Evaluating the Potential of Comprehensive Cycling Network for a Private Sector University Students

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Abstract

This research focuses on the possibility of a network of linked bicycle lanes that are used to enhance student movement at a private sector university in Lahore. The study also takes into consideration whether this nature of creating special lanes to bicycling could result in a safer, more sustainable and more equitable urban transportation system. At present, the city of Lahore can be described as very reliant on cars and other motorized transport methods. The data required to conduct the research will be acquired among the students of UMT, city planners, and people and workers living or working in the area. Data collection instruments will be interviews, focus groups and on-site observations. The research will elaborate on several problems experienced by its users, the definition of the needs of cyclists, and how the cycling as a means of transport can be enhanced. This paper concludes by giving a suggestion on how to develop continuous and shielded bicycle paths along two major streets; PIA Road, and UMT Road. It is also a demand to build safe and weather-protected bicycle parks in residential and business premises. These parking areas should be well-integrated into the surrounding environment. The results show that students have a strong desire to use cycling if enough infrastructure and safety measures are present. Thus, a well-planned network of cycles is foreseen to bring about better access and congestion, healthier lifestyles, and environmental sustainability. To ensure effectiveness and durability of the proposed cycling network, the study advocated for its phased implementation, ongoing maintenance and policy alignment, and continuous stakeholder engagement.

***Keywords*:** cycling network, students, safety, design intervention, sustainable

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Introduction

Transportation is one of the key factors for sustainable urban development and the way it unfolds the city's economic, environmental and social aspects. With the worsening of the problems caused by congestion, air pollution and climate change, biking has become a really attractive low carbon and healthy mode of transport (Sorensen et al., 2021). It is unfortunate, however, that in many urban areas, the use of bikes is still very low despite the fact that they represent the future of transport, mainly because infrastructures are fragmented, people are afraid of the risks and there is no policy support (Miskolczi et al., 2021). A complete cycling network that is well-integrated, accessible, and user-friendly has the power to change the face of urban mobility by making it more environmentally friendly, increasing the people's welfare, and reducing dependence on motor vehicles.

The growth of cycling infrastructure is, in general, constrained by different urban priorities that are competing against each other, planning that is centered on cars, and socio-cultural perceptions of cycling (Butler et al., 2020). A big part of the potential cyclists is kept away from cycling by a feeling of insecurity especially when sharing the road with motorized transport, while the lack of separate lanes and supportive facilities further limits the growth. Furthermore, inequality in terms of access to cycling infrastructure impacts more heavily the disadvantaged communities thereby reducing their mobility and making the social and economic disparities even more extensive (Winters et al., 2025). Without a carefully planned and inclusive strategy, cycling will only remain an option for the privileged few and will never become a mainstream mode of transport.

The research presented here documents the feasibility, challenges, and opportunities that come with the development of a comprehensive cycling network and to that end they look at infrastructure design, policy frameworks, user perceptions, and environmental benefits as the main factors. The study will present evidence-based, practical recommendations to the policy makers, urban planners, and others in the transportation field. To do this, we consider the most burning questions in the contemporary policies of cycling, referring both to quantitative data and to the qualitative data presented by hard numbers and deep case studies and the interviews with the professionals in the given sphere (Gitelman et al., 2020; Sobral et al., 2019). This combination of qualitative and quantitative methodology

will enable us to learn not only about the opportunities of the further development of urban cycling networks but also about the challenges that impede the process.

We also mention the solutions working across the world that are effective as we recognize the barriers to cycling to perceive cycling as safer and more appealing. This includes closer examination of secured bike lanes, bike sharing initiatives, smart cycling networks and the effect of community education programs (Fishman, 2016; Giles-Corti et al., 2022). We do not provide a list of these strategies but rather discuss them one by one in detail in order to provide local governments with clear and practical planning principles in the development of cycling networks which are sustainable, inclusive, and focused on the larger city goals.

In the core, this research paper contributes and develops the current debate on sustainable transportation and urban mobility. Cycling should play a larger part in urban planning. When cities invest in quality infrastructure, back it up with effective policies, and foster a culture that welcomes cyclists, they see real benefits from their cycling networks.

The takeaway is obvious: cities must urgently reconsider their transportation strategies. Mobility that puts people first works best with cycling at its heart (Qureshi et al., 2025). This involves constructing covered bike lanes, growing bike-share options, and ensuring that cycling is not only possible but also the convenient, attractive choice. However, infrastructure is not the only thing we need. The policies should protect cyclists, and fully integrate cycling in the broader transport infrastructure. It is also important that public awareness campaigns and education are conducted since more people will use their bicycles and safety concerns of new riders will be addressed. Collaboration is essential. Cities need to work with local groups and companies to make a genuine interest in cycling.

