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## **Disparity in Educational Quality in Border Areas (A Reflection on Marginalized Communities in Indonesia's East Nusa Tenggara Province)**

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**Abstract.** Providing inclusive and equitable quality education and promoting lifelong learning opportunities for all is the fourth target of the SDGs, in line with the mandate of the 1945 Constitution. Regional development disparities can affect the quality of education, and this paper aims to capture the socio-cultural conditions of border communities, which have the potential to be used as instruments to bridge the inequality in the provision of education across regions. A literature review approach combined with field observations was employed to confirm secondary data, followed by an analysis of the trends in parameters compared to the results of observations. The study also utilized a qualitative approach to describe the margin data, and content analysis was used to identify trends in the data. The low level of accessibility is not only due to the lack of infrastructure but also to the relatively limited opportunities to access educational facilities. As a result, more out-of-class learning opportunities are needed for students in border areas. Engaging the surrounding community, along with their local wisdom, can boost participation rates in schooling. The concept of inclusive education should not be limited to addressing the physical and mental limitations of learners but should also encompass technical regulations on inclusivity in education for border, remote, and island regions.

**Keywords:** *Disparities, Education Quality, Border Region*

### **1. Introduction**

The mandate of the constitution in the Preamble of the 1945 Constitution of Indonesia asserts that the nation's objectives are to promote general welfare, to enhance the intellectual life of the nation, and to contribute to the establishment of a world order based on freedom, lasting peace, and social justice. These three objectives are interrelated. The first step is to ensure that welfare is achieved independently and with social justice. To achieve welfare, an intelligent society is essential, making education a crucial matter before entering the global community, which is competitive and capable of maintaining world order ([Itasari, 2020](#)). The threats of climate change, environmental crises, inequality, and poverty have become a universal concern for the global community. This is reflected by the 193 member countries of the United Nations, who have continued the transition of the Sustainable Development Goals (SDGs), leading to the adoption of the 2030 Agenda, which comprises 17 goals and 169 targets. One of these goals pertains to quality education, ensuring inclusive and equitable education, and promoting lifelong learning opportunities for all, with 7 targets and 3 derivative action plans ([Bappenas \(Ed.\). \(n.d., 2021\)](#)).

Inclusivity arises due to disparities in the quality of education among individuals and groups, caused by various factors, including uneven development distribution, which fails to reach all segments of society in border, remote, outermost, and island regions. The standardization of education quality needs to be improved to ensure that graduates are competitive in a global society, avoiding marginalization due to unequal educational processes ([King, 2023](#)). Inclusive policies should not only address physical limitations for students with special needs but should also extend to communities in border, remote, outermost, and island

regions. Thus, the issue of education quality in these areas becomes a key parameter in regional inequality. Communities in these regions tend to have limited opportunities to access quality education that meets expected standards due to the lack of infrastructure, facilities, and resources needed for the standardization of educational processes.

The Ministry of Education and Culture has established eight (8) standards for educational quality, including content standards, process standards, education assessment standards, educational personnel standards, infrastructure standards, management standards, financial standards, and graduate competency standards. Other quality parameters include the Education Quality Index (Indeks Mutu Pendidikan, IMP), the Educational Quality Assurance Standards (Standar Penjaminan Mutu Pendidikan, SMPI), and the Program for International Student Assessment (PISA) standards. The IMP comprises three (3) dimensions and six (6) indicators: Student (repetition rates, graduation rates, dropout rates), Teacher (percentage of qualified teachers, student-teacher ratio), and School Infrastructure (the ratio of suitable and well-maintained classrooms). The SMPI parameters focus on quality mapping, quality improvement planning, implementation, internal evaluation/audits, and setting educational quality standards. PISA, as an international benchmark, assesses the ability of 15-year-olds to use their reading, mathematics, and science skills to face real-life challenges ([OECD, 2019](#)).

According to [JinJie \(2023\)](#), the eight standards will ultimately converge on a single standard for measuring education quality: the graduate competency standard. Once the minimum conditions for effective learning are established, the competitiveness of graduates can be assured. Global education systems face four major challenges: equity, quality of graduates, efficiency of administration, and relevance of outcomes. Therefore, inequality cannot be assessed solely based on the availability of infrastructure or other input-process instruments. Equalizing quality can only be achieved by setting common general standards, and as part of the global community, Indonesia's graduate standards must also adhere to PISA standards.

Indonesia's 2022 PISA ranking is still at 63rd globally, ranking sixth among ASEAN countries, behind Singapore, Vietnam, Brunei Darussalam, Malaysia, and Thailand. The PISA results reflect Indonesia's educational quality, with scores of 359 points in reading literacy, 366 points in mathematics, and 383 points in science, which are generally lower in rural, border, remote, outermost, and island regions, including parts of Eastern Indonesia. The progress of a region's education sector is measured by several parameters, such as School Participation Rates (Angka Partisipasi Sekolah, APS), Gross Enrollment Rates (Angka Partisipasi Kasar, APK), and Net Enrollment Rates (Angka Partisipasi Murni, APM). In the field of science, this includes the percentage of students using mobile phones, computers, and accessing the internet ([Rokhman Hum & Syaifudin, 2014](#)).

East Nusa Tenggara Province (NTT), which forms Indonesia's southern border, directly adjacent to Timor-Leste and Australia, faces a significant threat, especially due to its geographical characteristics as an archipelago. The risk of low-quality education is highly probable for communities in border, remote, outermost, and island regions. Referring to Presidential Regulation No. 179 of 2014, 88 sub-districts across 12 regencies in NTT are categorized as border areas, as they share land and sea borders with these two countries. This article reflects the disparities in education quality in border areas, particularly several sub-districts in Belu Regency and North Central Timor Regency, which have been prioritized for development in 2023 by the Deputy for Border Area Potential Management. Concerns about educational issues in both regencies are also confirmed by reports in Pos Kupang ([Tanggur, 2024](#)) and Pos Kupang ([Nong, 2024](#)), indicating the need to assess the quality of education in these two sub-districts based on key education sector development indicator.

