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Predictive Modeling of Personal Mobile Service (SMP) Coverage and Traffic as Instrument for Municipal Technological Development

Predictive Modeling of Personal Mobile Service (SMP) Coverage and Traffic as an Instrument for Municipal Technological Development

Henrique Dias Gomes

Summary

The expansion of mobile connectivity has increased the importance of telecommunications infrastructure for the technological, economic, and social development of municipalities.
In this context, predicting the coverage and traffic of Personal Mobile Service (PMS) is a relevant tool for network planning and optimization, allowing the identification of signal distribution patterns, estimating connectivity demand, and supporting decisions related to infrastructure expansion. This study aims to analyze the importance of PMS coverage and traffic prediction at the municipal level and its contribution to technological development and digital inclusion. To this end, aspects related to the evolution of mobile telephony in Brazil, the characteristics of mobile communication services, and the main propagation models used in coverage estimation are addressed, with emphasis on the Lee, Okumura, and Hata models. The analysis shows that the use of predictive models, combined with information on coverage and traffic, can provide support for telecommunications infrastructure planning and for identifying priority areas for investment. It concludes that improving the analytical and predictive capacity of mobile networks can contribute to improved connectivity, reduced territorial inequalities in access, and strengthened technological development at the municipal level.

Keywords: Mobile telephony; Personal Mobile Service; Network coverage; Data traffic; Prediction.

Abstract

The expansion of mobile connectivity has increased the importance of telecommunications infrastructure for the technological, economic, and social development of municipalities. In this context, predicting the coverage and traffic of the Personal Mobile Service (SMP) represents a relevant tool for network planning and optimization, allowing the identification of signal distribution patterns, the estimation of connectivity demand, and the support of decisions regarding infrastructure expansion. This study aims to analyze the importance of predicting SMP coverage and traffic at the municipal level and its contribution to technological development and digital inclusion. To this end, the study addresses aspects related to the evolution of mobile telephony in Brazil, the characteristics of mobile communication services, and the main propagation models used for coverage estimation, with emphasis on the Lee, Okumura, and Hata models. The analysis indicates that the use of predictive models, combined with information on network coverage and traffic, can provide relevant support for telecommunications infrastructure planning and for identifying areas requiring priority investments. It is concluded that improving the analytical and predictive capabilities of mobile networks can contribute to enhanced connectivity, the reduction of territorial inequalities in access to digital services, and the strengthening of technological development at the municipal level.

Keywords: Mobile telephony; Personal Mobile Service; Network coverage; Data traffic; prediction; Technological development.

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1 INTRODUCTION

Mobile connectivity is currently one of the main components of the infrastructure.
The technology necessary for the functioning of society and economic activities.
The expansion of mobile devices, digital services, and internet access has broadened
significantly increased dependence on communication networks capable of providing coverage.
adequate, availability, and capacity compatible with user demand.
In this context, the performance of mobile phone networks has implications that go beyond...
individual communication, encompassing business activities, public services, education,
trade, access to information and different processes related to development
technological.
At the municipal level, the availability and quality of mobile communication infrastructure.
These factors are particularly important, given the differences in network coverage and capacity.
They can influence the population's access to digital services and limit the use of
opportunities associated with technological transformation. Identifying the conditions for
Coverage and intensity of network usage allow for a better understanding of distribution.
Territorial connectivity and identifying regions that may require additional investments.
in infrastructure.

In this scenario, predicting the coverage and traffic of the Personal Mobile Service (SMP) constitutes
A relevant tool for planning and managing telecommunications networks.
Predictive analysis makes it possible to estimate signal behavior in different areas and evaluate the...
The relationship between available infrastructure and the demand for communication services. These
This information can support decisions related to expanding coverage, to
sizing network capacity and prioritizing investments, contributing to the
Improving the quality of services offered to the public.
The use of propagation models and data analysis techniques also allows,
Consider the geographical and urbanistic particularities of each territory. Characteristics such as
relief, land use, presence of buildings, vegetation, population distribution and
The location of infrastructure can interfere with signal propagation and network utilization.
Therefore, the analysis of coverage and traffic must consider the specific characteristics of the municipality.
studied, avoiding evaluations based exclusively on general parameters.
Beyond the technical perspective, the study of mobile connectivity is relevant to...
Technological development and digital inclusion. A telecommunications infrastructure.

