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LOCATION FACTORS FOR PUBLIC SCHOOLS: A COMPARATIVE ANALYSIS BETWEEN URBAN AND RURAL AREAS

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ABSTRACT

The Brazilian Constitution guarantees the right to education for all children. However, not all of the country's children attend school. One of the most relevant factors determining school absence is the difficulty faced by schoolchildren – and particularly by those living in rural areas – to go to and come back from educational institutions. Such difficulty is related to different factors, such as lack of rural school transportation, precarious conditions of existing means of transportation, insufficient school places as well as long distances between schools and children's homes. In that respect, studies show that the location of schools is an extremely relevant factor in ensuring children's attendance and retention in classrooms. As they require long travels to and from school, inappropriate location of education institutions may negatively impact on students, who may become exposed to accidents and fatigue and have their school performance affected, which might even discourage children from attending school. This article presents the results of a comparative analysis between the primary factors that determine the location of schools in urban and in rural areas. The survey was carried out among teachers, mayors, school transportation managers, experts and regional education authorities, and identified factors that are relevant in the process of defining the location of schools, including the distance to be traveled, local security levels, existence of electricity supply, among others. Thus, this study suggests answers to a few questions, such as: are location factors always the same? Do they change according to given characteristics? Are there differences between rural and urban areas?

Keywords: School transportation, Facility location, School location

INTRODUCTION

Education is a right guaranteed by the constitution of Brazil for all children and adolescents, whether they are in urban or rural areas. However, to guarantee that this right is exercised, the federal, state and municipal governments need to provide the necessary resources to ensure that students are able to access and to remain at school. In addition to actions such as the provision of school meals, teaching materials, transportation, construction of facilities, and sufficient number of places, pre-planning the schools locations must be cited to make it sure that schools are located as close as possible to students.

The location of schools is an important factor in ensuring the access and retention of students in classrooms since difficult transportation and lack of schools nearby, demotivate students and keep them away from schools. A study by Getúlio Vargas Foundation (GVF, 2009) indicates that the difficulty of accessing school contributes to approximately 11% of the total among of factors that lead to students not going to classes. This situation is even worse for students from rural areas who cannot always count on quality school transport services and whose schools are not close to their homes, which obliges them to make long commutes to go to the city center to guarantee their right to education.

Thus, knowing that the school location is an important motivational aspect for the student to go and stay at school, setting methods to establish the best location for new school buildings is a challenge and at the same time a government duty. However, prior to that, it is important to define methods of analysis to identify the differences between urban and rural, as these differences may influence the decision-making process for the location of schools.

Understanding these differences is crucial to develop decision-making processes that are consistent with the reality of the available locations. Therefore, this study aims to assess the differences in factors taken into consideration for the location of schools, comparing those seen as important in urban and rural areas. For this, a questionnaire was given to specialists, state and local education departments, teachers and school principals in different regions of the country, as well as officials connected to the Ministry of Education and the National Fund for Education Development – NFED.

RURAL VS URBAN SPACE

In literature, the distinction as well as the concept of what is urban and rural are controversial issues with distinct lines of thought and conceptual evolutions over the years.

Accordingly, the first study that examined the concept of the distinction between rural and urban adopted Ferdinand Tönnies' perspective of community and society dichotomy based on a classical conception of rural sociology, through which rural and urban spaces are differentiated socially (NEWBY, 1983).