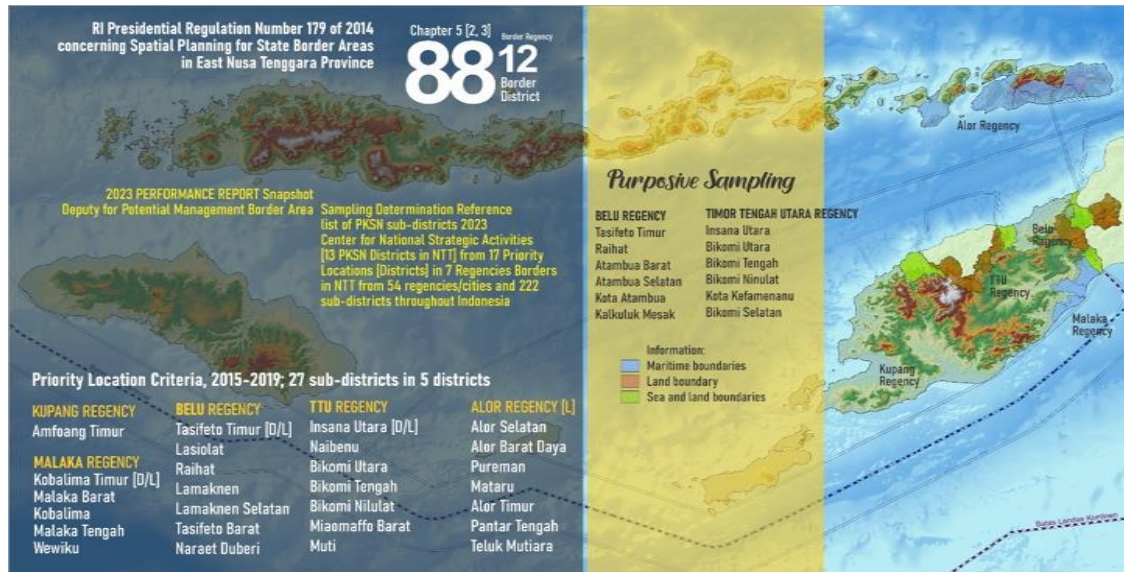


Figure 1. Map of Border Areas in East Nusa Tenggara Province and Its Priority Locations

## 2. Methodology

This article was presented as an invited speaker at the 3rd International Conference on Science, Applied Science, Teaching, and Education (ICoSASTE) at Nusa Cendana University, themed *"Integrating Technology and Education for Sustainable Development and Global Citizenship."* The research conducted in 2015 on the *"Identification of Border Area Development in Region II of East Nusa Tenggara Province"* in collaboration with the Ministry of Village Development and the UNDANA Research Institute, as well as an article presented at the UNDANA National Geography Seminar in 2021, served as initial references. This was followed by field data confirmation in several sample sub-districts in Belu Regency and North Central Timor Regency. The field data confirmation coincided with various news reports on the delivery of education in border regions, published in the *Pos Kupang* daily during the period from January to June 2024. A literature review was then conducted, referring to various documents such as the performance reports of relevant agencies, NTT education statistics, and several relevant scientific articles.

The sample selection was conducted deliberately based on priority locations in the 2023 Performance Report of the Deputy for Border Area Potential Management ([RIB \(n.d.\), 2024](#)), specifically targeting 6 sub-districts in Belu Regency and 6 sub-districts in North Central Timor (TTU) Regency. Data on the educational program's achievements were collected using research instruments, obtaining primary data from the relevant technical agencies to gather information on the schools in the 12 sub-districts. Field observations were then conducted at several nearby schools for sample verification. The field data was compared with NTT education statistics from 2022 and 2023 to carry out a qualitative analysis, focusing on the range of accessibility concerning the availability of facilities, the reach of facilities, and the opportunity to access educational facilities based on School Participation Rates (APK) and information technology literacy. The presentation of results also utilized spatial analysis to map the distribution of facilities and understand patterns of inequality in access to and quality of education at the sampled locations ([Purwanti, 2022](#)).

## 3. Results And Discussion

## Educational Challenges in Border Areas

East Nusa Tenggara Province (NTT), comprising 1,192 islands with a sea-to-land ratio of 70:30 percent, features a diverse topography, including hilly terrain (1,439 km<sup>2</sup>), flatlands (246 km<sup>2</sup>), and valleys (1,668 km<sup>2</sup>), which stretch across the two sampled regencies. The population settlement patterns are not fully concentrated, as they follow the distribution of arable land and local natural resources, making it difficult to intervene in regional spatial planning. The total population in the sampled sub-districts is 231,008 people in Belu Regency, with a growth rate of 2.13% and a population density of 100.26 people/km<sup>2</sup>, while in TTU Regency, there are 271,277 people, with a growth rate of 1.58% and a density of 101.61 people/km<sup>2</sup> ([BPS NTT \(n.d.\), 2024](#)). The demographic conditions of the sampled sub-districts are presented in Table 1 below.

Table 1. Population Conditions in Sampled Sub-districts in 2023

Regency/District Area	Total Population (Persons)	Population Growth Rate (%)	Population Density Level (Persons/Km2)	Sex Ratio (%)
<b>BELU REGENCY</b>	<b>231,008</b>	<b>2.13</b>	<b>166</b>	<b>100.26</b>
Tasifeto Timur District	28,275	2.92	112	100.86
Raihat District	14,897	1.35	198	100.36
Atambua Barat District	25,358	1.75	1,508	102.38
Atambua Selatan District	27,733	2.17	1,710	102.19
Kota Atambua District	32,747	2.21	1,309	99.73
Kalkuluk Mesak District	23,806	2.93	138	98.47
<b>TTU REGENCY</b>	<b>271,277</b>	<b>1.58</b>	<b>102</b>	<b>100.66</b>
Insana Utara District	10,715	1.93	199	101.75
Bikomi Utara District	6,514	1.50	92	99.20
Bikomi Tengah District	7,941	1.55	129	100.83
Bikomi Ninulat District	4,992	1.44	61	97.23
Kota Kefamenanu District	49,589	1.37	670	101.14
Bikomi Selatan District	11,717	1.69	241	103.67

Source: BPS NTT Statistics, 2023 ([BPS NTT, n.d., 2024](#))

The population density is uneven because some areas consist of urban sub-districts while others are rural sub-districts located in the outer border regions. However, there is a relatively high growth rate in several sub-districts in Belu Regency compared to the relatively low and equal growth in TTU Regency. The sex ratio among the population varies, generally showing more males than females, except in rural sub-districts of TTU Regency and urban sub-districts of Belu Regency.

