

# Public Perceptions of Socio-Cultural and Environmental Aspects of Trans Papua Development - Indonesia

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**Abstract**— The development of infrastructure for public and social facilities, such as road infrastructure, has an effect on improving people's welfare, so that inequality in development between regions is an important concern and priority for infrastructure development in Papua. Public perceptions and participation in the physical realization of infrastructure development need to be input and consideration in the planning, implementation and supervision of the Trans Papua road construction. The existence of the construction of the Trans Papua road has not been fully welcomed with support, drawing a lot of criticism from various circles of society. The lack of citizen involvement and the unknown perception of the public in planning and implementing the construction of the Trans Papua road are suspected of causing resistance and conflict. This research was conducted to find clarity of local society wisdom that can be used as the basis for developing a participatory development approach. The research question is how the public's perception of the construction of the Trans Papua road is viewed from the socio-cultural and environmental aspects. It is found that there are differences in perceptions and understanding between local societies and stakeholders in the construction of the Trans Papua road, requiring public involvement in planning and implementing development activities. This is an effort to minimize conflicts between the public and the government, especially those related to protected forest conservation, public empowerment issues, as well as technical issues in road construction.

**Keywords**— Road Infrastructure, Local Wisdom, Public Perception, Participation.

## I. INTRODUCTION

Regional infrastructure development affects the welfare of the public, improving the quality and mobility of people and goods. Infrastructure development in Papua has received special attention from the central government to open access to transportation for increasing social and economic activities of the public to the interior which has been built since 2014 until now. The Trans Papua road segment passes through Lorentz National Park (NP), which is in the world's spotlight because it is threatened with being on the in-danger list based on a report from the International Union for Conservation Nature (IUCN). Lorentz National Park is a World Heritage Natural Site awarded by the UNESCO World Heritage Committee in 1999 through letter No. WHC/74/409.1/NL/CS/1999. Many challenges and obstacles are faced in the field, ranging from security, socio-cultural issues, to environmental problems [1].

Road construction requires consideration of various aspects such as economic aspects, infrastructure and public support [2], [3]. Public involvement in road construction is very important to note, because the public is the target and recipient of the impact of development and at the same time plays a role as the subject of development implementation [4].

The many interests in the infrastructure development of Trans Papua have given rise to various conflicts. An approach that is too economic-oriented is not in line with the expectations and views of the OAP 'Papuan natives' who are still culture and environmental-oriented [5]. Evicted forest

areas affect OAP's traditional territories, places for social interaction, threats to public life with loss of livelihood sources and cultural sites as OAP's identity will become extinct.

The public assumes that the planning and construction process for the Trans Papua road has not involved the OAP community, so there have been many incidents, criticisms and they feel that the Papuan people are only objects of development. Allegations or hypotheses that the low involvement of indigenous peoples and OAP in communication and decision-making processes for the construction of the Trans Papua Road will affect the socio-cultural and environmental changes of OAP. In terms of social aspects, the forest becomes a place of interaction between members of the community, and social contact both verbally and physically which marks evidence of close social ties between communities. The development of Trans Papua is believed to eliminate this culture.

Development that gives rise to various perceptions is a process by which individuals organize and interpret their sensory impressions in order to give meaning to their environment [6]–[8]. Everyone's perception is different, depending on aspects that exist within the individual, such as experience, thinking ability, frame of reference and others. Robbins [6] suggests that there are 3 factors that can influence people's perceptions, namely, perceptual actors, targets or objects, and situations.

Public perception of road infrastructure development can be seen from the aspect of information and transparency of development, changes in activities and environmental impacts

[9]–[12]. This aspect is a reflection of several phenomena that occur in the public related to the construction of the Trans Papua road. According to Robbins [6] positive perception is an individual's assessment of an object or information with a positive view or as expected from the perceived object or from existing rules, on the contrary negative perception will give a negative view, contrary to what is expected from the object being perceived or from existing rules.

A person's negative perception can arise because of individual dissatisfaction with the object that is the source of his perception [8], [13]. The existence of individual ignorance and the absence of individual experience of the perceived object and vice versa, the cause of the emergence of a person's positive perception is due to individual satisfaction with the object that is the source of his perception, individual knowledge, and individual experience of the perceived object [12].

