

Editorial

Traffic-Calming Measures as an Instrument for Revitalizing the Urban Environment

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With the advent of rapid urbanization, cities are confronted with increasingly complex challenges. Increases in traffic and air pollution, and gradual reductions in public space threaten the quality of urban life [1]. In this scenario, traffic-calming measures have proven to be a potentially effective tool with which to address traffic safety issues and also to improve the urban environment as a whole [2].

These measures extend beyond the mere regulation of car traffic. They represent an integrated approach that includes the creation of welcoming pedestrian zones, the promotion of bicycle mobility, and the restriction of speed limits [3,4]. The main goal of these measures is to create an urban environment characterized by safety, sustainability, and comfort for the entire resident population, with special attention being paid to the most vulnerable road users, such as children and the elderly [5].

The effectiveness of such measures cannot be limited to road safety alone. They have multidimensional impacts and influence public health, social cohesion, and the overall quality of urban life. A well-designed urban space with moderate traffic serves as a catalyst for healthier lifestyles and better-connected communities [6].

The diversity of these measures is invaluable. From the implementation of pedestrian walkways that encourage social interaction to the creation of bike lanes that improve mobility and road intersections that ensure safe and comfortable crossing for pedestrians and cyclists, every measure contributes to the creation of a more livable urban environment [7,8]. This not only concerns restricting traffic, but also producing an environment in which urban life can develop and progress.

Of course, implementing traffic-calming measures comes with challenges that require effective collaboration between local authorities, citizens, and the private sector [9]. However, these challenges are surmountable, and the long-term benefits outweigh the difficulty of initial efforts.

In summary, traffic-calming measures are not only a means of improving road safety, but also a means of revitalizing cities. They represent an innovative response to modern challenges and promote the sustainability, health, and vitality of cities. Through these measures, it is possible to create an urban future in which road safety is seamlessly integrated into the establishment of a rich and fulfilling lifestyle for the entire population [10].

In this context, this Special Issue, entitled “Traffic calming measures as an instrument for revitalizing the urban environment”, takes a critical look at various strategies for improving safety and sustainability in urban traffic. Based on the concept of revitalization, the discussions in this Special Issue extend beyond conventional traffic management and emphasize the role of innovative measures in transforming urban spaces. Topics include pedestrian safety, vehicle speed control, and the dynamic interaction between infrastructure and traffic. The effectiveness of traffic circles, roundabouts, and turbo-roundabouts in residential areas is also examined, offering insights into their role in reducing speed and promoting sustainable development. Comprehensive analyses included in this Special Issue advocate for a holistic urban design that not only ensures safety and efficiency but



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also contributes to the overall enhancement of urban areas. Proposals for sustainable complete streets, shared spaces, and the integration of connected vehicles highlight a forward-thinking approach to urban planning. The overarching theme of the Special Issue highlights the close link between effective traffic-calming measures and the overall revitalization of urban landscapes.

The Special Issue opens with a paper by Natalia Distefano and Salvatore Leonardi on the application of an innovative method for evaluating the effectiveness of traffic-calming measures (TCMs). The SPEIR (speed profile, effectiveness indicators, and results) methodology is presented to evaluate the performance of TCMs in urban areas, especially in 30 km/h zones. The methodology aims to provide a comprehensive analysis of the effectiveness of traffic-calming measures, taking into account speed limit compliance and the consistency of speed profiles. Three case studies are presented to demonstrate the applications of SPEIR and to illustrate the fluctuating speed profiles resulting from the installation of TCMs. The authors suggest that SPEIR facilitates the comparison of different design solutions, creating a potential international database for the effectiveness of TCMs. Systematic applications of the method can help urban street managers optimize design decisions and achieve sustainable mobility goals by identifying corrective measures to improve TCM effectiveness in managed urban areas (Contribution 1).

The second article in the Special Issue is by Stanisław Majer and Alicja Sołowczuk. This article investigates pedestrian safety islands in Poland, where different traffic-calming measures in a two-way street are analyzed. The study examines the effects of diagonal and parallel parking, safety islands, horizontal deflection, and a one-way chicane. Using an heuristic method, the study identifies the main factors influencing speed on approach to the traffic island, including visibility, pedestrian visibility, and the traffic island's environment. Comparative analyses categorize TCMs as effective, moderately effective, or ineffective. The conclusions highlight the inadequacy of existing design guidelines and emphasize the importance of factors such as sight distance, traffic volume, and cityscape. The aim is to develop comprehensive design guidelines to ensure safe pedestrian safety lanes and effective speed management in urban streets (Contribution 2).

In the next paper, Mauro D'Apuzzo, Azzurra Evangelisti, Daniela Santilli, Sofia Nardoiani, Giuseppe Cappelli, and Vittorio Nicolosi address the need for effective speed control measures in urban areas, focusing on vertical traffic-calming devices. The study investigates the dynamic interaction between vehicles and road profiles, and develops a mathematical model and simulation to evaluate the acceleration associated with different vehicles and traffic-calming devices. Experimental investigations conducted on a raised crosswalk show initial results indicating different dynamic responses depending on vehicle type. The paper discusses acceleration thresholds and proposes the vibration dose value as a descriptor for the vibration experience of drivers. The theoretical approach developed is promising for setting thresholds for human vibration exposure in the development of new vertical traffic-calming devices (Contribution 3).

