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Article

Public Policy Planning and Management: Challenges in the Implementation of Road Safety in the State of Paraná

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ABSTRACT

In the context of industrial capitalism and the globalized growth of urban centers, the significant increase in traffic accidents has become a worrying reality. In view of this, this article aims to analyze the impacts of the implementation of the National Plan for Reducing Traffic Deaths and Injuries (PNATRANS) on the reduction of traffic accidents on municipal roads in the state of Paraná. The central question seeks to verify whether, in addition to regulatory advances, this public policy effectively contributes to road safety at the state level. To achieve this objective, some data will be considered, such as: number of traffic accidents from the period before the public policy until recently, number of victims (injured and dead), profile of those involved, among other relevant data. The analyses show a trend of insignificant reduction in the number of traffic accidents on municipal roads in the state in recent years. This data may be related to the effectiveness of public policies, but it should be considered that other factors and actions may also have contributed to this scenario.
Keywords: PNATRANS; urban mobility; traffic accidents; public policy.

RESUMO

No contexto do capitalismo industrial e do crescimento globalizado dos centros urbanos, o aumento expressivo dos acidentes de trânsito tornou-se uma realidade preocupante. Diante disso, este artigo tem por objetivo analisar os impactos da implementação do Plano Nacional de Redução de Mortes e Lesões no Trânsito (PNATRANS) na redução de acidentes de trânsito nas vias municipais no estado do Paraná. A indagação central busca verificar se, além dos avanços normativos, esta política pública efetivamente contribui para a segurança viária em âmbito estadual. Para atingir este objetivo, serão considerados alguns dados, como: número de sinistros de trânsito desde o período anterior a política pública até data recente, número de vítimas (feridos e mortos), perfil dos envolvidos, entre outros dados pertinentes. As análises evidenciem uma tendência de diminuição pouco significativa do número de acidentes de trânsito nas vias municipais do estado nos últimos anos. Este dado pode estar relacionado a efetividade das políticas públicas, mas deve-se considerar que outros fatores e ações podem também ter contribuído para esse cenário.
Palavras-chave: PNATRANS; mobilidade urbana; acidentes de trânsito; política pública.

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Introduction

The acceleration of the urbanization process in recent decades has provided a clearer perception of the growing urban problems in cities. According to the UN's World Cities Report (United Nations), approximately 55% of the global population currently lives in urban areas, with projections indicating that this number could reach 68% by 2050, coinciding with an estimated 10.2 billion people worldwide (UN, 2022). In Brazil, this process is even more intense, with about 87% of the population living in urban areas (IBGE, 2022). In the state of Paraná, this rate is also significant, with over 85% of the population residing in urbanized areas (IPARDES, 2022). Although this process slowed between 2020 and 2022 due to the COVID-19 pandemic—prompting a temporary migration from cities to rural areas in search of sanitary safety—these figures are not expected to hold, as a significant return to urban migration is likely (UN, 2022).

In this context, considering the projected urbanization rates and the frequent lack of adequate planning and infrastructure to accommodate this population growth, continuing with unsustainable development models tends to exacerbate environmental, social, and economic problems. In developing countries, common urban challenges include: precarious housing, occupation of irregular areas, basic sanitation, public and road safety, urban mobility, pollution, inadequate waste management, flooding, among many others.

When reflecting on road safety, it becomes clear that it is one of the most impacted factors in the urban scenario. According to Carvalho and Guedes (2023), in Brazil, approximately 392,000 people lost their lives in traffic accidents between 2010 and 2019, marking a 13.5% increase compared to the previous decade.

The significant impact caused by land transport accidents led the WHO (World Health Organization) and the UN Regional Commissions to establish the "Decade of Action for Road Safety" from 2011 to 2020, later extending the global plan to the 2021–2030 period. Recognizing that mobility is part of almost every aspect of our daily lives, the UN recommends formulating and implementing actions to reduce traffic accident casualties. It emphasizes the need to achieve this goal through the implementation of integrated safe systems adapted to local contexts (UN, 2023).

In the Brazilian context, one example is Law No. 13.614, enacted by then-president Michel Temer on January 11, 2018, and revised in 2021. This law establishes the National Plan for Reducing Traffic Deaths and Injuries (PNATRANS), and "adds a provision to Law No. 9.503, of September 23, 1997 (Brazilian Traffic Code), to establish a goal-setting regime for reducing traffic deaths per group of inhabitants and per group of vehicles" (Brasil, 2018a). To enable the implementation of PNATRANS, the National Traffic Council (CONTRAN) published Resolution No. 740/2018, which establishes guidelines for the plan's implementation, defines accident reduction goals, and details the indicators for monitoring and evaluating road safety policies (Brasil, 2018b).

Based on this context, this article aims to analyze the effects of PNATRANS implementation on the reduction of traffic accidents on municipal roads in the state of Paraná. The central question seeks to determine whether, in addition to regulatory advancements, these policies effectively contribute to road safety at the state level.

This paper is organized into the following sections, in addition to the present introduction and final considerations: the first section presents a brief reflection on public policies, urban mobility, and road safety, highlighting municipal challenges and the need to adapt policies to the specificities of each region in order to improve local dynamics. Then, the methodology employed in the research is presented. Finally, data regarding traffic accidents on Paraná's municipal roads are detailed and analyzed, along with the discussion of the public policy in question.

Integration of Public Policies in Road Safety

With the significant increase in the urbanization process in the country, public policies have proven to be essential pillars for the development of cities, guiding both planning and land use and occupation control. In light of this expanding urban scenario, the government, based on its assigned responsibilities, must represent and address the interests of the state by acting strategically and in a planned manner for the public good (Silva & Bassi, 2012).

In this context, Heidemann (2009) and Souza (2006) argue that public [social] policies should be understood as the field of knowledge that seeks to put the government into action, encompassing two key elements: action and intervention.

This understanding becomes even more relevant in the Brazilian context, where Law No. 10.257 of July 10, 2001, known as the City Statute, stands out as a significant milestone. This legislation not only established general guidelines for urban policy but also introduced management tools, providing a foundation for substantial transformations in urban areas.