Challenges like this give a signal that attention is needed on how the perceptions and aspirations of the local society can influence the realization of the development of Trans Papua [1]. This is important to do to adopt the values of local wisdom of the public so that it can be used as the basis for developing a participatory development approach. This study identifies how important issues and perceptions of the public in an area are affected by a road construction project. The purpose of this research is to find out how the public perceives the construction of the Trans Papua road.

II. METHODOLOGY

The locus of research is the Wamena – Habema – Kenyam road with a road length of 271 km located in Nduga Regency, Papua Province as shown in Fig. 1.

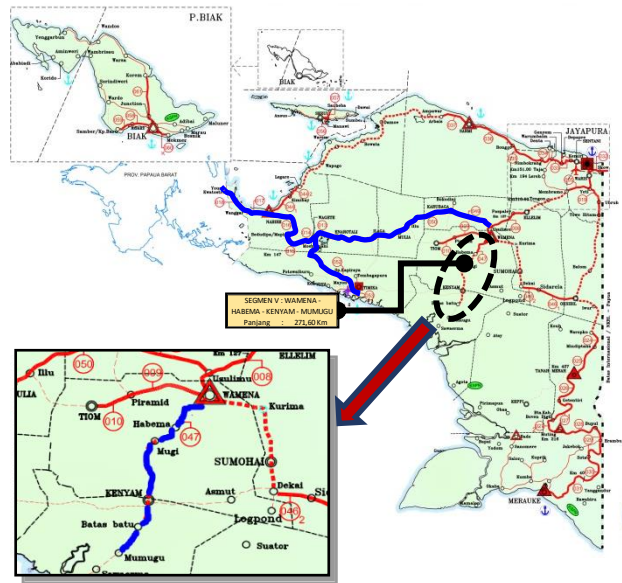


Fig. 1 Trans Papua Segment Wamena – Habema – Kenyam – Mumugu

The collection of road condition data (geometric and structural) is sourced from the Wamena National Road Implementation Center (NRIC), Central Bureau of Statistics of Nduga Regency and related references, while primary data is based on observations, field interviews (in dept interview) and focus group discussions with relevant stakeholders both

directly or indirectly with the development of Trans Papua in Nduga Regency.

Stakeholders who make up the population are very diverse and infinite population. The sample size is 105 people using a confidence level of 90%-95%. Stakeholders who became respondents included: 1) community elements including the OAP ‘Papuan natives’, migrant communities and/or non-Papuan ethnic groups (Javanese, Buton, Bugis, Makassar and Toraja), mixed communities (OAP with non-Papuans), tribal leaders La Pago. 2) Government elements (central, provincial and Nduga regency). 3) Elements of entrepreneur/private sector (mining and timber). 4) The implementers involved (Wamena National Road Implementation Center, National Park Manager. Lorentz, and the Contractors). 5) Academics or experts (transportation, environment, economics, sociology and anthropology). Distribution of respondents are shown in Table 1 and Fig. 2.

Stakeholders who become respondents have different characteristics; these differences will enrich opinions and perceptions of the construction of the Trans Papua road from various aspects. The process of collecting stakeholder perception data is carried out through in-dept interviews (IDI) and focus group discussions (FGD). The respondent's profile is described in Table 1.

TABLE I  
PROFILE OF RESPONDENTS

Respondents		%
Gender	Male	73
	Female	27
Age (year)	30 – 40	13
	41 – 50	39
	51 – 60	29
	> 61	19
Education	Senior High School	25
	S1 (Strata One)	41
	S2 (Magister)	20
	S3 (Doctor)	14

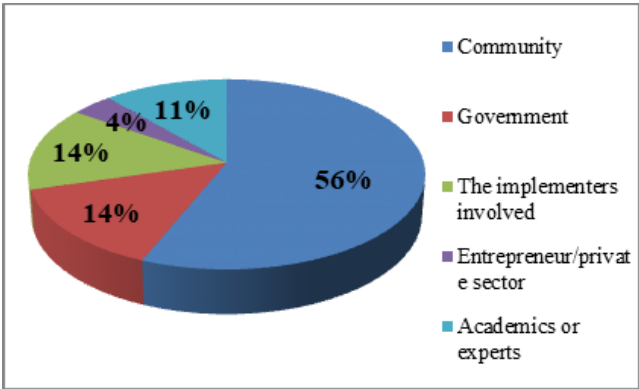


Fig. 2 Distribution of Respondents

The analytical method used is descriptive quantitative. Measurements were made using a Likert scale, namely 5 = very influential, 4 = influential, 3 = moderately influential, 2 = less influential, 1 = not influential. Measurement of perception through the stages of making a contingency table to determine the frequency of answers from stakeholders [14].