We don't dislike the broader context. Better cycling systems have economic and environmental benefits. Cycling is cheap, economical to the residents and also reduces traffic jams, pollution of the air and carbon emission, which plays an essential role on sustainability (Diao et al., 2021; Fuller et al., 2025). Social benefits are also there. Meaning of the research regarding gender and equity issue on cycling infrastructure is identified in the paper. Low-income neighborhoods are too often left behind, without proper or even without cycling infrastructure, which fueled the transport

inequality (Liang et al., 2023). The local governments should invest in these regions to ensure that cycling is affordable and accessible to everyone.

Lastly, the need of cooperation is emphasized by this study. A combination of government agencies, planners, transport bodies, advocacy bodies and communities can only help to provide for the development of effective cycling policies and programs.

Literature Review

One of the most challenging topics related to the city planning and policy of the modern world is transition to sustainable urban transport. The stakes are high: it could mean climate change reduction, better health of the population and more equitable cities. This is why the creation of strong cycling networks is no longer an extravagant thing, it is a key to the successful mobility strategies being created.

The paper is the synthesis of the main themes in literature. First of all, it looks at factual evidence to the relevance of cycling infrastructure. It then looks at the factors that are used in planning and designing effective networks. Lastly, it also explains where the existing research has failed, especially in the local context and user requirements. This study is set to fill those gaps.

Although it is hard to actually realize the significance of cycling networks, you have to see how it all works together in the larger context of the city planning. Think of the climate change, everybody is trying to reduce the amount of greenhouse gases, and cycling is the major action in this regard. The emission level of bikes is zero and as more people switch to bikes as their mode of transport instead of cars, the carbon footprint of a city reduces. The quality of air improves, as well, which is not insignificant. Cities have a severe air pollution issue, and it is negatively affecting the wellbeing of people, leading to respiratory problems, cardiovascular diseases and so on. Cycling solves both of these problems: it will decrease pollution and will motivate people to be active. In the long term, there are reduced incidents of heart disease, reduced cases of obesity and increased life span and healthy life of people. There is also the challenge, which is not all user groups are equal. It depends on age, ability, and experience on cycling, and when good networks are created, the differences are considered at the outset. Some people might value safety and convenience above all else, while others might prioritize speed and directness. By understanding

these different needs, planners can design networks that appeal to more people and encourage cycling. Research to date has drawn a strong link between the quality of cycling infrastructure and the level of usage. In their comprehensive review, Buehler and Dill (2016) cited numerous studies that show the installation of dedicated bicycle facilities especially those physically separated from motorized traffic result in a large increase in bicycles use both for commuting and other utilitarian trips. The main reason for that is the huge improvement of the perceived and actual safety which is the single factor most responsible for road users' fear of using the bike lane, especially for women, children, and elderly people (Garrard et al., 2008) and thus when such safe infrastructures are provided, the "safety in numbers" effect works even stronger to support cycling, thus a positive feedback loop is created (Jacobsen, 2003). Recent longitudinal research in Montréal has provided stronger causal evidence, showing that exposure to high-comfort cycling paths (e.g., those physically separated from traffic) within an acceptable distance is associated with significantly higher odds of people engaging in any cycling activity (Fuller et al., 2025).

The advantages of this modal shift are numerous. First of all, cycling is a mode of transport that emits zero pollutants and hence directly contributes to the decrease of local air pollutants (NOx, PM2.5) as well as greenhouse gases which in turn is beneficial for reaching climate change targets and at the same time improving urban air quality (Gössling et al., 2019). Second, from a healthcare point of view, making transport physically active is essential in the fight against lifestyle diseases as it lowers the risk of obesity, diabetes and cardiovascular conditions and over time it results in a huge economic saving on the healthcare system (Mueller et al., 2018). International initiatives increasingly frame such infrastructure as a direct population health intervention, with tools like the World Health Organization's Health Economic Assessment Tool (HEAT) now used to quantify the economic benefits of improved health from increased cycling (World Health Organization, 2024). Third, from an economic point of view, cycling infrastructures are an instrument of economic growth which, if well managed, bring back huge returns; they reduce the costs of congestion, decrease the household transport expenditure and through the increase of street-level activities and accessibility, they may also have the capacity to revitalize local retail economies (Litman, 2022). Additionally, bike networks foster social equality by delivering cheap access to transport to low-income urban dwellers and at the same time giving more freedom to

those individuals who are not able to drive a car (Lucas, 2012). Contemporary analyses in Canada show that recent expansions in cycling infrastructure have successfully increased access for equity-deserving groups, including recent immigrants, racialized people, and people with low incomes, highlighting the role of targeted network growth in promoting mobility justice (Winters et al., 2025).

