School Streets as a Strategy for Urban Greenways

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Abstract

The location of new greenways has expanded in recent years to increasingly proliferate in urban areas (Horte and Eisenman 2020). Greenways have become ways in which cities can "green" their streets, both through increased vegetative cover and through the facilitation of active modes of transportation. Legacy automobile infrastructure provides an opportunity where such linear parks can emerge (Ahern 2022). Pedestrianization can unlock street space for urban greenway implementation (Dostal and Eisenman 2022). Newfound public spaces around schools possess the potential to serve as crucial spines in a greater open space system (Jákli et al 2022).

Aimed at improving youth health outcomes through improvements in air quality, safety, and active mobility, robust "School Street" initiatives have rapidly developed worldwide since the Covid-19 pandemic (Reith et al 2022). School Streets have emerged as relatively swift and sustainable methods of pedestrian zone implementation due to their existing social infrastructure and the ease of pilot projects. Grassroots organizations composed of parents and teachers enable effective advocacy and tactical action necessary for temporary and permanent street closures. Pilot projects and temporally limited closures can build the proof of concept for more permanent and robust revitalization of the streetscape.

A systematic review and comparison of global School Street implementation explores the methods in which concerned parents, school staff, and municipalities have turned streets into green communal spaces. The research methodology of the literature review is based primarily on scholarly articles drawn from an academic database, while also including examples from practice which are derived from government planning documents, reporting, and case studies from advocacy organizations. Sources are referenced by the key word "school streets" and associated terms such as "pedestrianized school zones," then evaluated manually to ensure unique cases and the presence of the desired categories of analysis. The categories of analysis which are explored in the literature review include the level of permanence, history of a preceding pilot project, the actors involved in planning the school street, and the parties responsible for maintenance and programming. These topics of analysis cover the creation, operation, and logistics which underpin urban school street planning. A subsequent synthesis of best practices, limitations, and contextual factors helps to form recommendations that can inform a diverse array of stakeholders on the strategies they can utilize towards the implementation of a pedestrianized School Street.

Introduction

Expansion of pedestrian zones and urban greenways, both in concept and in footprint, has accelerated following pandemic era initiatives aimed at unlocking new green space for active transportation and recreation from legacy infrastructure in dense urban areas. Pedestrian zones are areas of a city reserved for non-vehicular use in which most, or all, automobile traffic may be

prohibited (Lah 2019), whereas urban greenways can be defined as linear public parks and places that facilitate active travel and recreation in urban areas (Horte and Eisenman 2020). School Streets are an extension of these concepts specifically centered around an urban educational institution. Relative to other pedestrian typologies, the school street has experienced significant growth in the number of locations worldwide and in the diversity of their form. This rise is aided by their existing social infrastructure and temporal flexibility. Amidst reductions in the number of children walking and cycling to school, growing health and safety concerns due to rising vehicle sizes and air pollution, and a general lack of active recreation space in many locations, many communities are turning to the school street concept to improve the health and mobility options of local youth.

Since the pandemic, these networks of pedestrianized school zones have benefited from a synergistic rise in the municipal acceptance and formalization of temporary and quick build project types which serve to provide low-cost quality of life improvements within a condensed time frame. A spectrum of impermanent implementation types has allowed a range of urban contexts to experiment with and formally create areas of restricted vehicular access adjacent to schools. The lowered barrier to entry enables volunteer school and community groups to pursue improvements to their neighborhoods themselves or with lesser municipal support and guidance. Many school streets continue to operate on a temporary basis by design, aiming for safety improvements during peak pedestrian travel periods while still preserving motorist travel through the area for the rest of the day. In contrast, more permanent types of school streets have become ways to integrate greenery and consistent active transportation into greater urban networks. The purpose of this paper is to utilize existing literature to organize the various forms of school streets into a set of typologies which can be utilized to better inform future planning.

