An Inclusive Transportation for Iraya-Mangyan IP in Accessing Social Infrastructure using Scalogram Analysis

Junekaycelle Aubrey Grace N. Carillo
Mapua University, Mandaluyong City, Philippines
jagncarillo@mymail.mapua.edu.ph

Frances Dale Danielle F. Dadiz
Mapua University, Bulacan, Philippines
fddfdadiz@mymail.mapua.edu.ph

Samantha Nicole T. Regala
Mapua University, Laguna, Philippines
sntregala@mymail.mapua.edu.ph

Geoffrey L. Cueto
Mapua University & MES Construction, Quezon City, Philippines
glcueto@mapua.edu.ph

Abstract

Indigenous people (IP) were the first residents who originally lived and hosted their represented nations or domains. Therefore, these natives were initially acknowledged as the first individuals, meaning they were included in the country's population and must be prioritized over the rest of the civilians, considering they were part of the country's history. However, despite being a small population, most of these individuals were poor and illiterate. In addition, they were unable to catch up with those normal citizens living in the modern world because of not being socially identified in institutional industry, being discriminated against due to their origins, and being deprived of social support like access to education, transportation, hospital, and other essential facilities. This research sought to study the quality-of-life Iraya-Mangyan IPs had and the present conditions in their inhabited area to determine how they lived their everyday lives and how they moved around their domain. By conducting this study, the proponents found no inclusive transportation and comprehensive social support infrastructure available and accessible for Iraya-Mangyan IP, and thus, the transportation system was insufficient and defective.

Keywords: Indigenous People (IP); Inclusive transportation, Social infrastructure, Scalogram Analysis

1. Introduction

Indigenous people (IP) were the first residents who originally lived and hosted their represented nations or domains. There were also distinct kinds of indigenous people worldwide or even within a country. Indigenous people (IP) or also known as natives, first populace, aboriginals were one of the minority population groups characterized by shared history with pre-colonial cultures, strong attachment to their heritage, beliefs, motherland, natural resources, linguistic, and other significant to them (United Nations, 2021). Therefore, these natives were first acknowledged as the first individuals, meaning they were part of the country's population and must be prioritized over the rest of the civilians, considering they were part of the history. However, despite being a small population, most of these individuals were poor and illiterate. According to the United Nations Development Programme (2010), even with some policies and

programs for indigenous people and their ancestral domains, they were still part of the country's poorest and most deprived individuals (United Nations Development Programme, 2010).

The most prominent Philippine indigenous groups were from the mountains of northern Luzon, called Igorot IPs. At the same time, the ethnic groups in southern Mindanao were also known as Lumad IPs (International Work Group for Indigenous Affairs, 2021). There were also smaller groups like the Mangyan IPs in the central islands, Magbukun Ayta IPs in Bataan, Kalanguya IPs of Nueva Vizcaya, Tongrayan IPs of Kalinga, and others. However, this research aimed to study the indigenous people from the central islands, which were the Mangyan IPs, particularly the Iraya-Mangyan IPs. Mangyan was the umbrella term for the eight tribes, which were Iraya, Alangan, Tadyawan, Tawbuid, Buhid, Hanunuo, Ratagnon, and Bangon. Each had its own separate language and traditions, yet, such features belonged to the Iraya-Mangyan, the richest cultural tribe among the Mangyans (Pomelo, 2020).

Researchers chose Mangyan IPs as they were less popular than other ethnic tribes, like Igorot IPs. Likewise, Iraya-Mangyan was the most prominent compared to the rest of the Mangyan tribes. Additionally, the research study would be conducted on Sitio Calomintao, Alacaak, in Santa Cruz, Occidental Mindoro, the motherland of the Mangyan tribes. The criteria for choosing the research location were based on where the enormous number of indigenous people lived and must be far from the urban areas.