Nevertheless, efficient cycling infrastructure is far from being simply the sum of the different isolated bike lanes; in fact, it is a network. Network planning principles highlight aspects such as connectivity, directness, safety, comfort, and coherence (Federal Highway Administration [FHWA], 2019) because hosting a complete network should unhesitatingly link the starting points like homes and hostels with the destinations such as universities, markets, and transit stations through the continuous and easy-to-follow routes since studies have shown that the main reasons for the abandonment of discontinuous or fragmented routes are the encounters with traffic at which the cyclist is forced into unsafe interactions (Forsyth & Krizek, 2010). The growing 15-minute city model, which aims to place essential services within a short walk or bike ride, underscores the importance of such connected, fine-grained networks in creating sustainable and livable urban environments (Qureshi et al., 2025). Technological advancements are crucial in this planning phase; Geographic Information Systems (GIS) and data mining of travel patterns enable evidence-based and equitable network planning that reflects actual ground realities, moving beyond theoretical models (Guerreiro et al., 2018; Sobral et al., 2019).

Less or more the same is true of design quality, with worldwide best practices as illustrated in the publications of National Association of City Transportation Officials (NACTO, 2022) and Crow Platform (2016) recommending physically separated cycle tracks on the high-traffic streets, traffic calmed bicycle boulevards on the quiet residential roads, and carefully constructed intersections that elevate the safety of the cyclists through such features as protected intersections, advanced stop lines, and dedicated signal phases. The incorporation of the supportive infrastructure is of the same importance, too, for instance, the trip ends must be equipped with convenient, secure and weather-protected bicycle parking facilities, while there should also be the presence of the easily accessible wayfinding and invitingly equipped repair stations and air pumps (Pucher & Buehler, 2008). The review also illustrates that integration across modes is pivotal

for cycling to reach its full potential and that happens when it goes hand in hand with public transit solving the "first-and-last-mile" problem, the need for secure bike parking at transit stations and policies that allow bicycles on buses and trains are the natural consequences of that (Martens, 2007). Recent research into intelligent transportation systems indicates that visualizing and analyzing integrated urban mobility data is essential for optimizing these complex, multi-modal networks. Doing so actually enhances the efficiency of the entire system (Butler et al., 2020; Sobral et al., 2019).

The rise of new technologies is transforming the landscape as well. For example, Geographic Information Systems (GIS), when combined with multi-criteria analysis and data mining of travel behaviors, help make network planning more equitable and realistic (Guerreiro et al., 2018). Bike-sharing schemes also offer significant benefits. When they are managed effectively and physically linked to the broader network, they reduce obstacles for casual users, enabling people to take spontaneous trips more easily (Fishman, 2016). Furthermore, the impacts of emerging transportation network companies on urban mobility patterns must be considered, as they can complement or compete with sustainable transport goals, necessitating thoughtful policy integration (Diao et al., 2021).

Though infrastructure is a crucial factor, it is frequently insufficient by itself, as cities that have achieved successful cycling build their benefits not only from infrastructure but also from policy support systems that promote cycling as a viable mode of transport. Such policies are, inter alia, identified by differently sourced money for the city plans and transport strategies, laws that ensure the safety of the most vulnerable road users, and educational programs for both cyclists and motor vehicle users (Pucher & Buehler, 2008). “Soft measures” play a significant role here. Initiatives like promotional campaigns, cycling classes, workplace incentives, and community events not only motivate people to cycle they can actually influence what society considers normal. These actions help overcome the persistent resistance to change (Handy et al., 2014). Additionally, an effective policy approach involves integrating public health into transportation planning. The “Health in All Policies” (HiAP) framework does exactly this, positioning cycling as a practical tool for promoting health equity and even addressing climate change (Giles-Corti et al., 2022).