Local geographical and demographic conditions may create disparities in education sector services due to uneven population distribution at the lowest density levels in hilly terrain. Accessibility between villages tends to be low, although connectivity is good, even though the road and bridge infrastructure is inadequate to support mobility in rural areas. Consequently, educational issues are not solely a matter of educational policy but are also influenced by the availability of other public infrastructure. Efforts to meet various education quality standards are not solely dependent on educational sector policies but also require support from other sectors, both in terms of infrastructure and superstructure from the government, as well as the socio-cultural conditions of the local community ([Doriza, Purwanto & Maulida, 2012](#)).

According to [Erianjoni, Beri & Yusra \(2023\)](#), common problems in the education sector include: equal opportunity, relevance to needs, availability of physical facilities, high costs, teacher welfare standards, and the quality and quantity of teachers, along with public support and participation. Field identification revealed several sub-issues and their causes, such as: unequal opportunities due to accessibility, low relevance of education levels to needs because of the availability of educational facilities, high supporting costs for education processes due to

difficulties in meeting basic and supplementary needs, the quality and quantity of teachers due to the lack of incentives for education graduates to settle in rural areas, low welfare for teachers and educational staff due to budget constraints, and socio-cultural support and participation from the community being oriented towards domestic work.

The initial picture of these issues requires multi-sector policy interventions that are synergistic across various policy levels, involving inclusive public participation based on the limitations of physical infrastructure and local socio-cultural constraints in the form of superstructure. The experience of educational delivery during the Covid-19 pandemic in both sampled sub-districts has seen interventions in education sector policy; however, the capacity of the providers and social cultural support could not sustain e-learning patterns due to relatively low adoption and adaptation capabilities post-Covid. This situation has resulted in inadequacies in input and process standards, thus lowering the quality and competence of graduates during that period, which has lagged for more than three educational periods. This means that both the government and educational providers need specific stimulation to address quality disparities exacerbated by Covid, so any policy interventions being pursued are merely part of the recovery of post-Covid standards.

### **Quality Standardization and Inclusive Education in Border Areas**

[Demetriou & Spanoudis \(2018\)](#) emphasizes the importance of accountability and continuous improvement in the education system so that it must simultaneously focus on evaluating input, process and output. [King \(2023\)](#), broadening the perspective on quality that can be seen from various perspectives, such as excellence (*excellence*), match (*fitness for purpose*), added value (*value added*), and customer satisfaction (*customer satisfaction*) so that the final results that are competitively superior and useful that users expect must be prepared from the initial stages of input, process to output, so standardization of graduate qualifications is needed. Quality assurance (*quality management*) determined by *quality control* to control test results/*assessment* and *quality assurance* to ensure input and process arrangements are useful and efficient so that the curriculum, facilities and methodology are as *tools* the operator ([Benavot, 2016](#)).

The various quality standards presented previously have been known and mutually agreed upon by the parties, are well defined and articulated and have graduate competency standards per subject, not just defining process standards so that the input and process aspects are sufficient. *minim condition for good learning*. Competencies for graduates from the Indonesian national education standards are available per level and educational unit category which includes the dimensions of attitudes, knowledge and skills but not yet per subject which is an input and process standard. This context is currently being developed through an independent learning curriculum that is competency-based, flexible learning and has a Pancasila character so that schools and regional governments have the authority to manage their own education in accordance with the conditions of their respective regions. The problem is that the commitment and resource capacity of regional education managers and administrators are not able to articulate it at a practical and comprehensive level oriented towards graduate output. Such conditions are often found in border, outermost, remote and island areas because they are unable to articulate the concept of independent learning appropriately *minim condition for good learning*.

Limited facilities and infrastructure are the initial conclusion that makes the paradigm of regional education managers and administrators tend to prioritize the provision of physical infrastructure needs and ignore the main elements of education administration, namely the quality and welfare of teachers and the initial conditions of students. That the suitability of buildings and infrastructure supporting the provision of education is an important aspect in the

process but its use can be optimized with and under minimum conditions for the continuity of good learning. This is confirmed by various field cases where several schools have adequate building conditions and supporting facilities but have minimal teacher availability, and even teacher welfare guarantees in border areas are still below eligibility standards. In other conditions, there are still several schools that do not have standardized facilities but are able to produce competent graduates according to graduation standards so that this reality becomes an anomaly if the problem is mapped.

Several other measurable standardization systems such as the Education Quality Index (IMP), Education Quality Assurance System (SPMP) and the international scale, PISA, almost all apply overlapping parameters. IMP is a measuring tool for assessing and comparing the quality of education at various levels by combining indicators of aspects of access, quality and educational outcomes so that accurate data validity is needed as a comparison between countries so that it does not only reflect academic results but also how education can encourage socio-economic development as well as relevant to future needs ([Kennedy, 2019](#)). While the SPMP approach emphasizes the importance of the involvement of all stakeholders (government, schools and the community) in the quality assurance process so as to use the CIPP evaluation model (*Context, Input, Process, Product*) to identify areas that need improvement and develop effective improvement strategies because constructive feedback occurs ([Widiputera & Agung, 2023](#)). This context is in the spotlight because the scope of standardizing the quality of education in border, outermost, remote and island areas is still a mechanistic institutional matter for schools and the government without considering participation and collaboration from the community. Community involvement is only open through the School Committee which is not activated and is merely formalistic without any collaborative mechanism for the local community in realizing quality education.

