



Perspectives of the Local Communities on the Development of Trans-Papua Road Infrastructure

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Abstract

Since the development of public and social infrastructure, such as road infrastructure, affects people's welfare, regional discrepancies in development are a key problem for Papua's infrastructure development. True, it's a top priority. When planning, executing, and overseeing road building, as it should be with the Trans-Papua route, public awareness and participation in the physical implementation of infrastructure development should be considered. The construction of the Trans-Papua Road drew a negative reaction and a huge amount of criticism from many social circles. A lack of community engagement in the development and implementation of the Trans-Papua Road project, as well as a public perception of ignorance, are accused of causing resistance and conflict. This research is an effort to understand better the awareness of specific communities, which may be used to design a participatory development strategy. The study's focus is on how the public views the Trans-Papua road's development from sociocultural, economic, and environmental viewpoints. The data was gathered through a survey and complemented with statistics from the local Central Statistics Bureau. The results showed that the community and stakeholders have different perspectives and understandings of the Trans-Papua road's construction, and it has been determined that the community should be involved in the planning and implementation of development measures based on the response of the local. This study demonstrates the importance of reducing community-government conflicts, especially those involving protected forest conservation, community empowerment, and transportation network development. The findings of this study can be used to provide recommendations for infrastructure development, particularly in locations where native communities are at threat of conflict.

Keywords: Local Wisdom, Public Perspectives, Road Development, Road Planning.

1. Introduction

The development of community infrastructure improves the quality and mobility of people and products, which increases people's well-being. The central government has paid special attention to the development of Papua's infrastructure in order to improve access to transportation and therefore expand the social and economic activities of internal communities that have been constructed since 2014.

According to a report from the International Union for Conservation of Nature, the Trans Papua Road Section passing through Lorentz National Park (TN) received worldwide attention for being off the hazard list (IUCN). The Lorentz National Park was designated a World Natural Heritage Site by the UNESCO World Heritage Committee in 1999 with the letter WHC/74/409.1/NI/CS/1999. There are many challenges and obstacles in this field, from security issues to socio-cultural and environmental problems [1].

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It is no secret in Indonesia that many communities in Papua frequently obstruct regional growth owing to the beliefs of people who want Papua to secede from Indonesia, also known as the Independent Papua Organization (OPM). The presence of these communities has a significant impact on local communities' and indigenous peoples' perceptions of government, particularly in terms of development in the area. The influence given is one of the anti-government efforts that were raised by individuals. Various conflicts have occurred in the last few years, even leading to local wars that claimed several lives, construction workers being held hostage, confiscation of supplies at construction sites, and so on. The author feels it is necessary to take an approach to local communities and indigenous Papuans (OAP) to neutralize the bad influence that may come from the doctrine of unscrupulous people, in order to create healthy and sustainable development.

The purpose of this research is to determine the involvement of local concerns and perceptions that affect the areas impacted by the road construction project. The goal of this survey is to determine how the general public views the construction of the Trans-Papua road.

2. Literature Review

Road construction necessitates consideration of a number of factors, including the economy, infrastructure, and community support [2, 3]. The importance of social responsibility in road construction cannot be overstated, because the community is both the target and recipient of development impacts, as well as the subject of development implementation [4].

Trans-Papua's infrastructure development interests have resulted in a number of conflicts. The too-business-oriented approach still does not meet the expectations and views of indigenous Papuans (OAP), who are more concerned with culture and the environment. The relocated forest areas have an impact on OAP customary areas, places of social interaction, threats to people's lives due to loss of livelihoods, and cultural locations that are being used to erase OAP identities.

The municipal government recognizes that because the OAP community was not involved in the planning and construction of the Papua causeway, there have been numerous incidents and criticisms, and the Papuan people believe that they are only a byproduct of development. Claims or hypotheses that the low participation of indigenous peoples and OAPs in communication and decision-making processes for the Trans-Papua road construction has an impact on OAPs' socio-cultural and ecological changes. Socially, the forest is a place for interaction among community members, with social contact both verbal and physical, demonstrating strong social relations between communities. The construction of Trans-Papua is thought to be capable of eradicating this culture.

The process by which an individual organizes and interprets his sensory inputs and makes sense of his environment [5–8] is the process that leads to different perceptions. An individual's perception is influenced by factors within the individual, such as experience, thoughts, standard framework, and so on. According to Robbins [6], three factors can influence people's cognition: perceptual actors, goals or objects, and situations.

The general perception of road infrastructure development can be seen in terms of development information and transparency, interaction changes, and environmental impacts [9–12]. This aspect reflects several phenomena that occur in the community as a result of the Trans-Papua road construction. Positive perception, according to Robbins [6], is a person's evaluation of an object or piece of information that is expected from a positive view, perceived object, or existing rules. Negative perceptions, on the other hand, elicit negative attitudes. What is expected is a perceived object or something perceived by existing rules.

Individual dissatisfaction with the object that is the source of a person's perception can cause a negative perception [8, 13]. Individual ignorance and a lack of personal experience with the object being perceived, as well as vice versa, are the causes of a person's positive perception, perception, and individual satisfaction with the object that is the source of his personal knowledge. There is a perception of an object [12].

These challenges highlight the importance of paying attention to how public awareness and aspirations influence the realization of Trans-Papua development [1]. It is critical to adopt local community wisdom values as a foundation for developing a participatory development approach.