It’s also essential to acknowledge the cultural and social dimensions. In

many regions Pakistan, for instance cycling is often dismissed as something only poor people do. For women, it is frequently seen as inappropriate. Social expectations and concerns about personal safety (beyond just traffic) also discourage people from cycling (Steinbach et al., 2011). These deeply rooted attitudes can be even harder to change than physical infrastructure. Hence, knowing these subjective, culturally grounded factors is the basis for creating effective promotion campaigns and building the infrastructure that is accessible to everyone. The urban reality of Lahore, characterized by explosive population growth, infrastructural stress, and governance fragmentation, presents a quintessential Global South challenge where these socio-cultural barriers intersect with severe spatial and institutional constraints (Qureshi et al., 2025).

Despite the vast amount of literature, there are still substantial gaps, especially concerning the cities of the Global South such as Lahore. The main gap is the lack of context as most of the empirical studies and design directives are based on the contexts of North America, Europe, or Australasia. These are cities with different structures of governance, capacities of enforcement, traffic mix (e.g., fewer motorcycles and rickshaws), and socio-cultural norms, thus leaving the problems of carrying out cycling networks in places with weak regulatory enforcement, informal traffic behavior, severe space limitations, and lack of money not properly investigated (Woodcock et al., 2009). Moreover, there is a user-centricity gap as most of the documents take a top-down, technical planning view with very few deep qualitative studies that focus on the lived experiences, fears, aspirations, and practical needs of those who might cycle in these difficult places (Nkurunziza et al., 2012). Without providing answers to questions about what potential users need in order to feel safe or how they move through the current streets, planning might be technically correct but socially irrelevant. Besides that, although the environmental and health benefits of cycling are quite well known, its possible use as a tool for urban equity and gender inclusion in highly segregated cities needs further exploration as the barriers low-income residents and women may face are different in quality and thus require separate, targeted research. Global efforts have continued to emphasize one thing-that while there is indeed real progress in cycling, cities in the Global South face a different set of challenges. They need to adapt and scale what works elsewhere; however, equity and infrastructure challenges are not replicated from the Global North (Liang et al., 2023).

This paper zooms in on the UMT route in Lahore, peeling back the everyday twists and turns of a major South Asian metropolis. The authors did not stay behind a desk with datasets and maps but went out, chatted with students, partnered with local organizations, and consulted city planners. These conversations anchored the study in real life. Rather than drifting into abstractions, they focused on real people who would navigate urban transport daily. It's a practical angle, aimed at uncovering solutions for real users-everyday commuters, not imagined ones.

The authors go beyond purely technical solutions. They explore how culture, social norms, and community-level values influence travel behavior and acceptance of new forms of transport. In many cases, local dynamics become more than just a backdrop; they determine whether a project will flourish or wither. The researchers would rather their ideas be absorbed into the city's social fabric than disrupt it. And with the revived focus on the 15-minute city concept, there is a realization that the transplantation of these models to the Global South is not that straightforward. Informal settlements and incomplete infrastructure underscore that solutions must be locally fitted, not simply transplanted from elsewhere (Qureshi et al., 2025). Infrastructure is at the heart of the matter. The design of the roads, how the bike lanes are integrated, and the connections to public transit-all these make the difference in whether, practically speaking, people will be able to adopt greener travel modes. And the team understands that. They are looking for ways to create systems that serve the entire population, not just an elite few. At its heart, what must be developed is a new, integrated model for sustainable transport planning. Technical solutions by themselves will not suffice. By applying engineering expertise with social and cultural understanding in infrastructure design that includes all citizens, projects become not only sustainable but life-enhancing for the people of the city. With clear, actionable recommendations, the paper will aim at supporting informed decisions by urban planners, policymakers, and the community in similar settings. The mission is simple yet ambitious: shape policies and actions that elevate quality of life, reduce environmental harm, and improve the lives of everyone in the city.

Case Study

To appreciate both the potential and the difficulties of introducing a cycling network in Lahore, one must first understand the city's specific urban structure, transportation systems, and sociocultural context. This case

study explores the particular context of the University of Management and Technology (UMT) area, demonstrating why it is a vital microcosm for the sustainable mobility intervention pilot.

Lahore, the capital of Punjab province, is a vast city with a population of over 13 million. Its lively economy and culture are, however, heavily outweighed by the serious and interlinked urban crises, mainly those related to the transport sector, that the city faces. Traffic congestion in the city is disastrous and the situation is further aggravated by the increase in motorization, which is the result of the rising incomes and the long standing poor condition of the public transport, thus the road network is getting more and more paralyzed and as a result, the speeds during the peak hours, which are the slowest ones and therefore the most time-consuming, become notoriously slow and they waste the productive time, increase fuel consumption, and cause immense economic loss. Going together with this is the problem of air pollution; Lahore is always among the most polluted cities in the world, and vehicular emissions are the main source of PM2.5 which causes respiratory and cardiovascular diseases, shortens the life expectancy, and leads to high public health costs, a crisis that is best symbolized by the annual winter smog.