Another notable advancement was the creation of the Ministério das Cidades in 2003, which played a central role in addressing urban mobility issues in the country. Within the Ministry, the secretariat responsible for urban mobility was called the Secretaria Nacional de Transportes e da Mobilidade Urbana (SEMOB). Over the years, the Ministry underwent structural and naming changes, transitioning from SEMOB to Secretaria Nacional de Mobilidade e Serviços Urbanos, and more recently, in 2020, to Secretaria Nacional de Mobilidade e Desenvolvimento Regional e Urbano (SMDRU), comprising three departments: regional structuring, regional and urban development, and urban mobility and services projects (Machado, 2022).

Between 2019 and 2022, this Ministry was merged with the Ministry of Social Integration to form the Ministério do Desenvolvimento Regional. Under the current government, the original secretariats were reinstated, and the name Ministério das Cidades was restored.

The Ministry manages programs and financial resources to support urban mobility initiatives. Among the main programs are: Programa Avançar Cidades – Mobilidade Urbana, Programa Avançar Cidades – Setor Privado, Regime Especial de Incentivos para o Desenvolvimento de Infraestrutura (REIDI), Sistema de Apoio à Elaboração de Planos de Mobilidade Urbana (PlanMob), Programa de Renovação de Frota do Transporte Público Coletivo Urbana (ReFROTA), and Programa de Renovação de Frota do Transporte Público Coletivo Urbano de Passageiros Sobre Trilhos (RETREM), among others. These programs aim to fund road interventions, public transport infrastructure, mobility plans, bus and rolling stock acquisition, and more (Brasil, 2025).

These initiatives reflect the government's acknowledgment of the importance of addressing urban mobility challenges in Brazil and aim to tackle issues such as the decline in public transport efficiency, the prioritization of individual transport, and the need to promote sustainable mobility practices. However, the effective outcomes of these actions still require ongoing evaluation to ensure significant improvements in the country's mobility conditions (Machado, 2022).

At the municipal level, the Política Nacional de Mobilidade Urbana (PNMU) places Brazil under a sustainable mobility perspective, providing tools for urban improvements, such as prioritizing non-motorized transport modes and public collective services, regulating access and vehicle circulation, setting pollutant emission standards, charging for the use of urban infrastructure, and ensuring user participation in decision-making (Brasil, 2012; Vieira & Frota, 2018).

The legislation requires municipalities with populations over 20,000 inhabitants to develop a Plano de Mobilidade Urbana (PMU) within three years of the PNMU's publication. This plan must be linked to and compatible with the Master Plan and, where applicable, aligned with integrated urban development plans and

metropolitan transport and mobility plans to maintain access to federal funding (Brasil, 2012). However, deadlines for plan development have been extended, revealing challenges, especially in smaller municipalities (Caldeira & Bastos, 2018).

Within this scenario, the Plano Nacional de Redução de Mortes e Lesões no Trânsito (PNATRANS) stands out as a key initiative for road safety in Brazil. It sets a goal to reduce traffic mortality rates by 50% over ten years, considering different population segments and vehicle categories (Brasil, 2021).

What distinguishes PNATRANS is its articulation with existing initiatives, expanding its reach by structuring actions around six strategic pillars. This approach enables comprehensive action on road safety, addressing multiple dimensions of the issue. The pillars are: (i) Road Safety Management, which deals with planning and coordinating actions; (ii) Safe Roads, focused on infrastructure and road safety; (iii) Vehicle Safety, covering vehicle standards and technological innovations; (iv) Road Safety Education, centered on driver and pedestrian awareness and training; (v) Victim Care, aiming at efficient emergency and rehabilitation services; and (vi) Regulation and Enforcement, responsible for compliance with guidelines and regulations (Brasil, 2021).

With this structure, PNATRANS proposes a systemic and coordinated response to road safety challenges, contributing to the construction of safer and more sustainable traffic. The implementation of this policy, along with strategic guidelines, seeks to broaden perspectives and guide urban mobility toward a safer future. In this context, the UN Decade of Action for Road Safety is also highlighted, a global campaign that reinforces the importance of coordinated and integrated measures among participating countries to reduce traffic mortality and injury rates (Caldeira & Bastos, 2018).

However, addressing these issues requires heightened attention, and unfortunately, the approaches adopted to deal with these challenges often fail in the face of their complexity. Traditionally, decision-making is reductionist, attributing each problem to a different person or agency, with limited expertise and fragmented responsibilities. This approach proves ineffective when addressing complex problems involving interrelated and often conflicting objectives (Litman, 2003; Silveira & Clementino, 2017).

Dye (2013) reinforces this by stating that public policies do not always operate as intended. He raises the question of whether policy analysis can truly "solve" problems, emphasizing that the pursuit of a better society must be accompanied by the awareness that solutions to these challenges may be difficult to achieve.

Thus, the implementation of these policies proves to be complex, subject to a series of obstacles intrinsic to Brazil's urban reality. The scope of various aspects of urban mobility demands an integrated approach—something not always achieved in municipalities where different sectors operate in a disconnected manner.

Fragmented management emerges as a significant initial barrier. In this perspective, as interpreted by Silveira and Clementino (2017), it is emphasized that:

> "It is certain that municipalities, being the level of government closest to citizens, can have a more sensitive structure for detecting public problems. Moreover, their proximity to the recipients of public actions can make local governance more transparent and participatory. However, it is not always possible to rely on adequate human resources, infrastructure, and financial means to meet the challenges involved in designing and implementing public policy. Thus, aspects that support positive opinions in favor of decentralization may prove to be rhetorical elements in stagnant municipal scenarios, which can hinder the development of effective policies" (Silveira & Clementino, 2017, p. 7)

Supporting these arguments, Silva and Bassi (2012) emphasize that the implementation of public policies faces significant challenges, particularly due to a shortage of qualified professionals, insufficient financial resources, and deficiencies in managerial capacity—factors that may compromise the effective execution of such policies.

Therefore, allocating specific funds becomes essential for the development of traffic safety infrastructure, ranging from road improvements to the use of modern signage and innovative technologies. However, the lack of proper management can undermine the effective implementation of the proposed guidelines and actions.

Finally, as Silva and Bassi (2012) point out, the challenge of a public policy lies in its need to be effective in defining and achieving its objectives (effectiveness), while striving to reach these goals with the least possible use of resources (efficiency). To achieve this, it is necessary to have a government with governance capacity and institutions capable of interacting and integrating throughout the entire policy cycle—from conception to evaluation and continuous improvement.