Referring to the Inclusive Education Implementation Guide ([Arriani \(n.d.\), 2024](#)), in its introduction that the National Education System Law classifies children with special needs into 3 categories, namely; (1) children who have physical, emotional, mental, intellectual and/or social disabilities; (2) children who have special intelligence and talent potential, and (3) children in remote and underdeveloped areas. In reality, specifically the third point is not technically explained in the derivative regulations and technical rules so that it escapes policy and is therefore not implemented in the field. The focus of inclusive education is only seen as the personification of humans because the paradigm that is built only highlights the pluses and minuses of each individual student without looking at the external aspects of the environment, especially the backwardness caused by disparities in development between spaces and regions. Children and students in border, outermost, underdeveloped and island areas only go about their routine of going to school without any serious efforts from stakeholders who systemically think about what kind of future these children will be delivered in the input and process of providing education to realize their own future for development. area. The results of the review of policy documents in the sample areas show that there is no medium-long term education sector policy planning that systemically orients the quality of graduates based on the qualifications of children's interests to address the competitiveness of future graduates and contribute back to the progress of regional development.

The support system for implementing inclusive education requires the roles and responsibilities of various stakeholders (the government, the community, parents, and educational institutions), both directly and indirectly. The community, in this case, includes the business and industrial sectors (DIDU), Non-Governmental Organizations (NGOs), professional organizations, and others, which oversee the process up to the output stage. Meanwhile, parents are actively involved during the input-process phase through their membership in the Inclusive Education Program (PPI). PPI plays a role in making educational decisions for participants and

addressing issues such as eligibility, evaluation, program development, and the placement of students with special needs in inclusive education. Support from educational institutions involves collaboration among key parties (principals, special education teachers, general teachers, peers, and student councils) to meet the needs of learners. This context tends to focus on individuals with special needs (students with mental disabilities and/or exceptional abilities), rather than being oriented around socio-economic disadvantages in border, outermost, remote, and island areas. Field conditions show challenges such as limited numbers and capacities of teachers, the absence of special education teachers (similar to guidance counsellors), a lack of peer education, and inactive student councils in accommodating the intended program. Therefore, it can be concluded that inclusive education policies have not yet been implemented for students and communities in border, outermost, remote, and island areas.

### School Participation Rate Trends in Border Areas

This study focuses on the School Participation Rate (SPR), which serves as an indicator of educational progress in a region according to BPS standards. Although its components are limited to quantitative data and do not reflect the quality of students, SPR can still be used as a reference since qualitative assessments can only begin with quantitative percentages. A high participation rate indicates that the community values education, while a low participation rate suggests barriers to accessing education, requiring contextual analysis from social, economic, cultural, and educational policy perspectives.

[Wijayanti, Suwartono, and Kusuma \(2022\)](#) highlight the availability and adequacy of educational facilities (buildings, classrooms, learning tools), supporting infrastructure (electricity, internet access, water, and roads), as well as teacher resources and school management, as factors that either encourage or decrease community participation rates. The social, economic, and cultural backgrounds that shape the community's mindset are external factors that are often overlooked, even though students come from the surrounding community.

The SPR and its derived indicators are used as parameters of success or failure in a region, not only in the education sector but also in other supporting policies, such as household per capita income, regional finances, poverty levels, and the overall well-being of the community. These factors either drive or hinder the urgency for children in border, outermost, remote, and island areas to attend school. The availability and adequacy of infrastructure, accessibility, and the opportunity to reach educational facilities are concrete reasons why the community may not prioritize schooling. The following figure shows the trend and projection of SPR at every educational level in Indonesia, accumulated from the SPR conditions across all regions of Indonesia ([BPS NTT \(n.d.\), 2024](#)).

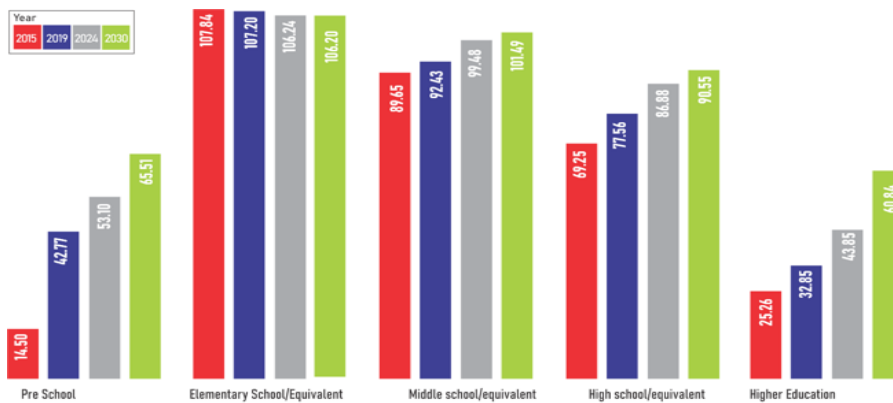


Figure 2: Trends and Projections of School Participation Rates in Indonesia, 2015 to 2030



Figure 2 above shows a significant increase in public awareness regarding the importance of preparing their children for preschool education from 2015 to 2019, driven by the implementation of Government Regulation No. 13 of 2015, which mandates the minimum age to start formal education, though preschool before elementary school is still not obligatory. Participation in elementary education, however, has slightly decreased over the past decade, which is a positive trend as children are now entering elementary school at the ideal age of seven and graduating before turning 13, a condition reflected in the increasing School Participation Rates (SPR) for junior high, senior high, and higher education over the past ten years.

There has been a stagnation among junior high school-aged children who do not graduate at the expected age. Despite this, participation in senior high education has shown a relatively steady increase over the last decade and is expected to stabilize by 2030. This projection suggests that by 2030, only 9% of the population aged 16-18 will not be enrolled in school at the appropriate age, and most of those who complete high school will continue to higher education.