For that reason, there was an antagonistic polarization between rural and urban spaces. This antagonism was represented by, for example, the rural representing delay, old, poor, low population density and economic activities closely linked to the land, while urban represents modernism, newness, high demographic density and diverse economic activities, including industrialization. Proponents of this idea identified nine aspects that characterize the differences between what is rural and what is urban (BLUME, 2004):

1. Occupational: differences in the population's involvement in economic activities. In general, rural people deal with only one type of economic activity, which is agriculture, livestock or even gathering. Thus, it is not very common that people engage in more than one of these activities at the same time;
2. Environmental: rural areas are influenced by direct contact with nature and climatic conditions;
3. Size of communities: negative correlation between the community size and number of people engaged in agriculture;
4. Difference in population density: the density of the population in rural areas is relatively lower than in urban areas due to large areas of farmland that cannot be inhabited ;
5. Difference in the homogeneity and heterogeneity of the population: the rural population tends to acquire similar characteristics as they engage in the same functions and is therefore more homogeneous because they do not suffer problems related to intense labor division;
6. Differentiation, complexity and social stratification: rural groups tend to be more homogeneous, less complex and without specialized functions; the rural cluster presents a simplified structure;
7. Difference in social mobility: low area mobility as, in rural areas, children follow their parent's occupation;
8. Difference in the direction of migration: unidirectional from the field (production center surpluses) to town (within consumer surplus), excepting in periods of loss (epidemics, among others);
9. Differences in social integration systems: although personal contacts established among rural inhabitants are far less frequent due to low mobility and diversification of contacts, they are denser and less ephemeral.

In 1930, the prospect of the rural/urban continuum, which is a variation of the analytical approach dichotomous, approached by authors such as Sorokin, Zimmerman and Galpin (BLUME, 2004) is presented. As a result, a polarized and antagonistic vision between rural

and urban is replaced by a vision that shows a gradual variation of spaces ranging from rural to urban, then named rural-urban continuum. This continuum is therefore an understanding of the rural and urban areas as being interrelated and interdependent, without a clear division between them.

Since the end of World War II, there have been changes in the rural world, with the technological modernization and commodification of social relations. As a consequence, new ways of understanding rural areas, with focus on agricultural issues and, more specifically, in studies of new technologies, was put forward. This model is called diffusionist and aims to determine the psychosocial characteristics of farmers (BLUME, 2004).

However, currently, scholars have pointed to a new change in the dynamics of rural areas. Matos et al (2004) addresses the increasing urbanization of the country's rural areas, which is ultimately attracting people, thus contradicting previous studies that pointed to an emptying of this space.

According to Matos et al (2004), such urbanization occurs as a result of the economic diversification observed in the countryside, which is influenced by the expansion of the urban fabrics. Accordingly, economic activities once thought to be exclusive to urban areas are now brought to rural areas. So, industries (mainly agro-industries), wholesale and services, including entertainment and tourism, become available in non-urban areas.

Thus, this new rural environment is composed of neo-rural and agribusiness, which are those that exploit some niche markets for new agricultural activities (exotic plants and animals etc.), as well as rural residents of upscale condominiums, clandestine subdivisions, family farming, agricultural and non-agricultural employees, amongst others (SILVA, 2001) (Figure 2.1).

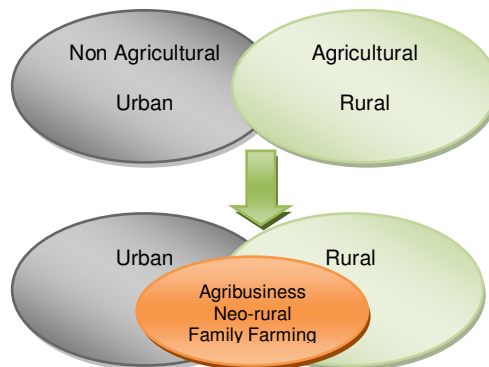


Figure 1 - Rural Environment New Set Up
Source: SILVA adaption, 2001

This new rural environment, termed by scholars as "The New Rural Brazil" (Silva, 1997), is characterized by not having a clear delineation between rural and urban life. In addition, the countryside cannot only be characterized by agriculture or livestock, as well as industry is not the sole economic activity in urban areas.