Methods

This study aims to deepen the understanding of the topic under analysis, and is characterized as exploratory research. As noted by Gil (2002), exploratory studies provide a more in-depth familiarity with the scope of the chosen approach, making it more explicit through subsequent analyses. Regarding the research approach, it is qualitative, with an emphasis on interpretation, and includes quantitative data collection.

The main data used in the analysis include:

- Traffic accident and victim rates: these provide essential insights for assessing the extent of fatalities and violence on the roads.
- Traffic accident rates by vehicle category: these allow for the identification of user groups most prone to traffic risks.
- Rates of drivers involved in accidents (by age and gender): these help identify more vulnerable demographic groups.
- Fleet growth rates: these offer insights into traffic dynamics.
- Vehicle-per-capita ratios and estimated population: these indicate vehicle density relative to the population.
- PNATRANS implementation: information on the state's participation in the plan.

Considering the data mentioned in the analyses, Table 1 presents the reference sources for this information, along with the time period covered.

Table 1. Reference sources for the analyzed data.

Analyzed Data	Time Period	Data Source
Traffic Accidents and Victims	2001 a 2022	Detran-PR Statistical Yearbook, 2005 to 2022 editions (DETRAN-PR, 2023)
Traffic Accidents by Vehicle Category	2005 a 2022	Detran-PR Statistical Yearbook, 2005 to 2022 editions (DETRAN-PR, 2023)
Drivers Involved in Accidents (by age and gender)	2005 a 2022	Detran-PR Statistical Yearbook, 2005 to 2022 editions (DETRAN-PR, 2023)
Evolution of the Vehicle Fleet	2001 a 2022	Detran-PR Statistical Yearbook, 2005 to 2022 editions (DETRAN-PR, 2023)
Vehicles per Capita × Estimated Population	2001 a 2022	Detran-PR Statistical Yearbook, 2005 to 2022 editions (DETRAN-PR, 2023)
PNATRANS Implementation	Current	Paraná, 2023

Source: Authors (2024).

It is worth noting that the data from Detran-PR, compiled in its statistical yearbooks, are essential for a comprehensive understanding of road safety in the state of Paraná. Detran-PR draws on information from sources such as BPTRAN – P/3 Planning Division and the Technology and Information Center of the Paraná Military Police, which play a significant role in collecting and recording traffic accident data. Additional data are provided by DPRF – Accident Records and Medical Division of the Federal Highway Police, IBGE – Brazilian Institute of Geography and Statistics, IPARDES – Paraná Institute of Economic and Social Development, and the State Highway Police Battalion, covering municipal roads as well as state and federal highways.

In this study, the selected data were limited to municipal roads. Therefore, the option was to use Detran-PR data, which facilitated the identification and separation of information specific to municipal roads from that related to state and federal highways.

This made it possible to interpret the levels of association between traffic accident data and the challenges related to road safety identified from the cited sources. Furthermore, this approach enables a better understanding of the effectiveness of PNATRANS in the state of Paraná.

Results and Discussion

The evolution of legislation and public policies aimed at urban development in Brazil stands out as a significant step toward addressing the country's pressing challenges. However, despite normative advances, the effective implementation of these instruments continues to face considerable obstacles.

These implementation challenges gain even more relevance when placed in the context of Brazil's traffic accident landscape. Between 2011 and 2020, Brazil saw a 2.3% increase in road accidents compared to the previous decade, a result far below the global target established by the UN's First Decade of Action for Road Safety (Carvalho & Guedes, 2023; IPEA, 2023).

Focusing specifically on the state of Paraná, it becomes essential to examine how national trends unfold at the local level. Detailed data on traffic accidents, victims, and economic impacts within the region offer valuable insights into the state's road safety context.

The implementation of PNATRANS emerges as a central element in this discussion, providing a set of guidelines aimed at improving mobility conditions and road safety. As these policies are put into practice, it is appropriate to question whether they have contributed to promoting traffic safety in Paraná, emphasizing the relevance of public policies and the need to prioritize the development of safer and more human-centered cities.

The analysis of traffic accidents and their impact on victims can enhance the understanding of the challenges faced by municipalities across Paraná, highlighting the need for more comprehensive measures addressing these issues. As such, these topics should be prioritized in public policy to ensure safer and more efficient cities.

Regarding traffic accidents, data from 2011 (Chart 01) show that Paraná experienced a high rate of incidents on its roads. Considering only municipal roads, both in the capital and in interior cities, the total number of accidents reached 90,955 (Table 01), of which 34.26% involved victims. In the years leading up to 2011, the rates had been increasing annually, in tandem with the state's population growth and vehicle fleet expansion, as shown in Chart 2 and Table 02.

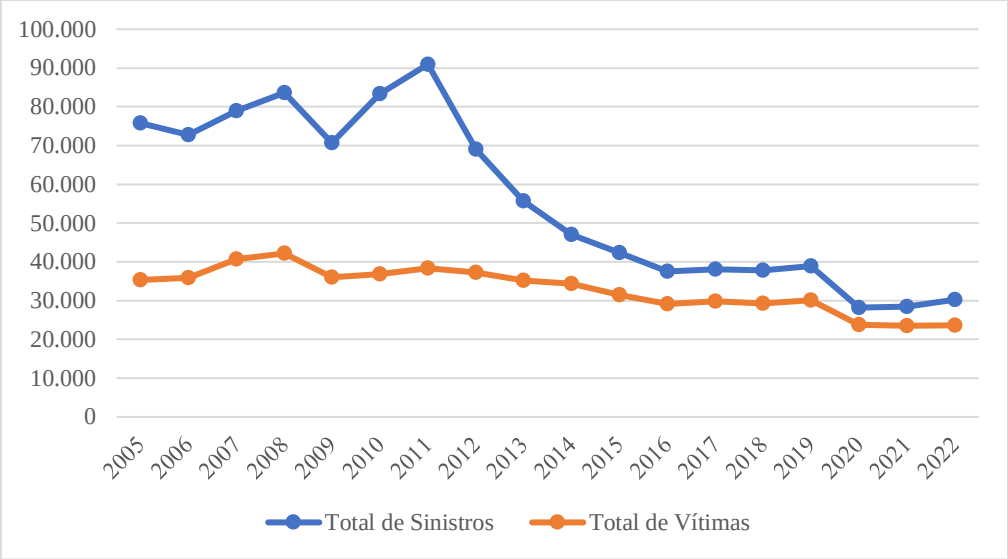

Chart 01. Traffic accidents on municipal roads in the state of Paraná (2005–2022).Source: Authors (2024), adapted from DETRAN-PR (2023).