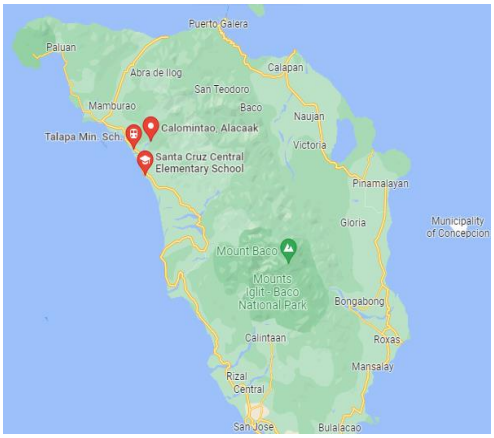

Fig. 1: Location Map of Mindoro, Philippines (Google Maps, 2023)

Indigenous people were left behind in the era of the modern world, which has rapid, advanced, and refined technologies and infrastructures. Other than their strong attachment to the land, they were born on and the nature around it, indigenous people struggle to adapt to non-indigenous people's modern way of life. This was because they were not socially identified in institutional industry, discriminated against due to their origins, and deprived of access to education, transportation, hospital, and other essential facilities. Indigenous people in the Philippines have always been subject to historical prejudice and marginalization from political circles and economic advantages (United Nations Development Programme, 2010).

Additionally, previous studies reveal the shortcomings of different governments in providing inclusive access to basic life processes and necessities for the Indigenous People. These are access to health care (Bjerregaard, Petersen & Larsen, 2018; Burnett, et al. 2020), protection of the environment (Camargo, Winchenbach, & Maguirre, 2022), preservation of culture and heritage (Muir, 2022), lack of representation in policymaking (De La Cruz, et al., 2020), and little to no access to innovative education systems (Li, Brar, & Roihan, 2021). A research study was also conducted in Africa that studied the experiences and cases of older people residing in its cities, as they are one of those

population groups often neglected in terms of transportation access and livelihood support (Wignall, et al., 2019). This meant that even older people were deprived of those social supports; what more, the indigenous people who also composed of elders.

The actual case was the Mangyan IPs, who have lived their entire lives in the mountains or at the foot of the hills, far from the nearest urban areas. This also meant they struggled to travel to urban areas and access transportation, health care, technology, etc., as they were surrounded only by nature, and there was little to no progress and encouragement from local governments. Furthermore, some remote areas like mountains or islands in the Philippines were not easily accessible as there was still little to no transportation infrastructure available in those places. That was why researchers sought to examine the chosen respondents' domains to help and provide them access to social infrastructures, which normal people living in the city always had and acquired.

The study's main objective was to develop the components and approaches to how inclusive transportation will help indigenous people. This aimed to propose a feasible and sustainable Inclusive Transportation for Iraya-Mangyan IP in Accessing Social Infrastructure using Scalogram Analysis. Specifically, this research intended to:

1. Assess the present condition and quality of life of the Iraya-Mangyan indigenous people in terms of:

    1.1 Education
    1.2 Employment and Livelihood
    1.3 Health
    1.4 Social Relations

2. Analyze the condition of the area inhabited by the Iraya-Mangyan indigenous people, particularly:

    2.1 Geographic features
    2.2 Accessibility
    2.3 Mobility
    2.4 Available Modes of Transportation
    2.5 Nearest Urban Area

3. Determine the requirements set by the governing bodies, as well as the practical and social significance of constructing a social support infrastructure and system for the Iraya-Mangyan indigenous people, particularly of:

    3.1 Mode of Transportation
    3.2 Type of Transportation Infrastructure

4. Assess the most feasible, suitable, and sustainable social support infrastructure and system to propose for the Iraya-Mangyan indigenous people, with respect to their demography

2. Methodology

The theoretical framework intended to produce a more precise depiction of the research study's scope in which guided data collection. The variables presented in this study are education, employment and livelihood, health, environment, and social relations.

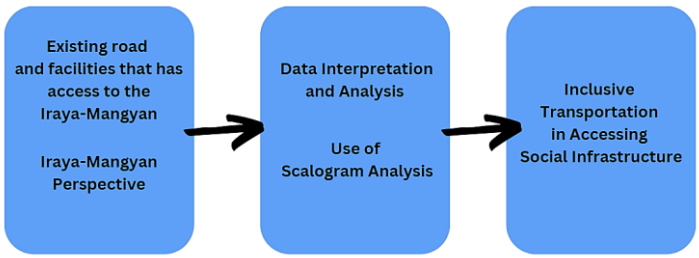

Fig. 2: Framework of the study

The research design refers to the overall strategy that one might choose to integrate the different components of the study coherently and logically. The researchers utilized qualitative method in analyzing the current condition of the target population by using a scale to know the factors that greatly affect their daily lives. On the other hand, the data collected from the scale analysis was treated quantitatively by computing the coefficient of likeability. This allowed the researchers first to describe the existing condition and correlate it to investigate how the difference of one variable affected the variation of the other. In this research, a survey was used because it involved respondents and questionnaires to provide answers to the problems related to the study, specifically on the following aspect:

1. Education – access to educational establishments, means of transportation going to school, and easiness in purchasing school materials.
2. Employment and Livelihood – access to infrastructures that generates employment or cater livelihood activities, having means of transportation going to workplace, and earning sustainable salary.
3. Health – access to health and medical establishments, having a way of transportation going to medical establishments, accessibility of the area for emergency vehicles to enter.
4. Social Relations – feeling of belongingness around people outside of their indigeneity, accessibility of the area for people outside their indigeneity to enter, having means of transportation to go to social activities outside their area.

This study used a convenience sampling technique, a non-probability sampling technique where subjects were selected because of their convenient accessibility and proximity to the researchers. Largely, convenience sampling included the individuals who were most accessible to the researchers. This was an easy and inexpensive way to gather initial data. Still, there was no way to tell if the sample was representative of the population, so it could not produce generalizable results. The sampling design was justified to be selected for this study as the population was not well defined, or there was no accurate data that showed the population of the Iraya-Mangyan people. As of 01 May 2020, the province of Occidental Mindoro had a total population of 525, 354 persons. Of this total, the household population comprised 99.3 percent or 521,444 persons. Based from this 2020 census of population, the 8.07% was the population of the municipality of Santa Cruz (Philippine Statistics Authority, 2022). The sampling size was based on the randomly selected population in the tribe of the Iraya-Mangyan Indigenous People. These sampling techniques focused on recruiting more potential participants that were difficult to locate.

The data gathered in this study would be analysed using the following statistical tools:

- **Simple Percentage** would be utilized to determine the respondents' demographic profile, including sex, age group, educational attainment, and income range. To compute the percentage, the following formula would be utilized:

$$P = F\ 100N$$ where: P = percentage

F = frequency

N = total number of respondents

- **Guttman Scale**, also known as the **Scalogram Analysis**, comprises components that can be sorted hierarchically. It reflects respondents' extreme "attitude," whether they are exceedingly favourable or unfavourable about the topic. The Guttman scale is beneficial because a single answer can predict responses to all items; therefore, it is deterministic. Guttman scale is

depicted by their items' "implicational" or "scalable" nature (Gothwal, et al., 2019).

Guttman Scale would be utilized to determine how likely it was to build a transportation system for the Iraya-Mangyan IP to connect them to the nearest urban area. The scale consisted of twenty questions that were arranged in ascending difficulty order. Participants would be asked to answer positively or negatively to each question. A positive reaction was assessed as a 0 (yes), while a negative response would be counted as a 1 (no). This should follow a Guttman scale because the reply could only potentially affirm the following question after confirming the preceding question (Gothwal, et al., 2019). This was comparable to the likelihood that respondents would agree or disagree with the construction of a road and bridge, given the current state of their daily lives, where the reader should only be able to decide on the next item if he/she had been able to answer the previous item. As a result, responses on a Guttman scale should be able to be separated into two categories, indicating whether a participant "passed" or "failed" an item. The proportion of participants who passed or failed a question was used to create an item hierarchy, which was created by categorizing items from most to least difficult (Gothwal, et al., 2019).

- The **Coefficient of Reproducibility (CR)** was used to validate the Guttman Scale, which measures scalability when instituting a hierarchy using the Guttman Scalogram technique (Jobling, & Snell, 1961). However, instead of calling it the way it was, the researchers used different terminology, **Coefficient of Likelihood (CL)**, which was more fitting to the objectives of the present study. Nevertheless, both coefficients' computation process does not differ much from each other. This value was calculated as one minus the total number of errors divided by the total number of responses. A CL score of higher than 0.90 was regarded as acceptable, indicating that the Guttman scale was both cumulative and unidimensional.

3. Results and Discussion

The compilation of the questionnaire, the results and analysis of the study's qualitative findings, and the results and analysis of the qualitative data were all covered in this chapter. With the help of scalogram analysis, this study sought to propose inclusive transportation for Iraya-Mangyan IP to access social infrastructure.