Projection data shows that by 2030, more than 40% of preschool-aged children will not attend preschool, instead starting directly with elementary education. Despite this, the proportion of elementary school students exceeds 106%, as there are still children aged 7-12 in elementary school, but 6.76% of them do not continue to junior high school. The 2024 SPR data indicates that school age ranges across educational levels have stabilized, with growing awareness of the importance of preschool education as a prerequisite for early childhood development and compliance with starting formal education at the correct age and graduating on time. The 12-year compulsory education policy, starting from elementary school through high school, has resulted in relatively stable SPRs during the elementary to high school periods. Therefore, by 2030, it may be considered to extend the compulsory education standard to include 1 year of preschool, followed by 6 years of elementary education, 3 years of junior high, 3 years of senior high, and less than 4 years of higher education. The 2030 projection also indicates that college participation will continue to rise due to the increasing demand for degree qualifications in the job market.

Meanwhile, the trend data for the School Participation Rate (SPR) in NTT over the past five years shows fluctuating patterns across all education levels, with relatively small variations each year. The data indicates a positive trend in the School Readiness Rate (SRR) for the people of NTT, where more than 50% of first-grade elementary students have attended preschool, thanks to the Early Childhood Education (PAUD) program. However, over 25% of students do not continue their education from junior high to senior high school.

The traditionally patriarchal culture in NTT, which favors sending boys to school over girls, has seen a significant shift over the past 12 years. The trend in school readiness among girls is now 6.94 points higher than that of boys. Girls are considered more diligent and disciplined in following the educational process, often achieving success and graduating with higher honors than boys. Meanwhile, the difference in SPR between urban and rural areas is only a marginal 0.66 points, indicating that the issue of gender equality in access to preschool education is far more concerning than the disparity between regions.

Education Level	Year				
	2019	2020	2021	2022	2023
Elementary School/Equivalent	53.05	53.98	54.02	53.22	54.59
Middle school/equivalent	98.47	98.57	98.42	98.59	98.62
High school/equivalent	95.11	95.25	95.32	94.83	94.89
Higher Education	75.36	75.52	75.77	75.55	75.93
Perguruan Tinggi	31.48	31.47	32.41	32.12	33.03

Table 2. School Participation Rate (SPR) of NTT Province, 2019 to 2023  
Source: NTT BPS Statistics, 2023 ([BPS NTT \(n.d.\), 2024](#))

Gender issues in school participation in NTT apply to all education levels, while regional disparities have decreased from senior high school to higher education levels. This is due to the relative difficulty in accessing senior high school and higher education services, resulting in a drop in school readiness by 26% at the senior high school level and more than 78% at the higher education level.

The drive to continue education beyond high school is higher among urban females, while in rural areas, males are prioritized for schooling. This suggests that urban communities place more emphasis on the quality of education and academic achievement for their children, whereas rural communities prioritize education for boys mainly to ensure they receive a basic level of education.

The School Participation Rate (SPR) margin at each education level over the past five years has not seen significant changes. However, there is a large margin drop when transitioning to higher education. This indicates that the motivation to complete a child's education is influenced by socio-cultural factors but faces economic challenges, as the cost of higher education is relatively high. Rural communities are prepared to continue their children's education, but the investment in higher education is expensive due to the limited availability of higher education institutions in the region, high tuition fees, and the cost of living during college. These factors have led to a significant decrease in the number of students pursuing higher education, with an average margin drop of 78.3% over the past five years.

Other participation parameters, such as APM and APK, also indicate several aspects when assessing the level of school participation in the community of East Nusa Tenggara (NTT), namely: [1] Girls in both rural and urban areas tend to start school on time and are able to complete their studies at each educational level punctually, [2] Boys tend to be undisciplined in starting school at the appropriate age and often fail to complete their studies at certain educational levels on time, [3] The dropout rates at the elementary and secondary education levels are higher among girls in rural areas, while at higher educational levels, the dropouts predominantly occur among boys, [4] Although the proportion of girls attending school is smaller than that of boys, they tend to be more consistent in completing their education up to higher education. This reality indicates that girls are more likely to successfully navigate the critical period of school dropout at the high school level; once they graduate from high school, they are more likely to continue their studies to higher education. Meanwhile, boys face a critical phase of school dropout threats starting from junior high school, necessitating strengthened motivation for boys aged 13 and above to continue their education.

The data on APS and other related parameters in NTT Province ([BPS NTT, n.d., 2024](#)) illustrate the conditions across 22 districts/cities in NTT. However, in the sample areas (Belu and Malaka districts), the situation remains within a tolerable range when comparing the ratios among districts across all types of parameters at each educational level, as neither of the sample districts falls among the three districts with the lowest APS, AKS, APM, and APK. The TTU district shows more progressive participation levels compared to the Belu district at nearly every educational level, especially in the border regions of Belu, where access to education and components of educational input-process are still very limited. The APS for preschool and elementary education in Belu and TTU districts is above the NTT average, indicating that the awareness of the communities in Belu and TTU regarding education is generally higher than in other areas, although this applies only to preschool and elementary education.

School participation in the communities of Belu and TTU districts declines as they progress to junior high school and beyond, as evidenced by the relatively lower margins each

year for the senior high school and higher education categories. The population aged 13 and above in TTU and Belu districts is increasingly at risk of not being able to continue their education to the next level, facing a significant threat of dropout, particularly at the senior high school level, and tending not to pursue higher education. In TTU and Belu districts, girls exhibit higher school participation at the preschool and elementary levels, despite limited educational opportunities. Conversely, boys in rural areas show increased participation in elementary education but decline when transitioning to high school and higher education. Opportunities for pursuing higher education are more broadly offered to boys in rural areas; however, participation rates decrease, contrasting with girls who have limited opportunities yet relatively higher graduation rates.

Girls tend to complete their studies at each educational level, coinciding with an increase in participation rates; however, they have limited opportunities to continue their education. In contrast, boys, who are given broader opportunities to pursue higher education, often fail to complete their studies, with a margin of 3.17 points. This situation aligns with the shifting societal paradigm, where investment in children's education has begun to shift from boys, who were traditionally seen as more responsible for their futures, to girls, who are understood to leave the nuclear family after marriage to follow their husbands.

