Proceeding of International Joint Conference on UNESA
Homepage : https://proceeding.unesa.ac.id/index.php/pijcu
e-ISSN : 3032-3762

PIJCU, Vol. 3, No. 2, June 2026
Page 01-11
© 2023 PIJCU :
Proceeding of International Joint Conference on UNESA

Bike Repair Station as a Supporting Facility for Bicycle Maintenance and Sustainable Mobility Education in School Environments

Kusuma R. Haratama[1*], Anita Susanti[1], R. Endro Wibisono[1], Muhammad Hidayat[1], Dadang Supriyatno[1], Amanda R. Pattisinai[1], Oktavia E. Putri[1]

[1*] State University of Surabaya

Keywords:
Bike repair station
Bycicle maintenance
Cycling infrastructure
Sustainable mobility
School environment

ABSTRACT

Bicycle use is an important component of sustainable mobility, particularly for short-distance trips such as journeys to school. However, promoting cycling requires more than the provision of bicycle lanes; supporting facilities that enable users to maintain and repair their bicycles are also necessary. This study examines the role of Bike Repair Stations as supporting infrastructure for bicycle maintenance and sustainable mobility education in school environments. A narrative literature review was employed to synthesize academic publications concerning bicycle repair facilities, maintenance practices, cycling infrastructure, and school-based active mobility. The literature was analyzed thematically to identify the functional, educational, and mobility-related contributions of bicycle repair facilities. The synthesis indicates that Bike Repair Stations can provide access to basic maintenance tools, support minor bicycle repairs, and facilitate the development of practical maintenance skills through assisted learning. Their educational function may also encourage students to develop greater awareness of bicycle maintenance and sustainable mobility practices. This study proposes a conceptual framework for integrating Bike Repair Stations into school environments, using SMAN 1 Trenggalek as a contextual reference. The contribution of this study lies in connecting bicycle maintenance infrastructure with practical education and active mobility at the school level.

INTRODUCTION

The development of sustainable transportation has increasingly emphasized the importance of reducing dependence on motorized vehicles and encouraging the use of environmentally friendly modes of transportation. Cycling is one form of active mobility that can support this transition, particularly for short-distance journeys. In addition to reducing reliance on motorized transportation, cycling contributes to physical activity and provides an alternative for daily mobility. However, the adoption of cycling is influenced not only by the availability of bicycle lanes but also by the supporting facilities and conditions that enable people to use bicycles comfortably and consistently. The promotion of cycling therefore requires an integrated approach that considers infrastructure, accessibility, safety, and the practical needs of bicycle users (Chanpariyavatevong et al., 2024).

One aspect that deserves attention in the development of cycling infrastructure is bicycle maintenance. A bicycle is a mechanical mode of transportation that requires regular maintenance to ensure its components function properly. Problems such as insufficient tire pressure, detached chains, loose components, and brake or gear malfunctions may interfere with bicycle use. The availability of maintenance facilities can therefore become an important supporting element for cyclists. Explain that bicycle maintenance and repair are essential practices for sustaining cycling activities. Their study of Bike Kitchens demonstrates that facilities providing tools and repair assistance can support bicycle self-

repair practices while also creating opportunities for users to develop maintenance knowledge and practical skills (Valentini & Butler, 2023).

The concept of bicycle repair facilities can be found in different forms, including public bicycle repair stations, community bicycle workshops, and Bike Kitchens. Although these facilities may differ in scale and management, they share a common function: providing access to tools, equipment, and assistance for basic bicycle maintenance. Bicycle repair activities are not limited to restoring the mechanical function of bicycles (Valentini & Butler, 2023). They can also create opportunities for learning, knowledge exchange, and the development of practical competencies. In this context, a Bike Repair Station can be understood as a supporting facility that connects the material needs of bicycle users with the development of maintenance skills.

The educational dimension of bicycle maintenance is particularly relevant in school environments. Schools are not only institutions for formal learning but can also provide spaces for developing practical competencies and environmentally responsible behavior. A bicycle maintenance facility can introduce students to basic mechanical knowledge, including the identification of bicycle component problems, the selection of appropriate tools, and the application of simple repair techniques. Highlights that bicycle repair involves specific practical knowledge and competencies developed through interaction between people, tools, and repair activities. This suggests that access to appropriate equipment and opportunities for guided practice can support the development of students' practical maintenance skills (Tummons, 2023) .