3. Research Methodology

Figure 1 depicts the survey location, which is the Wamena-Havema-Kenyam road section in Nduga Regency, Papua. The Wamena National Highway Administration Agency (BPJN), the Highway Agency, the National Statistics Agency (BPS) of Nduga Regency, and other sources provided data on road conditions (geometric and structural), however the primary data observed were based on observations. - Based on the growth of Trans-Papua in Nduga Regency, detailed interviews and focus group discussions with important direct and indirect stakeholders were conducted.

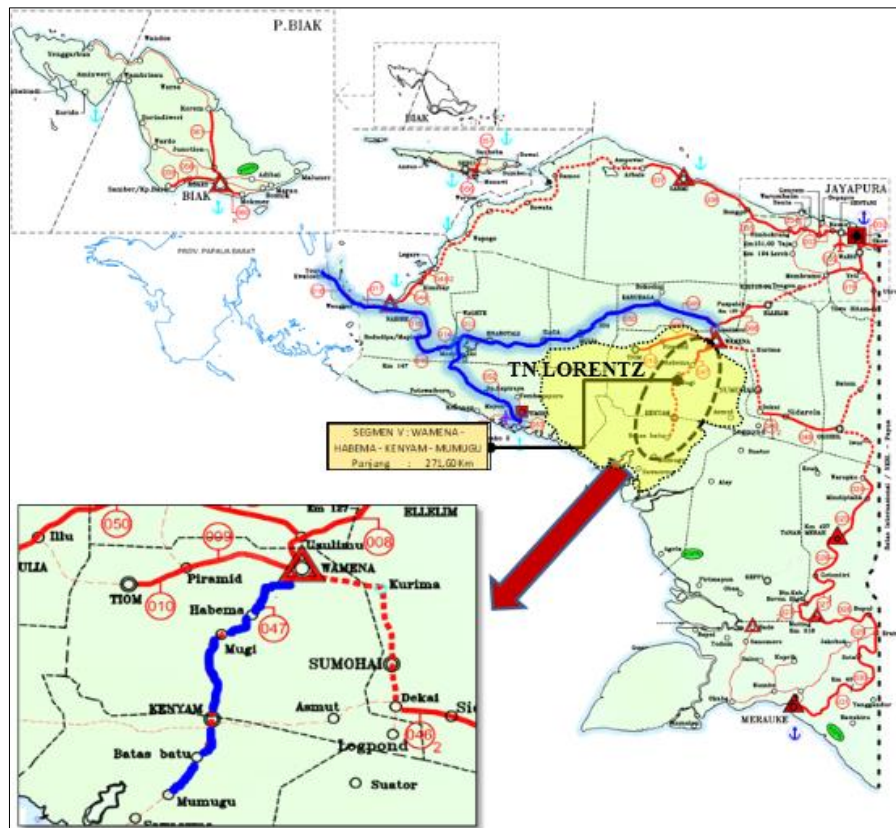


Figure 1. Trans-Papua Road Segment Wamena – Habema – Kenyam – Mumugu

Stakeholders in the population are various, and their overall number is unknown (unlimited population). The sample size is 105 participants, and the degree of confidence ranges from 90 to 95%. The following are the respondents:

- Community features include indigenous Papuans (OAP), migrants and/or non-Papuans (Javanese, Buton, Bugis, Makassar, Toraja), mixed communities (OAP and non-Papuans), and Lapago traditional leaders.
- Elements of government (central, state, and Nduga district government).
- Business owner/private sector (mining and timber).
- Implementers who are relevant (BPJN Wamena, Lorentz National Park management and contractors).
- Academic or professional (transport, environment, economics, sociology and anthropology).

The distribution of respondents is shown in Table 1 and Figure 2. The stakeholders may have different qualities, and these variances enhance their perspectives and impressions of Trans-Papua road construction in a number of ways. In-depth interviews (IDI) and focus group discussions (FGD) were used to acquire information on stakeholder awareness (FGD). The demographics of the respondents are shown in Table 1.

Table 1. Respondent’s Profile

Respondents		%
Gender	Male	73
	Female	27
Age (Years)	30 – 40	13
	41 – 50	39
	51 – 60	29
	> 61	19
	High School	25
Last Education	Bachelor Degree	41
	Magister Degree	20
	Doctoral Degree	14

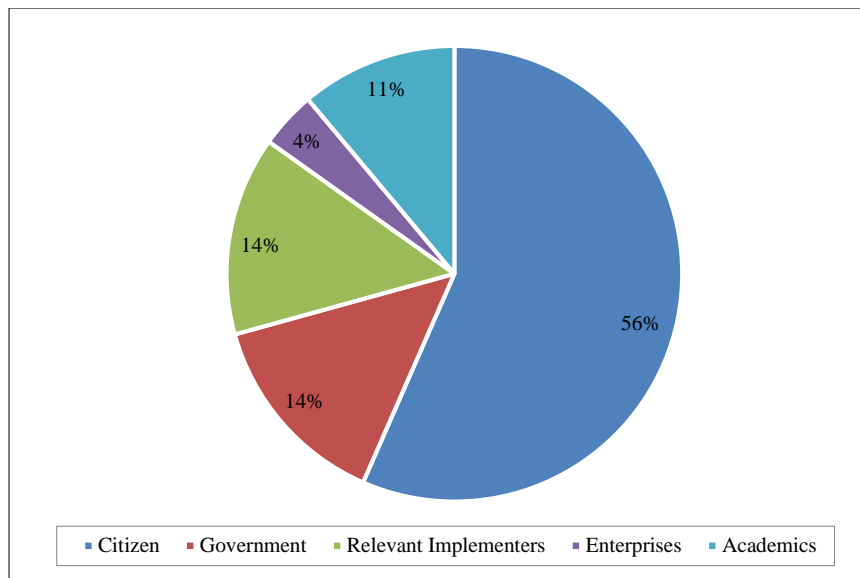


Figure 2. Respondents' distribution

The method of analysis employed is both descriptive and quantitative. A Likert scale was used to assess the response with following criteria:

- Score of 5 means Very Influential
- Score of 4 means Influential
- Score of 3 means Moderately/Partially Influential
- Score of 2 means Less Influential
- Score of 1 means No Influence

To determine the frequency of responses from stakeholders, perceptions were measured throughout the contingency table creation step [14].

The evaluation includes the analysis of economic, sociocultural, and environmental factors. Economic growth, regional original income (PAD), investment, gross domestic product (GRDP), minimum wages, per capita income, land prices, and basic requirements are all examples of macroeconomic and regional economic growth. There are price indications provided. Socio-cultural aspects include accessibility, HDI, low population growth, changes in livelihoods, retirement exclusion, life expectancy, population growth, the importance of local wisdom, open unemployment, and views toward infrastructure availability. Environmental aspects include depletion of natural resources (SDA), damage to Lorentz National Park (TN), soil maximum bearing, biodiversity conservation, urban development, and the usage of raw water, air, water, and soil fertility.

4. Result and Discussions

4.1. The Trans-Papua Road's Condition and Functionality

The Trans-Papua Road runs 3,421 kilometers from Sorong, West Papua, to Merauke, Papua, and is a national road divided into 2,351 kilometers in Papua and 1,070 kilometers in West Papua. The first 746 kilometers of the 1,746-kilometer Trans-Papua Road are in the BPJN Wamena area, with the remaining 605 kilometers in the BPJN Jayapura area.

The state of the Trans-Papua Road in the Wamena BPJN area (2021) is mostly in asphalt construction along 616 km, weather-resistant solid concrete road construction along 1,120 km, unpaved construction along 103 km, and still covered in forest along 10 km. Figures 3 and 4 depict typical road characteristics and Trans-Papua road handling in each road section.