Literature Review

School streets can be defined as the streets directly adjacent to an educational institution through which vehicular access is restricted temporarily or permanently. School streets operate on the principle of "filtered permeability" which blocks motor vehicles from entering the street while allowing pedestrians and cyclists to freely move through the zone (Savaria et al. 2021). School zones experience high levels of recurring pedestrian activity which is concentrated during the hour prior to the start of the school day and the hour immediately following school dismissal. Pedestrian volumes on school streets are quite predictable, with the aforementioned patterns of pedestrian activity occurring exclusively during the school week from September to June. This high pedestrian traffic is almost completely composed of youth users, a vulnerable group whose developing nature inhibits them from being safe pedestrians (Weiss 2009). As road traffic injuries are now the leading cause of child death in most developed countries, travel to school consists of the largest share of a child's exposure to traffic as a pedestrian, and 50% of child pedestrian collisions occurring during school travel times with a significant proportion within 300 meters of the school, ensuring safe walking and biking routes to school for students is a significant public health and safety issue (Rothman 2014). High density areas which are most conducive to walking to school present the greatest ease of pedestrianization of school zones, therefore there is an opportunity to significantly improve the safety and experience of pedestrians walking to and from school by completely eliminating cars from the streets directly adjacent to schools (Rodriguez-Lopez 2017).

From their inception in Northern Italy in the 1990's, school streets have slowly grown in use across Western Europe, with examples of the concept present in 8 countries by 2019 (Clarke 2022). The Covid-19 pandemic massively accelerated the growth of this phenomenon across the rest of Europe and North America. This trend was especially evident in cities which were already active in pedestrianizing school streets, with London increasing its number from 80 in 2018 to over 500 in 2022 (Clarke 2022). The city of Paris, under the direction of Mayor Anne Hidalgo, has also instituted such a policy on a wide scale, pedestrianizing over 218 "Rues Aux Écoles" within the city, representing over half of the elementary and nursery schools in the city (City of Paris 2024). Over half of these streets are permanently pedestrianized, with 70 having been revitalized into landscaped "green streets" (City of Paris 2024). The city of Paris plans to expand these numbers to 300 pedestrianized school streets and 100 green school streets by 2026 (City of Paris 2024). These initiatives have proven to be popular among residents, with over three-quarters of parents in pilot programs in Ghent, Belgium finding their children's school environments safer than before (Van Lancker 2015). Not only are these initiatives based in improving safety outcomes, but have also resulted in increases in local air quality and increasing youth physical activity, thus the way these zones are planned reflect these sentiments (Air Quality Consultants 2021).

Figure 1. Permanent School Street: Rue Elbé, Paris, France. (Christopher Belin, Ville de Paris)

The vast majority of the increase in school streets has been in locations with higher density which are inherently more walkable and therefore experience larger shares of student populations walking to school (Rodriguez-Lopez 2017). These schools are often reached by a single narrow access road, making it simpler to pedestrianize the area directly adjacent to the school than if it were located in a lower density context where there typically is a greater dependence on vehicular traffic to bring students to school. Once closed off to vehicular traffic, a new space is unlocked on the site of the former street, allowing for schools, municipalities and communities to repurpose the former street space. School yards have been shown to contribute positively to the physical and social development of children, yet urban schools often lack the requisite space while many low income communities are similarly by inadequate access to park spaces which would serve to fulfill

this need (Bates 2018). Thus, the pedestrianized street can be repurposed to provide this open space and incorporate elements of the school yard within a dense urban landscape.

When pedestrianizing school streets, the main factor to consider is the unique demographic being planned for. The vast majority of visitors to this zone are the children attending the adjacent school. While children are the overwhelming focus of this zone, this setting is important to parents and teachers as well. For the adults who accompany their children to and from school, the school gates can be an important social gathering space (Clarke 2022). Creating a zone that makes them comfortable with both spending longer periods of time watching their children and allowing their children to use the zone unsupervised is vital. Teachers and other school employees similarly must pass through the zone, albeit at significantly earlier and later times than their students. For them, the zone should also work as a desirable place to take breaks and provide teaching opportunities that get the children out of the classroom. School streets exemplify safety beyond their physical security from the dangers of automobiles as the proximity to the community resource of the school as well as the near constant presence of teachers and other parents to supervise the younger users of the zone creates a sense of social safety that promotes usage of the zone.