Furthermore, school-based active mobility requires supporting conditions that extend beyond the availability of cycling routes. Through a systematic review of walking school buses and bicycle trains, identify the importance of improving walking and cycling infrastructure to support the implementation of active school transportation (Agyeman et al., 2023) . Chanpariyavatevong et al. (2024) also identify educational programs and structured activities as important components of interventions intended to encourage active travel among children and adolescents. These findings indicate that school-based cycling initiatives should not be limited to encouraging students to ride bicycles but should also consider the supporting facilities and educational elements required to sustain cycling practices.

The importance of supporting facilities is also reflected in research on cycling infrastructure in Indonesia. Identify shortcomings in complementary facilities and bicycle service conditions in their assessment of the Suroto bicycle lane in Yogyakarta. Although their research does not specifically examine Bike Repair Stations, it demonstrates that the quality of cycling infrastructure needs to be considered beyond the physical provision of bicycle lanes (Agustin & Khoirunnisa, 2025). Similarly, in other journal show that cyclists' perceptions of cycling infrastructure are associated with maintenance and operational conditions (Aasvik & Bjørnskau, 2021). These studies reinforce the importance of considering supporting infrastructure as part of a broader cycling environment.

Despite the growing discussion of cycling infrastructure and bicycle repair practices, the relationship between bicycle maintenance facilities and practical mobility education in school environments requires further conceptual attention. Research on Bike Kitchens has primarily examined community-based repair practices and their relationship with cycling behavior, while studies of school-based active mobility have focused more broadly on interventions, infrastructure, and travel behavior. This creates an opportunity to synthesize these perspectives by examining how a Bike Repair Station can function simultaneously as a maintenance facility and an educational medium within a school environment.

In this context, SMAN 1 Trenggalek provides a relevant setting for considering the development of a Bike Repair Station. The community service proposal identifies the need for supporting facilities that enable students to perform basic bicycle maintenance. The proposed facility includes an air pump, basic mechanical tools such as Allen keys and spanners, screwdrivers, chain lubricant, and basic spare parts. It is also designed to provide simple instructions and guidance for bicycle maintenance. Accordingly, this study aims to analyze the functional characteristics of Bike Repair Stations, examine their potential contribution to bicycle maintenance education, and formulate their relevance as supporting infrastructure for sustainable mobility in school environments. The study uses the proposed Bike Repair Station at SMAN 1 Trenggalek as a contextual reference rather than as an empirically evaluated intervention.

RESEARCH METHOD

This study employed a narrative literature review to identify, examine, and synthesize academic publications related to Bike Repair Stations, bicycle maintenance, cycling infrastructure, and school-based sustainable mobility. A narrative review was selected because the study aims to develop a conceptual understanding of the functions and potential contributions of bicycle repair facilities rather than to calculate the statistical effects of a specific intervention.

The literature search was designed around four main themes: (1) bicycle repair facilities and Bike Kitchens, (2) bicycle maintenance and repair practices, (3) cycling infrastructure and supporting facilities, and (4) school-based active mobility and mobility education. Relevant publications were identified through academic search platforms and journal databases, including Google Scholar, Scopus, and ScienceDirect. The search terms included "Bike Repair Station", "Bicycle Repair Facilities", "Bicycle Maintenance", "Bike Kitchen", "Cycling Infrastructure", "Sustainable Mobility", "School Cycling", and "Active School Travel". Combinations of keywords were used to identify publications addressing the relationship between bicycle maintenance, supporting infrastructure, and educational practices.

The literature selection considered publications relevant to the research focus, particularly peer-reviewed journal articles published between 2021 and 2026. Both empirical and review studies were considered when they discussed bicycle repair practices, cycling infrastructure, or interventions promoting active mobility among

children and adolescents. Publications that did not address these themes were excluded from the conceptual synthesis.

The selected literature was analyzed using thematic synthesis. Each publication was examined based on its research focus, methodological approach, and principal findings. The findings were then grouped into three analytical themes: (1) the functional role of bicycle repair facilities, (2) the educational value of bicycle maintenance practices, and (3) the integration of Bike Repair Stations into school-based sustainable mobility infrastructure. The results of the synthesis were subsequently interpreted in relation to the proposed Bike Repair Station at SMAN 1 Trenggalek.

FINDINGS/SYNTHESIS OF LITERATURE

Bicycle Repair Facilities as Supporting Infrastructure

Bicycle repair facilities represent a supporting component of cycling infrastructure because they provide access to tools and equipment needed to maintain bicycle functionality (Figure 1). Unlike bicycle lanes, which primarily accommodate bicycle movement, repair facilities address the mechanical needs of bicycle users during or before their journeys. Their function is particularly relevant when cyclists experience minor mechanical problems that can be resolved through basic maintenance.