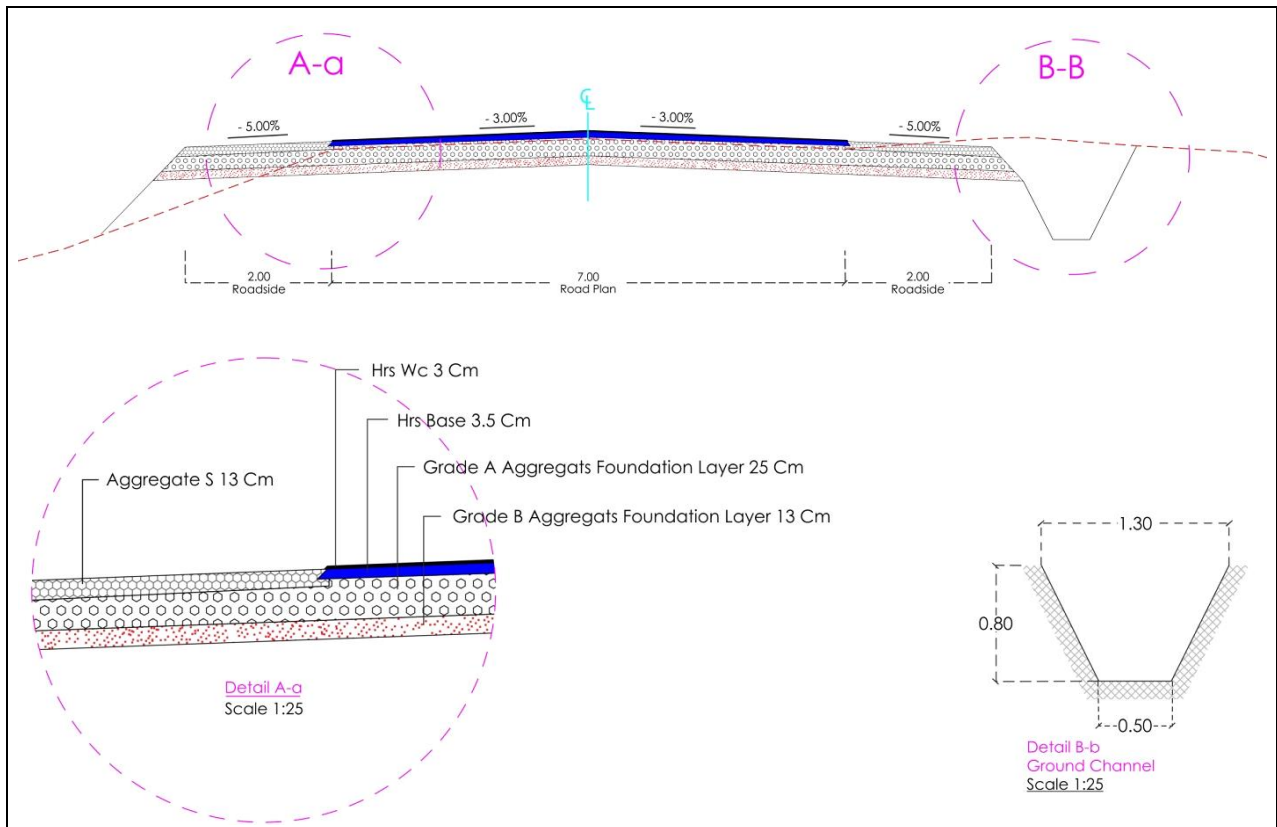


Figure 3. Typical Wamena – Habema – Kenyam – Mumugu Road

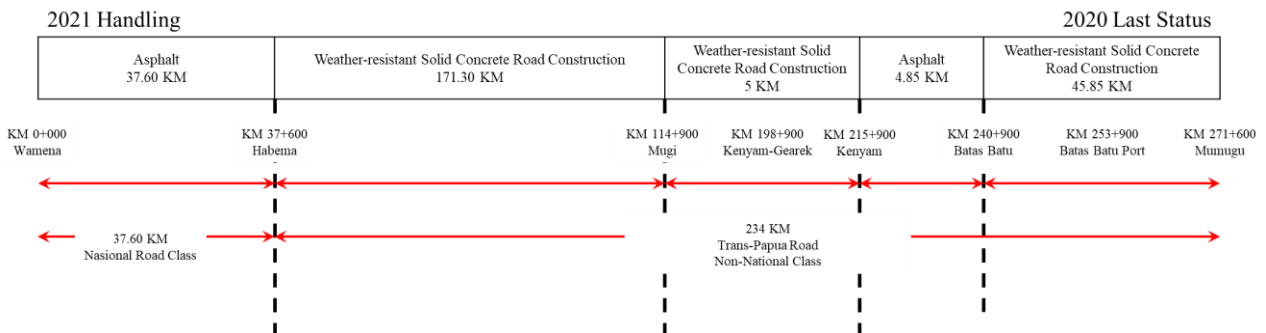


Figure 4. Handling of the Wamena – Habema – Kenyam – Mumugu road section

The Trans-Papua road opened in 1997, but construction on it began in 2014, including asphalt, bridge construction, and dealing with landslides (Figure 5).



Figure 5. Comparison of Trans-Papua road from 2014 – 2020



Figure 6. Transportation used for passengers and goods

The number of transportation connections directly experienced by the community is growing [15]. Access to all basic facilities, such as health, education, and trade, has been improved. Previously, access to traditional markets required a 45-hour walk, but taxis now cost 20,000 IDR* per person. Using a motorcycle will cost 20,000 IDR to 50,000 IDR for 15-30 minutes of duration per person. The flow of agricultural products into Nduga Regency has become smoother, prices have decreased compared to before Trans-Papua existed, a variety of commodities are available for purchase, and the public consumption index has increased.

4.2. Nduga Community Social Condition

According to Presidential Regulation No. 63 of 2020, Nduga Regency, along with 22 other regencies in Papua, is on the list of underdeveloped areas. Basically, developing areas have a lot of natural resources, but they are isolated, have limited access to public services, have low human capacity, and have limited access to financial institutions, markets, and economic activities. People are unable to go about their daily lives as a result of limited access. In order to optimize connectivity to growth centers, there is a lack of understanding of sustainable wealth and natural resource management, as well as a lack of attention to the region's social and cultural peculiarities.

Prior to the Trans-Papua Road, the people of Nduga were geographically isolated and could only be reached by plane on a limited basis. The people of Nduga Regency face the reality that the price of basic necessities and daily needs is not reasonable because daily needs are shipped by air. There will be approximately 106,533 residents in 32 sub-districts [16] in 2020, with a workforce of 70,771 and an unemployment rate of 658, with the majority having primary school education (SD) without having a degree.

Residents' incomes are significantly below the poverty line. Prior to the construction of the Trans-Papua road, the majority of residents worked in the agricultural and plantation sectors, using a generation-old agricultural system and processing plantation commodities, cutting wood, selling pigs, and hunting for forest output. Increased connectivity as a result of road construction has replaced community economic activity and residents' orientation to using forest products for sale outside Nduga to increase income. Furthermore, it makes it easier for people of productive age to temporarily migrate to cities in search of more decent jobs in Wamena and Jayapura.

In 2020, the average monthly cost of living in the Nduga community was 1,462,880 IDR, or about 48,000 IDR per day. This amount is spent on food consumption (61%), with the remainder on non-food consumption. Grains are the most commonly consumed food, and the majority of household and household utensil spending is on non-food items [16]. With 31 deaths in 2015, infant mortality is extremely high. This is thought to be due to insufficient services [5]. The presence of transpapua infrastructure, particularly in the Wamena-Havema-Kenyam-Mumugu segment, will at the very least increase productivity and connectivity. The district's linkages between villages and sub-districts facilitate basic services and contribute to an increase in community life expectancy from 54.82 in 2018 to 55.27 in 2020.

4.3. Stakeholder Perception on Trans Papua Development

4.3.1. Economic Aspect

Road construction, in theory, has a positive impact on regional and rural economic growth. Trans-Papua's development is expected to increase economic opportunities for the community and business stakeholders. Access to district production centers on the way to growth centers increases farmers' sales force, which has a direct impact on increasing people's per capita income [9, 11, 13].