Aspects that become elements of the assessment are socio-cultural, and environmental aspects. The socio-cultural aspects include indicators of accessibility, HDI, poor population growth, changes in livelihoods, marginalization of OAP, life expectancy, population growth, the value of indigenous peoples' wisdom, open unemployment rate and, behavior towards infrastructure availability. Environmental aspects include indicators of exploitation of natural resources (NR), damage to Lorentz National Park (NP), land carrying capacity, protection of biodiversity, and development of built-up land, availability of raw water, quality of air, water, and peat soil.

III. RESULTS AND DISCUSSION

A. The Condition and Function of the Trans Papua Road

The Trans Papua Road is a national road that stretches from Sorong City in West Papua Province to Merauke in Papua Province with a length of 3,421 km which is divided into 2,351 km in Papua Province and 1,070 km in West Papua Province. Of the total length of the 1,746 km Trans Papua road, it is in the area of the Wamena National Road Implementing Agency (NRIA), while the remaining 605 km is in the Jayapura NRIA area.

The condition of the Trans Papua road in 2021 which is in the area of the Wamena National Road Implementing Agency (NRIA) is in the form of 616 km of asphalt construction, 1,120 km of Japat construction, 103 km of land construction and 10 km of still forest (NRIA Wamena, 2022). Typical road characteristics and handling of the Trans Papua road for each road segment are shown in Fig. 3 and 4.

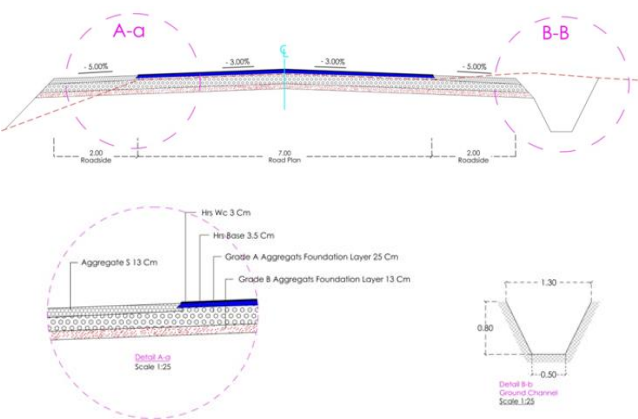


Fig 3. Typical Wamena – Habema – Kenyam – Mumugu Road

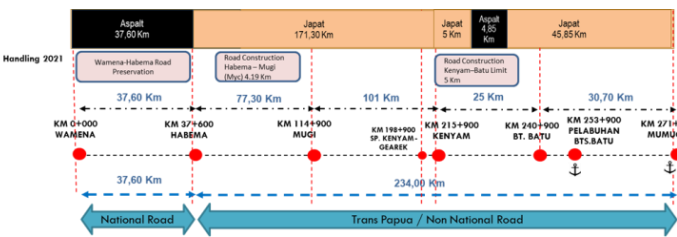


Fig. 4 Handling of the Wamena – Habema – Kenyam – Mumugu Road

The Trans Papua road was opened in 1997 but construction began in 2014, such as asphaltting, building bridges and handling landslides on the road (Fig. 5).



Fig 5 Comparison of the Trans Papua road from 2014 and 2020

There is an increase in transportation connectivity experienced by the community directly [15]. Improved access to transportation services to all basic facilities in the form of health, education, trade facilities. Previously, access to traditional markets was about 4-5 hours on foot, now by taxi (figure 6) at a cost of IDR 20,000 per person or ojek at a cost of IDR 50,000 per person with duration of 15-30 minutes. The distribution of agricultural commodities out of the country and vice versa for commodities that enter Nduga Regency is smooth and prices have decreased compared to before Trans Papua, the public consumption index has also increased with a large variety of goods that can be purchased.



