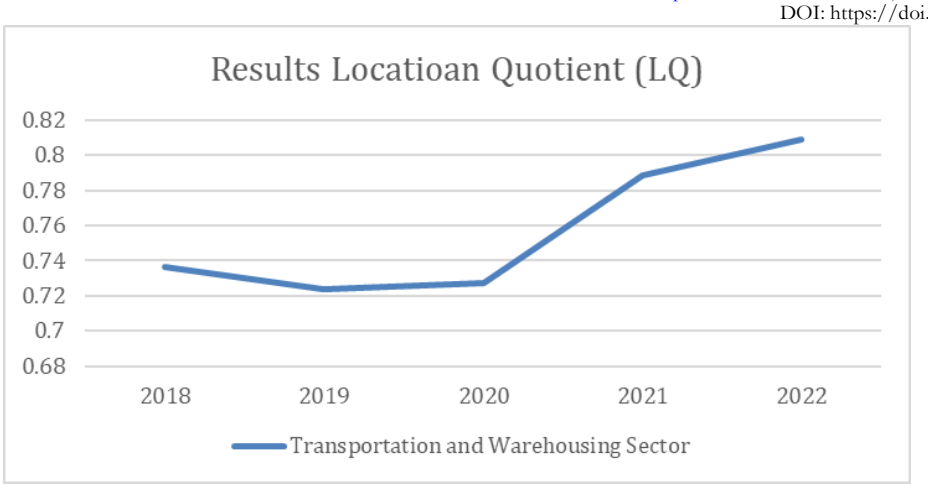

Fig. 2 Results of Location Quotient (LQ) Analysis of Asahan Regency 2018 – 2022

Source: Result of data analysis by Author

From the data from location quotient (LQ) analysis calculations, it can be seen that the transportation and warehousing sector from 2018-2022 has an average of 0.757, where LQ < 1 indicates that the transportation and warehousing sector still requires support from the government and from outside to meet the needs of its region. . The transportation and warehousing sector has an average LQ < 1. This sector is a developing sector, because the construction of the Indrapura-Kisaran toll road is expected to increase the GRDP of Asahan Regency in this sector and make the Transportation and Warehousing sector a potential sector.

The preparation of the draft policy related to the Optimization of the Influence of Trans Sumatra Toll Road Development on Regional Development in Asahan Regency is guided by: 1. Sustainable Development Goals in the Sustainable Development Goals (SDGs); 2. National Development Plan, North Sumatra Province and Asahan Regency; 3. National Spatial Plan, North Sumatra Province and Asahan Regency.

Therefore, in order to identify the impacts that will arise, it is necessary to conduct Research or Study on the Optimization of the Influence of Trans Sumatra Toll Road Construction on Regional Development in Asahan Regency as a consideration in determining the planning, direction and strategy of regional development in Asahan Regency. As part of the study, it is also necessary to determine the impact of toll road construction on economic, social and environmental aspects of the community in Asahan Regency. Impact measurement is expected to find out how much the role of toll road construction in the development of potential economic, social and environmental aspects for people whose lives are crossed by toll roads, then developed by finding alternative solutions for people affected by toll roads.

Literature Review

National development can also be interpreted as deliberate economic, social and cultural transformation through policies and strategies towards the desired direction (Deddy, 2005) Development was first used in the sense of economic growth. A community is considered successful in carrying out development if the economic growth of the community is high enough, thus what is measured is community productivity or state productivity every year (Rochajat & Ardianto, 2011). There are 2 stages. First, the fact is that development aims to eliminate poverty. If this goal has begun to be felt, the second stage is to create opportunities for its citizens to be able to live happily and have all their needs fulfilled (Sirojuzilam, 2005).

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History records the emergence of new paradigms in development such as growth with distribution, basic needs, independent development, sustainable development with attention to nature, development that pays attention to income inequality according to ethnicity (Kuncoro, 2004). Factors that are challenges, problems, and obstacles in carrying out the development agenda that can be used as opportunities or threats are: globalization; poverty, unemployment, and inequality; Industrialization, agriculture, and economic informalization; Corruption, leakage, and inefficiency; Foreign debt; Environment (ecology); Bureaucracy (Damanhuri, 2010). The role of the government in development can include the roles of entrepreneurs, coordinators, facilitators and stimulators (Tomlinson, 1989). The positive impact of development is the human condition where the people are in a prosperous, healthy and peaceful state so that to achieve this condition the person needs an effort according to his ability. Increased welfare felt by humans because the facilities and infrastructure needed by the community are available (Widyastuti, 2012). The theory of regional economic growth states that the increase in people's income is due to an increase in all the overall added value that occurs in the region such as land, capital, labor, and technology operating in the region (Tarigan, 2005). Agglomeration theory is the grouping of several companies in an area or region so as to form a special industrial area. Agglomeration can also be divided into two types, namely primary agglomeration and secondary agglomeration (Weber, 1909). The central theory of growth states that a center of activity that always serves the various needs of the population must be located in a central place, whose population is effectively able to be served by a central place (Walter, 1994).