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adequate access can improve access to digital services for the population, promoting economic activities and contribute to the integration of municipalities into information flows. and to new technologies. In this sense, understanding the distribution and capacity of networks is crucial. Furniture can provide subsidies for development strategies that take into account... specific technological needs of each location.

Given this context, the general objective of this study is to analyze the importance of Prediction of coverage and traffic of Personal Mobile Service (SMP) at the municipal level. considering its contribution to telecommunications infrastructure planning.

The aim is, therefore, to highlight how the use of information related to coverage and Demand for mobile services can help in identifying expansion needs. connectivity and contribute to technological development, digital inclusion and Strengthening the economic and social conditions of the municipality analyzed.

2. THEORETICAL FRAMEWORK

2.1 The Telecommunications Sector and the Structure of Mobile Communication Services in Brazil

According to information provided by the Brazilian Telecommunications Association - TELEBRASIL (2017), the Telecommunications Sector is included in the Technology Sector of Information and Communication – ICT. In Brazil, the Brazilian Institute of Geography and Statistics - IBGE, in the Annual Services Survey - PAS, classifies Information Services as follows manner:

• Telecommunications Services: Include Fixed Telephony, Mobile Telephony, SME (Trunking), Satellite Telecommunications, Internet Access Providers, Transmission and TV and radio signal reception, installation services, and more.

• Information Technology Services: These include software development, data processing, data, consulting, equipment and software sales, outsourcing, support and maintenance of software and other things.

• Audiovisual Services: Includes advertising and merchandising on broadcast television and radio, subscription TV programming, film screenings and ancillary production services television programs.

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• Other services: include publishing, print-integrated publishing, news agencies and Journalism services.

According to TELEBRASIL (2017), Telecommunications Services involve the transmission, transmission or reception of symbols, characters, signs, writings, images, sounds or information of of any nature, by means of wire, radio, electricity, optical means or any other electromagnetic process. The provision of these services is carried out by agents who possess concession, permission or authorization. The Telecommunications Sector is defined as: sector of the economy that encompasses telecommunications services, value-added services and products used to provide these services.

According to data obtained through the Telecommunications Legislative Agenda (2017), in

In recent years, the telecommunications sector has been one of the infrastructure branches that has grown the most. They invest in the country, accounting for 4.2% of Brazil's Gross Domestic Product (GDP) and generating approximately 500,000 jobs. TELEBRASIL (2017) classifies the Sector as Telecommunications in three segments:

• Segments Private Agents - Telecommunications Services Companies what They hold a concession or authorization to provide services, such as fixed-line telephony, Mobile Communications, Multimedia Communications, Pay TV, Broadcasting and others.

• Products and services for Telecommunications Service Providers - Suppliers of equipment and service providers that support the provision of Services of Telecommunications, including space capacity providers.

• Value-Added Services - Companies providing services that have as support main telecommunications services.

Among these three segments, telecommunications services include a variety of services, being Cellular telephony is the most prominent mobile communication service.

This service is characterized by user mobility and is provided in Brazil by holders. authorization for Personal Mobile Service - SMP, regulated in 2010 by Anatel, allowing the existence of virtual providers (ANATEL, 2018).

In addition, there are other Mobile Communication Services, such as Mobile Service. Specialized Mobile Service (SME), Special Mobile Radio Paging Service (SER), Global Mobile Service by Satellite (SMGS), Aeronautical Mobile Service (SMA) and Maritime Mobile Service (SMM) (TELEBRASIL, 2017).

Mobile Communication Services are provided by licensees to... service provision. In the case of SMP, up to four companies can provide service in each

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region of the country. The service providers are consolidated into the following groups: Vivo, Claro, Tim, Oi, CTBC and Sercomtel (MOURA FILHO; 2021).

2.2 Historical Evolution of Mobile Telephony in Brazil

The implementation of mobile telephony in Brazil occurred gradually and represents one of the Key milestones in the expansion of communication technologies in the country. The commercial introduction This service was first implemented in the early 1990s, with Rio de Janeiro as the first city. The first Brazilian city to offer mobile telephony, in 1990. The following year, the service was... established in Brasília, initiating an expansion process that would later reach other important Brazilian cities, including Belo Horizonte, Goiânia, São Paulo and Campo Grande (MOURA FILHO, 2021).

The early years of mobile telephony were characterized by a still limited number of users. of users. Data from the National Telecommunications Agency (ANATEL) indicates that, in In 1990, there were approximately 667 cellular phone lines in the country. In just one year, This number increased to approximately 6,700 lines and, in 1992, surpassed the 30,000 mark. units, highlighting the rapid growth in demand for this new means of communication. (RAPPAPORT, 2009).

