

# Accessibility to rural primary schools: a case study of the District North 24 Parganas, West Bengal, India

Sweta Mondal, Dr. Sudakshina Gupta

*Department of Economics,*

<sup>1</sup>*Sarojini Naidu College For Women, 30, Jessore Road, Kolkata-700028, India*

<sup>2</sup>*University of Calcutta, 56A, BT Road, Kolkata-700050, India*

munkolsweta@gmail.com, sudakshinagupta@yahoo.co.in

## Abstract

**Objectives:** Access to primary education determines the extent of mobility. Here, we assess the accessibility of children to rural primary schools through the three parameters such as travel time, travel cost and quality of schools.

**Methods/Statistical analysis:** The new approach to local-level planning is known as Integrated Rural Accessibility Planning (IRAP). The feature of local level planning is the development of a quantification technique by which accessibility to primary schools would be determined. It would be expressed in form of indices. Here household is taken as the unit of analysis. The three parameters taken are travel time, travel cost and quality of service, represented by Accessibility Index.

**Findings:** Results show that with the help of an Accessibility Index, a village with a higher score has more difficulties in accessing primary schools and a village with a lower score has fewer difficulties. These are determined by the importance put on accessibility to primary schools based on travel time, travel cost and quality highlighting no. of students, teachers, classroom and number of classes. Weights are assigned accordingly. The village Berunanpukuria would be more concerned over the problems caused due to more travel time factor, lack of quality factor depending on the importance put on them. On the other hand, the village Fateabad Narayanpur would be less concerned with the problems because they have assigned lower importance to the factors of accessibility as quality factors have catered the need for accessibility. We need to identify the alternative projects and then select the best solution within the available budget, in consultation with the villagers. Thus, it is necessary to examine the impact of the facility or infrastructure on the nearby villages.

**Application/Improvements:** Accessibility Index is a useful parameter to decide the provision of infrastructure, services and its impact. The accessibility indices (AI) help to compare the villages with regard to accessibility to primary schools.

**Keywords:** Education, access, mobility, primary schools, weights

## 1. Introduction

Access is an important contributor to the development of educational sector in the rural areas. The role of transport is to facilitate access to goods, services and facilities by improving mobility of the people. Improvement of the transport sector leads to sustainable development. Adequate and efficient road infrastructure is crucial and a pre-requisite for the provision of accessibility and mobility [1]. Social infrastructure like education and health are essential for economic development. Accessibility and mobility are provided to such infrastructure through rural road investment. Rural access can be defined as the ability and the level of difficulty, of rural people to use, reach or obtain the necessary facilities, goods and services. It can be improved through the provision of rural infrastructure and by improving rural transport. The process of improving rural access is by identification of real access needs and the transport patterns of the rural people. Traditional cost-benefit analysis of the improvement of the road have focussed on measurable output like road length, number of beneficiaries, reduced travel time, transportation costs and environmental effects [2]. Rural access can be determined by a number of factors. They can be enumerated as follows: Physical access relates to distances and travel. It can be improved by the provision of physical infrastructure. A lack of physical access deprives people of the opportunities to improve and sustain their living.

It is further determined by two factors such as mobility which is the ease or difficulty in travelling to a specific location and proximity which is the distribution of goods, services and facilities. Social Access is culture, customs and responsibility. Economic Access relates to ability to pay. Accessibility has three elements: (i) the location of the households; (ii) the location of the facilities and services; (iii) the transport system [3]. Physical Accessibility is the degree of difficulty people have in accessing locations for satisfying their economic and social needs such as education, primary health care, transport etc. Rural infrastructure projects must address the real access needs and optimize the scarce resources for infrastructure development such as rural roads, schools, health centres etc. Infrastructure plays a key role in the improvement of living conditions. Road transportation has an important impact on infrastructure and other facilities as it provides the basic infrastructure for investment [4]. Investment in transport contributes directly to improved mobility, increased access, employment and income and indirectly results in economic growth. Inadequate road investment results in limiting accessibility, mobility and regional connectivity but also results in increased production and transport costs [1]. This also impedes poverty alleviation, socio-economic development, overall macroeconomic growth and development. The growth of a road network has a positive correlation with the indicators of infrastructural development like education, health facilities, drinking water etc. Education in the rural sector has a positive correlation with accessibility i.e. physical, social and economic. An improvement in the physical accessibility plays an important role in the improvement of enrolment in primary schools in the rural areas [5]. This study highlights how parameters of accessibility have an impact on accessibility to primary schools of rural areas along with the comparison of different villages with respect to accessibility to primary schools. A quantification technique has been developed to determine the accessibility to primary schools. This would be expressed in the form of indices based on the availability and quality of services. It helps us to compare the different villages with respect to accessibility to primary schools. This brings a clear picture of which school has adequate accessibility and which school lacks it. With the help of this Accessibility Index, the primary schools will come to know of their problems and try to rectify it by improving the parameters which would lead to easy accessibility. The primary schools need to give importance according to the priority. Some studies have shown the effect of accessibility of children being enrolled in school and the impact on socio-economic development.