The availability of educational facilities and supporting infrastructure in urban areas significantly encourages school participation among urban communities. Conversely, limited access to educational infrastructure and low opportunities for schooling contribute to the low school participation rates in rural areas, border regions, remote areas, and islands. The margin in school participation rates between border regions and the outermost regions reaches 7.15 points, primarily due to limited opportunities for children in rural areas, who often have to engage in family economic activities. A summary of the comparison of APS, APK, and APM for each educational level in East Nusa Tenggara Province, Belu District, and TTU District in 2023 is presented in Table 3.

Table 3: APS, APK, and APM in East Nusa Tenggara Province, Belu District, and TTU District for Each Educational Level in 2023

The 3<sup>rd</sup> International Conference on Science,  
Applied Science, Teaching and Education 2024

School Participation Rate (SPR)	Gender		Region		Total
	Man	Women	Urban	Rural	
<b>Pre School</b>					
SPR NTT	24.61	27.24	26.53	26.74	26.63
Belu	24.94	34.4	33.75	30.18	31.99
TTU	29.91	33.61	35.39	29.61	32.71
GER NTT	34.83	33.89	30.13	35.72	34.38
Belu	54.8	41.01	34.11	52.07	47.55
TTU	40.02	39.98	29.63	44.45	40.01
NER NTT	33.78	32.96	30.13	34.41	33.39
Belu	52.19	38.82	34.11	48.88	45.16
TTU	36.19	35.79	29.63	38.76	36.02
<b>Elementary School/Equivalent</b>					
SPR NTT	99.65	98.29	98.36	98.88	98.62
Belu	97.81	97.83	99.3	96.35	97.83
TTU	100	98.68	99.46	98.38	98.9
GER NTT	112.4	110.29	111.24	111.38	111.35
Belu	109.31	115.13	116.44	110.73	112.22
TTU	125.13	107.05	141.43	110.6	115.83
NER NTT	95.99	95.97	96.12	95.83	95.98
Belu	96.99	95.31	97.55	93.93	95.75
TTU	99.55	95.61	97.65	94.98	96.28
<b>Middle school/equivalent</b>					
SPR NTT	97.38	94.01	93.31	96.51	94.89
Belu	93.31	92.19	87.72	97.22	92.51
TTU	85.12	98.14	93.29	97.74	95.4
GER NTT	89.64	90.67	87.61	93.29	90.41
Belu	76.5	80.81	82.65	76.59	79.61
TTU	75.65	90.89	87.18	88.23	87.68
NER NTT	74.11	73.24	71.14	75.87	73.47
Belu	65.07	64.6	66.21	63.28	64.73
TTU	59.87	70.81	64.4	73.04	68.51

School Participation Rate (SPR)	Gender		Region		Total
	Man	Women	Urban	Rural	
<b>High school/equivalent</b>					
SPR NTT	79.91	74.32	75.24	76.61	75.93
Belu	65.95	61.79	65.88	60.52	62.91
TTU	77.88	73.44	78.04	71.02	74.32
GER NTT	101.63	83.43	86.94	90.37	88.66
Belu	78.14	70.29	72.4	72.4	72.4
TTU	93.75	78.52	89.22	74.71	81.54
NER NTT	64.62	55.53	56.55	59.74	58.15
Belu	48.11	46.89	48.94	45.84	47.22
TTU	60.09	54.21	52.5	57.94	55.38
<b>Higher Education</b>					
SPR NTT	48.17	26.22	31.61	34.59	33.03
Belu	13.23	16.66	20.79	10.39	15.72
TTU	46.53	29.39	29.38	34.62	31.76
GER NTT	52	23.95	30.27	35.28	32.65
Belu	8.72	7.68	10.91	4.87	7.97
TTU	65.26	29.04	24.26	45.83	34.04
NER NTT	34.91	14.45	19.48	22.24	20.79
Belu	4.29	5.53	10.13	23.38	5.19
TTU	23.96	19.25	10.89	30.77	19.9

The availability of higher education institutions in TTU District significantly impacts the high participation of TTU residents in pursuing higher education, even though it remains relatively low compared to the NTT average; it is still better than the participation rates of residents in Belu District. The close geographical position of the two districts should ideally attract interest in pursuing higher education among Belu residents, yet the presence of state universities in TTU does not significantly stimulate this interest. This situation illustrates that accessibility to higher education does not solely determine the desire to pursue it; rather, environmental support factors and the partnership between the two districts need to be improved to encourage Belu residents' interest in attending university. The APS for higher education in Belu District is only 5.19 points, with a margin of 14 points compared to TTU District, supporting this argument. Interestingly, participation among girls from rural areas in Belu is higher than that of boys.

### Digital Literacy of Students in Border Areas

[Demetriou & Spanoudis \(2018\)](#) argue that digital literacy skills are not just about the technical ability to use and operate digital devices; they also encompass critical thinking and collaboration skills in digital environments. The ability to evaluate information sources and assess their validity through critical thinking, supported by rational arguments, is essential for the younger generation and students in utilizing information technology. The availability of technological devices along with information system networks can facilitate students in accessing a vast array of knowledge freely from the internet. However, without the protection of critical and systematic thinking skills, students may fall victim to the negative impacts of the internet.

Support from information system networks should be utilized in a limited and controlled manner for students' learning activities in schools, serving as an instrument for enriching knowledge from the outside world. Information available on the internet can be a valuable source of knowledge when used to obtain various scientific references, assist in the teaching and learning process, facilitate communication with the outside world, and ease the evaluation of

learning achievements. Restrictions on access and the categories of information appropriate for different ages and educational levels should also be aligned to prevent disparities in capturing, analyzing, and consuming relevant information or knowledge (Benavot, 2016).

The capacity for literacy among students and university students can be measured by the parameters of opportunity and the technical ability to utilize information and computer technology, which have significantly increased after COVID-19. A series of learning activities shifted from face-to-face (offline) learning to online meetings (online), becoming mandatory across all educational levels throughout Indonesia. Students in NTT, especially those in border areas, remote locations, and islands, experienced similar shifts, despite still facing significant limitations in internet access and technology. National policies for post-COVID recovery in the education sector include stimulating the provision of ICT equipment for online learning activities; however, conditions in border, remote, and island areas are hindered by technical electricity support, internet accessibility, and teachers' ability to educate their students (Mamengko et al., 2023). Additionally, the role of family and community environments must adapt to these changes in the learning process, shifting some of the educational responsibilities that were previously concentrated in school management to families and communities.