The expansion of mobile telephony intensified throughout the 1990s and early 2000s. 2000, following the structural transformations that occurred in the telecommunications sector. Brazilian. In February 2004, the country already had 47,865,593 registered cell phones, a result of a growth process sustained by the expansion of infrastructure, by the dissemination of the devices and the changes promoted in the organization of the market (MOURA FILHO, 2021).

The institutional restructuring of the sector was a decisive factor in this process. The decade The year 1990 was marked by the privatization of telecommunications companies and the creation of a new regulatory model, established from the General Telecommunications Law. This milestone The law promoted significant changes in the organization of the sector and created the National Agency of Telecommunications (ANATEL), responsible for regulation, oversight and monitoring of telecommunications activities in the national territory (ALMEIDA, 2019).

In the early stages of mobile telephony development, service provision was... structured in different radio frequency bands. According to Quintella and Costa (2009), the

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The operators used bands A and B, with the former ranging from 825.03 to 834.99.
MHz, corresponding to channels 1 to 333, and the second located between 835.02 and 844.98 MHz,
covering channels 334 to 666. This configuration was part of the technological structure and
regulatory framework used to organize the operation of mobile communication services in that region.
period.

The introduction of band B represented a significant change in the competitive landscape of
market. The service was initially made available in this format in the District
Federal, in 1997, contributing to the opening of the market to competition. This process was
favored by Law No. 9,295, of July 16, 1996, which established conditions for expansion.
and reorganized telecommunications services and created a basis for greater participation.
of private agents in the sector (MOURA FILHO, 2021).

Alongside the regulatory changes, new companies began to participate in
Brazilian mobile telephony market. Telesp Celular, which began its operations in 1993,
It stood out among the companies responsible for expanding the service, using systems
digital cellular telephony in its operations (ALMEIDA, 2019). Subsequently, the opening
The reorganization of the market favored the entry and consolidation of different groups.
business opportunities, increasing competition and contributing to the expansion of service offerings.
furniture.

The technological evolution of Brazilian cellular telephony can also be understood from
of the succession of different generations of mobile networks. Oliveira (2013) presents this trajectory.
considering the technologies employed by the operators and the transformations resulting from
Evolution of communication systems. The transition between generations enabled the increase.
progressive increase in network capacity, data transmission speed, and variety of
services offered to users.

With the opening and expansion of the market, different companies began to operate in the provision of services.
Mobile communication services in Brazil. Among the groups and brands that have been part of its trajectory.
The companies in the sector include TIM, Claro, CTBC, Oi, Porto Seguro Conecta, Vivo, Sercomtel, and Nextel.
in different periods and business configurations. The expansion of the number of service providers.
contributed to intensifying competition, stimulating the expansion of coverage, and diversifying the
alternative ways to access mobile communication services.

In this context, the provision of mobile communication services has come to involve not only
the operators directly responsible for the infrastructure and the provision of services, but
also different operating models and business partners. Regulatory authorization and

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The structure of service delivery thus constituted fundamental elements for the expansion of mobile telephony and consolidation of communication networks in different regions of Brazilian territory.

The historical trajectory of mobile telephony therefore demonstrates a significant transformation. in the Brazilian telecommunications infrastructure. From a service initially restricted to a few. With users concentrated in specific urban areas, mobile communication has evolved into a A wide-ranging territorial infrastructure, essential for access to communication and to digital connectivity. This evolution makes the analysis of coverage and... particularly relevant. Traffic on Personal Mobile Service (SMP) networks, given the territorial distribution of Infrastructure and the intensity of service utilization can provide information. important for technological planning and for identifying needs of Expanding connectivity in Brazilian municipalities.

2.3 Technological Evolution, Characteristics and Applications of Mobile Telephony

The development of communication technologies has brought about profound transformations. in the forms of interaction between individuals and in access to information. In this process, telephony Mobile technology has established itself as a technology characterized by its ability to communicate. without the need for a permanent physical connection, allowing the user to establish contact. with other people and access information regardless of their location and, on a large scale measure, from the moment when these resources are needed (NOVO, 2011).

The expansion of mobile connectivity has accompanied the growth of internet access in Brazil. In 2013, approximately 75 million Brazilians used the Internet, corresponding to about 40% of the population. At that time, the country occupied a prominent position among the nations with the largest absolute number of users connected to the World Wide Web (LUNARDI; DOLCI; WENDLAND, 2013). In parallel, the mobile telephony market It was experiencing strong expansion, reaching more than 250 million active lines, a number that This highlights the scale that mobile services have reached across the country.