* 1 IDR \cong 0.000067 USD

The perception of the OAP community and the traditional leaders of the La Pago tribe toward economic change assumes that the Trans Papua road will have little impact on the local community's economic development. Meanwhile, the migrant (non-Papuan ethnic group) and non-OAP mixed communities believe that the road's existence has a significant impact on the community's economy. Positive perceptions emerged from the business community, academics, implementers involved, and the government, with the group assessing that the community's local economy was growing in tandem with the construction of the Trans Papua road.

The OAP community's perception of road infrastructure based on economic indicators remains negative, despite the fact that they are content with changes in their lives, such as increased travel patterns (selling activities to the market is easier) and consumption patterns (the number of types of goods that can be purchased such as noodles). The community provides instant, cigarettes, salt, and daily necessities. In contrast to the perception of the non-OAP community and migrants, as many as 82 percent of respondents gave a positive assessment, while as many as 98 percent gave a positive assessment among entrepreneurs, actors involved in road construction, academics, and the government.

OAP's ability to benefit from the existence of Trans Papua's infrastructure from economic life has not been maximized, with roads being used only to transport crops from plantations or forests to markets around Wamena, such as the production of "hipere" (yam), coffee, taro, hipere leaves, bananas, pineapples, shallots, and so on. In contrast to non-OAP communities and migrants, they can benefit from the road by recognizing opportunities to expand the commodity market. Plantation and agricultural commodities can be sent to Jayapura, and basic goods from Jayapura can be sent to Wamena, Nduga, and surrounding areas.

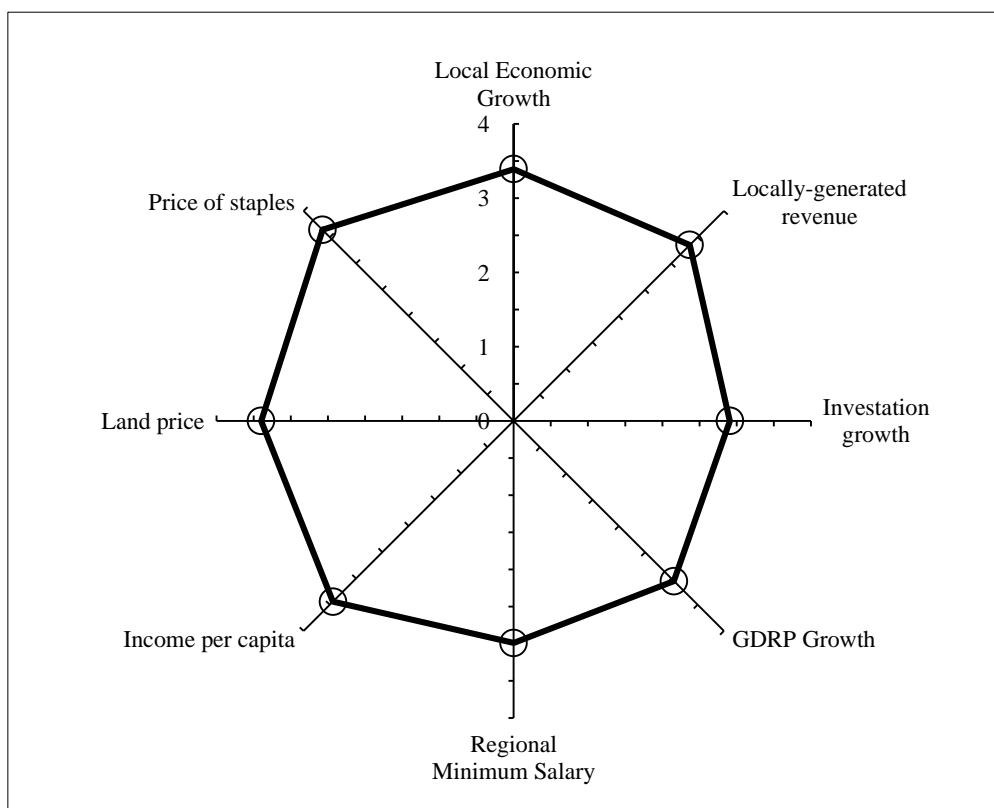


Figure 7. Average perception with indicators of economic aspects

According to the average results of economic indicators and stakeholder perceptions (see Figure 7), the existence of the Trans Papua road has an impact on the community's economy. Particularly in terms of decreasing prices for basic and strategic goods in Nduga Regency. Income per capita, land value, local economic growth, local revenue growth, GRDP rate, district minimum wage, and investment growth are all factors to consider. In general, the existence of the Trans Papua road has a significant impact on the improvement of the community's economy.

Nduga Regency has seen an increase in investment, though the amount is not large. GRDP increased at a rate ranging from 4.84 percent to 7.71 percent per year. The community's per capita income rises by an average of 3.61 percent per year in tandem with the opening of market access. In addition, the district minimum wage has risen from Rp. 2.4 million in 2016 to Rp. 3.5 million in 2020. Because of changes in land use, the value of land along the Trans Papua road has changed, as have the prices of basic commodities and essential goods in Nduga Regency (for example cement price from 1.5 million IDR to 400.000 IDR per bag).