PUBLIC EDUCATION IN BRAZIL: RURAL VS URBAN

The Brazilian Constitution of 1988 - CF/88 - establishes in its article 227 that every child and adolescent has the right to life, health, food, education, leisure, professional training, culture, dignity, respect, freedom, family and community life (BRAZIL, 1998). In this manner, education is a social right (art. 6 of CF/88) to be guaranteed for all children and adolescents living in urban or rural areas in order to allow them equal conditions and opportunities to exercise their role as citizens.

According to data from the Ministry of Education and the National Institute for Educational Research and Studies (INEP), in Brazil there are more than 50 million students in basic education. Out of these, approximately 75% of the students enrolled in rural schools attended elementary school in the year 2007, while in urban areas this percentage was 58%. This shows a wider distribution of students in different educational categories in urban areas, leaving rural areas with a large concentration of pupils in early childhood and basic education, corresponding to almost 88% of the schoolchildren (MEC/INEP, 2007).

In regard to the enrolment in schools, there is still a strong dependence on public schools for students who are in basic education. In 2007, 99% of students living in rural areas were enrolled in basic education at public schools. Nonetheless still significant, the percentage for those living in urban areas was reduced to 86%.

In the countryside, the illiteracy rate of the population aged 10 and above reached 21% in 2008, while in urban areas it was 8% (PNAD, 2008). Although between 1991 and 2008 there was a reduction in illiteracy rates, observed mainly in rural areas, the results still point to large discrepancies between city and countryside (ECM, 2007).

In relation to the schooling system in the early twentieth century, there were programs to build schools in rural settings, called isolated schools (Pegoretti, 2005). These schools were built to try to stem rural exodus by maintaining people in the countryside to disperse education opportunities. However, the initiative did not succeed because of inadequate school supplies and buildings (schools were too small and poorly maintained), low quality of the education provided, and poor salaries of teachers, who had insufficient training and lacked pedagogical and administrative support (Vasconcellos, 1992). In addition, other problems were the difficulty in obtaining supervision services due to geographical isolation, multi-grade classrooms, schooling being limited to the 4th grade and high dropout rates (GEIPOT, 1995).

Such problems led to the failure of the so-called isolated schools, which were replaced by schools in urban areas. This resulted in the centralization process of schools, which were clustered in more developed urban or rural areas where there was enough demand to sustain them. This has increased the demand for transport to ensure students access to school, as well as created problems for the students who had to stay inside the vehicles for a long time.

In 2007, Brazil had more than 198,000 schools of basic education. More than 55% from this total were located in urban areas (MEC/INEP, 2007). Table XX shows that, in 2007, about

45% of the country's schools were in rural areas. However, this percentage reached 50% in 2002 (MEC, 2007). So, between 2002 and 2007 there was a decrease in the quantity of education facilities available in rural areas, whereas in the urban areas there was a growth.

The means employed by students living in rural areas to reach their schools very often constitutes an obstacle to keeping them in the classrooms and reduces the quality of learning. In this sense, a survey carried out by IBGE (2006) showed that the absence of a school near the student's home, lack of jobs and lack of school transportation are key factors preventing students from attending school. Due to these reasons, it was found that over 17% of students between 0 and 6 years old, and almost 15% of students between 7 and 14 years old were not attending schools (Table I).

Table I – Percentage of students not attending school or day care due to lack of schools or day care institutions close to their homes or lack of places or school transportation

| AGE GROUP | BRAZIL | NORTH | NORTH-EAST | SOUTH-EAST | SOUTH | MID-WEST |
|----------------|--------|-------|------------|------------|-------|----------|
| 0 to 6 years | 17.2% | 14.2% | 17.0% | 17.4% | 21.1% | 15.3% |
| 7 to 14 years | 14.7% | 20.9% | 12.9% | 15.1% | 8.4% | 19.0% |
| 15 to 17 years | 5.3% | 6.7% | 5.3% | 4.4% | 6.1% | 5.8% |

Source: IBGE (2006).