The economic impact was greatly felt by the batik business in Pekalongan City with a total of 31.82% of respondents stating a decrease in sales, while social and environmental factors had a positive impact on the Pekalongan batik business (Noor et al., 2017). The existence of the Pejagan - Pemalang toll road section II West Brebes - East Brebes has a great impact on the lives of the village people of Brebes Regency. The magnitude of the impact felt by the community is that social factors can explain the variance of 34.454%, economic factors can explain the variance of 21.351%, environmental factors can explain the variance of 13.913% (Dhony & Soedarsono, 2017). The results of the study showed an increase of 13.74% in the accommodation & food and beverage provision sector in West Nusa Tenggara Province as follows: electricity and gas procurement 1.21%; agriculture, forestry & fisheries 0.99%; information & communication 0.53%, related to the impact of infrastructure development for the development of the Mandalika Special Economic Zone (Amalia et al., 2021).

Methodology

Data Sources

The purpose of the study was to analyze and test the variables of economic, social and environmental aspects of the impact of the construction of the Indrapura - Kisaran toll road (Case Study in Seven Affected Districts), which was carried out directly using primary data to carry out a research approach. Furthermore, to determine the elements of the cluster to find the best alternative solution to the impact of toll road development. The types of data in this study are secondary data and primary data, in the form of economic growth data and toll road construction.

The data processing method uses Smart-PLS with primary data obtained directly from the community in seven sub-districts affected by toll road construction, using questions from questionnaires and interviews. Secondary data in this study can be obtained directly from the source through official publications such as the Central Statistics Agency, Asahan Regency BAPPEDA, PUPR Toll Road Regulatory Agency (BPJT-PUPR). For primary data, it is necessary to provide an explanation or answer to the research problem in the form of the influence of variables of economic aspects, social aspects and environmental aspects of the impact of the construction of the Indrapura-Kisaran toll road. Especially for the Analytic Network Process method, primary data is used with the respondents being experts or practitioners who have an understanding of the problems discussed.

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The population of this study spread across 7 sub-districts and 27 villages is 89,221 people, then the sampling in this study uses a non-probability sampling method in a way that does not give everyone the same opportunity to choose. The sample technique in this study is accidental sampling, which is a data collection method that relies on chance, anyone who happens to be met by the researcher can be included in the sample if it is determined that they are suitable as a data source. The sampling formula uses the following formula slovin (Lachenbruch & Cohen, 1989) :

$$n = \frac{N}{1 + \mathrm{N}(e)^2}$$

Where:

n = number of samples

N = number of population

e = fault tolerance limits 5%

$$n = \frac{89221}{1 + (89221 \text{ x } 0{,}082)}$$

= 398,21 = **398** sample

The questionnaire was distributed in 7 sub-districts and 27 villages/sub-districts as many as 398 respondents with the following details:

Table 1. Distribution of 398 Questionnaires in 7 Districts and 27 Villages

District	Village	Number of Respondents
Air Batu	Sijabut Lake	15
	Air Batu Plantation I/II	15
	Pulahan Plantation	15
	Pinanggiripan	15
	Sei/Sungai Alim Ulu	15
	Sijabut Lotus	15
Western Kisaran	Sei Renggas	15
	Sendang Sari	15
Meranti	Sei Balai Plantation	15
	Sukajadi	15
	Gedangan	15
	Glare Forestry	15
Pulo Bandring	Pulo Bandring	15
	Suka Damai	15
	Suka Damai Barat	15
	Suka Makmur	15
	Taman Sari	15
	Tanah Rakyat	15
Sei Dadap	Tanjung Alam	15
	Tanjung Asri	15
Deep Bay	Maria Island	14
	Cape Island	14
	Piasa Ulu	14
	Source of Hope	14
King Height	Teladan	14

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	Central Canal	14
	King Height	14
Sum		**398**