4.3.2. Socio-Cultural Aspect

The construction of the Trans Papua road by the government is a constitutional mandate and is expected to be able to connect people in the mountains to access public services, both schools and health services. On the other hand, the main obstacle to the development of Trans Papua (besides the security factor) is the differences and perceptions of concern about the social and cultural changes of the OAP community, which are influenced by outside cultures (see Figure 8). It is believed that infrastructure development will change human behavior and culture, which are closely related to the environment (cultural ecology). Cultural changes will encourage new patterns of exploring and exploiting their natural surroundings [5].

According to this viewpoint, the OAP community and La Pago traditional elders in Nduga Regency believe that Trans Papua is significantly different from its existing culture, in which the forest is both a source of cultural identity and a source of income for the indigenous Papuan people. Non-OAPs, academics, government officials, involved implementers, and entrepreneurs, in contrast to the migrant population, tend to be moderate, and they believe they have a significant impact on socio-cultural development.

The development of the Trans Papua road is expected to have a substantial impact on OAP marginalization, livelihood changes, service center accessibility, and the open jobless rate. Indicators of HDI growth, poverty growth, and life expectancy are all very influential, however indicators of the importance of indigenous peoples' wisdom and behavior on infrastructure availability are not.

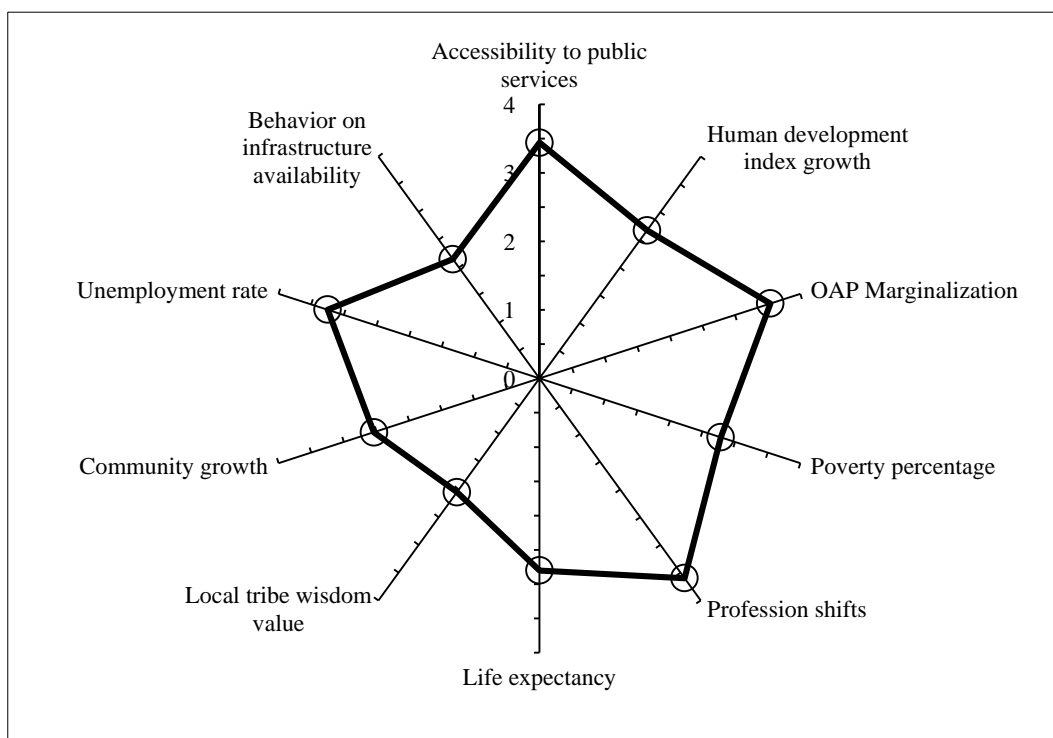


Figure 8. Average perception with indicators of socio-cultural aspects

From a social point of view, the OAP community and traditional elders believe that destroying forest area for road building endangers traditional cultural ceremonies. Forests are holy sites where traditional rituals and accoutrements are performed, as well as origin myths and history that have direct or indirect ties to traditional areas. From a sociocultural standpoint, even the tiniest cultural shift will have a significant impact on the life of the Papuan (traditional) people. The Trans Papua Road has been viewed by OAP and the community as a driver for ecological change that has affected the lifestyle of the Papuan people in Nduga. In general, the average value of stakeholder views for socio-cultural indicators on the Trans Papua road development is estimated to be.

The public health status in Papua Province as measured by morbidity, which is defined as health concerns that disturb everyday activities, has steadily improved from 23% in 2012 to 16% in 2016. (BPS, 2021). The impoverished population is expected to decline from 38.47 percent in 2016 to 36.82 percent in 2020. From 26.56 in 2016 to 31.55 in 2020, the HDI has risen. From 54.82 in 2018 to 55.27 in 2020, life expectancy has grown. Similarly, the open unemployment rate fell from 1.71 percent to 1.03 percent. In the year 2019, OAP exploited the rise in connection to access health services at the public health center, boosting the impact of free public health center services since more people came for treatment of various problems. The public health status in Papua Province as measured by morbidity, which is defined as health concerns that disturb everyday activities, has steadily improved from 23% in 2012 to 16% in 2016. (BPS, 2021). The

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4.3.3. Environmental Aspect

The environment is linked with the OAP community's sociocultural and economic concerns. As a location to interact and make a living, the forest is an excellent choice. The reality is that most Papuans who live in villages and outlying areas in the nature of forests that still have a lot of forestry economic potential are planting tubers, sago, and using them as natural "cages" for domesticated animals like pigs. Forests and the changes that will occur as a result of the building of the Trans-Papua road, according to the OAP community and indigenous peoples, would cause a clash of cultures for the Papuan people, especially those who live in villages and the outlying areas. To be in agreement with the process of adapting to OAP culture, it is necessary to anticipate environmental changes [12, 17].