A similar study conducted by the Getúlio Vargas Foundation (FGV, 2009), which was based on the micro data of the PNAD education annexes, identified four main groups of factors that lead students to leave classes, namely: lack of access to the school (10.9%), need to work and generate income (27.1%), lack of intrinsic interest (40.3%) and other reasons (21.7%).

Importantly, lack of school transportation and distance from the school to the student's homes are among the major reasons for not going to school, which reinforces the need for programs and projects aimed at improving the supply, transportation and spatial distribution of schools within the municipality.

THEORY OF LOCATION

The classical theories of location are an attempt to understand the phenomena related to the location of economic activities in a given region. In early theoretical approaches, the transport cost question was always present as it was one of the determining factors of the process.

The study of the location aims to determine the best location for a new productive building, such as a building school. Defining the best place is influenced by the type of facility, its purpose, political, economic, social and cultural environments. Therefore, the classical approach of location theory seeks to explain the factors determining the spatial distribution of industrial activities. This subject is the focus of studies related to Regional Economics, under which a private initiative seeks to assist in defining the more economically viable location, i.e., one that generates the greatest return for the investment manager. On the other hand, when it comes to public projects, the theory of location seeks to subsidize policies that

promote balanced regional development or even reduce socio-economic inequities between regions.

In spatial analyses, two studies are performed: regional and location analysis. The first relates to the location of an economic unit in a continuous space, while the second deals with the study of the location system in complex relations. Among the scholars of localization problems, Johann Heinrich von Thünen is regarded as a pioneer. In his work, spatial dimension is introduced in the analysis of geographic phenomena (FERREIRA, 1974).

In 1826, Von Thünen developed the theory of agricultural location using some assumptions to prove the existence of a relationship between income and distance to the consumer market. He concluded that the further away the center of the production was from the market, the lower the producer surplus (Teruya, 1994).

Alfred Weber developed in 1909 what is now known as the theory of industrial location. In his approach, the analysis of transport costs plays a crucial role in determining the location of industrial activities. The shipping cost is a function of the product's physical weight and the distance to be travelled (FERREIRA, 1974). Therefore, the industry location is determined by the cost of transporting from the producer to the consumer, the cost of labor, and by agglomeration economies.

Weber deepened the study of location factors. In his view, the location factors correspond to a gain, a reduction in costs in which economic activity is to be located at a given point in space. In the taxonomy adopted by Weber, he considers two categories of factors (FERREIRA, 1974):

1. General factors: those that interfere in all industries in lesser or greater intensity (e.g. transportation costs, labor, income, etc.).
2. Special factors: particular aspects of a particular economic activity (e.g. perishable raw material, air humidity, temperature, etc.)

However, there are cases where locations depend on or are guided by special factors such as climate, water conditions, availability of land etc., or depend on causes arising from tangible or intangible factors.

The decision to locate facilities can also be approached from a macro and micro perspective. The macro approach is related to the geographical location within a wide area, when it seeks to optimize the location in relation to the producer market (supplier of raw materials), and the consumer market. The micro perspective examines factors to define a more precise location in a given territory (LAMBERT and STOCK, 1992).

However, there are several factors that influence and should be considered for optimal location decision-making. Among others, strategic, technological, macroeconomic, political, competition, logistic, operational, and infrastructure factors may be mentioned (CHOPRA and MEINDL, 2003).