Especially in this study, sampling for the purpose of the impact of toll road construction uses the ANP method. The data used is primary data obtained from the results of interviews with experts, practitioners or village officials who have an understanding of the problems discussed. The number of respondents in this study was 7 people consisting of 6 practitioners and 1 representative of BAPPEDA Asahan Regency with competent considerations. The requirements for valid respondents in the ANP are that they are people who are masters or experts in their fields, to be more specific as follows:

Table 2. Number of Samples by Practitioner

No.	Community	Respondents
1.	Representative of FE Lecturers at Asahan University	1
2.	Representative of FE Lecturers at Asahan University	1
3.	Representative of FE Lecturer at Medan State University	1
4.	Representative of FE Lecturer at Medan State University	1
5.	Representative of FE Lecturers at University of North Sumatra	1
6.	Representative of FE Lecturers at University of North Sumatra	1
7.	Representative of BAPPEDA Asahan Regency	1
Sum		**7**

Research Methodology

The analysis method used in this study is SEM on the basis of variance (Partial Least Square Path Modeling PLS-PM, to see the influence of the relationship between economic, social and environmental aspects and their indicators). The first test carried out was an outer model consisting of convergent validity, discriminant validity, internal consistency reliability, and composite reliability (Sarstedt et al., 2021). Furthermore, the inner model test consists of a determination test, simultaneous test, fit model, hypothesis test, multicollinearity test. Finally, analyze the research model to see both direct and indirect effects (Ngwabebhoh et al., 2020).

After looking at the results of the influence between the variables, then using the Analytic Network Process (ANP) method to find solutions or alternatives that are most needed by the community today from the impact of the construction of the Indrapura - Kisaran toll road. The stages of the ANP work are as follows:

Construct the model

Create a comparison matrix

$$A \cdot W = \lambda \max \cdot W$$

A = paired comparison matrix

λmax = the greatest eigenvalue of A

Calculate consistency ratio

$$CI = \frac{\lambda max - n}{n - 1}$$

λmax = largest eigenvalue of the n x n paired comparison matrix

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n = number of items compared

Creating a supermatrix consists of an Unweighted supermatrix, a Weighted supermatrix, and a Limit matrix

Selection of the best alternatives

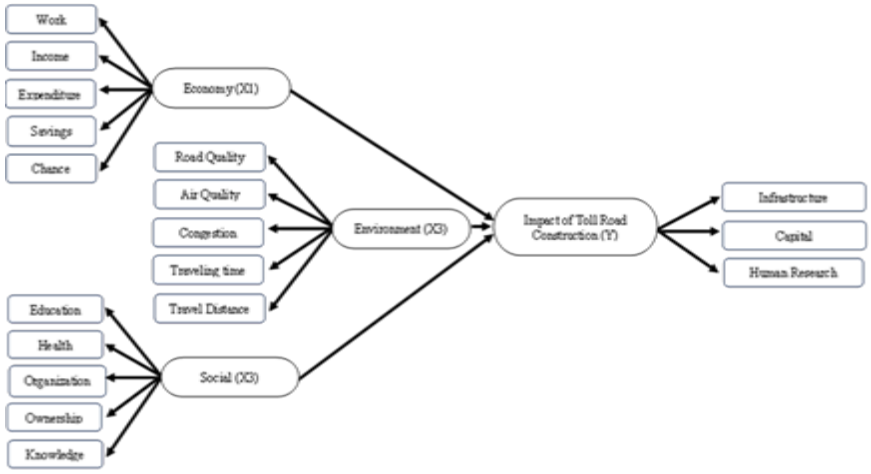

Fig. 3 First Research Framework Using the Smart-PLS Method

Source : Research Framework by Author

Information

X1 = Economic Aspect

X2 = Environmental Aspect

X3 = Social Aspect

Y=Impact of Toll Road Constructio

Then the model construction using ANP (Analytic Network Process) in Superdecision Software on the Impact of Toll Road Development is analyzed and made as follows