In another study, [6] it is shown that the effect of accessibility on improving the chance of being enrolled in school and how it differentially affect various groups in the society like boys and girls, and poor and non-poor house-hold, younger children and older children. It also sees whether improving accessibility improves the social structure in favour of socially disadvantaged group. The improvement of transportation services has increased the accessibility and mobility of individuals which had led to increase in social and economic opportunities. Inaccessibility induces the effect of the socio-economic and institutional barriers on school enrolment. Another study focuses on broadening the analysis by including social considerations. The social impact analysis approach focuses on non-economic aspect. Rural roads have an impact on non-economic factors like reducing poverty, increasing access to schools and health-care facilities, increased labour mobility and improved access to markets. Poor roads affect all areas of development like education, health, poverty and economic growth. The social impact score was designed to prioritize investment in rural roads leading to benefit social impact. There are two reasons for the impact of rural road infrastructure on improving education. One is the increased mobility of the students especially girls to go to school due to lower transportation time for going to schools and for other needs. The second is the availability of higher quality teachers. So, there is a link between development of roads and enrolment due to improved accessibility [7].

Another study [8] shows the impact of rural road infrastructure development on socio-economic conditions of the rural people. Rural road connectivity and accessibility provides access to critical services and opportunities like education, health etc. through poverty reduction and employment opportunities by accelerating investment in rural infrastructure. This enhances economic growth. Rural roads provide access to and help in the utilization of physical and social infrastructure. Another study focuses on the Physical Infrastructure of West Bengal. We see a relationship between enrolment of rural primary schools of West Bengal and Physical Infrastructure. Unified District Information System for Education Data 2012-2013 has been used to analyse the situation. Enrolment factors to a primary school is analysed by principal component method. It is used to see the correlation among the factors of enrolment. Both number of teachers and number of schools are important for enrolment. Their availability and accessibility is crucial for enrolment. A positive correlation between enrolment and physical infrastructure suggest that physical infrastructure plays an important role for teachers and students [5].

In [9] assesses the level of access to infrastructure and the impact on the subjective and objective human well-being based on the perceptions of the respondents in rural Nepal. The study found that the impact of infrastructure on human well-being is higher in the remote areas. It has an impact on the socio-economic development. Increased level of well-being affects the access to infrastructure as human's education, health and income increases, the demand for infrastructure also increases. The results show hilly areas have a high demand for access to roads and drinking water. They prioritised it as highly important because they knew access to roads and drinking water are the means to achieve health and educational objectives. Prioritisation of infrastructure was done according to the local needs.

### 1. Objectives of the study

The objective of the study is to determine the accessibility to primary schools, in the rural areas. For this a sample of ten schools from ten villages is taken for the purpose of this study. The sample survey was done in the rural areas of Barasat, which comes under North 24 Parganas in West Bengal, India. The Accessibility Index helps us to compare different villages based on the importance put on accessibility to primary schools based on the parameters of travel time, travel cost and quality of services.

## 2. Materials and Methods

### 1. Data collection and methodology

A new approach to local level planning based on the series of studies of ILO, World Bank and a number of Asian and African countries, is known as Integrated Rural Accessibility Planning (IRAP). Here household is taken as the unit of analysis. The logic of IRAP methodology is the modification of AI based on mode of transport, gender and other relevant variables [10]. One of the features of local level planning is the development of a quantification technique by which accessibility to primary schools would be determined. These would be expressed in form of indices based on the availability of facilities and quality of services. The three parameters taken for the quantification of Accessibility are travel time, travel cost and quality of service, represented by Accessibility Index. Here all indicators would not have equal importance, so weights were assigned to each of these indicators. The score of a particular village is obtained by multiplying the respective indicator and weight. A higher score indicated higher priority. Primary Data was used to arrive at the Accessibility Index.