Fig. 6. Taxis transporting passengers and goods (Documentation: Sigit Arifianto)

B. Social Conditions of the Community of Nduga Regency

Nduga Regency is classified as a disadvantaged area according to Presidential Regulation No. 63 of 2020 together with 22 other districts in Papua Province. Basically underdeveloped areas have great natural resource potential, but the community has not been able to optimize for daily life due to isolation and limited access to public services, low human resource capacity, limited access to financial institutions, markets and economic activities, low accessibility and connectivity to growth centers, lack of understanding of sustainable asset and natural resource management, and lack of attention to local social and cultural characteristics.

Prior to the construction of the Trans Papua road, the Nduga community were geographically isolated, and could only be reached by airplane with a limited frequency. The daily needs of basic goods are transported by plane so that the prices of basic goods and essential goods become irrational according to the reality of the people in Nduga Regency. In 2020, there are around 106,533 residents spread across 32 districts [16], the total workforce is 70,771 people with an open unemployment of 658 people and the majority of educated people have not finished elementary school.

Economically, the income level of the public is far below the poverty line. Before the Trans Papua road was built, the



majority of the people worked in the agricultural and plantation sectors by relying on an agricultural system that had been managed for generations as well as processing plantation commodities, cutting wood, selling pigs and hunting for forest products. Increased connectivity due to road construction has changed people's economic activities and community orientation by using forest products to be sold outside Nduga to increase income. In addition, it makes it easier for people of productive age to temporarily migrate to cities to look for more decent jobs in Wamena and Jayapura.

The average monthly expenditure of the Nduga community in 2020 reached IDR 1,462,880 or approximately IDR 48,000,- per day. This figure is dominated by spending on food consumption by 61% while the rest is non-food consumption. Food commodities for the largest expenditure are grains, while for non-food expenditures are housing and household facilities [16].

The infant mortality rate is very high reaching 31 deaths in 2015 and is thought to be due to poor services [5]. The existence of Trans Papua infrastructure, especially in the Wamena-Habema-Kenyam-Mumugu segment, at least has an impact on increasing productivity and connectivity. Connections between villages and districts within the district facilitate basic services which have an impact on increasing the life expectancy of the community from 54.82 in 2018 to 55.27 in 2020.

### C. Stakeholder Perception of Trans Papua Development

#### 1) 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. Infrastructure development is believed to change human behavior/culture which is closely related to the environment (cultural ecology). Cultural changes will encourage new patterns in exploring and exploiting their natural surroundings [5].

Based on this view, the perception of the OAP community and the La Pago traditional leaders in Nduga Regency assumes that Trans Papua is very different from its current culture, where the forest is the existence of the cultural identity of the indigenous Papuan people and a source of livelihood. In contrast to the views of the migrant community, non-OAP, academics, government, involved implementers, and entrepreneurs tend to be moderate, they judge that they are quite influential on socio-cultural change.

The construction of the Trans Papua road is considered to have a significant effect on the marginalization of OAP, changes in livelihoods, accessibility to service centers, and the open unemployment rate. Indicators of HDI growth, growth of the poor, and life expectancy are considered quite influential, while indicators of the value of indigenous peoples' wisdom and behavior on infrastructure availability are considered less influential.

From a social perspective, the clearing of forest land for road construction is considered by the OAP community and

customary leaders to damage sites for traditional cultural rituals. Forests are sacred areas used to carry out traditional rituals and accessories, including origin stories and history that have direct or indirect linkages with customary areas. From a socio-cultural perspective, the slightest cultural change will greatly affect the life of the Papuan (customary) people. This condition has caused OAP and the community to view the Trans Papua Road as a catalyst for ecological change that has disrupted the life of the Papuan people in Nduga Regency.

In general, the average value of stakeholder perceptions for socio-cultural indicators on the construction of the Trans Papua road is considered to be quite influential, especially for OAP, as shown in Fig. 7.