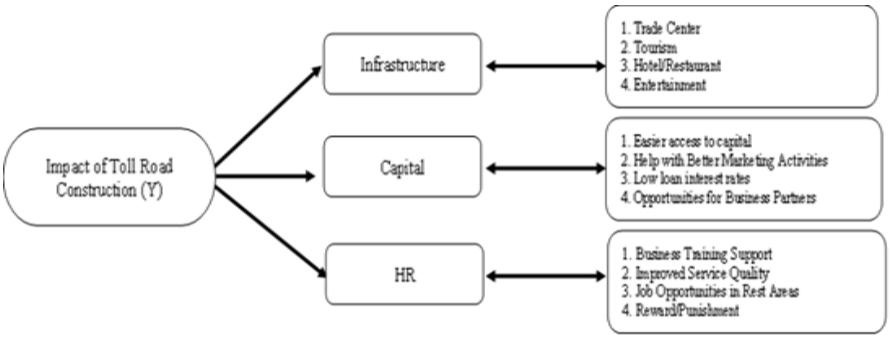

Fig. 4 The Second Research Framework Uses the ANP Method

Source : Research Framework by Author

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Furthermore, for more details, the details of the measurement of variables and indicators are as follows:

Table 3. Measurement of Research Variables and Indicators

Variable	Indicators
X1. Economic Aspects	1. Work
	2. Income
	3. Expenditure
	4. Savings
	5. Chance
X2. Environmental Aspects	1. Road Quality
	2. Air Quality
	3. Congestion
	4. Traveling Time
	5. Travel Distance
X3. Social Aspects	1. Education
	2. Health
	3. Organization
	4. Ownership
	5. Knowledge
Y. Impact of Toll Road Construction	1. Infrastructure
	2. Capital
	3. Human Research
Y1. Infrastructure	1. Trade Center
	2. Tourism
	3. Hotel/Restaurant
	4. Entertainment
Y2. Capital	1. Easier Access to Capital
	2. Help With Better Marketing Activities
	3. Low Loan Interest Rates
	4. Oppurtunities for Business Partners
Y3. Human Research	1. Business Training Support
	2. Improved Service Quality
	3. Job Oppurtunities in Rest Areas
	4. Reward/Punishment

Result

Smart-PLS Method

Outer Model Testing

Through retesting the convergent validity for the second literacy model, the results of all indicators in this study have a loading factor value above 0.7 which shows that the indicator is valid in measuring the construction in question. This means that these indicators are strongly correlated with the constructs they measure (Table 4).

Table 4. Convergent Validity Results

Indicators	Outer Loadings
X1.1	**0.946**
X1.2	**0.811**
X1.3	**0.856**

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X1.4	**0.767**
X2.1	**0.859**
X2.2	**0.946**
X2.4	**0.966**
X2.5	**0.964**
X3.1	**0.750**
X3.2	**0.927**
X3.3	**0.718**
X3.4	**0.909**
Y.1	**0.983**
Y.2	**0.977**
Y.3	**0.994**

The composite reliability value shows that all construction variables have values above 0.7 so that all construction variables meet the good reliability criteria (Table 5). All variables have an AVE value greater than 0.50, which means that the amount of variation in each measurement indicator item is contained in the variable itself. Overall the AVE value for all variables is 0.50 and the variable convergence validity is accepted (Table 5).

Table 5. Composite Reliability & Extracted Mean Variance

	Cronbach's alpha	Composite reliability (rho_c)	Average variance extracted (AVE)
X1. Economic Aspects	**0.867**	**0.910**	**0.718**
X2. Environmental Aspects	**0.952**	**0.965**	**0.874**
X3. Social Aspects	**0.847**	**0.898**	**0.691**
Y. Impact of Toll Road Construction	**0.984**	**0.990**	**0.970**

Inner Model Testing

The r-square value of 0.466 shows that the Social Aspect variable is able to explain the change by 46.6% and the remaining 53.4% is explained by other variables outside the literacy model used and has sufficient influence. Meanwhile, the r-square value of 0.356 for the variable Impact of Toll Road Development was able to explain the change of 35.6% and the remaining 64.4% was explained by other variables outside the literacy model used and had a small influence (Table 6). The value of f square 0.798 which is greater than 0.35 indicates that there is a large effect between the Economic Aspect variable on the Social Aspect variable, the large effect between the Social Aspect variable on the Toll Road Construction Impact variable with an F Square value of 0.502. Furthermore, there is a small effect between the Economic Aspect variable on the Toll Road Development Impact variable with an F Square value of 0.098 which is between 0.02 to 0.15. Finally, the relationship between the Social Aspect variable and the Toll Road Development Impact variable on the Environmental Aspect variable shows a negligible influence because it has an F Square value smaller than 0.02 (Table 6).

Table 6. R Square Value & F Square Value

R Square Value	**R-square**	**Adjusted R-square**
X3. Social	0.466	0.459
Y. Impact of Toll Road Construction	0.356	0.343
F Square Value	**X3. Social**	**Y. Impact of Toll Road Construction**
X1. Economic	**0.798**	0.098
X2. Environmental	**0.001**	**0.000**

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X3. Social		**0.502**

Based on the SRMS criterion of 0.099 which is smaller than 0.1 for both the saturated model and the estimation model, it can be said that the literacy model used has met the fit model (Table 7).