The predominant actors involved in pushing for the creation of the school street are parent-led advocacy groups who represent the interests of their children who are in daily contact with the school zone (Clarke 2022). Parent-led initiatives are generally temporary closures of the street as they often lack funding or permission for more permanent measures. The school itself is a vital institution in this process as the street essentially becomes an extension of the school when pedestrianized. Therefore, the educational institution in question has a significant influence on the design and programming of this pedestrian zone. Lastly, the municipal government can act as either a partner that helps enable pedestrianization or is the main driver of it (Linton 2021). Being capable of providing the planning permission and funding for permanent pedestrianization means that city government led initiatives can be enacted in a more widespread and robust manner that supports sustainable permanence. The downside is that city-led initiatives can take significantly more time to implement than more nimble parent-teacher organizations which often utilize tactical urbanism methods to close the street themselves.

Methods

The research methodology of this article follows a systematic review and comparison of global School Street implementation. This is structured as an extensive literature review followed by a qualitative analysis that serves to draw connections among distinct cases and studies that serve as the basis for a set of typologies. The foundation of the literature review was based around scholarly articles from the online databases JSTOR, Google Scholar, and Scholarworks. As an emerging trend that has grown exponentially in the number of implementation locations since the start of the pandemic in 2020, many recent School Streets have not yet been subject to academic studies. In the absence of journal articles, robust evaluations and case studies conducted by government agencies, advocacy groups, and journalists were examined as part of the literature review to form a more holistic and encompassing view of School Streets.

Sources were referenced by the key word “school streets” and associated terms such as “pedestrianized school zones.” As a global trend, the School Streets concept has been adapted to

fit different cultures and terminology, therefore adjacent terms that describe School Streets around the world such as "Open Streets for Schools" in New York City and "Rue Aux Écoles" in Paris were also queried. Sources were then verified manually to ensure unique cases, full pedestrianization, and the availability of specific information by which the School Streets were analyzed and compared. In total, 39 sources were analyzed using this framework. The categories of analysis which are explored in the literature review include the level of permanence, history of a preceding pilot project, the actors involved in planning the school street, and the parties responsible for maintenance and programming. These categories were chosen as lenses through which School Street's creation, associated actors, ongoing logistics, and role in the green transportation network of the surrounding city could be compared. Through a subsequent qualitative analysis, common themes and typologies outlining best practices, barriers, and co-benefits with greenway planning were derived.

Results

The temporal limitations of individual school streets are the greatest factor in dictating how they are planned. The amount of time that a school street is enacted for guides the type of greenery and furniture which is permissible within, the number of people needed to maintain the zone, and the funding required to sustain the school street. Temporary zones which are pedestrianized for half an hour at a time must be able to transition quickly between pedestrian and vehicular use, thus they tend to have an absence of infrastructure beyond moveable bollards and barriers which can blend into the streetscape when not in use (Linton 2021). In contrast, school streets which are pedestrianized in a more permanent manner are able to significantly change the landscape of the street and include additional programming to make better use of the newly acquired pedestrian space. This zone is essentially an extension of the school itself, therefore it acts as a safe space for children to congregate and recreate at any time. The longer that vehicular access is restricted, the greater the ability of local actors to furnish, green, and program the street. Following this principle, a spectrum of pedestrianized school streets has emerged across different contexts, ranging from hyper transient to permanent. A collection of typologies is formed below to organize case studies based on their level of permanence.

<u>Hyper Transient</u>

The highly predictable pedestrian volumes of school start and end times make school streets incredibly amenable to temporary pedestrianization which only disrupts vehicular traffic for half an hour to an hour at a time. While this limited timeframe means that such closures are not ideal for the implementation of robust infrastructural improvements, there is still significant opportunity for flexible measures which can improve the livability and use of the zone. This starts with flexible barriers which are able to be enacted and retracted within minutes. Plastic accordion-esque barriers have proven to be the cheapest and quickest solution, most notably used in the school streets of Hackney, London (Linton 2021). Elsewhere, lightweight wooden or metal barriers can be affordable options to prevent automobile encroachment while more established school streets often utilize swinging metal gates such as those found at parking lots. The simplicity of the infrastructure requires minimal volunteer or school employee presence to enact and remove the barriers at the designated times.The downside is that this flexibility comes at the expense of interior of the zone being unsuitable for much furniture as it is forced to return to a typical vehicular dominated streetscape. While temporary pedestrianization may provide the desired safety benefits,

this corridor style pedestrianization does not effectively turn the streetscape into a resource for fostering greater social and physical health.