Accessibility Index is expressed as:

$$AIPS = \{FT \times w_1 + FCT \times w_2 + w_3 \times \sum_{i=1}^n \{w_{3i} \times FQSi\}\}$$

AIPS = Accessibility Index for primary schools

FT = Score on a scale between 0 and 4 based on the average travel time for reaching the service.

FCT = Score on a scale between 0 and 4 based on the cost of transportation to a service.

FQSi = Score on a scale between 0 and 4 based on the one of the sub-factors which determines the quality of the service.

w1 = Relative weight assigned to Travel time while considering all factors in a sector.

w2 = Relative weight assigned to Cost of transportation while considering all other factors in a sector.

w3 = Relative weight assigned to Quality of service while considering all other factors in a sector.

W3i = Weights assigned to sub-factors of Quality of Service so that  $\sum_{i=1}^n W_{3i} = 1$

n = Total number of sub-factors used in defining Quality of service.

### 2. Case study

With the help of the technique mentioned, a case study was conducted in the rural areas of Barasat under 24 Parganas. Here, 10 villages were considered and the children of the villages have access to primary education. In all 10 villages varying number of households were considered. Relevant data required for the study was collected through a village level questionnaire survey. The number of households in each village is shown in Table 1. The survey was conducted for the quantification of accessibility to primary schools. Walking, Bicycle and motorized two wheelers (motorcycles) are quite popular in most of the villages. Besides the income level of the residents, the ownership of the vehicles depends on the connectivity with the surrounding villages, distance to schools and the type and quality of roads. Most of the villages are connected with adjacent roads, though not necessarily with quality roads.

Table 1. Number of households in the villages

Village	No. of households
Berunanpukuria	981
Kathuria	400
Machpole	250
Chakbarbaria	2000
Netajipally	25000
Sonakharki	126
SubhasNagar	150
Moynagodi	4000
Sadearpur	1900
FateabadNarayanpur	3000

### 3. Scores on primary education sector

Various factors such as number of students, travel time and cost, quality of service in terms of the student teacher ratio, classroom to class ratio and teacher to class ratio were used to arrive at an index for this sector. These parameters were represented by scores for quantifying the accessibility. The scores were assigned arbitrarily but they were relative and were derived considering the maximum and minimum values of each parameter. The scores on the parameters for accessing primary education are presented in Table 2. In the rural areas the schools have an inadequate number of classrooms and teachers, the quality in this study has been measured based on: classroom to class ratio, teacher to class ratio and student to teacher ratios.

Table 2. Scores on parameters for accessing primary education

Name of Village	Scores on				
	Students in school (FPPS)	Travel time (FTP)	ClassRoom/Class (FQS1PS)	Teacher/Class (FQS2PS)	Student/Teacher (FQS3PS)
Berunanpukuria	2	4	4	4	3
Kathuria	2	1	4	3	0
Machpole	2	1	0	4	3
Chakbarbaria	1	3	4	4	0
Netajipally	4	2	0	3	4
Sonakharki	2	1	4	4	0
SubhasNagar	4	4	0	2	3
Moynagodi	4	2	0	2	3
Sadearpur	3	3	4	3	3
FateabadNarayanpur	3	2	0	2	0

Table 3. Values of parameters for accessing primary education

Name of village	Students in school	Travel time (min)	Travel Cost (Rs.)	Class Room/Class	Teacher/Class	Student/Teacher
Berunanpukuria	85	20	0	0.6	0.8	21.25
Kathuria	85	5	0	0.8	1	17
Machpole	80	5	0	1	0.8	20
Chakbarbaria	58	5-15	0	0.8	0.8	14.5
Netajipally	218	10	0	1	1	43.6
Sonakharki	65	5	0	0.6	0.8	16.25
SubhasNagar	187	20	0	1	1.6	23.37
Moynagodi	187	10	0	1	1.4	26.71
Sadearpur	105	10-15	0	0.8	1	21
FateabadNarayanpur	135	10	0	1	1.4	19.28

The number of students in each village is given in Table 3 and depending on the variation in numbers; scores were assigned as given in the Appendix. A village which had more than 150 students was given the highest score of 4 and with less than 60 was assigned the lowest score of 1 as given in A-1. Similarly, travel time was assigned scores as shown in A-2.