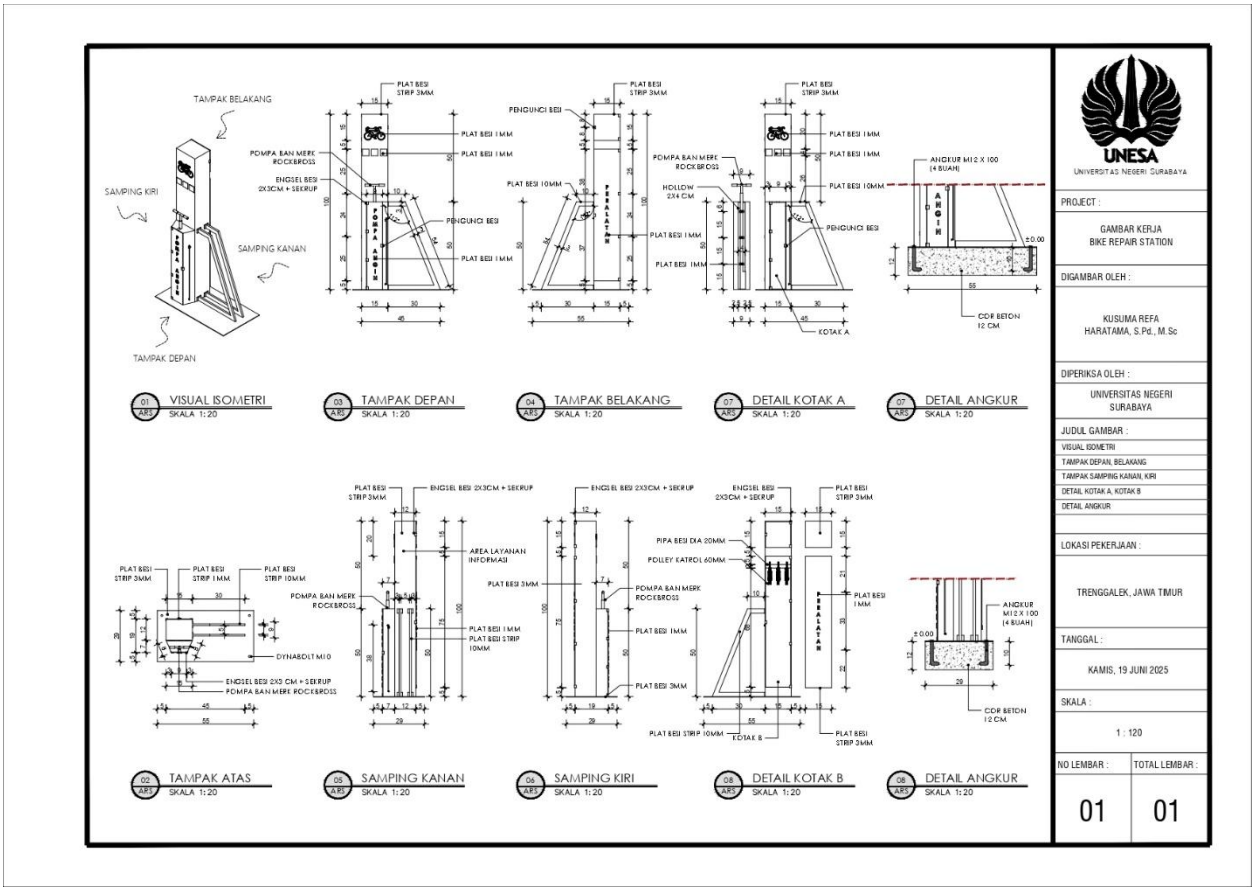


Figure 1. Design of Bicycle Repair Station

Bike Kitchens as spaces that provide tools, spare parts, and repair assistance to support bicycle self-repair (Valentini & Butler, 2023). Their findings indicate that the availability of repair resources enables users to engage directly with bicycle maintenance practices. This relationship demonstrates that bicycle repair facilities can serve as practical infrastructure that supports the continuity of cycling activities. The authors also emphasize that repair and maintenance practices help sustain cycling by connecting the availability of material resources with users' practical engagement in bicycle care (Valentini & Butler, 2023).

The availability of maintenance facilities is also related to the broader quality of cycling infrastructure. Agustin and Khoirunnisa (2025) identify the need for improvements in complementary facilities and service conditions in their evaluation of bicycle infrastructure in Yogyakarta. Although their research focuses on bicycle lane performance rather than repair stations, it highlights that cycling infrastructure should be assessed through a wider range of supporting elements. Aasvik and Bjørnskau (2021) similarly demonstrate the relevance of maintenance and operational conditions to cyclists' perceptions of cycling infrastructure.