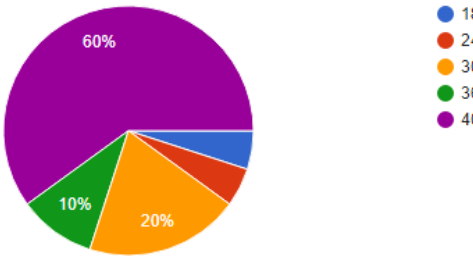

Fig. 3: The Demographic Profile of the Respondents

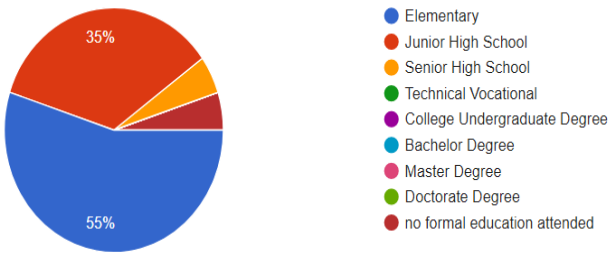

Fig. 4: The Demographic Profile of the Respondents

This figure 3 represented the frequency of the age brackets of Iraya-Mangyan IP. Based on the graph, the majority of the respondents were aged 40-60 years old, followed by 30-35 years old, 36-40 years old, 18-23 years old, and finally, 24-29 years old. Figure 4 shows the frequency of the educational attainment of the Iraya-Mangyan IP. According to the graph, 55% of the respondents finished elementary school, while 35% graduated from high school. A significantly small percentage of the respondents finished senior high school, which had an equal number as those who never attended any formal educational institution.

HEALTH						SOCIAL RELATIONS					
	Statement 3.1	Statement 3.2	Statement 3.3	Statement 3.4	Statement 3.5		Statement 4.1	Statement 4.2	Statement 4.3	Statement 4.4	Statement 4.5
SCORE	16	20	15	14	19	SCORE	6	7	20	7	0
%	0.8	1	0.75	0.7	0.95	%	0.3	0.35	1	0.35	0
RII	0.84					RII	0.4				

EDUCATION						EMPLOYMENT AND LIVELIHOOD					
	Statement 1.1	Statement 1.2	Statement 1.3	Statement 1.4	Statement 1.5		Statement 2.1	Statement 2.2	Statement 2.3	Statement 2.4	Statement 2.5
SCORE	17	19	19	12	18	SCORE	19	19	19	10	20
%	0.85	0.95	0.95	0.6	0.9	%	0.95	0.95	0.95	0.5	1
RII	0.85					RII	0.87				

Fig. 5: Assessment of the status of the Iraya-Mangyan IP using Scalogram Analysis

The figure above shows the scalogram analysis of the data gathered by the researchers from their survey interview for the Iraya-Mangyan IP. A mark of one (1) means that the respondent agreed with the given statement, while a grade of zero (0) 58 means that they disagreed with the statement. Each aspect (education, employment and livelihood, health, and social relations) had a separate tally to assess what was most needed by the respondents regarding each aspect.

The Coefficient of Likeability (CL) is a term derived from Coefficient of Reproducibility (CR), which is often used as a criterion of scalability when forming a scale by the Guttman Scalogram technique (Jobling, & Snell, 1961). The researchers used the same equation as Guttman defined CR.

Definition of Coefficient of Reproducibility

Guttman defines the coefficient of reproducibility to be

$$C_R = 1 - \frac{\text{total number of errors}}{\text{number of items} \times \text{number of persons}}$$

and is thus equal to the overall proportion of responses which can be correctly reproduced. (Jobling, & Snell, 1961).

CL measures the extent to which an observed set of response patterns agrees with that expected to form a perfect scale (CL = 1.0). In connection, a high value of CL indicates a close agreement, which is expected to be at least 0.70. Meanwhile, CL lower than 0.70 indicates that the response pattern is not close to a perfect scale. Table 1 shows the tabulated results of the CL computations done by the researchers.