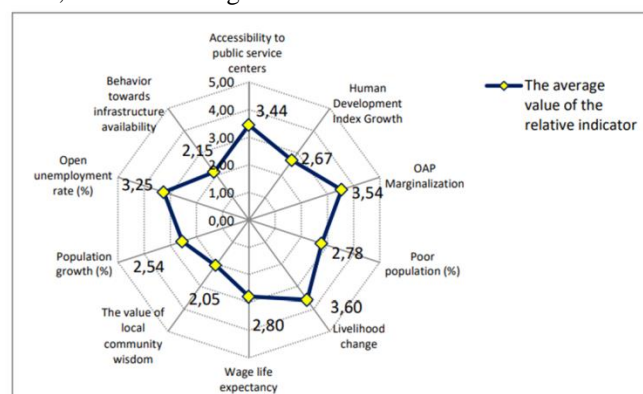


Fig. 7 Average perceptions of socio-cultural indicators

The public health situation through morbidity which is defined as health complaints causing disruption of daily activities in Papua Province has decreased consistently from 23% in 2012, down to 16% (Central Bureau of Statistics, 2021). The decrease in the poor population from 38.47% in 2016 to 36.82% in 2020. The HDI increased from 26.56 in 2016 to 31.55 in 2020. Life expectancy increased from 54.82 in 2018 to 55.27 in 2020. Likewise, the open unemployment rate decreased from 1.71 to 1.03 In 2019. Increased connectivity is used by OAP to access health services at Community Health Centers, increasing the effect of free Public Health Center services because more residents come for treatment directly to Community Health Centers with various complaints such as colds, coughs, aches and dizziness.

#### 2) Environmental Aspect

The environmental aspect is closely related to the socio-cultural and economic aspects of the OAP community. Forest is a place to socialize, and earn a living. The fact is that most of the Papuan people who live in villages and hinterlands in the form of forests that still have a lot of forest economic potential are planted with various tubers, sago and to be used as natural 'cages' for domesticated animals such as pigs. The perspective of the OAP community and indigenous peoples about forests and the changes that will occur due to the construction of the Trans Papua road that sudden ecological changes will create a culture shock for the Papuan people, especially those who live in villages and hinterlands. It is necessary to anticipate environmental changes to be in tune with the process of adapting the culture of OAP [12], [17].

In addition, Trans Papua stretches across Lorentz National Park which is in the world's spotlight because it is threatened with being on the in-danger list based on a report from the International Union for Conservation Nature (IUCN). There are 9 (nine) important indicators that need to be observed, including the exploitation of timber and mining, the extinction of the *Nothofagus* forest, the receding water level of Lake Habbema as a raw water source, and the reduction of highland peat.

There are differences in the views of stakeholders regarding the development of Trans Papua from the environmental aspect. The OAP community and La Pago traditional leaders consider it influential. Academics, non-OAP communities, and migrant communities consider it quite influential. These stakeholders are of the opinion that the construction of the Trans Papua road has the potential to cause excessive exploitation, forest destruction, and a decrease in the carrying capacity of the land. For the government, the entrepreneurs and implementers involved consider it less influential because environmental aspects can be overcome as long as maintenance and law enforcement is carried out.

The construction of the Trans Papua road is considered to have an effect on indicators of exploitation of natural resources (timber and mining), damage to the *Nothofagus* forest in Lorentz National Park, and protection of biodiversity. For indicators of decreasing land carrying capacity, development of built-up land, reduced availability of raw water, degradation of peat soil quality, it is considered quite influential. Meanwhile, indicators of decreasing water quality and decreasing air quality are considered less influential.

In general, it can be concluded that the construction of the Trans Papua road is considered to have a negative effect on environmental aspects. Environmental indicators that affect the construction of the Trans Papua road are shown in Fig. 8.