This situation continued throughout the COVID-19 pandemic but was only effective for two years. After the pandemic, school learning activities resumed with face-to-face approaches, although some new habits from the pandemic, such as the use of ICT devices, persisted. Data from the NTT Education Statistics (BPS NTT, n.d., 2024) show that the percentage of students accessing the internet, using computers, and mobile phones significantly increased in 2021 (post-COVID-19) but then declined after 2022. The use of computers and mobile phones decreased between 2022 and 2023, while internet utilization rose by 2%, from 51.30% in 2021 to 53.44% in 2023. The decline in the use of computers and mobile phones became more pronounced after the return to offline learning; however, the internet remains utilized for various educational services.

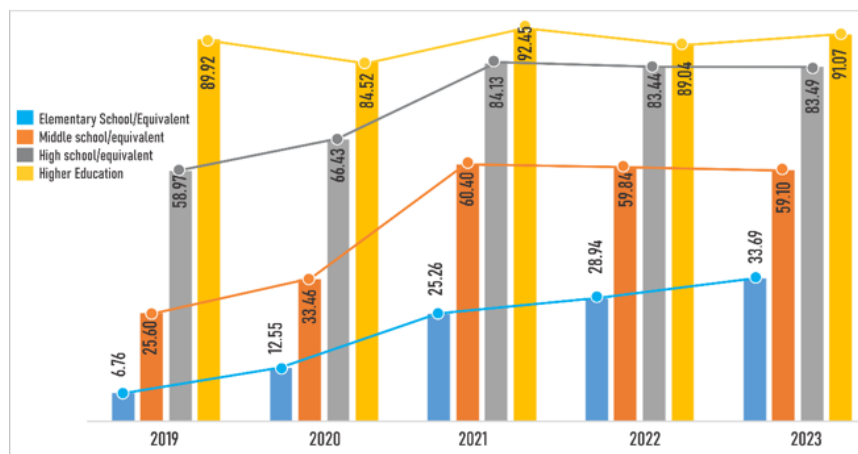
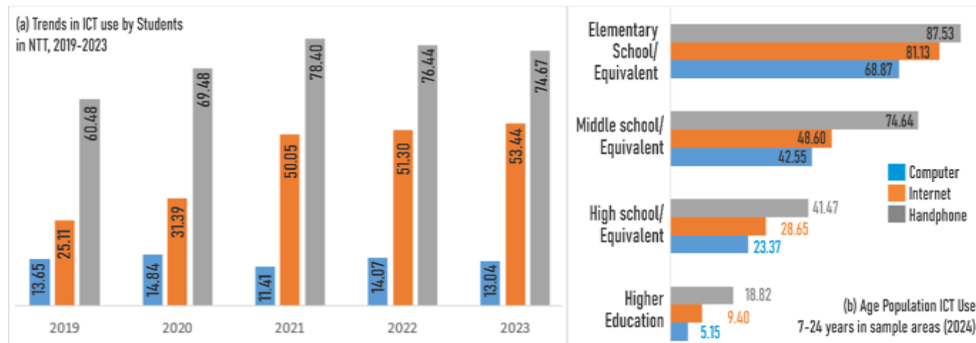


Figure 3: Internet Usage Trends Among Students in NTT, 2019 to 2023  
(Source: NTT Education Statistics, 2023)

Wulakada (2021) outlines various challenges faced by students in remote, isolated, border, and island areas during the implementation of learning activities amid the COVID-19 pandemic, particularly the limitations of telecommunication networks. The central government, through post-COVID recovery programs, has encouraged improvements in internet services for all NTT residents to break the isolation from internet access and information systems. The region's topography and the dispersed settlement patterns result in low accessibility to internet networks because the ratio of Base Transceiver Station (BTS) towers does not meet the standard

relative to the number of potential users. Data show that the number of BTS units in NTT was limited to 421 before COVID-19, which was then increased by 120 units in 2021, reaching a total of 541 units by 2023, with standard 4G capacity. Under these conditions, it is expected that more than 85% of the NTT Province will be accessible, although the network coverage remains inadequate for educational activities.

Table 4: Digital Device Usage; (a) Trend of ICT Usage Among Residents Aged 7-24 in NTT, 2019-2023, (b) ICT Usage Among Residents Aged 7-24 in Belu-TTU, 2024



Source: (a) Education Statistics, 2023 (processed), and (b) primary data

Table 4 illustrates the percentage of residents aged 7 to 24 who use technology devices such as computers, access the internet, and use mobile phones in NTT Province over the past five years, along with similar conditions in 2024 in the sampling locations. This condition indicates that computer usage (PC/laptop) is limited, with less than 54% of students/university students in NTT using them. While internet access is relatively accommodating, students prefer to use mobile phones for learning needs because they are more practical and multifunctional. Computers are not used intensively in the learning process since assignments can often be completed using mobile phones, which have effectively replaced their function. However, university students show a significant dependency on laptops, nearly equal to their use of mobile phones.

Table 4 (b), taken from the sampling locations (72 schools in Belu and TTU districts), shows that the optimization of computer usage remains relatively low, despite adequate internet access and capacity. Students prefer using mobile phones for learning activities due to their practicality and lack of personal computers, except were provided by schools, which often limit their usage time for educational purposes. The availability of internet access is not optimally utilized by schools to facilitate the learning process with computers, while the high allocation of mobile phone usage is largely diverted to non-educational activities. In contrast, university students use computers more frequently for their studies, supported by internet availability and mobile phone ownership, but this represents only a small fraction of the total number of students and university students in Belu and TTU districts. The data reflect only ownership, mastery, and utilization of digital devices, and do not assess the content and knowledge disseminated. Therefore, the ideal assessment of digital literacy cannot yet conclude the extent of digital literacy among students/university students in border, remote, and island areas

### Educational Accessibility in Border Areas

The final section of this article discusses the parameters of educational participation rates influenced by the accessibility and utilization of educational facilities, as well as the opportunities to reach them in the border areas of Indonesia and Timor Leste. The term "accessibility" refers to the social, cultural, and psychological encouragement from individuals and their families to participate in educational activities at specific educational levels. The

approach used is an analysis of locational accessibility, which indicates how easy or difficult it is to reach one location from another, determined by travel distance, travel time, costs, and geographical obstacles, thereby influencing the attractiveness of school participation.