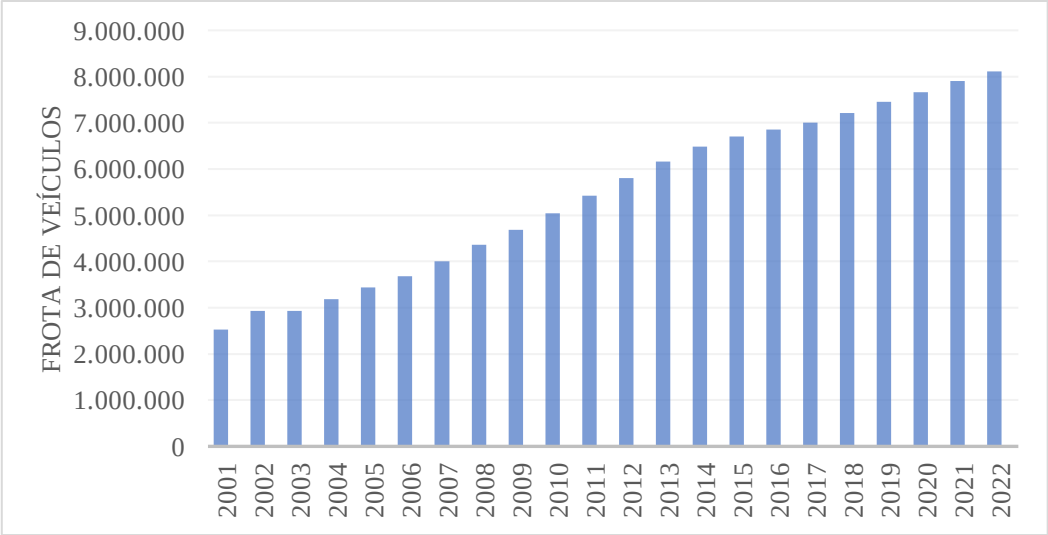

Chart 02. Vehicle fleet (2001–2022). Source: Authors (2024), adapted from DETRAN-PR (2023)

Table 01. Traffic accidents on municipal roads in the state of Paraná (2005–2022)

Year	Total Accidents	Accidents w/ Victims	Accidents w/o Victims	Total Victims	Injured	Deaths at the Scene	Deaths Afterward
2005	75.757	27.965	57.792	35.367	34.955	412	*
2006	72.688	28.715	43.973	35.896	35.516	380	*
2007	78.881	32.567	46.314	40.727	40.311	416	*
2008	83.663	33.946	49.717	42.174	41.748	426	*
2009	70.652	29.438	49.214	36.062	35.706	356	*
2010	83.354	30.154	53.250	36.824	36.386	438	*
2011	90.955	31.170	59.783	38.343	37.893	450	*
2012	69.060	30.703	38.357	37.258	36.835	523	*
2013	55.699	28.569	27.130	35.142	34.677	322	143
2014	47.002	27.808	19.194	34.319	33.843	286	190
2015	42.290	25.751	16.539	31.440	31.000	267	173
2016	37.472	23.840	13.632	29.070	28.689	268	113
2017	38.040	24.646	13.394	29.810	29.409	255	146
2018	37.817	24.250	13.567	29.246	28.832	274	140
2019	38.869	25.136	13.733	30.102	29.697	266	139
2020	28.206	20.235	7.971	23.831	23.474	266	91
2021	28.502	20.075	8.457	23.516	23.121	296	99
2022	30.206	20.086	10.124	23.647	23.230	328	89

* Not available

Source: Authors (2024), adapted from DETRAN-PR (2023).

Table 02. Vehicles per 100 inhabitants × Estimated population

Year	Population	Vehicles per 100 Inhabitants.
2001	9.606.435	26,36
2002	9.718.001	27,98
2003	9.827.936	29,81
2004	9.936.549	32,02
2005	10.043.918	34,17
2006	10.150.139	36,21
2007	10.284.503	38,89
2008	10.590.169	41,15
2009	10.686.247	43,83
2010	10.439.601	48,30
2011	10.512.151	51,62
2012	10.577.755	54,81
2013	10.997.465	56,01
2014	11.081.692	58,56
2015	11.163.018	60,02
2016	11.242.720	60,92

Year	Population	Vehicles per 100 Inhabitants.
2017	11.320.892	61,89
2018	11.348.937	63,57
2019	11.433.957	65,18
2020	11.516.840	66,53
2021	11.597.484	68,13
2022	11.751.111	69,67

Source: Authors (2024), adapted from DETRAN-PR (2023).

The analysis of the data highlights that, starting from the early 2010s, there was a significant decline in the number of traffic accidents and casualties, suggesting a possible correlation with various initiatives and policies implemented both globally and nationally. The *First Decade of Action for Road Safety* played a key role in mobilizing efforts and raising awareness about the importance of road safety. At the national level, public policies targeting this issue may also have contributed to this trend by seeking to improve traffic conditions and promote measures aimed at reducing accidents.

In recent years, as also observed in Table 01, there has been a decrease in the number of injuries and fatalities (both at the scene and subsequent) in traffic accidents in Paraná, compared to the previous decade. However, it is important to emphasize that there have been changes in the collection and complexity of interpreting this data, due to modifications in how accidents have been recorded over time. In the early 2010–2020 decade, the Military Police was called to all incidents on municipal roads, regardless of whether there were casualties or only property damage. Currently, the police only need to be involved when there are injuries or fatalities.

In cases involving only material damage, the recommendation is for those involved to file a report through an incident bulletin (*boletim de ocorrência*), but this practice is not always followed. Often, parties prefer to settle the matter without involving legal authorities, which may hinder the accurate collection of this information and affect the quality of statistical records.