A few decades of car centric planning have been geared towards the private car, that is, roads have been widened at the cost of the sidewalks, pedestrian crossings have become less frequent and unsafe, green spaces have been eaten up for parking thus an environment has been created that is very unfriendly to the vulnerable road users such as pedestrians and cyclists who make up a large portion of trip makers yet get the least space and protection. Although the recent introduction of the Orange Line Metro Train might be seen as a step forward in mass transit, the mobility system is still far from being complete, there are major "last-mile" connectivity issues to and from stations, the bus system is overcrowded and unreliable, and there is no efficient, safe, or dignified alternative for short trips under 5 km which make up a large share of daily travels.

Within such a situation, cycling is in a paradoxical state of potential and neglect. On one side, there would be a huge number of daily trips for education, shopping, and local services that fall within the perfectly cyclable distance of 3-10 km, while the bicycle would be the most affordable, not susceptible to fuel price shocks, and space-efficient means of transport. On the flip side, the infrastructural absence that starkly

contrasts with this potential is such that the city is almost devoid of any cycling lanes that are dedicated and protected; therefore, cyclists are either forced to share the space with fast and aggressive motorized traffic on the main arteries or they have to dangerously 'weave' along the road margins.

The absence of this infrastructure has contributed to the occurrence of a safety issue, thus making cycling a risky activity in a country which is among those with the highest rates of road traffic fatalities worldwide, vulnerable road users being those who are mostly affected by the issue thus the perception of cycling as an unsafe activity is a logical evaluation of actual risk and not just subjective fear. Besides that, there is a profound socio-cultural stigma attached to cycling; it has been mostly identified with low-income laborers such as delivery men and factory workers and therefore the aspiring middle class, especially students, sees it as a sign of economic deficiency or going down the social ladder. As far as women are concerned, there are even more layers of cultural norms about the public space, modesty, and safety that stand in the way of them adopting cycling as their mode of transport.

The region around UMT in Johar Town, on the other hand, is a very convincing strategic point for a cycling pilot project that can combine with these multifaceted problems to produce a solution. It has a very high demographic concentration as the large private university is attracting thousands of students and the surrounding areas are full of hostels, residences, and commercial markets, thus creating a compact geography with densely concentrated trip origins and destinations. Student travel patterns are the best for cycling as daily trips between hostels, campus, and nearby markets are generally very short (2–5 km), flat, and repetitive, however, at the moment these trips are done using economically burdensome and polluting means like rickshaws, motorcycles, or ride-hailing apps. The physical corridors of PIA Road and UMT Road, which are the main roads of the area, show the typical road design of Lahore: they are wide enough to allow the tactical reallocation of space, but are currently almost entirely used for moving and parked vehicles, while pedestrian sidewalks are either encroached upon or in a bad state and therefore signify a clear and obvious opportunity for transformative urbanism. In addition, the corridor is of great symbolic and demonstrative value; as a center for innovation and social change, the successful implementation of a cycling network here can lead the way for a cultural change, making cycling a

normal mode of transport among the youth who are the future professionals and leaders of the city and thus acting as a real, visible, and scalable to other educational districts and residential neighborhoods across Lahore kind of proof of concept. Therefore, the case of the study simply by design of bicycles lanes. The case is about using a certain, area with high potential to question urban, transport, and cultural paradigms that are old and deeply rooted, and as a result, serve as a testbed for whether Lahore can begin to redesign its public spaces around people instead of vehicles and, as a result, solve some of its most serious environmental, health and equity problems.

Problem Statement

Even though cycling has been proved to be a source of sustainable, equitable, and healthy urban mobility, its adoption in Lahore is still extremely low. A safe, continuous, and integrated cycling network is almost non-existent in the city that suffers from severe traffic congestion and air pollution of very poor quality. A combination of predominantly car-oriented planning and the lack of proper infrastructure, together with cultural barriers and the unavailability of supportive policies, is driving away residents, among them a large student population of UMT, who could otherwise take cycling as a daily means of transport. This research, therefore, explores the possibility of a comprehensive cycling network in Lahore focusing on UMT and its neighboring areas to pinpoint the local infrastructural, social, and policy related issues that constitute a barrier to the realization of the cycling potential for urban accessibility, health, and environmental sustainability.