Early childhood education facilities, such as PAUD and TK, are evenly distributed across every village and are increasingly available in urban areas, with a participation margin of 3.34 points higher for girls compared to boys, attributed to better access to educational facilities. Children aged 5-6 years in urban areas have higher participation rates than their rural counterparts, with a margin of 0.82 points, due to the relatively high costs associated with early education, which is not yet a mandatory part of the 12-year formal education system. The reach of preschool children in urban areas is increasingly extended, not due to a lack of nearby TK/PAUD facilities, but rather because of school location choices based on other considerations, such as time efficiency and transportation opportunities.

In Belu District, elementary schools (SD) are sufficiently available and strategically located for access from residential areas. In urban areas, there are more than two SD units in each village or sub-district, providing varied options for schooling based on proximity or school quality. The travel distance for children aged 7-12 in rural areas is much shorter compared to their peers in urban areas, as urban residents have more opportunities to choose their preferred schools, even if they do not follow zoning regulations. Both girls and boys have equal opportunities to access primary education, as awareness of the importance of schooling begins at the age of 8. Thus, the vulnerable period for school dropout occurs early in their education, but once they feel comfortable in the school environment, they tend to continue their education until the age of 12.

For children aged 13 to 15 in both districts, although the data shows a decline in the participation rate (APS), the potential for school dropout is relatively small, except for rural children at age 15, making the risk of dropout particularly pronounced at the end of junior high school (SMP). Facilities are sufficiently available, though not evenly distributed to all residential bases, adequately meeting the needs of children of that age group, despite moderate accessibility and relatively low opportunities in rural areas. Junior high school students must travel more than 3 km to reach their schools due to a lack of alternatives, while in urban areas, students often travel more than 5 km to select their desired schools.

The availability of senior high school (SMA) facilities in both districts remains limited and uneven, with low accessibility and low opportunities for reaching them. In urban areas, facilities are sufficiently representative and easily accessible, particularly if schools have large class sizes to accommodate local students. In contrast, rural students often need to leave their villages for extended periods to access SMA facilities located more than 10 km away from their homes. The participation rate for rural children aged 17 at the end of their schooling is lower due to increasing saturation, coupled with limited access opportunities for girls.

The conditional description above suggests that the availability of educational facilities is relatively sufficient for all educational levels in both urban and rural areas. However, accessibility remains relatively low due to challenges related to the alternative choice of school locations based on residence and the domestic demands of transportation. Although the distribution of school units has been balanced according to the needs of school-aged children, the limited capacity and availability of supporting facilities continue to hinder the learning process. It is hoped that this issue will gradually be resolved as opportunities for access improve.

Community support around schools is crucial to creating a comfortable environment for students outside of school hours, so schools and educational providers should collaborate to achieve this, not only through school committees. The culture of schooling has become a driving force that keeps the community consistently sending their children to school, leading to an increase in participation rates each year. However, gaps in school participation rates (APS)

between educational levels are influenced by external factors. Thus, attention needs to be given to the vulnerable phases when students are most at risk of dropping out, particularly at the end and beginning of each educational level.

#### **4. Conclusion And Suggestion**

Based on the discussion in the results and analysis section, several conclusions have been formulated, along with the following recommendations:

1. Educational infrastructure disparities exist in border, remote, and island areas, but they are conditional and can support the minimum conditions for effective learning. It is hoped that local education managers can accelerate teachers' creativity to maximize the limited potential in their regions.
2. Low accessibility levels are due to the strict enforcement of school hours, which tends to disrupt students' domestic routines. There should be inclusive policies in the education system in border, remote, and island areas to develop a flexible curriculum that allows students more opportunities to engage in activities outside of school.
3. The availability of educational facilities should not only focus on schools and their supporting infrastructure but also include the availability and adequacy of auxiliary infrastructure, such as roads and bridges, that facilitate access to educational services. This requires synergy in non-educational sector planning to enhance the attractiveness of schooling and increase participation.
4. While the ratio of schools to student demand is currently sufficient, it may become inadequate as school participation rates continue to rise. It is recommended to anticipate future needs for the availability, adequacy, and accessibility of primary and supporting educational facilities. A limited zoning system can be used to accommodate schooling opportunities for communities living near educational facilities.
5. An often-overlooked factor in evaluating the quality of graduates is the socio-cultural support from the community around the school. This support must be consolidated both within the school and through local government initiatives to foster a social and digital literacy culture that is conducive to students' social life.
6. The local community in border, remote, and island areas already values the importance of education due to positive experiences observed in their surroundings. Therefore, local governments and schools must be bold in building strategic partnerships with local stakeholders to encourage greater community participation.
7. The 12-year compulsory education policy, which does not include pre-school as part of compulsory education, should be reconsidered. It is recommended to incorporate a 14-year compulsory education program to include early preparation before school and address stunting issues for pre-school-aged children.
8. Inclusive education policies should not only address physical and mental disabilities among students but also consider the disparities in resources that support education in border, remote, and island areas. It is recommended that the government provide technical guidelines for implementing inclusive education in these areas.
9. The location of schools has not yet considered the long-term prospects of regional development and spatial planning. This is important due to the potential for population spread, which requires the availability and accessibility of supporting infrastructure for education in border, remote, and island areas. In the medium to long term, there is a need to



synchronize plans for residential spaces with the provision of educational, health, economic, and cultural facilities in a unified zoning system.

10. Key components such as teachers and curriculum play a vital role in achieving quality educational outcomes. However, these variables were not analyzed in this article. It is recommended that future research consider these important parameters.

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