To reinforce the interpretation of the presented scenario, between 2001 and 2008 there was an increase in the number of injuries and fatalities per 100,000 inhabitants (Figure 03), reaching its highest peak in 2008.

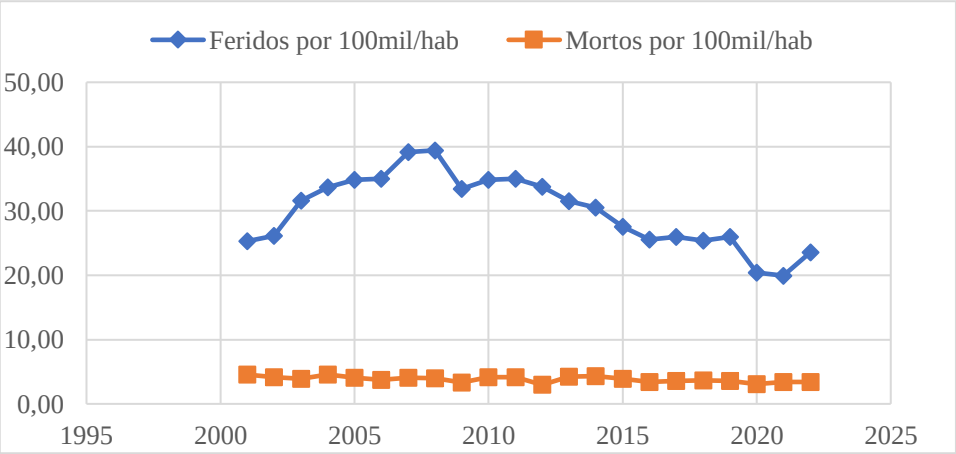

Chart 03. Injuries and Deaths in Traffic Accidents per 100,000 Inhabitants on Municipal Roads in the State of Paraná (2001–2022). Source: Authors (2024), adapted from DETRAN-PR (2023).

From 2014 onward, the mortality rates per 100,000 inhabitants showed a more pronounced decline. Research by IPEA (2023) associates this drop with the intensity of the economic crisis prior to the impeachment process.

It is also important to consider that the COVID-19 pandemic may have played a significant role in the dynamics of traffic accidents and, consequently, in the variation of these numbers over time. Mobility restrictions and changes in behavior patterns during this period may have directly impacted the frequency and severity of accidents. The reduction in vehicle traffic during certain periods, combined with social distancing measures, may have contributed to an apparent decrease in the number of recorded accidents.

In 2022—the year following the implementation of PNATRANS—a slight increase in the number of injuries was observed, indicating the ongoing need for monitoring and adapting strategies to address the specific challenges associated with road safety in the state.

According to the latest Statistical Yearbook from DETRAN-PR (2022), an analysis of accidents recorded on municipal roads reveals that the most impactful occurrences were collisions, accounting for 10% of the cases. Pedestrian accidents represented approximately 7% of the occurrences. Next, rollovers and crashes with fixed objects accounted for 6% and 5% of the cases, respectively. Additionally, a significant portion—over 20%—is attributed to other unspecified types of incidents (DETRAN-PR, 2023).

Although the data points to a slow decline in the number of fatalities in the state over the past decade, the assessment of the First Decade of Action for Road Safety (2010–2019) ranked Paraná among the states with the highest number of pedestrian fatalities, along with Rio de Janeiro, Pará, Ceará, and Alagoas, highlighting the need for attention (Carvalho & Guedes, 2023).

Another important factor in addressing issues related to road safety and urban mobility in urban contexts is the category of vehicles involved in these accidents. The diversity of transport modes present on the roads—such as cars, motorcycles, bicycles, buses, and trucks, among others—significantly influences both the severity and the social and economic impacts of accidents.

Chart 04 presents a detailed analysis of traffic accidents in Paraná from 2005 to 2022, segmented by the types of vehicles involved. In general, the number of accidents varied across years and vehicle types.

More specifically, accidents involving trucks and pickup trucks showed greater stability over the analyzed period, with less variation. On the other hand, automobiles, station wagons, and motorcycles had a strong presence in accidents, though with a downward trend in recent years—suggesting possible efforts to improve safety in this segment.

Accidents involving bicycles showed relatively low numbers. Those involving buses and minibuses fluctuated over the years but showed a slight recent decline. The "Other" category experienced a significant increase in 2017, indicating the need for further investigation to better understand the nature of these records.

Another relevant aspect is the influence of gender and age group, as these elements play important roles in the risks and severity of accidents. Regarding gender (Chart 05), distinct behavioral patterns between men and women are observed. Statistics frequently indicate that men are more often involved in accidents, while women may tend to adopt more cautious behavior (Panichi & Wagner, 2006).

In the gender-related chart, it is clear that the disparity between men and women is consistent throughout the listed years. Between 2005 and 2022, the total number of accidents varied, with a sharp peak in male accidents in 2008. However, from 2011 onwards, consistent with the trends shown throughout this study, there is a visible decline in numbers, particularly among men.

Another important variable is age group (Chart 06), which involves specific behavioral, physical, and psychological characteristics. Variations in perception, decision-making, and stress response abilities across age groups directly influence the occurrence and severity of traffic accidents. Young people, for instance, often

display more impulsive behavior and a greater propensity for risk-taking, which can result in accidents. Older adults, on the other hand, may have slower reflexes and reduced physical capacity, which can also contribute to specific types of incidents (Panichi & Wagner, 2006).

The analysis of the chart reveals interesting patterns in the distribution of traffic accidents over the years, segmented by age group. The "30 to 59 years" category shows the highest number of occurrences, indicating that middle-aged adults are more likely to be involved in accidents. The "18 to 29 years" group—comprising young adults—also displays a significant incidence.

Unsurprisingly, the "Under 18" category presents relatively low figures, as individuals in this group are not legally permitted to drive under national legislation. The "60 years and over" age group shows a lower frequency of occurrences; however, it is important to consider the greater vulnerability of this population to severe injuries in the event of an accident.

In parallel, when analyzing historical traffic accident data in the state of Paraná, a positive trend is observed, with a decrease in such events over the decades. This evolution raises pertinent questions about the possible influence of PNATRANS on this scenario.