This growth was associated with a combination of different factors, including evolution. technological aspects of networks, investments made in telecommunications infrastructure, progressive reduction in access costs and the growing demand from the population for services of communication and connectivity. The popularization of mobile devices, especially smartphones and tablets also contributed significantly to the expansion of the number of

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users and to diversify the ways in which mobile networks are used.

The technological trajectory of Brazilian mobile telephony has been marked by progressive replacement. of first-generation systems, based on analog technologies such as AMPS, by Digital standards capable of offering greater capacity, quality, and diversity of services. In this process, technologies such as GSM, 3G, 4G and, later, 5G stand out, whose Evolution expanded not only the capacity for voice communication, but also for transmission. data and access to applications dependent on mobile connectivity (ALMEIDA, 2019).

The expansion of mobile networks was also favored by competition among service providers. telecommunications services. Competition for the market has stimulated the creation of different different types of plans, data packages and services, expanding the alternatives available to consumers and contributing to the spread of mobile connectivity (MOURA FILHO, 2021).

The effects of this expansion went beyond the realm of interpersonal communication. Telephony Mobile devices have come to play a significant role in accessing information and using services. digital technologies, in application development, in business activities, and in communication. professional. The expansion of mobile connectivity also favored the growth of e-commerce and the creation of new business models based on applications and digital services (ANATEL, 2016).

The relevance of mobile devices has become even more evident with the shift in Internet access standards. With the expansion of smartphones and mobile networks, access Internet access via portable devices has experienced significant growth in in relation to the traditional use of desktop computers. This process contributed to the Strengthening mobile commerce and developing systems and applications specifically designed for environments characterized by mobility (SILVA JÚNIOR, 2013).

The characteristics of mobile telephony and the Internet can be analyzed from three perspectives. complementary dimensions: user, environment, and system (KELLER et al., 2019). Under the From the user's perspective, mobile devices offer a high degree of personalization and Individualization. Smartphones and tablets are generally used as personal devices. remaining close to their owners for much of the day. This characteristic It enables continuous access to information, social networks, applications, and communication services. and personalized content.

The environmental dimension is related to mobility and the availability of connectivity.

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Unlike traditional fixed access systems, mobile technologies allow that
the user establishes an internet connection while traveling or located in different places.
localities. This feature significantly expands the possibilities for using the
digital services, since connectivity is no longer necessarily linked to a
specific physical point. From a systemic point of view, however, mobile devices
traditionally they have limitations when compared to the equipment used in
Fixed Internet environments. Issues related to computational capacity, autonomy.
Energy consumption, screen size, storage, and resource availability can influence the...
user experience with mobile services. Even so, the evolution of devices and...
networks have progressively reduced some of these limitations, allowing the execution of
increasingly complex applications (LUNARDI; DOLCI; WENDLAND, 2013).

The diversity of applications available in mobile environments can be grouped into three categories.
Major categories: commerce, communication, and content. The commerce category includes
services such as mobile banking, electronic payments, and purchasing
of products and services. Communication includes resources such as email, messaging.
Instant messaging, calls, and interactive platforms. The content category includes news,
Information about traffic, financial data, downloads, and other content that may be...
made available according to the user's time or location (MOURA FILHO,
2021; ALMEIDA, 2019).

In Brazil, the expansion of possibilities for using mobile telephony has gained new momentum.
with the deployment of third-generation (3G) networks, commercially available in the country
starting in 2007. The introduction of this technology represented a significant change in the profile.
the use of mobile networks, as it allowed for greater data transmission capacity and
It enabled the development and popularization of services that required more connectivity.
fast and stable (RAPPAPORT, 2009).

Among the features favored by the expansion of 3G networks, access to the Internet in [location] stood out.
Speeds exceeding those available in previous generations, video calls and usage
of more sophisticated mobile applications. The expansion of data transmission capacity.
It gradually changed user behavior, who began using the devices.
Mobile phones are not only for phone calls and messages, but also for accessing
information, use digital services, consume content and perform different daily activities (SILVA JÚNIOR,
2013).