Trans Papua also runs through Lorentz National Park, which is currently in the spotlight due to a study from the International Union for Conservation of Nature putting it on the endangered species list (IUCN). The exploitation of lumber and mining, the extinction of the Nothofagus forest, the falling water level of Lake Habbema as a raw water supply, and the decline of highland peat are among the nine (9) critical indicators that must be monitored. Stakeholders have differing perspectives on the development of Trans Papua from an environmental standpoint. It is regarded as influential by the OAP community and traditional authorities of La Pago. It has a significant impact on academics, non-OAP groups, and migrant communities. These parties believe that the development of the Trans Papua road would result in excessive exploitation, forest degradation, and a reduction in the land's carrying capacity. The entrepreneurs and implementers active in the government believe it has less influence since environmental issues may be solved as long as maintenance and law enforcement are carried out.

The Trans Papua road is thought to have an impact on indices of natural resource exploitation (timber and mining), harm to the Lorentz National Park's Nothofagus forest, and biodiversity conservation. It is regarded very relevant for indications of diminishing soil bearing capacity, growth of built-up land, reduced availability of raw water, and deterioration of peat soil quality. Meanwhile, signs of declining water and air quality are thought to be less important. Overall, it can be stated that the development of the Trans Papua road will have a detrimental impact on the ecosystem. Figure 9 depicts environmental parameters that impact the development of the Trans Papua road.

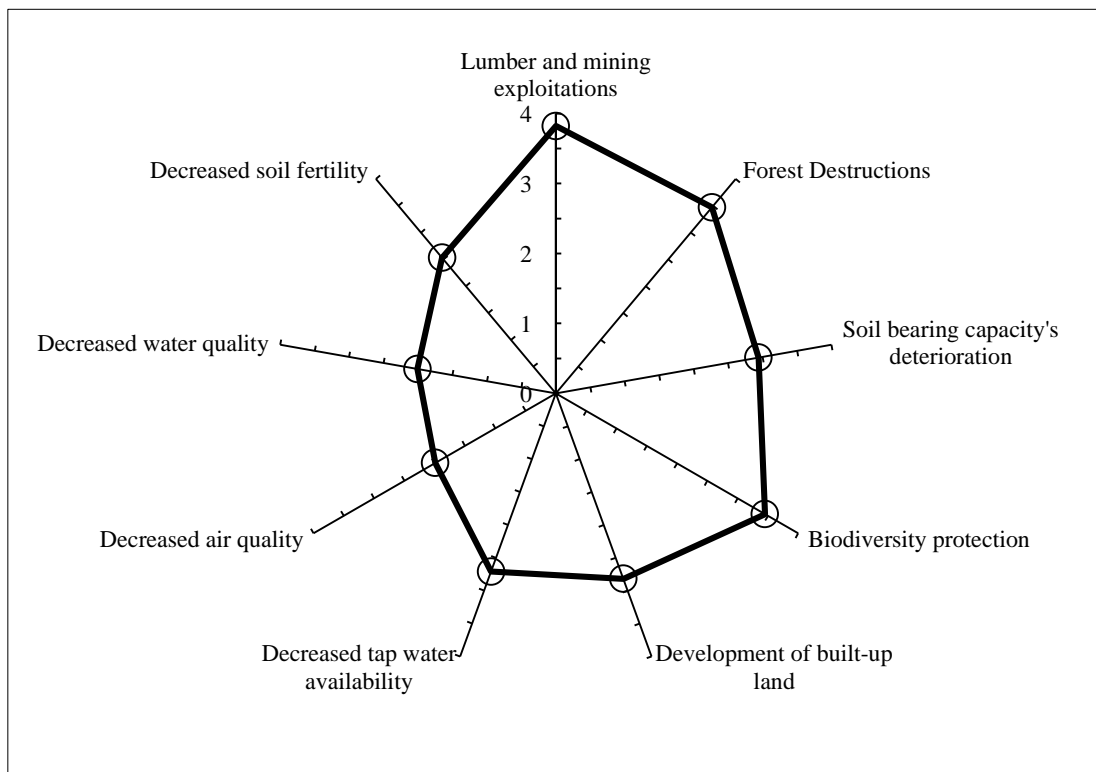


Figure 9. Average perception with indicators of environmental aspects

At an elevation of 1,000 to 3,300 meters above sea level, the *Nothofagus* forest may be found in Lorentz National Park. It is a source of life for the local indigenous peoples, who utilize it for building materials, sege (farming tools), wooden fences, spears, bows, and bridge construction materials. The die-back occurrence is suspected to have been caused by the construction of the Trans Papua road, according to an IUCN reactive monitoring expedition conducted in 2013. (Figure 9). In addition, the reduced/reduced surface of Lake Habbema is one of the issues that is thought to be influenced by the construction of the Wamena–Habbema–Kenya toll road. This lake plays a central role in supporting the sustainability of the hydrological cycle and regional ecosystems. The construction of the Trans Papua segment for the Wamena–Habema–Kenya segment has also opened up highland peat which is usually passed by water flows to Lake Habema.