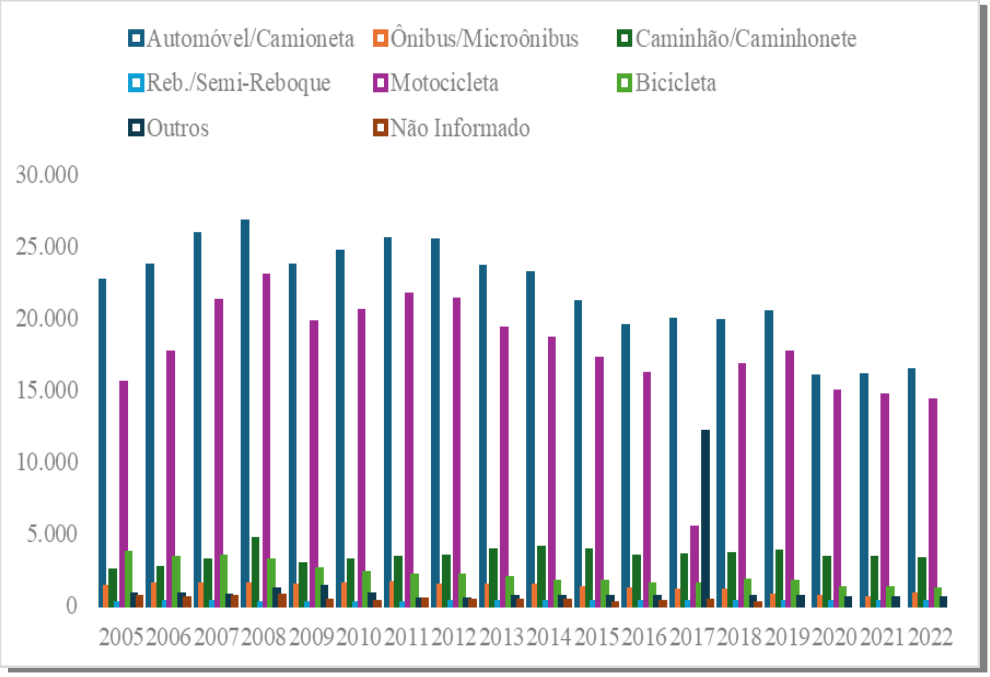

Chart 04. Vehicles involved in traffic accidents with victims on municipal roads in the state of Paraná (2005–2022). Source: Authors (2024), adapted from DETRAN-PR (2023).

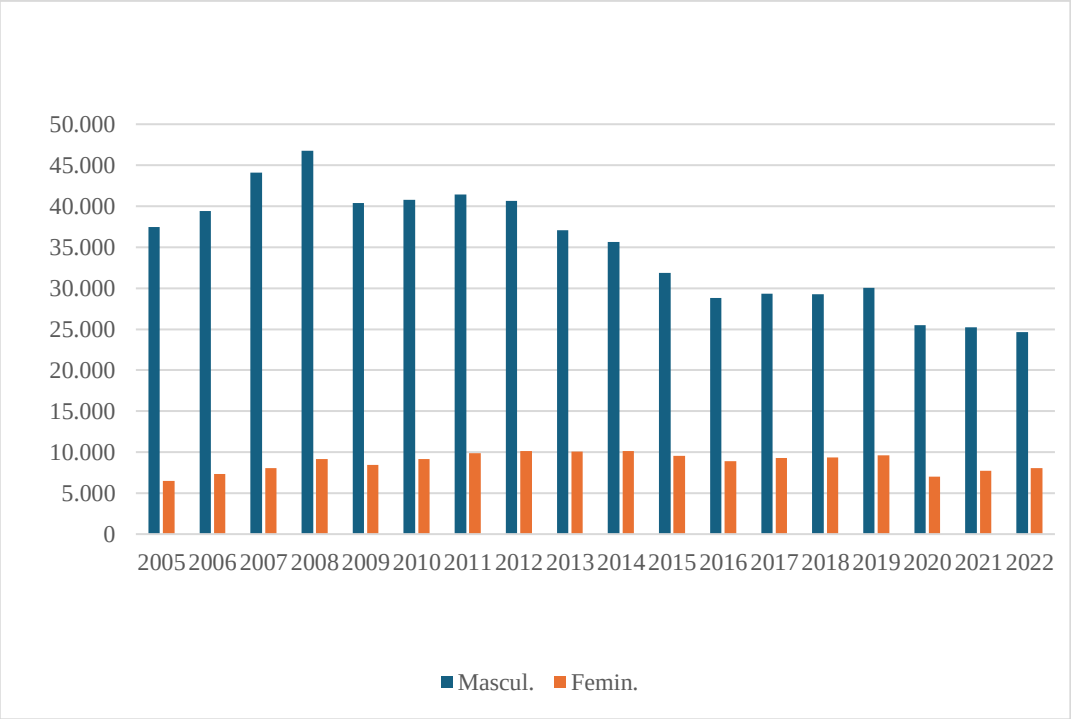

Chart 05. Drivers involved in traffic accidents, by gender, on municipal roads in the state of Paraná (2005–2022).

Source: Authors (2024), adapted from DETRAN-PR (2023).