Research Methodology

The research methodology that was used in this study involved different phases and steps to find out if a complete cycling network is possible at the University of Management and Technology (UMT), Lahore. Data were obtained by long interviews and focus group discussions with important people, such as students, urban planners, and local community members, to get their views on the problems, safety perceptions, and needs of users in detail. Field observations in the main campus corridors (PIA Road and UMT Road) were the supplement to this data, noting down the actual cycling behavior and the conditions of the infrastructure.

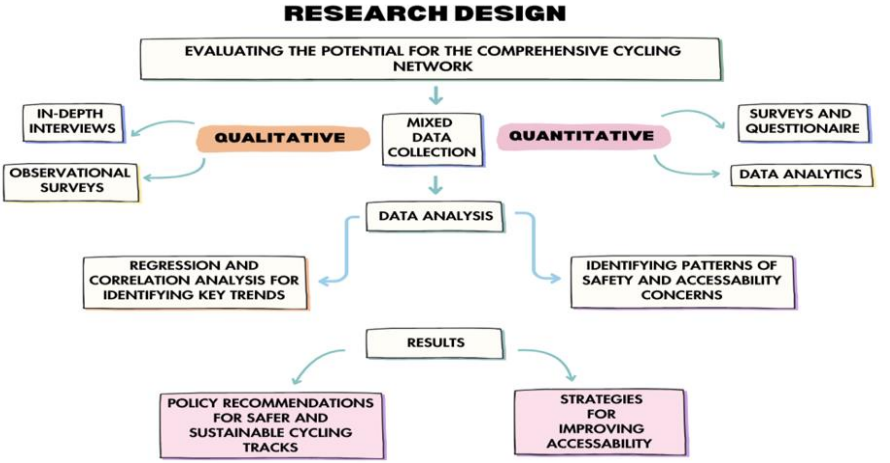
A questionnaire was given to 400 people who represented UMT students and residents of hostels nearby, to travel behavior, preferences, and perceptions. The purposive sampling method was used to select qualitative

participants so that the right experts and people with experience would be included. All the qualitative data were processed using thematic analysis to determine the main themes and insights. This user-centered approach was aimed to provide locale sensitive, real, and evidence-based design and policy recommendations.

Survey and interview data exposed a significant hidden demand for cycling as more than 80% of the respondents said they would cycle if the infrastructure was safe. Yet the biggest problem for safety was emphasized by 75.5% of the respondents who had experienced an unsafe situation while cycling, and this was mainly due to aggressive drivers and a lack of dedicated lanes. The creation of protected and designated cycling lanes was the intervention most requested (49% of the respondents).

Figure 1

Research Design



The analysis of existing road cross-sections revealed a severe bias for vehicular spaces. PIA Road (120 ft wide) and UMT Road (40 ft wide) had no space allocated for dedicated cycling lanes, thus cyclists were forced to risky shared roadways or sidewalks. The preferences of users showed that the main reasons for short trips (3-5 km) would be recreational (34.8%) and commuting (30.8%), which is in complete harmony with the travel patterns of the study area. Affordability was one of the factors (42% chose a price lower than PKR 10,000 for bicycles), however, the modern option of e-cycles attracted the most attention, indicating the existence of a market for different types of bicycles.

Analysis and Discussion

This paper provides a strong and timely case for action on urban cycling. There is clearly demand from the population to cycle; what is needed is leadership and investment to match that demand. Sorensen et al. (2021) The analysis goes beyond the usual cultural or climatic causes and identifies the key cause: cycling is seen by too many people as dangerous. It is not an inherent perception but rather a design problem, and thus it is solvable. It also supports the international evidence that if cities create dedicated and comfortable cycling infrastructure, then more people in all demographics will cycle (Buehler & Dill, 2016; Fuller et al., 2025)

These proposed actions go far beyond the simple installation of bike lanes or street painting; rather, they require a re-think in the use of street space. Currently, decisions on space are dominated by motor vehicles in ways relating to movement, parking, and space allocation. New plans place the needs of the most vulnerable road users at the center. This is essential in achieving sustainable and equitable cities. Car-centric urban planning has been highly inefficient and has added burdens on low-income communities and non-drivers (Lucas, 2012). By reassigning space, the proposed network seeks to reduce inequities and ensure access to safe, affordable travel for all. Finally, recent research supports that infrastructure provision in underserved neighborhoods is critical to truly inclusive active transportation (Winters et al., 2025).