Table 7. Fit Model Results

	Saturated Model	Estimated Model
SRMR	0.099	0.099
d_ULS	1.168	1.168
d_G	0.825	0.825
Chi-square	645.908	645.908
NFI	0.784	0.784

Each of the indicators obtained is in the range of 1,069 to 1.922, which is still smaller than 5 in its entirety. Therefore, all indicators in the literacy model of this study did not experience multicoloniality problemss (Table 8).

Table 8. Multicollinearity Score Results

	VIF
X1. Economic -> X3. Social	**1.069**
X1. Economic -> Y. Impact of Toll Road Construction	**1.922**
X2. Environmental -> X3. Social	**1.069**
X2. Environmetnal -> Y. Impact of Toll Road Construction	**1.071**
X3. Social -> Y. Impact of Toll Road Construction	**1.873**

Research Model Analysis

The first hypothesis tests the direct influence of the Economic Aspect on the Social Aspect, there is a significant positive influence with a coefficient value of 0.675 and a statistical t of 13.691 so that it has a P value of 0.000 smaller than the value of 0.05.

The second hypothesis tests the direct influence of Economic Aspects on the Impact of Toll Road Development, there is a significant positive influence with a coefficient value of 0.348 and a statistical t of 4.652 so that it has a P value of 0.000 smaller than the value of 0.05.

The third hypothesis tests the direct influence of Environmental Aspects on Social Aspects, there is an insignificant negative influence with a coefficient value of -0.029 and a statistical t value of 0.437 so that it has a P value of 0.062 greater than a value of 0.05.

The fourth hypothesis tests the direct influence of Environmental Aspects on the Impact of Toll Road Development, there is an insignificant negative influence with a coefficient value of 0.006 and a statistical t of 0.105 so that it has a P value of 0.916 greater than 0.05.

The fifth hypothesis tests the direct influence of Social Aspects on the Impact of Toll Road Development, there is a significant positive influence with a coefficient value of 0.778 and a statistical t of 12.053 so that it has a P value of 0.000 less than 0.05.

The sixth hypothesis tests the indirect influence of the Economic Aspect on the Impact of Toll Road Development through the Social Aspect, there is a significant positive influence with a coefficient value of 0.525 and a statistical t of 7.976 so that it has a P value of 0.000 less than 0.05.

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The seventh hypothesis tests the indirect influence of Environmental Aspects on the Impact of Toll Road Development through Social Aspects, there is an insignificant negative influence with a coefficient value of -0.023 and a statistical t of 0.436 so that it has P values greater than 0.05.

Table 9. Hypothetical Results, Direct Effects and Indirect Effects

Direct Effects	Original sample	T statistics	P values
X1. Economy -> X3. Social	0.675	13.691	**0.000**
X1. Economy -> Y. Impact of Toll Road Construction	0.348	4.652	**0.000**
X2. Environmental -> X3. Social	-0.029	0.437	**0.662**
X2. Environmetnal -> Y. Impact of Toll Road Construction	0.006	0.105	**0.916**
X3. Social -> Y. Impact of Toll Road Construction	0.778	12.053	**0.000**
Indirect Effects	**Original sample**	**T statistics**	**P values**
X1. Economy -> X3. Social -> Y. Impact of Toll Road Construction	0.525	7.976	**0.000**
X2. Environmental -> X3. Social -> Y. Impact of Toll Road Construction	-0.023	0.436	**0.663**

The results of the influence of the research model that has been tested, it can be seen that between constructs has a significant influence and between indicators and constructs also has a significant value. More clearly it is displayed as follows:

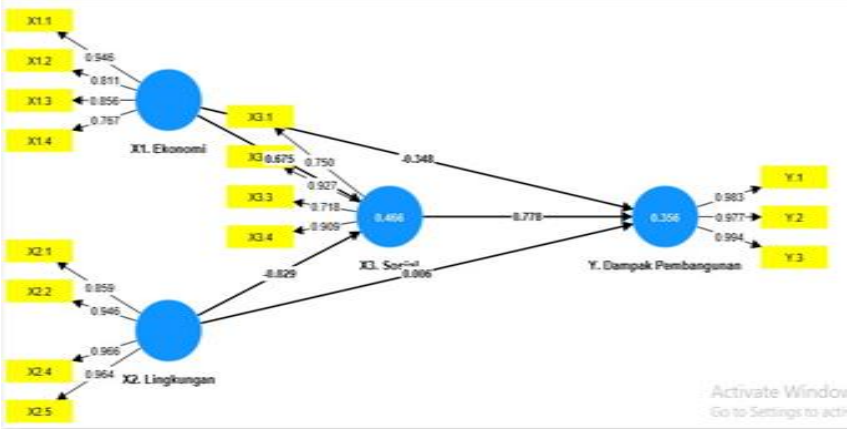

Fig. 5 Results of Path Analysis Structural Model with Smart-PLS

Source: Result data analysis by Author

The direct influence of the Economic Aspect variable on the Toll Road Development Impact variable is 0.348, showing that when the Economic Aspect variable increases by 10%, the Toll Road Development Impact variable increases by 3.48%. According to research conducted (Saputri et al., 2022), the construction of the Pekalongan - Batang Toll Exit road is because it makes it easier for the community to access. The wholesale market became more and more crowded, reducing congestion that occurred on Pantura road, increasing batik sales before there was a toll road and after there was a toll road experiencing an increase in sales. The results of this study are emphasized (Hadiyanti, 2019) land acquisition carried out for the construction of the Surabaya - Mojokerto Toll Road has a positive impact on the community whose land is freed. The compensation money received by the community can increase income and be useful for capital to buy land or housing in other places.

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The direct influence of the Environmental Aspect variable on the Toll Road Development Impact variable is 0.006, showing that when the Environmental Aspect variable increases by 10%, the Toll Road Development Impact variable increases by 0.06%. According to research conducted (Revayanti, 2020) it is stated that the construction of toll roads has a bad impact on the environment because it causes dust pollution, hotter air conditions and floods due to the construction of the Bocimi Toll Road. The results of this study are emphasized (Noor et al., 2017), due to the construction of the Surabaya - Mojokerto Toll Road in Wringinanom District, it has a negative impact due to the change in mileage that occurs due to the relocation of the respondents' residences due to the displacement of the toll road construction project.

The direct influence of the Social Aspect variable on the Toll Road Development Impact variable is 0.788, showing that when the Social Aspect variable increases by 10%, the Toll Road Development Impact variable increases by 7.78%. According to research conducted (Siswanto et al., 2019), social impacts such as relationships with batik material suppliers are getting easier, access to batik businesses is easier and many newcomers have a positive impact. The results of this study were emphasized, before the existence of the Bocimi Toll Road, the condition of houses (social strata) was made of wood and semi-permanent, but after the loss due to the construction of the toll road, the condition of the houses (social strata) changed to permanent.

The indirect influence of the Economic Aspect variable on the Toll Road Development Impact variable through the Social Aspect variable of 0.525, shows that when the Economic Aspect variable increases by 10%, the Toll Road Development Impact variable can increase indirectly through the Social Aspect variable by 5.25%. The results of this study are confirmed (Zeynep, 2012), the construction of the Geheyan Dam creates horizontal inequality between relocated people and unrelated people as soon as the relocation is realized. But from a long-term perspective, it takes people out of poverty and improves both economic and social development groups through urbanization and tourism.

The indirect influence of the Environmental Aspect variable on the Toll Road Development Impact variable through the Social Aspect variable is -0.023, showing that when the Environmental Aspect variable increases by 10%, the Development Impact variable can decrease indirectly through the Social Aspect variable by -0.23%. The results of this study are emphasized (Chung, 2002), stating that the total road construction in rural areas of China is termed as an 'invisible wall" that creates the opposite effect of restricting the flow of people, vehicles and commodities. Socially, this dilemma has increased tensions between farmers and local governments. Rural road users (farmers) must pay tolls every time they travel to their markets or rice fields, in addition to other levies.

Analytic Network Process Method (ANP)

Constructing the Analytic Network Process

The Analytic Network Process (ANP) method all criteria can be related, but if there are unrelated criteria then the criteria will be worth 0. There are 2 types of linkages in the ANP method, namely the linkage in a set of clusters (inner dependence) and the linkage between different clusters (outer dependence). The existence of this association makes the ANP method more complex.