Subsequently, the evolution to fourth and fifth generation networks further expanded the

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possibilities for using mobile connectivity, with increased capacity for
data transmission, latency reduction, and support for a growing number of devices and
connected applications. In this scenario, mobile telephony ceased to be understood.
exclusively as a service intended for voice communication and became part
fundamental to contemporary digital infrastructure.

This transformation highlights the importance of mobile communication infrastructure for the
society and for technological development. The quality and availability of services
They depend directly on the capacity of the networks, the territorial distribution of the stations, and the
The adequacy of the infrastructure to the existing demand. Consequently, variables related to
Coverage and traffic data from mobile networks become relevant for understanding patterns of
use of services and to subsidize strategies for expanding connectivity, especially in
municipalities with different levels of development and technological needs.

2.4 Coverage Prediction Models in Mobile Communication Networks

Estimating the coverage of a mobile communication network is an essential step in...
Planning and optimization of cellular systems. Prediction allows for the evaluation of distribution.
spatial analysis of the signal, estimating received power levels, and identifying regions where the
The quality of communication can be compromised. Therefore, propagation models...
They play a relevant role in infrastructure sizing and in defining
strategies for expanding or adapting networks.

Throughout the development of telecommunications, different propagation models have been used.
formulated with the aim of representing the behavior of electromagnetic waves in
different environments. The selection of the most suitable model depends on the characteristics of the area.
analyzed, based on the frequency of operation, the properties of the land, and the distance between
transmitter and receiver and other parameters associated with the network infrastructure. Models
Empirical and semi-empirical methods are particularly useful in this context because they allow
estimates based on experimental measurements and parameters adjusted to the characteristics
of certain environments.

The characterization of the propagation environment is therefore an important aspect for the
obtaining reliable results. In general, the areas can be classified into three
Main categories: rural or open, suburban, and urban. Rural regions feature, in
Compared to urban environments, there are fewer buildings and obstacles capable of...

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to significantly interfere with signal propagation. In suburban areas, one observes a
Intermediate occupation, characterized by the presence of residences, vegetation and other
Obstacles are distributed in a less concentrated manner. Urban environments, on the other hand, present...
high density of buildings, structures and vegetation, which can produce phenomena such as
reflection, diffraction, scattering and shading of the signal (VINHAL, 2020).
Among the models used to estimate propagation in mobile networks is the...
Lee's model, developed by WCY Lee from experimental measurements.
in different environments. This is an empirical model, also associated with models
Statistical or stochastic propagation patterns, used to estimate the intensity of the received signal.
and assist in the planning of mobile communication systems (ALMEIDA, 2019).
The Lee Model was developed in the 1980s and has particularly good applications.
associated with frequencies close to 900 MHz and environments with specific topographical characteristics
relatively regular. Its use in mountainous regions or with conditions of
propagation significantly different from that observed in the original experiments may
producing results that differ from the theoretical values, requiring attention to parameter calibration.
used. One of the characteristics of the Lee Model is the possibility of making estimates.
without the need to represent in detail all the elements present in the morphology.
of the region. The model uses information related to the type of environment and parameters.
specific propagation methods, allowing their application in different scenarios. The studies
The experimental experiments that formed the basis of its formulation made it possible to establish parameters for
conditions such as urban and suburban environments, areas with denser vegetation, and regions
close to bodies of water. This characteristic makes the model a relatively alternative
simple for coverage analysis, especially when information is not available.
detailed information about the distribution of the buildings (VINHAL, 2020).
Another model traditionally used in estimating signal propagation in environments
External factors include the Okumura Model, developed by Yoshihisa Okumura based on extensive research.
measurement campaigns conducted in Japan during the 1960s. Because it possesses
Based on empirical evidence, the model was constructed using real-world observations of
signal strength under different propagation conditions and became a reference for
Coverage studies in mobile communication systems. The Okumura Model presents
application primarily in urban and suburban environments, where the effects caused
The presence of buildings and land use exert a significant influence on
propagation. Its use involves parameters related to the operating frequency, the height

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from the transmitting station's antenna and the distance between the base station and the mobile terminal. Although While it can be used in different conditions, its accuracy tends to be lower in certain environments. rural situations when compared to the situations for which it was originally developed (VINHAL, 2020).

Based on Okumura's work, Masaharu Hata developed a model in 1980. mathematical model designed to represent in a simpler way the results obtained by the model. The Hata Model thus constitutes an empirical formulation derived from the curves and original. Okumura's measurements, allowing their use in propagation calculations without the need for... to directly consult the experimental graphs that characterize the original model.