- Strategic factors: The location of a business is closely related to its strategy. In other words, the decision to locate near the consumer market or sources of raw material will depend on the strategic objectives set by the company.
- Technological factors: The more the technology is employed in the operation of a particular company, the greater the need for proximity to major urban centers, to allow easier access to skilled labor to operate the technology and to an entire network of support services.
- Transport cost: The cost of transportation has significant weight in the decision to locate a business. Transportation costs of raw materials, labor or the finished product to the consumer market influences the location of the company. So, depending on these costs and the company's objectives, facilities will be positioned closer to the raw material supplier market or closer to the consumer market.
- Tax incentives: Tax incentives are reductions in tariffs or rates offered by governments to attract businesses.
- Exchange rate: When it comes to choosing the location for multinational companies, fluctuations in exchange rates are considered because they affect the profitability of these organizations, which leads them to choose safer markets.
- Political factors: The same way exchange rates are taken into consideration, policies adopted by a country may be a factor that attracts or repels the setting up of companies. Countries with more stable policies tend to attract more investments than those politically unstable.
- Legal factors: In addition to political stability, another factor of great importance is the existing legislation for the sector, which may be more restrictive or provide greater guarantees for companies.
- Infrastructure factors: Any company depends on basic infrastructure to operate. So, good infrastructure, including transport, energy, water and communications, is a factor of attraction for the establishment of industrial facilities.
- Labor: In many cases, the setting up of a company in a given region is linked to the existence of skilled labor. Accordingly, institutions dedicated to research and development tend to be located near places that have universities or training centers, since they require skilled labor. Likewise, high-tech manufacturing units will be installed in locations where there is supply of scientists, engineers and highly qualified technicians. Such requirements are reduced as the company adopts production processes that do not require highly-skilled workforce.
- Land cost: Land costs are higher in large metropolitan areas than in smaller towns or rural areas. In urban centers, industrial areas cost less than the residential or commercial ones. It is also important to consider a possible expansion space, which becomes a problem in urban areas.

- Competitive factors: Decision makers must take into account the level of competition in each alternative region. As a rule, establishment of companies in areas saturated with competition is avoided
- Facilities and logistics cost: Logistics costs are the costs of transport, storage and inventory, which should be evaluated at the facility location.

Theory of Location Applications

Many studies of economic activities locations are grounded in the precepts of location theory, with emphasis on agribusiness activities research. For the location of schools, there were studies mainly dedicated to urban schools, which contain peculiarities that are distinct from those required in the rural area, as it can be seen in Table II. However, concern with this topic is old, which shows its importance and complexity.

Table II - Location Theory Application in Educational Services

| Area of Study | Process | Goal | Authors |
|---------------|---|--|---------------------------------------|
| Urban School | Multicriteria Analysis | Location of schools in Urban areas in Lisbon - Portugal | COELHO (1990) |
| | P-Median Model | Model Evolution for location of schools in Rio de Janeiro - RJ | PIZZOLATO AND SILVA (1997) |
| | Geographic Information System (GIS) | School location and transportation cost for students in São Carlos - SP | DUTRA (1998) |
| | Cellular Automata and Artificial Neural Networks | School location in relation to transportation costs – São Carlos - SP | LIMA (2003) |
| | P-Median Method | Location of early education schools in urban areas | LOBO (2003) |
| | P-Median | Methodology for location of public schools in urban areas | PIZZOLATO <i>et al</i> (2004) |
| | P-Median | School location for elementary schools in the city of Vitória - ES | BARCELOS, PIZZOLATO AND LORENA (2004) |
| | P-Median, with skilled and unskilled methods | Assessment of public schools – Vitória - ES | PIZZOLATO <i>et al</i> (2004) |
| | Multicriteria Analysis | Conceptual model of urban school location | SANTOS (2005) |
| | Relationship between the school student, and means of transport | Showed complexity of school transport and school distribution in Zwijndrecht - Holland | BOER (2005) |
| | Accessibility | Analysis of students' accessibility to schools in the city of Fortaleza, Ceará State, Brazil | HOLANDA AND MOREIRA (2006) |
| | Hierarchical Discrete Location Model | To maximize accessibility to schools within the urban area of Coimbra in Portugal | TEIXEIRA AND ANTUNES (2008) |
| Rural Schools | Location Factors | Analysis of the interrelationship between cost, quality and efficiency in the delivery of educational services in the rural area of Nevada - USA | SADLER AND CHING (1975) |
| | | To describe the similarities and differences between schools based on their location (urban and rural) | MCCRACKERN AND BARCINAS (1991) |
| | Location Factors | Identify factors that influence the decision making for school locations in rural areas | SILVA (2004) |

It is noteworthy that the specificities and peculiarities of the rural setting do not allow a simple adaptation of the methodologies developed for the urban area as seen in section 2. Therefore, there is a lack of studies specific to rural areas.