The criteria and alternatives used to assess the performance of the impact of toll road construction, as well as the relationship between its influence, then an ANP model is created in the Super Decision software. The construction of the model is made as follows:

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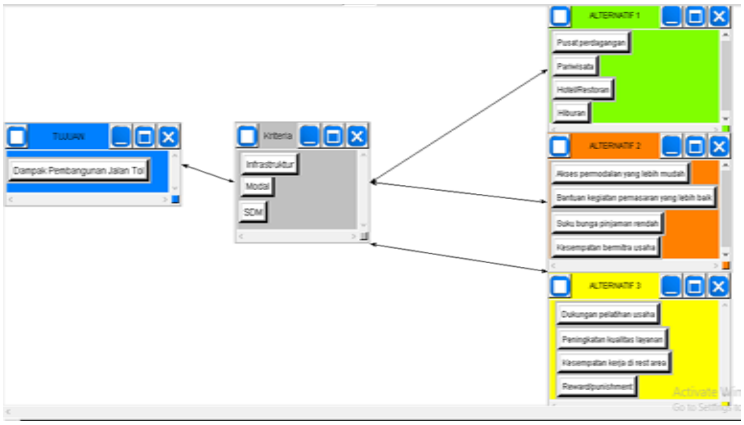

Fig. 6 ANP Model Impact of Toll Road Construction

Source: Result data analysis by Author

Synthesis and Analysis Results

The results of the rater agreement of 0.4899 show that the criteria have a fairly perfect agreement because it is close to the number 1 and is considered the accuracy of the assessment of all respondents in answering quite well (Table 10).

Table 10. Rater Agreement Results for Criteria

	1. Infrastructure	2. Capital	3. Human Research
Sample 1	1	2	3
Sample 2	1	2	2
Sample 3	2	1	3
Sample 4	2	1	3
Sample 5	1	2	2
Sample 6	2	1	3
Sample 7	2	1	3
Total	**11**	**10**	**19**
Ranking	**2**	**1**	**3**
U	**13,33**	**S**	**48,67**
MaxS	**99,33**	**W**	**0,4899**

The result of the rater agreement of 0.3697 shows that alternative 1 has a fairly perfect agreement because it is close to the number 1 and is considered to be the accuracy of the assessment of all respondents in answering quite well (Table 11).

Table 11. Rater Agreement Results for Alternative 1

	1D. Entertainment	1C. Hotel/ Restoran	1B. Tourism	1A. Trade Center
Sample 1	3	3	2	1
Sample 2	2	3	3	1
Sample 3	2	4	1	3
Sample 4	4	2	3	1
Sampel 5	3	4	2	1
Sample 6	1	4	1	3
Sample 7	4	3	2	1
Total	**19**	**23**	**14**	**11**

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Ranking	3	4	2	1
U	16,75		S	84,75
MaxS	229,1875		W	0,3697

The rater agreement result of 0.7346 shows that alternative 2 have a perfect agreement because it is close to number 1 and is considered the accuracy of the assessment of all respondents in answering very well (Table 12).

Table 12. Results of the Rater Agreement for Alternative 2

	2A. Easier Access to Capital	2B. Help With Better Marketing Activities	2D. Oppurtunities for Business Partners	2C. Low Loan Interest Rates
Sample 1	1	3	4	2
Sample 2	1	3	4	1
Sample 3	1	4	2	2
Sample 4	1	4	3	2
Sampel 5	2	2	2	1
Sample 6	1	4	3	1
Sample 7	1	4	2	2
Total	**8**	**24**	**20**	**11**
Ranking	**1**	**4**	**3**	**2**
U	**15,75**		**S**	**168,75**
MaxS	**229,68**		**W**	**0,7346**

The results of the rater agreement of 0.536759 showed that alternative 3 had a fairly perfect agreement because it was close to the number 1 and was considered the accuracy of the assessment of all respondents in answering well (Table 13).

Table 13 Rater Agreement Results for Alternative 3

	3A. Business training support	3C. Job oppurtunities in rest areas	3B. Improved service quality	3D. Reward /punishment
Sample 1	1	3	4	2
Sample 2	1	3	2	3
Sample 3	2	1	3	4
Sample 4	1	1	3	4
Sample 5	3	1	1	4
Sample 6	2	1	2	4
Sample 7	2	1	2	4
Total	**12**	**11**	**17**	**25**
Ranking	**2**	**1**	**3**	**4**
U	**16,25**		**S**	**122,75**
MaxS	**228,6875**		**W**	**0,5367**

The main priority of alternative 1 related to the Trade Center is due to people's concerns about their businesses which will experience a decrease in revenue turnover, therefore people who have MSMEs or do not ask to build a trade center at the exit and entrance of the toll road. This can give rise to new economic centers such as the construction of petrol stations, restaurants, hotels and community settlements.