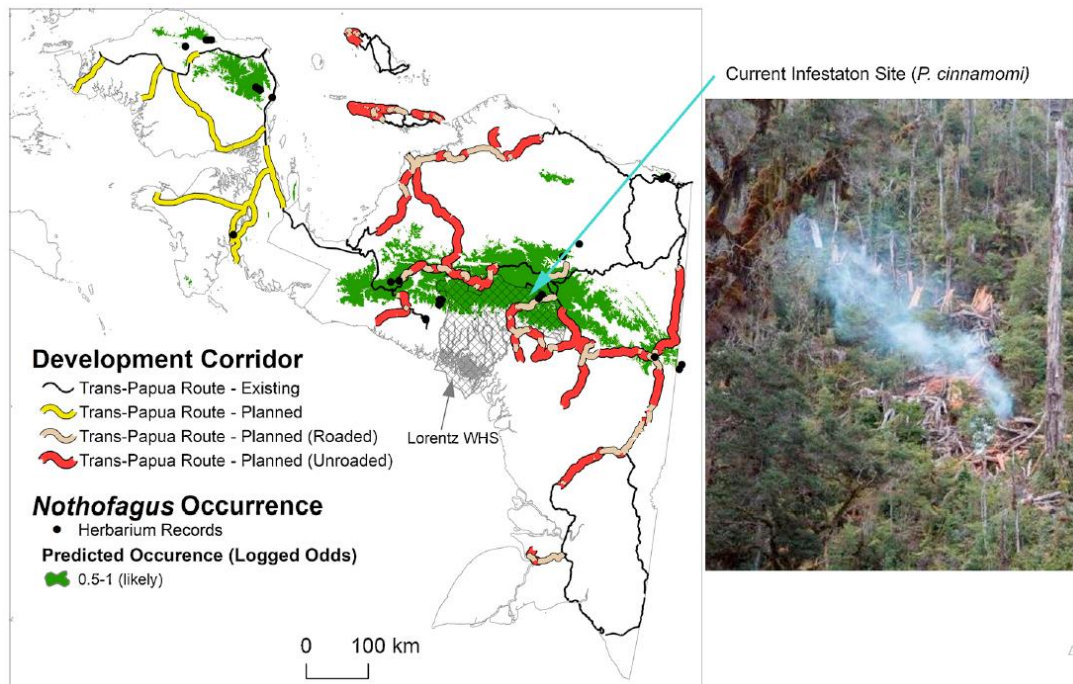


Figure 10. Probability of damage to *Nothofagus* in Lorentz National Park

The Papua New Guinea Province is experiencing a decline in the Land Cover Quality Sub-Index, according to the Environmental Quality Index. The province was able to achieve an annual index average of 97 points from 2012 to 2014, but the annual index average dropped to 79 points from 2015 to 2017 [15]. Aerial views of vegetation cover variations in Tanah Papua over the last 17 years [18, 19] confirm what the Land Cover Quality Sub-index shows. The status of forest cover in 2001 was substantially different from the level of tree cover in 2017. In the last four years of satellite photographs, the reddish dots indicating the steady loss of forest cover have become increasingly visible. This is especially true in places along the national highway and the Trans-Papua highway network. The rising need for wood to build houses for villages – both OAP and non-OAP – intensifies logging and, in particular, timber sales. Previously, logging was only done up to the Pelebaga District, according to inhabitants' information. However, as road access improves, logging operations move closer to Lake Habema. There used to be a forest on the hill behind Hitelowa and Welilimo villages, but it's now gone, and people are returning to Habema for wood.

5. Conclusion

With the building of the Trans Papua road infrastructure in Nduga Regency's Wamena-Habema-Kenyan-Mumugu segment, which is connected to the Wamena-Jayapura, Enarotali-Wamena, and Kenyan-Dekai-Oksibil highways, transportation connectivity has improved, resulting in a higher public consumption index and more efficient logistical delivery of basic and needed products. With increased access and movement of people, commodities, and services, the social circumstances of the community have altered. This is one of the immediate benefits of boosting the local economy.

In general, the construction of the Trans Papua road is thought to have a negative impact on environmental aspects, particularly indicators of natural resource exploitation (timber and mining), damage to the Lorentz National Park's *Nothofagus* forest, biodiversity protection, and a reduction in land carrying capacity. From a socio-cultural perspective, the existence of the Trans Papua road is thought to have a detrimental impact on the marginalization of OAP and create changes in people's livelihoods. On the other hand, it has a favorable influence on enhancing access to service centers, lowering poverty, and raising HDI and life expectancy. Meanwhile, from the economic aspect, the Trans Papua road is considered capable of increasing the local economy and people's income, as well as having an impact on reducing logistics costs.

6. Declarations

6.1. Author Contributions

Z.K., M.Y.J., M.S.P., and M.I.R. contributed to the design and implementation of the research, to the analysis of the results and to the writing of the manuscript. All authors have read and agreed to the published version of the manuscript.

6.2. Data Availability Statement

The data presented in this study are available in the article.

6.3. Funding

The authors received no financial support for the research, authorship, and/or publication of this article.

6.4. Conflicts of Interest

The authors declare no conflict of interest.

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