Accordingly, this study brings innovations to the application and concepts of the Theory of Location, bringing to it social and regional peculiarities combined with economic and technical particularities.

RESEARCH METHODOLOGY FOR IDENTIFICATION OF LOCATION FACTORS

As seen in previous sections; the differences between rural and urban settings are evident. As a result, based on the location theory described in section 4, a methodological process to identify the location factors was developed through the submission of a questionnaire to state and municipal education managers, teachers, school principals and specialists linked to the Ministry of Education and to the National Fund for Education Development - NFED.

The methodology adopted for the study is presented in Figure 2. This structure (or process) is based on a questionnaire where a list of location factors is presented to educational and school transport administrators who may identify them as valid and, in case there other factors not included in the list, they are presented. The list was drawn up, as mentioned, based on national and international literature.

Figure 2: Methodology for identification of location factors

In order to locate a school unit is necessary to understand the needs of the children who live in rural areas and the social, economic and political dynamics of rural areas and students displacements. In this way, the process of identifying location factors was developed in two steps: the first was identified on the basis of the literature review listed on Table II and the second was complemented by various actors that participated in this research, who were given freedom to insert or remove factors from the list identified in step 1. The results of this process for urban and rural areas are presented on Table III.

Table III - Location Factors for Schools

| Item | Location Factors |
|-------------|--|
| 1 | Topographic features of the land (elevations, depressions, valleys, slopes etc.) |
| 2 | Hydrographic aspects (rivers, streams, lakes, canals) |
| 3 | Proximity of other service centers (health clinics, squares, sport facilities and community centers) |
| 4 | Distance to other schools |
| 5 | Distance to the city center |
| 6 | Size of the school to be constructed |
| 7 | Water availability |
| 8 | Electricity supply |
| 9 | Existence of a sewer system |

| | |
|----|---|
| 10 | Existence of a storm water system |
| 11 | Existence of land lines or cellular telephony signals |
| 12 | Existence of satellites signals for wireless internet |
| 13 | Existence of carpooling systems |
| 14 | Land cost |
| 15 | Closeness of the school to the main roads |
| 16 | Closeness of the school to secondary roads |
| 17 | Existence of road marking |
| 18 | Existence of sidewalks |
| 19 | Demand of students for a school (historical and current) |
| 20 | Environmental conditions (occurrence of pollution, wetlands, floodplains and areas subject to landslides) |
| 21 | Transportation time from home to school for commuter students |
| 22 | Transportation time from home to school for teachers and other employees |
| 23 | Transportation cost for students to commute from home to school |
| 24 | Transportation cost for teachers and other employees to commute from home to school |
| 25 | Transportation distance for students to commute from home to school |
| 26 | Transportation distance for teachers and other employees to commute from home to school |
| 27 | Legislation restrictions related to land use and occupation |
| 28 | State of the roadways |
| 29 | Type of pavement (paved or not paved) |
| 30 | Population density |
| 31 | Safety of the location where the school will be implemented (crime rate) |

After defining the factors, the list was submitted to different school managers who evaluated and qualified them by rating each of them with scores 1 to 5 (Likert scale) depending on the degree of importance that the item had in relation to the location of the school in an urban area as well as in a rural area. The Likert Scale is a type of psychometric response scale commonly used in questionnaires or, in other words, it is a scale that assigns a numeric value to the characteristics of people or to subjective issues that involve opinions, preferences or needs (BERTRAM, 2009).