The central challenge runs deeper than that of infrastructure in cities like Lahore, where cycling is a stigmatized activity-it is seen as something the poor do, or it is inappropriate for women. This stigma is significant, and infrastructure cannot eliminate this on its own (Steinbach et al., 2011). Traditional planning tends to overlook such social barriers. So, discourse needs to transcend engineering issues and design needs to explicitly invite all users onto safe, active, and friendly cycling routes able to change perceptions and thereby modernize cycling and make it accessible for all.

The survey shows that this is a multilevel approach: it must include physical infrastructure, but also "soft" measures such as policies on parking management and traffic calming, and stricter enforcement against lane violations, as well as targeted outreach-activities and campaigns-and ongoing collaboration with communities (Handy et al., 2014; Pucher & Buehler, 2008). To transform the system, it needs "push and pull" from all

sides. Embedding cycling within public health policy through frameworks such as Health in All Policies (HiAP) can secure funding and hold cycling on the agenda for both health and climate benefits (Giles-Corti et al., 2022). The Bike-Sharing System (BSS) exemplifies how infrastructure, technology, and policy come together: when integrated into a safe network, bike-sharing reduces barriers to entry, supports spontaneous trips, and enables wider behavior change (Fishman, 2016).

A more important dimension is multi-modal integration. A strong cycling network serves most efficiently if it is integrated into public transportation, solving first- and last-mile problems and adding to the overall value of the system (Martens, 2007). This would involve providing bike-and-ride facilities at transit stops and allowing bicycles on buses and trains. New mobility technologies and services add a layer of complication that can support or detract from sustainability, depending on the policy decisions made by local leaders (Diao et al., 2021).

The UMT corridor is an ideal starting point, but there needs to be more than this. If the pilot succeeds, it can engender public and political trust and create a model that is replicable. It would enhance confidence in novel approaches for local planners. The pilot should be used as a learning platform as a means to adapt global best practices, such as the 15-minute city concept, to the unique realities of a South Asian megacity (Qureshi et al., 2025). This relates to managing mixed traffic flow, informal use of streets, and general scarcity of space (Woodcock et al., 2009). Lessons from other contexts reinforce that success in the Global South depends less on reproduction than on meaningful adaptation to the local context (Liang et al., 2023). Sustainable change in this context requires ongoing evaluation, flexibility, and a willingness to learn from the local experience.

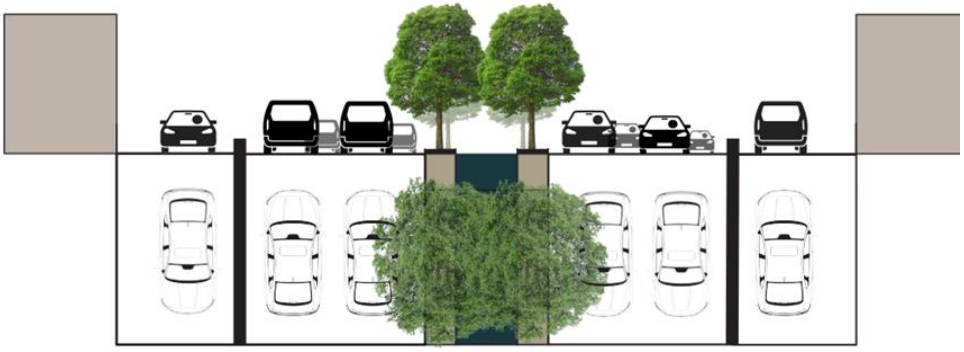
Conclusion

This study explores UMT Street in Lahore, looking not only into the complex daily life of a South Asian megacity but also delving deeper into the understanding of its people. The researchers engaged extensively with students, local organizations, and city officials to discuss experiences and concerns, keeping in mind that the primary focus should be on daily transportation users-those who will be most affected by transport policy. The project extends beyond technical analysis to assess how social and cultural forces shape perceptions of and access to transportation. The

success of any new system requires consideration for the incorporation of local practices and community values. This puts the researchers in a better position to design transport projects that would fit the social context of the city. The study also recognizes the role of infrastructure in transportation. Infrastructure design and provision in terms of roads, bike lanes, and mass transit access can make a big difference in transitions to greener travel modes. Rather than seeking infrastructure for the privileged few, the development of a transport system should take into account the needs of every single member of the community. Thus, this work develops a detailed model of sustainable transport planning, which intimately combines engineering with social insight, cultural sensitivity, and informed design. The overriding aim is to establish workable, sustainable, and long-term system balances in transport. It does so by adding to the growing body of knowledge with emphases on socially conscious and technically robust solutions, particularly for cycling in developing urban contexts. The paper points out solid insights and recommendations that can inform urban planners, policymakers, and other communities facing similar challenges globally, to support informed decisions about equitable and sustainable transportation development. The ultimate goal is to help policy formation that improves the quality of life and reduces harm to the environment while fostering livable cities for all.