One of the main advantages of the Hata Model is its simplicity. mathematics and ease of implementation in computational simulation tools and Network planning. However, its application is subject to certain timeframes. frequency, antenna heights, and distances between the base station and the mobile terminal. In this way, the suitability of the model must be verified according to the characteristics. specific to the scenario analyzed (VINHAL, 2020).

The models by Lee, Okumura, and Hata therefore present different characteristics and levels. They are complex, but they share the common goal of estimating signal behavior. radio waves under specific propagation conditions. The choice between these approaches must considering the geographical and urban characteristics of the region, the operating parameters of Network and data availability for calibration.

In the context of analyzing Personal Mobile Service (SMP) coverage, the use of models propagation allows transforming physical and technical characteristics of the network into estimates. quantitative data on the signal distribution. These estimates can be associated with information from network traffic and usage, enabling more comprehensive analyses of the relationship between available infrastructure, demand for connectivity, and territorial distribution of services mobile communication. Therefore, coverage modeling is a fundamental step. for studies focused on the prediction and planning of telecommunications infrastructure in municipal scale.

CONCLUSION

This study highlighted the importance of mobile telephony as a fundamental component. of contemporary technological infrastructure and as an element directly related to

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Increased connectivity and socioeconomic development. The expansion of networks.
Furniture in Brazil has significantly changed the ways we communicate and access information.
and the use of digital services, making mobile connectivity an integral part of activities.
personal, professional and economic aspects of the population.
The analysis carried out allowed us to observe that the characteristics of mobility, accessibility and
The availability of mobile devices and services has contributed to expanding the possibilities.
communication and internet access. In addition to interpersonal communication, mobile networks
They have come to support a wide variety of applications related to commerce and the provision of services.
from services, to entertainment, to the dissemination of information and to professional activities,
reinforcing its relevance to society and the economy.
In this context, the quality and availability of network coverage are key factors.
Key factors for the effectiveness of mobile connectivity include the spatial distribution of the signal.
The amount of power received and the physical and urban characteristics of the locations served influence
directly impacts network performance. For this reason, coverage prediction is a
An important tool for planning, sizing, and optimizing infrastructure.
telecommunications.
The analysis of the propagation models presented in this study, especially the models of
Lee, Okumura, and Hata demonstrated the existence of different approaches to estimating the
Signal behavior in different propagation environments. Although each model presents
These methodologies provide specific characteristics, parameters, and application conditions.
Relevant subsidies for evaluating coverage in urban, suburban, and rural areas. A
The choice of model should consider the characteristics of the territory, the frequency used, and the
Available infrastructure and the specific conditions of the environment being analyzed.
The evolution of mobile networks, from early analog technologies to the latest generations.
Recent events demonstrate that infrastructure planning needs to keep pace not only with
growth in the number of users, but also the increasing demand for capacity of
data transmission. In this sense, the expansion of fifth-generation networks represents a
A new stage in the development of telecommunications, with the potential to increase speed.
transmission, reduce latency, and enable applications that depend on higher capacity and
Connection reliability.
Identifying areas that still have limited coverage or lack thereof.
More advanced technologies, such as 5G, should be understood as an important element.
for the planning of future infrastructure expansion actions. The improvement of

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Connectivity can contribute to reducing territorial inequalities in access to technology.
digital and expand the conditions necessary for the development of services and activities.
Economic and technological solutions in municipalities.
In the specific case of Maranhão, the discussions involve public bodies and entities.
Regulators and representatives from telecommunications companies demonstrate the relevance of
Coordination between the different agents involved in providing the services. Initiatives of this kind.
nature can contribute to identifying deficiencies, defining priorities and
developing strategies aimed at improving the coverage and quality of services
mobile communication.
Therefore, it can be concluded that the expansion of mobile telephony must be accompanied by
planning mechanisms capable of simultaneously considering the distribution of
infrastructure, territorial characteristics, coverage levels, and effective demand for
Connectivity. The use of predictive models, combined with coverage data analysis.
and Personal Mobile Service (SMP) traffic, presents itself as a relevant approach for
to support decisions related to the planning and expansion of networks.
Finally, the study reinforces that the continuous improvement of telecommunications infrastructure
It is essential to keep up with the growing demand for connectivity and to promote...
Technological development of municipalities. Predictive analysis of coverage and traffic.
This can contribute not only to improving network efficiency, but also to...
Identifying priority investment areas, providing information capable of supporting
Public policies and strategies for expanding mobile connectivity in Brazil.

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