It is important to note that when it comes to different environments, it is expected that there are differences in the degree of importance given to factors viewed from the urban perspective compared with the rural perspective. The scale presented has the following meaning: a) Irrelevant b) Little Relevant c) Relevant d) Very Relevant, e) Highly Relevant.

RESEARCH FINDINGS

Out of all questionnaires sent, a total of 225 questionnaires from 86 municipalities distributed in five regions of the country were returned with valid information. The distribution of the questionnaires throughout the country and among different professionals is presented, respectively, in Table IV and Table V.

*Location Factors for Public Schools: a comparative analysis between urban and rural areas
(CARVALHO, Willer; MATSUO, José; YAMASHITA, Yaeko)*

Table IV - Spatial Distribution of Questionnaires

| Region | Total | % |
|----------------------|------------|------------|
| North | 62 | 27,6 |
| North East | 46 | 20,4 |
| Mid-West | 42 | 18,7 |
| South-East | 26 | 11,6 |
| South | 49 | 21,8 |
| General Total | 225 | 100 |

Table V - Questionnaire per actors

| Actors | Total | % |
|-----------------------------------|------------|------------|
| Teacher | 53 | 23,6 |
| Municipal Secretary of Education | 51 | 22,7 |
| School Principal | 38 | 16,9 |
| Advisor / Technical Assistant | 21 | 9,3 |
| Education Manager | 20 | 8,9 |
| School Transportation Coordinator | 19 | 8,4 |
| MEC / NFED / Specialist | 17 | 7,6 |
| Mayor | 4 | 1,8 |
| State Education Department | 2 | 0,9 |
| General Total | 225 | 100 |

The tables shows a significant nationwide range of the data surveyed, which enables to capture regional differences that affect the determination of location factors. Considering the average grades received by each of the factors, it can be observed a different score when considering the two areas under analyzes (urban and rural), in addition to a significant difference in the ranking of factors. Subsequently, Table VI shows the hierarchical position that each factor has received for the urban as well as for the rural space, and the difference between the hierarchical positions considering both environments.

Table VI – Hierarchy of the Factors for Urban and Rural Areas

| Location Factor | Urban | Rural | Difference |
|--|-------|-------|------------|
| Topographic features of the land | 24 | 17 | 7 |
| Hydrographic aspects (rivers, streams, lakes, canals) | 30 | 13 | 17 |
| Proximity to other service centers (health clinics, squares, sport facilities and community centers) | 19 | 27 | 8 |
| Distance to other schools | 28 | 25 | 3 |
| Distance to the city center | 31 | 23 | 8 |
| Size of the school to be constructed | 7 | 11 | 4 |
| Water availability | 4 | 10 | 6 |
| Electricity supply | 2 | 4 | 2 |
| Existence of a sewer system | 3 | 18 | 15 |
| Existence of a storm water system | 25 | 24 | 1 |
| Existence of land lines or cellular telephony signal | 10 | 22 | 12 |
| Existence of a satellites signals for wireless internet | 14 | 21 | 7 |
| Existence of a carpooling systems | 11 | 26 | 15 |
| Land cost | 22 | 29 | 7 |
| Closeness to main roads | 27 | 19 | 8 |
| Closeness to secondary roadways | 29 | 20 | 9 |
| Existence of road marking | 20 | 30 | 10 |
| Existence of sidewalks | 9 | 31 | 22 |
| Demand of students for a school (historic and current) | 5 | 6 | 1 |
| Environmental conditions (existence of pollution, wetlands and areas subject to landslides) | 6 | 9 | 3 |
| Transportation time from home to school for commuter students | 12 | 1 | 11 |