Travel time of 5 minutes was assigned a score of 1 and travel time of over 15 minutes was assigned a score of 4. Since there was no cost involved in travel to school in all the villages, the score on travel cost was assigned zero. The quality of service in the primary education sector depends on a number of factors such as infrastructure as well as number and quality of teachers. The scores used to grade this are given in A-3, A-4 and A-5. All the children in all the villages walk to school and no cost was involved in travel and thus the score on travel cost FCTPS was assigned zero for all cases.

#### 4. Values of the parameters and their scores

To calculate the accessibility indices for primary education, relevant data was collected from each village through a survey. Besides population served, data on travel time, travel cost and the quality of service was collected. The values as obtained in the villages on the parameters for the quantification of accessibility to primary education are shown. These values are then represented in terms of the scores.

#### 5. Weights on primary schools and parameters

A level of importance is attached to primary schools depending on the existing level of accessibility prevailing in a village. The Accessibility Index (AI) is calculated by multiplying the scores with the weights assigned to the factors such as travel time, travel cost and quality. The weights on each factor are determined by putting importance ratings in a scale between 1 and 4 where 1 represents low importance and 4 represent high importance. These weights are then normalised. The weights assigned and their normalised values are shown in Table 4. The normalised values of the weights assigned to different parameters for accessibility to primary schools. Quality of the service has been assigned a high weight in most of the villages with regard to accessibility to primary schools.

Table 4. Normalized values of weights allotted to travel time (w1), travel cost (w2), quality of service (w3) and sub-parameters of quality of service for quantifying accessibility to primary education

Name of the Village	Weights on					
	Traveltime (W1PS)	Travelcost (W2PS)	Quality of service (W3PS)	Class Room/Class (W31PS)	Teacher/Class (W32PS)	Student/Teacher (W33PS)
Berunanpukuria	0.37	0.125	0.5	0.33	0.33	0.33
Kathuria	0.2	0.2	0.6	0.33	0.33	0.33
Machpole	0.2	0.2	0.6	0.27	0.36	0.36
Chakbarbaria	0.28	0.28	0.42	0.36	0.36	0.27
Netajipally	0.33	0.16	0.5	0.25	0.37	0.37
Sonakharki	0.33	0.16	0.5	0.25	0.37	0.37
Subhas Nagar	0.3	0.3	0.4	0.4	0.4	0.2
Moynagodi	0.28	0.14	0.57	0.5	0.25	0.25
Sadearpur	0.28	0.28	0.42	0.36	0.27	0.36
Fateabad Narayanpur	0.4	0.2	0.4	0.4	0.2	0.4

Table 5. Accessibility index

Name of the village	Primary School AIPS	Accessibility Index in Percent
	Accessibility Index (AI)	
Berunanpukuria	3.29	82.25
Kathuria	1.58	39.5
Machpole	1.71	42.75
Chakbarbaria	2.04	51
Netajipally	1.95	48.75
Sonakharki	1.57	39.25
Subhas Nagar	1.76	44
Moynagodi	1.27	31.75
Sadearpur	2.23	55.75
Fateabad Narayanpur	0.96	24

## 6. Calculation of indices

Using the quantification technique developed through this study and the score and weights assigned through survey, the accessibility indices have been calculated using the equation (i). To facilitate comparison, they have been shown using a percentage. Each score has been divided by the maximum possible value of 4 and then multiplied by 100 to get the percentage.

The accessibility indices and the percentage scores of accessibility index are shown in the Table 5. Lack of access to primary education would be a concern for the people. The importance, or the weight, is a reflection of the need to access the facility.

## 3. Results and Discussion

The accessibility Index developed shows the accessibility to primary schools. From the table it is observed that regarding accessibility to primary schools, Berunanpukuria has a major deficit with a score of 82.25 while Fateabad Narayanpur has fewest problems with a score of 24. These are determined by the importance put on accessibility to primary schools based on travel time, travel cost and quality highlighting no of students, teachers, classroom and number of classes. The village Berunanpukuria would be more concerned over the problems caused due to more travel time factor, lack of quality factor depending on the importance they put on them. On the other hand, the village Fateabad Narayanpur would be less concerned with the problems because they have assigned lower importance to the factors of accessibility as quality factors have catered the need for accessibility to primary schools. Once the accessibility problems in different villages are identified, the next step is to identify the alternative projects and then select the best solution with in the available budget, in consultation with the villagers. Thus, while identifying appropriate projects it is necessary to include the impact of the facility or infrastructure on the nearby villages.