Figure 2

Current Cross Section of PIA Road



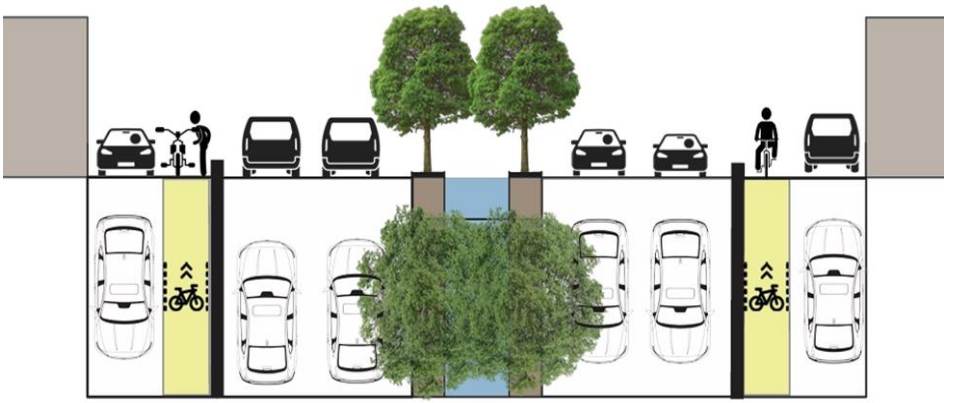
Recommendations

Several actionable steps can be taken to ensure the effective

implementation and long-term success of the comprehensive cycling network. The foremost step is the implementation of the proposed design with an emphasis on keeping the cycling lanes dedicated, clearly indicating, and physically separating them in the entire corridor so that the users can feel safe and be confident. Besides, bicycle parking that is both safe and provides relief from the sun should be made available at such locations as the university library, hostels, and commercial hubs, thus eliminating one of the major concerns of the cyclists. Without affecting the flow of the traffic, mid-block turning points as well as link roads should be carefully planned allowing cyclists to take turns safely and conveniently and also access the neighboring roads without any hassle as shown in Figure 3.

Figure 3

Proposed Cross Section



Besides that, it is necessary to put an end to the illegal parking and encroachment activities along the cycling lanes by law enforcement agencies so that these lanes remain free and can be used by the public. Moreover, the implementation of this plan can be supported by a proposal for a multi-story parking plaza for vehicles with which the road space can be freed up as shown in figure 4 and traffic congestion that is the main cause of the discomfort of the cyclists can be reduced. Other than that, modern precautions to ward off possible threats can be undertaken such as AI-powered security cameras and proper lighting along the courses in order to augment safety and keep the cyber and physical vandals at bay.

Figure 4
Shaded Bicycle Stand Near UMT

Figure 5
Bicycle Parking Near UMT Library

Besides that, there should be a move to embed cycling planning as a

core function within city governance by creating a dedicated 'Active Mobility Cell' in the Lahore Development Authority (LDA) and Traffic Police. The body should be accountable for the planning, execution, funding, and evaluation of projects for cycling and walking within the whole city with the UMT network being a pilot model.

Contact with the public has to be maintained at the forefront of the strategy when the network is being built. The residents, the students, and other people who have a stake in the project should be involved in the discussions to make sure that the network is designed as per their needs and that they support it. In the end, it is imperative that the infrastructure also be regularly monitored and maintained in order to be fit for use, while the cyclical checks should be an opportunity for design adjustments based on the users' feedback and changes in the urban context. In case these recommendations are implemented, they can go a long way in making cycling a dependable, alluring, and environmentally friendly way of getting about that would, both, the individuals and the community at large, reap the fruits of.

Conflict of Interest

The authors of the manuscript have no financial or non-financial conflict of interest in the subject matter or materials discussed in this manuscript.

Data Availability Statement

Data associated with this study will be provided by the corresponding author upon reasonable request.

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