Following the same themes as those of the previous paper, the following is the fourth contribution of the Special Issue. Giuseppe Cantisani, Maria Vittoria Corazza, Paola Di Mascio, and Laura Moretti examine a series of traffic-calming measures to improve pedestrian safety in urban areas. The study discusses both physical (hard) and psychological (soft) measures that include vertical and horizontal devices as well as landscaping. The study highlights the need for a comprehensive multi-criterion analysis that considers factors such as pedestrian levels, access for residents and emergency vehicles, drainage, snow issues, parking, and environmental objectives. The study recognizes the challenges of implementing traffic-calming measures in consolidated areas and highlights the importance of regulatory support and standardized specifications. The study proposes supranational regulation to ensure the consistent enforcement and widespread adoption of traffic-calming measures across Europe (Contribution 4).

The fifth paper is also based on the idea of a radical transformation of urban streets into important public spaces that accommodate all users of a transportation system. Alfonso

Montella, Salvatore Chiaradonna, Alessandro Claudi de Saint Mihiel, Gord Lovegrove, Pietro Nunziante, and Maria Rella Riccardi introduce the concept of “sustainable complete streets”. The proposed design criteria integrate socio-environmental considerations relating to aesthetics, environment, quality of life, and safety, and provide a framework for the creation of intuitive multimodal networks. The case study in Naples, Italy, focuses specifically on the urban redevelopment of the “Mostra d’Oltremare” area and demonstrates the practical application of the proposed criteria. The study highlights the importance of incorporating sustainability and street integrity criteria during the planning, design, and operational phases to promote healthier, safer, and more sustainable urban development. The eco-design approach, which includes ecological and architectural rehabilitation, highlights the potential benefits, such as reductions in traffic, energy consumption, noise and air pollution, as well as increases in safety and improvements in the aesthetic quality of public spaces (Contribution 5).

The exploration of the Special Issue extends to Thessaloniki, Greece, where the dynamics between pedestrians and cyclists in shared spaces are investigated through a web-based questionnaire survey. Using descriptive and inferential statistics, latent variable models and path models, Chrysanthi Mastora, Evangelos Paschalidis, Andreas Nikiforiadis, and Socrates Basbas analyze the behavior, perceptions, and preferences of users. The study concludes that crosswalks, although they do not physically separate users, contribute to a sense of order in interactions. It shows correlations between perceived safety, aggressive behavior, and preferences for interventions. The paper suggests that a degree of separation is desirable and emphasizes the importance of user beliefs and respect in shared spaces (Contribution 6).

The seventh paper is by Stanisław Majer and Alicja Sołowczuk, who examine the effectiveness of traffic circles as sustainable elements in residential areas using the example of a village in Poland. The study analyzes speed reduction within the residential zone, focusing on traffic circle design parameters, location, road function, and their impact on sustainable development factors such as fuel consumption and air pollution. Statistical analyses using non-parametric tests confirm the effectiveness of traffic circles as traffic-calming measures in residential areas. The conclusions highlight the importance of center island height, cross slope, and design considerations based on pedestrian traffic and road characteristics. Recommendations include one-way traffic, green infrastructure, and fixed barriers between traffic circles to maintain desired speed zones (Contribution 7).

The infrastructures with a rotating circulation are also the protagonist of the eighth contribution to the Special Issue. Salvatore Leonardi and Natalia Distefano examine the operational and safety performance of turbo-roundabouts compared to multi-lane roundabouts in a case study on an urban arterial road in eastern Sicily, Italy. The study uses simulation software to evaluate both operational (AIMSUN Next 20.0.1) and safety (SSAM 3.0) aspects. The results of this study indicate that multi-lane roundabouts have better operational performance at medium/low traffic volumes than do turbo-roundabouts, but the latter show significant improvement under high traffic volumes by reducing the number of stops and delays. The safety parameters highlight the benefits of turbo-roundabouts, including the presence of fewer conflict points and that of fewer rear-end and lane change conflicts compared to those observed with multi-lane roundabouts. The study suggests the introduction of turbo-roundabouts in Italy and the revision of legislation to establish them as a viable solution alongside modern roundabouts (Contribution 8).

In the ninth paper, Maria Luisa Tumminello, Elżbieta Macioszek, Anna Granà, and Tullio Giuffrè address the transformation of transportation due to connected and automated vehicles (CAVs). Focusing on roundabouts in Palermo, Italy, the study proposes a simulation-based framework to assess CAV impacts on safety and efficiency. By dedicating a lane to CAVs, the study reports reduced travel times and conflicts compared to those observed under mixed traffic scenarios. However, safety benefits decrease in scenarios with CAVs only, indicating a need for further research to address the methodological limitations

of this approach and to incorporate conflict characteristics into decision support tools (Contribution 9).

The last paper in the Special Issue also deals with the topic of revitalizing urban contexts through technologically advanced tools. Rachid Belaroussi, Margherita Pazzini, Israa Issa, Corinne Dionisio, Claudio Lantieri, Elena Díaz González, Valeria Vignali, and Sonia Adélé focus on the evaluation of user perception in the urban redevelopment of the canal in the port of Rimini, Italy, using virtual reality (VR). This study engages participants through VR scenarios depicting the current state of development and proposed future redevelopments. Two questionnaires assess the correspondence between real and virtual scenarios and users' perceptions of specific elements such as green spaces and access points. The results highlight the benefits of involving users early in the planning process and emphasize the importance of attraction points and aesthetics in promoting sustainable transport. The study demonstrates the effectiveness of VR in assessing the appropriateness of projects and provides insights for the benefit of future detailed assessments (Contribution 10).

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