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| Location Factor | Urban | Rural | Difference |
|---|-------|-------|------------|
| Transportation between home and school for teachers and other employees | 16 | 5 | 11 |
| Transportation cost for students to commute from home to school | 15 | 2 | 13 |
| Transportation cost for teachers and other employees to commute from home to school | 23 | 7 | 16 |
| Transportation distance for students to commute from home to school | 21 | 3 | 18 |
| Transportation distance for teachers and other employees to commute from home to school | 26 | 8 | 18 |
| Legislation restriction related to land use and occupation | 13 | 16 | 3 |
| State of the roadways | 18 | 14 | 4 |
| Pavement type (paves or not paved) | 17 | 28 | 11 |
| Population density | 8 | 15 | 7 |
| Location safety Index | 1 | 12 | 11 |

It was verified a variety of responses for each of the factors considered. Thus, for all the factors, there were answers in all levels of importance. This reflects the complexity of the subject, as well as the diverse characteristics that each region has when dealing with the school transport issue. In this way, a factor that was considered extremely important in a region was seen as irrelevant in another. This was confirmed when the variance and the standard deviation of the ranking of each factor were evaluated.

When comparing the 10 items considered most relevant in the process of locating the school, one can note the differentiation between these two environments. Thus, Table VII shows the 10 factors considered most important in decreasing order of importance.

Table VII - The 10 most relevant factors per environment.

| Ranking | Urban Area Factors | Rural Area Factors |
|---------|---|---|
| 1 | Local safety index | Transportation time between home and school for commuter students |
| 2 | Electricity supply | Transportation cost for students |
| 3 | Existence of a sewer system | Transportation distance for students |
| 4 | Water availability | Electricity supply |
| 5 | Demand of students for a school | Transportation time for teachers and other employees |
| 6 | Environmental conditions | Demand of students for a school |
| 7 | Size of the school to be constructed | Transportation cost for teachers and other employees |
| 8 | Population density | Transportation time for teachers and other employees |
| 9 | Existence of sidewalks | Environmental conditions |
| 10 | Existence of communication by telephone or mobile phone communication | Water availability |

As shown above, among the ten factors, only four reappear, though in different hierarchical positions. This indicates the difference in dynamics between these two economic spaces and gives evidence to the need for specific studies for each of them with regard to the decision-making process about the location of schools.

The results demonstrates that the concerns related to the locations of schools in rural areas are quite different from those in urban areas, showing that in the rural space the issue of time and distance of travel are the most important factors. This confirms the Brazilian reality presented

by CEFTRU/FNDE of large displacements, when it was observed that some of the students had to travel more than four hours every day to reach their school, causing discomfort and resulting in tiredness during classes, which affected pupils' school performance.

It is verified that in the urban area the security question is prioritized, reflecting concerns with the urban violence that is mainly prevalent in Brazilian cities of medium and large size. Moreover, although the urban area provides a basic infrastructure that in general is more appropriate than that found in rural areas, major concerns arose about the existence of such infrastructure. This is justified by the fact that many smaller Brazilian municipalities do not count with the infrastructure that is necessary for the implementation of a school in its entire urban area.

FINAL CONSIDERATIONS

This research was done with ample distribution across the Brazilian territory, enabling the collection of opinions from different professionals related to the subject of the study and taking into consideration specific political, cultural, geographical and weather conditions of each region, which ultimately affect the decision-making process for school locations in the Brazilian municipalities.

Thus, the results obtained from this study demonstrate the complexity of a decision-making process for school location, regardless of being in a rural or urban area. Furthermore, the contrast between these two environments is evident, so it is necessary to study each of them.

This fact is verified by observing the difference in the ranking of factors, and which ones were considered most relevant in each of the areas studied. Therefore, factors justifiably appearing in urban areas, such as the issue of security and existence of sidewalks, are not detected in the analysis of the rural environment. On the other hand, factors observed in rural areas - for example travel distance for the students - do not arise in the analysis of the urban space. This is because they are environments with different characteristics and distinct levels of development whose needs must also be differentiated. It is clear that in the study of school location it is essential to pinpoint the characteristics of the environment where they will be placed so that a proper investigation is conducted to identify the real needs of the community.

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