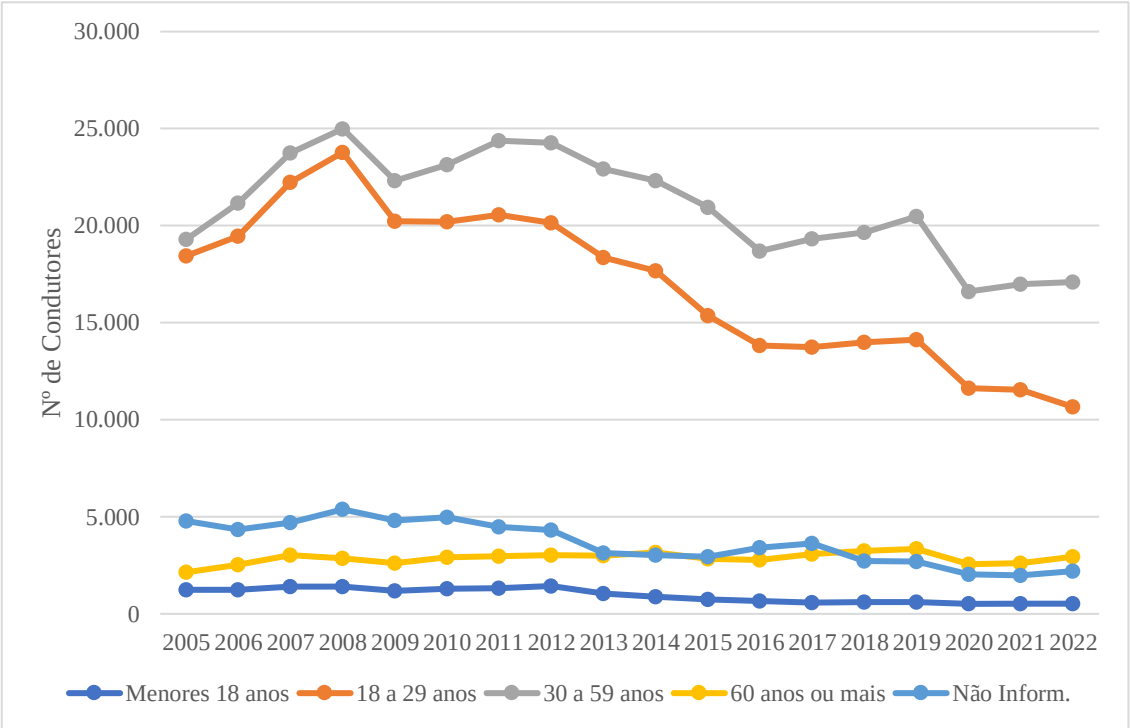

Chart 06. Drivers involved in traffic accidents, by age group, on municipal roads in the state of Paraná (2005–2022).Source: Authors (2024), adapted from DETRAN-PR (2023).

Considering PNATRANS, the state of Paraná was the first to join the Plan, back in 2021, aligning itself with the global road safety agenda. This national plan sets the goal of preserving approximately 86,000 lives by

2028. The initiative contributes strategically to public health and the social security system. Currently, the Paraná State Department of Transit (Detran-PR) is working to develop a strategy to raise awareness among municipalities about the importance of road safety (Paraná, 2023).

Paraná has stood out with a set of 60 actions based on the six pillars of PNATRANS. Of this total, 23 actions focus on Traffic Education, 20 on Regulation and Enforcement, 9 on Traffic Safety Management, and 8 on Safer Roads. So far, no actions have yet been implemented in the pillars of Vehicle Safety and Post-Crash Response in the state (Paraná, 2023).

Currently, the following municipalities in Paraná are either active in or in the process of accreditation under the Plan: Cascavel, Curitiba, Foz do Iguaçu, Francisco Beltrão, Londrina, Pinhais, and São José dos Pinhais (Paraná, 2023).

Finally, it is worth emphasizing that road safety is an increasingly important issue in urbanized contexts, and traffic accident analysis must consider a variety of factors that can influence the statistics. The analysis of data presented for the state of Paraná offers a broad perspective; however, the relationship between the presence of public policies and accident reduction must also take into account a range of socioeconomic and cultural variables.

One particularly significant factor in recent years may be related to the COVID-19 pandemic, which profoundly altered urban mobility behavior in many cities, including in the state of Paraná. With the mobility restrictions imposed during the pandemic, a decrease in traffic volume was observed during certain periods, which may have resulted in changes in accident rates. However, this shift may have had a contradictory effect: as restrictions were lifted, certain driving behaviors—such as speeding and reckless driving—may have increased, resulting in a new pattern of accidents.

Data analysis shows that in 2022, there was a slight increase in the number of injured individuals. This phenomenon may be attributed not only to the resumption of routine traffic flow but also to new behaviors acquired during months of isolation, which require special consideration in policy evaluations.

Therefore, to ensure the effectiveness of road safety policies, it is essential to integrate the analysis of external factors into ongoing evaluations. This includes: collecting contextualized data, conducting longitudinal analysis, adopting adaptable and dynamic policy evaluation models, and engaging the community, among other strategies.

To make road safety policies truly effective, it is fundamental to adopt a multidimensional approach that considers both structural and behavioral factors, adjusting strategies according to changes in the urban landscape. In this way, it will be possible to promote a safer environment for citizens and sustainably achieve the goals of reducing road traffic deaths and injuries, while adapting to emerging realities.

Final Considerations

In order to deepen the understanding of the topic at hand, which addresses the contribution of PNATRANS to road safety in the state of Paraná, several relevant observations are presented. Urban mobility in Brazil represents a multifaceted challenge, with road safety being a key concern on governmental agendas. The data show that the country has experienced high rates of traffic accidents, many of which result in fatalities and negatively affect the population's quality of life.

Silva (2015) emphasizes the importance of comprehensive public policies that view urban mobility not merely as a logistical issue, but as a fundamental pillar of sustainable development. Such policies must promote equality, inclusion, and safety for all members of society. The author also highlights the fundamental civil right to "freedom of movement," which underscores the need to integrate road safety as a central element in public

policymaking. Furthermore, Silva stresses that urban mobility policies should be designed to prevent disparities in access to transportation and mobility services, thereby contributing to the reduction of social inequalities.

Regarding PNATRANS, the data presented indicate a downward trend in the number of traffic accidents on urban municipal roads in the state of Paraná during the period in which these measures were implemented. While this reduction may, in part, be attributed to the effectiveness of PNATRANS, it is essential to consider that other factors and initiatives may also have contributed to this outcome.

Thus, it is important to acknowledge the complexity of the factors that influence urban mobility and, consequently, road safety. The development of effective public policies that positively impact safety conditions on the roads—both within the state and across the country—is essential to addressing current challenges. Although many obstacles remain, it is necessary to refine and adapt strategies to transform urban spaces into safer, more efficient, and more human-centered cities, articulating promising progress both for urban areas and for the broader population, whether residents or not of these centers.