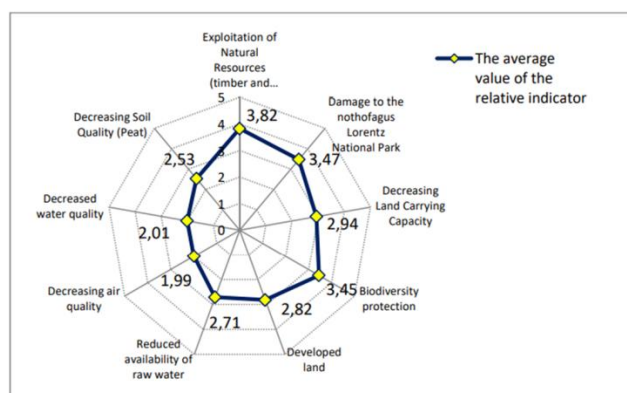


Fig. 8 Average perceptions of environmental indicators

At the Lorentz National Park location, there is the *Nothofagus* forest at an altitude of 1,000 to 3,300 meters above sea level, for local indigenous people it is a source of life to be used as building materials, sege (farming equipment), wooden fences, spears, bows, and bridge construction materials. Based on the reactive monitoring mission carried out by IUCN in 2013, the die-back incident is thought to have been caused by the construction of the Trans Papua road (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 – Kenyam 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 – Habbema – Kenyam segment has also opened up highland peat which is usually passed by water flows to Lake Habbema.

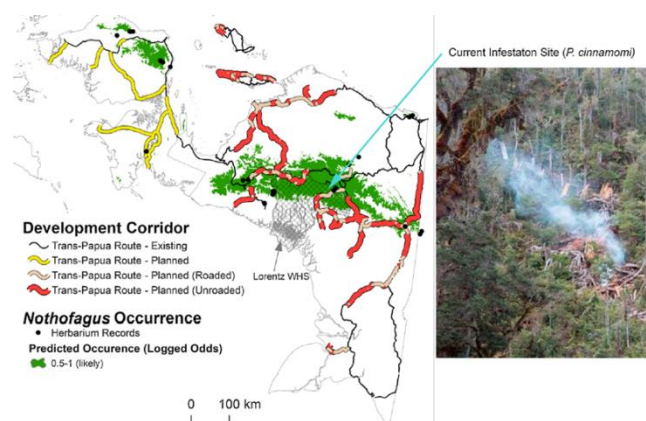


Fig. 9 Probability of *Nothofagus* damage in Lorentz National Park [1]

Based on the Environmental Quality Index, Papua Province is facing a setback in the Land Cover Quality Sub-Index. In the 2012-2014 periods, the province was able to record an annual index average of 97 points, but in 2015-2017, the annual index average declined to reach 79 points [15]. What is shown by the Land Cover Quality Sub-index is confirmed from satellite photos that map tree cover changes in Tanah Papua in the last 17 years [18]. The state of the tree cover captured in 2001 is very different from what was photographed in 2017. The reddish spots showing the gradual loss of forest cover have seen more and more in the last four years of satellite photos. This is significant in areas that are on the national road route and the Trans-Papua road network. The increasing demand for wood to build houses for villagers – OAP and non-OAP – increases the intensity of logging, especially the sale of timber. In Habbema, according to residents' information, previously, logging was carried out only up to the Pelebagia District. However, as the road access opens, logging is carried out further towards Lake Habbema. The hill behind Hitelowa and Welilimo villages used to be a forest, but now it's gone and people are going back up to Habbema to get wood.

#### 4. CONCLUSION

There has been an increase in transportation connectivity with the construction of the Trans Papua road infrastructure in Nduga Regency in the Wamena - Habbema - Kenyam - Mumugu segment, which is connected to the Wamena - Jayapura, Enarotali - Wamena, Kenyam - Dekai - Oksibil roads. Increased public consumption index and smooth logistics distribution of basic and important goods. The social conditions of the community have changed with the increase in access and mobility of people, goods, and services. This is one of the direct impacts of improving the community's economy.

In general, the construction of the Trans Papua road is considered to have a negative effect on environmental

aspects, especially indicators of exploitation of natural resources (timber and mining), damage to the nothofagus forest in Lorentz National Park, and protection of biodiversity and a decrease in land carrying capacity. From the socio-cultural aspect, the existence of the Trans Papua road is considered to have a negative effect on the marginalization of OAP and causes changes in people's livelihoods; on the other hand it has a positive impact on improving accessibility to service centers, reducing poverty and increasing HDI and life expectancy.