Figure 2. Accordion Barriers Designating a School Street: Hackney, London, UK. (Catherine Kenyon)

Temporary

Enabled and supported by the Department of Transportation, New York City is notable for its "Open School Streets" program which fosters temporary pedestrian zones, generally lasting several hours at a time. This typology utilizes the same low-cost, barrier infrastructure that functions as a gate to return the street back to cars after the closure. In contrast to hyper-transient school streets, temporary school streets are enacted for much of the school day and are often kept for several hours after school ends. While the impermanent nature of the zone prevents significant furnishing or difficult to move greenery, the greater time allotment allows for active and social programming on the street. During school hours, the street becomes a space for recess and physical education for schools which otherwise may have insufficient outdoor space. In the hour or two following the end of school, students and their parents may continue to utilize the space in lieu of a park, creating a "play street." The inevitable return of automobile traffic to the street necessitates that all sporting equipment and games must be moveable or kept to the periphery, while smaller items are often stored at the adjacent school. Such longer enduring zones are ideal places for more structured physical activities for afterschool programs and recess hours. This can include the use of sporting infrastructure that is easily relocated such as moveable basketball hoops and lightweight goals. The use of chalk and paint on the street and adjacent walls can improve the aesthetic nature of the zone and provide both educational and recreational value for young users of the zone while causing minimal disruption to vehicular function on the street. Heightened levels of programming mean that this type requires a greater number of volunteers to organize activities and supervise children, with teachers and parents taking on this role during the school day and after school ends respectively.

Semi-Permanent

Semi-permanent school streets restrict vehicular through-traffic full time. While residents may enter some zones to park their vehicles, the paradigm of the street has been flipped to become a space of human scale activity. Though the street closure may be permanent, a lack of funding or greater municipal involvement prevents the street from being fully renovated and landscaped. This type acts almost as a pilot with temporary materials to still allow for some automobile access and to facilitate straightforward removal if reverted or made fully permanent. Therefore, its infrastructure must still be flexible, moveable, and multipurpose. Vegetation can be introduced on a wider scale as heavier planters and pots can be placed without having to be moved often. In many cases, planter boxes are utilized as barriers for parts of the periphery of the zone. Semi-permanent school streets may feature smaller trees in containers for limited shade. As a place of active transportation and recreation, the school street environment must be controlled in a manner that makes it more comfortable for its users. The lack of shade cover and low albedo of a street makes it a significantly hotter landscape, inhibiting physical activity with its increased heat and UV exposure. As impermanent types are unable to accommodate large shade trees, they may feature foldable tents and umbrellas to provide shade in their absence. Plastic or wooden play structures and sporting infrastructure such as multipurpose nets, basketball hoops, and ramps can help facilitate more structured play and formalized games. If space permits, several school streets in Paris and Grenoble have utilized renovated shipping containers and trailers as storage units for moveable barriers, toys, equipment, and furniture. The zone also serves to further social connection between students and parents alike. Ample seating for parents in the form of folding chairs and wooden benches serves to make supervising their children a more comfortable experience while facilitating connections between parents. Similarly important are tables which provide a space for playing games as a group, doing homework, and eating. Also warranting inclusion in the zone are bike sheds which safeguard bicycles during school hours, improving the capacity for more children to cycle to school. The significantly greater presence of furniture, greenery, and more consistent programming necessitates more organizational presence and funding to sustainably maintain the space. The permanence of this zone creates the potential for greater integration into a larger greenway network. The 34th Avenue Open Street in Queens, New York City was originally formed around a school street that operated on a semi-permanent basis to facilitate active travel and recreation for multiple schools in the vicinity. This served as a proof of concept for the design and construction of a greater car-light corridor that now spans for over 26 city blocks.