## 4. Conclusion

The parameter Accessibility Index is a useful parameter to arrive at a decision regarding provision of infrastructure and services. The accessibility indices (AI) help to compare the villages with regard to accessibility to primary schools. It is a good indicator to show the village which has proper accessibility to development of primary schools and the village which lacks it. This paper estimates that the provision of rural road is an essential service to stimulate accessibility to primary schools. Thus, rural infrastructure such as development of primary schools is essential for economic growth and accessibility and mobility should be provided for such infrastructure.

## 5. Acknowledgement

I acknowledge my sincere thanks to my supervisor Dr. Sudakshina Gupta for her helpful suggestions in writing this paper. This work is self-funded and it a part of my research findings.

## Appendix

*Table A-1 Score on Population for Access to Primary Schools (FP<sub>PS</sub>)*

No of Students	Score
Less than 60	1
60-85	2
86-150	3
More than 150	4

*Table A-2. Score on Population for Access to Primary Schools (FT<sub>PS</sub>)*

Travel Time(mins)	Score
5	1
10	2
10-15	3
More than 15	4

Table A-3. Score on Quality of Service: Classroom to Class Ratio (FQS1<sub>ps</sub>)

Classroom to Class ratio	Score
Equal to 1	0
More than 0.5 but less than 1	4

Table A-4. Score on Quality of Service: Teacher to Class Ratio (FQS2<sub>ps</sub>)

Teacher to class ratio	Score
More than 1	2
More than 0.8 but equal to 1	3
Equal to 0.8	4

Table A-5. Score on Quality of Service: Student to Teacher Ratio (FQS3<sub>ps</sub>)

Student to teacher ratio	Score
Less than 20	0
20-35	3
More than 35	4

## 6. References

1. P. Lombard, L. Coetzer. The estimation of the impact of rural road investment on socio-economic development. 2017; 1-17.
2. S.K. Khandker, Z. Bakht, G.B. Koolwal. The poverty impact of rural roads: Evidence from Bangladesh. *Economic development and cultural change*. 2009; 57(4), 685-722.
3. C. Donnges. Improving access in rural areas. *Guidelines for integrated rural accessibility planning*, ILO. 2003.
4. D.S. Rawat, S. Sharma. The Development of a Road Network and Its Impact on the Growth of Infrastructure: A study of Almora district in the central Himalaya. *Mountain Research and Development*. 1997; 17(2), 117-126.
5. J. Karmakar. Assessing the enrolment and primary educational infrastructure of rural West Bengal, India: A district level analysis. *Journal of South Asian studies*. 2016; 4(3), 101-108.
6. K.C. Shyam. Society and infrastructure: Geographical accessibility and its effects on school enrolment in Nepal (Doctoral dissertation). University of Maryland, Baltimore, USA. 2007.
7. A. Schweikert, P. Chinowsky. Re-defining " Project Impact": Incorporating social considerations into the rural road prioritization process. *Working paper proceedings on EPOC*. 2013; 1-18.
8. P.K. Samanta. Development of rural road infrastructure in India. *Pacific business review international*. 2015; 7(11).
9. J.B. Sapkota. Access to infrastructure and human well-being: Evidence from rural Nepal. *Development in Practice*. 2018; 28(2), 182-194.
10. A.K. Sarkar & M. Dash. Quantification of accessibility and prioritization of villages for local level planning. *Transport and communications bulletin for Asia and the Pacific*. 2011; 81, 1-22.

The Publication fee is defrayed by Indian Society for Education and Environment ([www.iseeadyar.org](http://www.iseeadyar.org))

**Cite this article as:**

Sweta Mondal, Dr. Sudakshina Gupta. Accessibility to rural primary schools: a case study of the District North 24 Parganas, West Bengal, India. *Indian Journal of Economics and Development*. June 2019, Vol 7 (6), 1-7.

Received on: 29/05/2019

Accepted on: 21/06/2019