References

Brasil 2012. Lei nº 12.587, de 3 de janeiro de 2012. Diário Oficial da União: Seção 1, Brasília, DF, 4 jan. 2012. Available from: http://www.planalto.gov.br/ccivil_03/_ato2011-2014/2012/lei/l12587.htm

Brasil 2018a. Lei nº 13.614, de 11 de janeiro de 2018. Diário Oficial da União: Seção 1, Brasília, DF, 12 jan. 2018. Available from: http://www.planalto.gov.br/ccivil_03/_ato2015-2018/2018/lei/L13614.htm

Brasil 2018b, Conselho Nacional de Trânsito (CONTRAN). Resolução nº 740, de 10 de outubro de 2018. Diário Oficial da União: Seção 1, Brasília, DF, 16 out. 2018. Available from: https://www.gov.br/prf/pt-br/concurso-2021/resolucoes/R740-18

Brasil 2021, Ministério da Infraestrutura. Plano Nacional de Redução de Mortes e Lesões no Trânsito (PNATRANS) 2021. Available from: https://www.gov.br/transportes/pt-br/assuntos/transito/arquivos-senatran/Anexo_I_pnatrans.pdf

Brasil 2025, Ministério das Cidades. Ações e Programas: Mobilidade Urbana. Available from: https://www.gov.br/cidades/pt-br/acesso-a-informacao/acoes-e-programas/mobilidade-urbana

Caldeira GP, Bastos JT 2018. Planos de Mobilidade Urbana e a Segurança Viária: uma Análise das capitais brasileiras. *In: Congresso de Pesquisa e Ensino em Transporte da ANPET*, 32, 2018, Gramado, Rio Grande do Sul. Anais [...] Gramado, p. 3253-3264.

Carvalho CHR de, Guedes EP 2023. Balanço da primeira década de ação pela segurança no trânsito no Brasil e perspectivas para a segunda década. Brasília, DF: Ipea (Dirur: Nota Técnica, 42).

Departamento de Trânsito do Paraná (DETRAN-PR). Anuários estatísticos de trânsito no Paraná. 2023. Available from: https://www.detran.pr.gov.br/Pagina/Estatisticas-de-transito

Dye TR 2013. Policy Analysis: What Governments Do, Why They Do It, and What Difference It Makes. *In: Understanding public policy*. 14 ed. United States of América: Pearson Education.

Gil AC 2002. Como Elaborar um Projeto de Pesquisa. 4ª ed. São Paulo.

Heidemann FG 2009. Do sonho do progresso às políticas de desenvolvimento. *In:* Heidemann, Francisco G. e SALM, José Franscisco (Org.). *Políticas públicas e desenvolvimento: bases epistemológicas e modelos de análise*. Brasília: UnB.

Instituto Brasileiro de Geografia e Estatística (IBGE). Censo Demográfico 2022: Panorama do Brasil. 2022. Available from: https://censo2022.ibge.gov.br/panorama/

Instituto de Pesquisa Econômica Aplicada (IPEA). Estudo aponta aumento de 13,5% em morte no trânsito. 2023. Available from: https://www.ipea.gov.br/portal/categorias/45-todas-as-noticias/noticias/13899-estudo-aponta-aumento-de-13-5-em-mortes-no-transito#:~:text=No%20Brasil%2C%20entre%202010%20e,servi%C3%A7o%20e%20fora%20de%20estrada

Instituto Paranaense de Desenvolvimento Econômico e Social (IPARDES). Indicadores Socioeconômicos do Paraná 2022. 2022. Available from: https://www.ipardes.pr.gov.br/indicadores-socioeconomicos-2022

Litman T 2003. Exploring the paradigm shifts needed to Reconcile Transportation and Sustainability Objectives. *Journal of Transportation Research Record.* Canadá, p. 8-12.

Machado MD. 2022. *A Política Nacional de Mobilidade Urbana de 2012 a 2019*. Monografia de Especialização em Controle de Políticas Públicas, Escola Superior do Tribunal de Contas da União, Brasília-DF, 107 pp.

Organizações das Nações Unidas (ONU). World Cities Report 2022: Envisaging the Future of Cities. 2022. Available from: https://unhabitat.org/sites/default/files/2022/06/wcr_2022.pdf

Organizações das Nações Unidas (ONU). Plano Global: Década de Ação pela Segurança no Trânsito 2021-2030. 2023. Available from: https://cdn.who.int/media/docs/default-source/documents/health-topics/road-traffic-injuries/global-plan-for-the-doa-of-road-safety-2021-2030-pt.pdf?sfvrsn=65cf34c8_35&download=true

Panichi RMD, Wagner A 2006. Comportamento de risco no trânsito: revisando a literatura sobre as variáveis preditoras da condução perigosa na população juvenil. *Interamerican Journal of Psychology.* v.40 n.2 Porto Alegre.

Paraná - Agência Nacional de Notícias. Com 19 ações, Paraná lidera implantação do plano de redução de mortes no trânsito. 2023. Available from: https://www.aen.pr.gov.br/Noticia/Com-19-acoes-Parana-lidera-implantacao-do-plano-de-reducao-de-mortes-no-transito#:~:text=O%20Plano%20Nacional%20tem%20o,86%20mil%20vidas%20neste%20per%C3%ADodo

Silva CL, Bassi NSS 2012. Políticas públicas e desenvolvimento local. *In:* Christian Luiz da Silva. (Org.). *Políticas Públicas e desenvolvimento local: instrumentos e proposições de análise para o Brasil.* 1ed. Petrópolis: Vozes, v. 1, p. 15-38.

Silva ERA 2015. Os objetivos do desenvolvimento sustentável e os desafios da nação. Brasília: IPEA, pp. 659-678.

Silveira RM da CS, Clementino M do LM 2017. Novas Regras, Velhos Entraves: o Desafio da Gestão dos Resíduos Sólidos nos municípios Brasileiros. *In: ENANPUR*, 17, 2017, São Paulo, São Paulo. Anais [...] São Paulo, p. 1-21.

Souza C 2006. Políticas Públicas: uma revisão da literatura. *In: Sociologias*, nº 16. junho/dezembro, p. 20-45.

Vieira CRC, Frota FH da S 2018. A Política Pública de Transporte e Mobilidade Urbana: da exceção à busca da normalidade. *In: Direito e Cidadania*. Org. Francisco Horácio da Silva Frota, Maria Helena de Paula Frota, Maria Andréa Luz da Silva. – Fortaleza, Ce: Edmeta, 517p.