Permanent

As a fully pedestrianized area, permanent school streets can become a formal part of a city's greater active transportation or greenway network. As part of a full reconstruction, permanent zones have the ability to be landscaped and plant trees to provide shade and cool the microclimate of the street. This inclusion of greenery does not stop at planting trees as the new space that is unlocked makes the zone conducive to school gardens which function not only as a new green space but also as an educational tool for the students. Other low lying vegetation can be included into the landscape to reduce impervious surface cover, manage stormwater, and enhance the aesthetic quality of the space. The street is often repaved as a lighter surface that stays cooler to better accommodate human scale movement. Programming is still important to promote use of the zone beyond movements to and from school, but now programs can be more consistently scheduled with built in infrastructure to support these activities. Maintenance staff, generally from the municipality, is needed to support the increased green cover, though there is little need to move

barriers as the space is almost exclusively restricted to vehicles. Permanence does come at a significant cost and requires a more detailed planning process, thus municipalities are best equipped to take the reins from community groups and schools for this type.

Typology of Urban School Streets

Type	Duration	Programming	Greenery	Infrastructure	Actors
Hyper Transient	30 min to 1 hr at school start and end times.	Active Transportation.	Little to none. Barrier planters.	Light moveable barriers and zone signage.	Minimal school staff and parent organizations.
Temporary	1 to 12 hours during daytime school hours.	Active recreation. School and after-school programs.	Minimal. Large barrier planters.	Moveable barriers. Sporting equipment. Paint and chalk art.	Moderate school staff and parent organizations.
Semi-Permanent	Full time, with exceptions at night and for residents cars.	Community active, cultural, and leisure events. School programs.	Moderate. Heavy planters and potted plants.	Heavy Barriers. Storage units. Shade structures. Moveable furniture.	Community organizations supported by City Gov.
Permanent	Full Time.	Community active, cultural, and leisure events. School programs.	Significant. In-ground trees, gardens, and lawns.	Full repaving and landscaping. Built in furniture and barriers.	City Gov with support from school and residents.

Discussion and Conclusion

As school streets increase in popularity and permanence, it can be anticipated that further typologies may emerge. Spreading beyond dense urban settings to provide safety relief in suburban settings may bring challenges in adapting the concept to wider streets and a more vehicular dominated landscape. School zones which prohibit automobile access at certain times of day through signage rather than physical barriers are already present in certain cities in the Netherlands. While greater pedestrianized street coverage may be achieved, ensuring compliance and utilizing the space for additional activities could become more difficult. Beyond additional types, the relative novelty of school streets due to the acceleration of the trend following the pandemic means that the longevity of temporary schemes is yet to be fully realized.. Increased municipal involvement and rising global familiarity with school streets can serve to standardize approaches over time. Therefore, further time and research would be useful to identify further innovations, issues, and best practices.

The ultimate goal in the pursuit of school streets is the creation of permanent non-vehicular zones which become a constant and fully landscaped fixture in a city's park, greenway, and active transportation networks. The high cost of a full redesign of the street and significant disruption to

residential parking requires circumstances in which there is considerable citizen buy-in and familiarity with the concept. The municipal government should display financial commitment and devise a robust school streets program to lead the development and sustain the operation of a permanent school street. In contexts where the school street is a less familiar concept and funding is limited, semi-permanent school streets can serve well as a proof of concept that provides new leisure space under the leadership of community groups which guide the operation of their local zone. Temporary school streets are optimal for contexts where the adjacent school lacks open space for physical education, gatherings, recess, and after school play. The school itself can play a key role in advocating for and managing this space. While they may provide the least additional amenities, hyper-transient school streets are an excellent way to provide rapid low-cost safety relief and reliable active transportation corridors for local school children. The relatively minimal infrastructure and time-commitment involved makes this type achievable for parent organizations to implement even in contexts where other residents may be resistant or unfamiliar with pedestrianization.

In conclusion, the school street concept offers a flexible and iterative approach to improving safety for vulnerable users and quality of life of the surrounding community. As more municipalities formalize procedures for planning, permitting, and funding school street initiatives, there is significant potential for the quality, level of permanence, and sustainability of urban school streets to rise. This greater stability can allow for school streets to be increasingly utilized as a strategy to introduce greenery and active travel corridors into the urban environment.

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