Table 1: Coefficient and Likeability

	Education	Employment and Livelihood	Health	Social Relation
No. of errors	15	13	16	60
No. of items	5	5	5	5
Coefficient of Likeability	0.85	0.87	0.84	0.4

As observed in the table above, in terms of education, the response pattern of the respondents has a CL of 0.85, meaning that the answers of the sample will most likely be the same as the whole population. In connection, this also shows that there is a difficulty in accessing basic education for the Iraya-Mangyan IP. Moving on to the aspect of employment and livelihood, the computed CL is 0.87, which indicates another close agreement to a perfect scale. In this light, this also shows that there is a crisis in employment and livelihood for the Iraya-Mangyan IP. Meanwhile, the health aspect has a CL of 0.84, which shows that the response pattern of the respondents also has a close agreement to a perfect scale. Again, this indicates that there is a problem accessing basic health services for the Iraya-Mangyan IP. On the other hand, the CL for the social relation aspect is only 0.4, which is below the acceptable CL of 0.70. This indicates that the Iraya-Mangyan IP do not experience extreme injustice or discrimination from the people

outside their indigeneity.

Based on the actual setting of the Iraya-Mangyan IP first handedly witnessed by the researchers, there was little to no social support infrastructure around their area. From the Municipality of Sta. Cruz, at least thirty (30) minutes of a tricycle ride to go to the location of their tribe. The route to the Iraya-Mangyan IP area was not paved and only had one lane. Moreover, the roads were next to agricultural lands owned by the private sector. The area of the tribe was very secluded. Their way of living was not primitive, but when compared to the lifestyle of the people in the nearest urban area, one could observe a massive gap. For instance, the municipal hall of Santa Cruz was well architectured and was next to a stadium wherein sports and other huge events could be conducted.

Based on the data collected from the respondents, the social support infrastructure they all agreed they needed was a bridge that could be built to connect two points that went over the creek. According to the Iraya-Mangyan IP, if the water level rose, it would be impossible for them to go through it because the current would also be substantial. When an emergency happened, it was challenging to transport sick patients. Moreover, it would also greatly help the tricycle drivers who would pick up and/or drop off passengers to and/or from the tribe's location. On the other hand, the only mode of transportation that could pass through the narrow roads going to the Iraya-Mangyan Tribe was only tricycles. However, no tricycle lanes were designated to serve the people coming out and/or in their area. Based on the data gathered, these two particular projects were needed by the Iraya-Mangyan people, and they would benefit from a faster and safer trip when they needed to go to and from their tribe.

4. Conclusion

This research sought to study the quality-of-life Iraya-Mangyan IPs had and the present conditions in their inhabited area to determine how they lived their everyday lives and how they moved around their domain. This would also indicate if they had access to social infrastructure, whether a transportation system was available throughout their locations, or how far they could access transportation infrastructure in their area. In addition, knowing their difficulties in life would make this study feasible as it aimed to provide help and convenience for indigenous people around the country, especially in Iraya-Mangyan IP.

In conclusion, no inclusive transportation and comprehensive social support infrastructure were available and accessible for Iraya-Mangyan IP. The transportation system was not sufficient and was defective. According to them, they had requested the local government several times to build a bridge since there was a stream along their route. However, they have failed miserably since, up until now, no construction was happening. In addition, the road was bumpy and not sustainable. In addition, the healthcare system provided for them by the government was flawed since they had to wait for a week before they could get financial assistance. If this were the case, the critical patient would die by the end of the week. Moreover, the clinic provided for them in their domain was useless, as they would still not be treated since no health professionals and medical equipment were available. They would borrow money just for them to acquire medicine or medical services. Additionally, they hardly got any assistance for their farms, like even fertilizers, knowing they needed the aid since most of them only do farming.

The statements mentioned above would indicate that the government did still not prioritize indigenous people. This might be because they were just one of the minority groups and not profit-makers that could contribute drastically to the economy. That was why Iraya-Mangyan struggled so much to survive and endure all the hardships they had experienced. They might be starting to catch up to people in the modern world, but that would take a while and not that easy as they have limited

exposure, especially to education. However, with the help of the government and the other people around them, it would be possible and safe for them, especially the new generation of Iraya-Mangyan, to dream big and go out of their comfort zone. One aspect that would help them be exposed to the modern world is transportation. Once they have easy access to the urban areas and other social infrastructure, many opportunities might arise, like job opportunities. Their way of living would improve. They could also broaden their horizons and perspectives. In addition, once they could access higher education, they would be knowledgeable, which would help them elevate their lives. There would be a big chance that some of the Iraya-Mangyan could be successful in their chosen field or become one of the country's presidents. Moreover, they would now have the power and resources to help other minority groups and contribute to the country's success.

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