The main priority of alternative 2 is related to easier access to capital., in general, one of the main obstacles, especially for small communities when they want to build a business, is the difficulty of obtaining access to capital, usually because there is no guarantee in the form of assets to get a capital loan from the bank. The

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existence of easier access to capital makes business prospects better, making it a main or side job to increase people's income related to the impact of the toll road construction.

The main priority related to job opportunities in the rest area is due to the high interest of the community around the toll road to open new business opportunities in the toll road rest area. Initially, many people who worked as farm laborers, MSME actors and people who wanted to start a business experienced social changes, these social changes were shown by the opening of wider job opportunities in rest areas for the community.

Conclusion

This study aims to analyze the impact of the construction of the Indrapura - Kisaran toll road on the economic, social, and environmental aspects of the community in Asahan Regency, with a special focus on the seven affected sub-districts. This research provides in-depth insights into how large infrastructure such as toll roads can affect various aspects of local people's lives. Local economic growth from the impact of the construction of the Indrapura - Kisaran toll road has made a positive contribution to local economic growth. Data shows an increase in GDP in the major trade and retail sectors, as well as the provision of accommodation and food. This shows that toll road infrastructure is able to increase economic activity by accelerating the distribution of goods and services. In general, toll roads have increased people's mobility by reducing travel time between one area and another. This makes it easier for people to access economic centers, health services, and education. This increased accessibility also contributes to better social integration between regions. Despite negative impacts such as the reduction of green land, it is hoped that appropriate mitigation measures can reduce the impact on the environment.

The novelty of this study uses a combination of the Analytic Network Process (ANP) and Smart-PLS methods, which is a new approach in evaluating the impact of toll road construction. ANP is used to capture dependencies and feedback between elements in a complex network, while Smart-PLS is used to test the validity and reliability of models and relationships between constructs. This hybrid approach provides a more in-depth and holistic analysis. This study combines the analysis of economic, social, and environmental aspects simultaneously, which provides more comprehensive picture of the effects of toll road construction. This multi-dimensional approach is rarely applied in similar studies that generally focus on only one or two aspects.

Research findings from the economic aspect have increased mobility and efficiency in the distribution of goods and services. This is reflected in the increase in distribution speed and the decrease in transportation costs, which in turn increases the competitiveness of the local economy. Despite the increase in accessibility, some community groups, especially farmers whose land is used for toll road construction, have experienced a decrease in income because they have to buy replacement land that is more expensive and less productive. The findings further found that mitigation efforts were made to reduce negative impacts on the environment, such as greening around toll roads and the construction of waste management facilities. Generally, the construction of toll roads has an impact on air quality and the environment around the construction area. There was an increase in air pollution and noise during the construction phase, but the impact was reduced once the expressway was put into operation.

There are some limitations to this study. First, research was conducted to see the impact of the construction of the Indrapura toll road - The range of results cannot be fully generalized. Future studies need to be developed to cover a wider regional level such as the provincial and national levels. Second, only consider economic, social and environmental aspects in the sub-districts affected by toll road construction. Future research should investigate aspects of psychology with indicators (e.g. social changes, depression, housing interactions and health levels). Future research should focus more on the relationship between structural variables (such as economic, social, environmental and psychological) by linking the level of dimensions (infrastructure, capital and human resources) to the impact of toll road construction. Applying different methods, such as using the evaluation of the stage II (second order) measurement model on the Smart-PLS, the measurement model is multi-dimensional because the variables are measured by a number of sub-

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variables/dimensions and then each sub-variable/dimension is measured by a number of measurement items. In addition, PLS predict test and RMSE & MAE comparison test (PLS vs LM model) can be added.

The policy implications of the research results are as follows: the impact of toll road construction must be integrated with the broader regional development plan to ensure that the project supports the sustainable development goals (SDGs) and regional spatial plans; The government must involve the community in the planning and implementation process of infrastructure projects through public consultation and participation mechanisms, this ensures that the voice of the community is heard and accommodated in decision-making; The government needs to ensure better access to health services for people affected by toll road construction, including preventive health programs and improved health facilities in remote areas; encouragement to develop Micro, Small and Medium Enterprises (MSMEs) around the toll road area can create new jobs and increase local people's incomes, training programs and access to business capital can be concrete steps; Local governments need to develop a network of secondary roads connected to toll roads to ensure a more equitable distribution of economic benefits across the region.

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