## REFERENCES

- [1] S. Sloan *et al.*, "Hidden challenges for conservation and development along the Trans-Papuan economic corridor," *Environ. Sci. Policy*, vol. 92, pp. 98–106, Feb. 2019, doi: 10.1016/J.ENVSCI.2018.11.011.
- [2] G. R. Clements *et al.*, "Where and How Are Roads Endangering Mammals in Southeast Asia's Forests?," *PLoS One*, vol. 9, no. 12, p. e115376, Dec. 2014, doi: 10.1371/JOURNAL.PONE.0115376.
- [3] M. Alamgir *et al.*, "Economic, Socio-Political and Environmental Risks of Road Development in the Tropics," *Curr. Biol.*, vol. 27, no. 20, pp. R1130–R1140, Oct. 2017, doi: 10.1016/J.CUB.2017.08.067.
- [4] W. F. Laurance and I. B. Arrea, "Roads to riches or ruin?," *Science (80-. )*, vol. 358, no. 6362, pp. 442–444, Oct. 2017, doi: 10.1126/SCIENCE.AAO0312/SUPPL\_FILE/AAO0312-LAURANCE-SM.PDF.
- [5] E. A. A. Mote, "Dinamika Ekologi-Budaya Masyarakat Nduga di Jalur Trans Papua (Nduga – Wamena) 1," pp. 1–13, 2017.
- [6] S. P. Robbins, *Perilaku Organisasi, Konsep, Kontroversi, dan Aplikasi Terjemahan*. PT. Prenhallindo, 2001.
- [7] M. Indrawan, J. Caldecott, and Ermayanti, "Mitigating Tensions over Land Conversion in Papua, Indonesia," *Asia Pacific Policy Stud.*, vol. 4, no. 1, pp. 147–157, Jan. 2017, doi: 10.1002/APP5.157.
- [8] M. Margorínová and M. Trojanová, "Social costs of the road project in the operation phase," *Transp. Res. Procedia*, vol. 40, pp. 1103–1110, Jan. 2019, doi: 10.1016/J.TRPRO.2019.07.154.
- [9] T. Airey, "The impact of road construction on the spatial characteristics of hospital utilization in the Meru district of Kenya," *Soc. Sci. Med.*, vol. 34, no. 10, pp. 1135–1146, May 1992, doi: 10.1016/0277-9536(92)90287-Z.
- [10] S. Sloan *et al.*, "Infrastructure development and contested forest governance threaten the Leuser Ecosystem, Indonesia," *Land use policy*, vol. 77, pp. 298–309, Sep. 2018, doi: 10.1016/J.LANDUSEPOL.2018.05.043.
- [11] X. Zhang, G. Wan, and X. Wang, "Road infrastructure and the share of labor income: Evidence from China's manufacturing sector," *Econ. Syst.*, vol. 41, no. 4, pp. 513–523, Dec. 2017, doi: 10.1016/J.ECOSYS.2017.08.001.
- [12] H. L. Khoo and M. Ahmed, "Modeling of passengers' safety perception for buses on mountainous roads," *Accid. Anal. Prev.*, vol. 113, pp. 106–116, Apr. 2018, doi: 10.1016/J.AAP.2018.01.025.
- [13] J. Gomez, A. Papanikolaou, and J. M. Vassallo, "Measuring regional differences in users' perceptions towards interurban toll roads," *J. Transp. Geogr.*, vol. 54, pp. 22–33, Jun. 2016, doi: 10.1016/J.JTRANGE.2016.05.001.
- [14] R. Oktora, "Persepsi Masyarakat Terhadap Pembangunan Jalan Lingkar Utara Kota Solok Provinsi Sumatera Barat," 2011.
- [15] T. A. F. & I. I. of S. LIPI, "Jalan Untuk Komunitas : Membangun Infrastruktur Konektivitas Jalan Untuk Penghidupan Orang Asli Papua," 2018.
- [16] "Badan Pusat Statistik Kabupaten Nduga." <https://ndugakab.bps.go.id/publikasi.html> (accessed Feb. 20, 2022).
- [17] M. Hamersma, E. Heinen, T. Tillema, and J. Arts, "The development of highway nuisance perception: Experiences of residents along the Southern Ring Road in Groningen, The Netherlands," *Land use policy*, vol. 61, pp. 553–563, Feb. 2017, doi: 10.1016/J.LANDUSEPOL.2016.12.008.
- [18] G. F. Watch, "Balancing Development and Forest Protection in Papua | World Resources Institute." <https://www.wri.org/insights/balancing-development-and-forest-protection-papua> (accessed Feb. 20, 2022).