In the context of school environments, identifying cycling infrastructure, connectivity, safety, and the surrounding environment as important domains in assessing school bikeability (Paulusová & Sharmeen, 2025). Their study emphasizes that the conditions supporting cycling to school need to be considered as an interconnected system rather than focusing solely on the presence of bicycle routes. This perspective provides additional support for considering complementary facilities as part of a broader school cycling environment.

Based on these findings, a Bike Repair Station can be positioned as a complementary facility within a school cycling environment. Its role is not to replace professional bicycle repair services but to provide basic equipment for minor maintenance and emergency repairs. The facility can therefore help address practical problems that may otherwise interrupt bicycle use.

Bicycle Maintenance as a Practical Educational Medium

Bicycle maintenance involves more than the use of mechanical tools. It requires users to understand bicycle components, identify mechanical problems, select suitable equipment, and apply appropriate repair techniques. These activities provide opportunities for experiential learning because students can directly observe and interact with the components being maintained.

Tummons (2023) explains that bicycle repair work involves specific competencies and knowledge that are developed through practical engagement with tools, materials, and other individuals. This perspective indicates that maintenance skills are not acquired solely through theoretical explanations but also through direct participation in repair practices. The study highlights the relationship between technical knowledge, practical experience, and the use of tools in everyday bicycle repair activities (Tummons, 2023).

Valentini and Butler (2023) further demonstrate that Bike Kitchens can facilitate the exchange of repair knowledge through assisted self-repair activities. The interaction

between users and individuals with repair experience creates opportunities to develop practical competencies. In a school environment, this concept can be adapted through the provision of basic tools, illustrated instructions, and guidance from teachers or individuals with relevant bicycle maintenance knowledge.

Therefore, the educational function of a Bike Repair Station can be developed through three complementary elements: access to maintenance equipment, information about basic repair procedures, and opportunities for supervised practice. These elements allow the facility to function not only as a place to address mechanical problems but also as a practical learning environment.

Integration of Bike Repair Stations intro School-Based Sustainable Mobility

School-based sustainable mobility requires facilities and educational support that encourage students to consider cycling as a practical transportation option. Agyeman et al. (2023) emphasize the importance of adequate walking and cycling infrastructure in supporting active school transportation programs. Chanpariyavatevong et al. (2024) also identify educational activities as relevant components of interventions designed to promote active travel among children and adolescents.

The importance of a supportive school environment is also discussed by Paulusová and Sharmeen (2025), who identify infrastructure, connectivity, safety, and the surrounding environment as key dimensions of school bikeability. Similarly, through a systematic literature review of child-friendly school commuting, highlight the importance of creating safe, accessible, and inclusive environments for children's journeys to and from school (Quan et al., 2026). These studies indicate that promoting cycling among students requires attention to the wider conditions of the school commuting environment.

Within this framework, a Bike Repair Station can complement existing school cycling facilities by addressing the maintenance needs of students. Its presence may provide students with access to basic tools and information when encountering minor bicycle problems. More importantly, integrating maintenance activities into school-based education can help students understand that sustainable mobility requires not only the choice of a transportation mode but also the ability to maintain the equipment used.

The integration of such a facility can be conceptualized through three dimensions. First, the infrastructure dimension concerns the availability of physical equipment and tools. Second, the educational dimension concerns the transfer of basic maintenance knowledge and skills. Third, the mobility dimension concerns the facility's role in supporting the practical conditions required for cycling activities.

These dimensions indicate that a Bike Repair Station should be designed as an integrated facility rather than merely a collection of mechanical tools. Its effectiveness as an educational and mobility-supporting facility depends on the suitability of its equipment, the clarity of its instructions, and the availability of appropriate guidance.

RESULTS AND DISCUSSION

Functional Characteristics of the Proposed Bike Repair Station

The literature synthesis indicates that bicycle repair facilities have two closely related functions: providing access to basic maintenance equipment and enabling users to develop practical repair competencies. These functions can be translated into the proposed Bike Repair Station at SMAN 1 Trenggalek.

Based on the community service proposal, the facility is designed to accommodate basic bicycle maintenance activities, including tire inflation, reattaching detached chains, adjusting brakes and gears, and replacing minor components. The equipment proposed includes an air pump, Allen keys, spanners, screwdrivers, chain lubricant, spare inner tubes, and bicycle chains. The facility is also intended to provide instructions for using the equipment and simple guidance for carrying out basic repairs.

The relationship between the proposed equipment and its functions is presented in Table 1.

Table 1. Proposed Bike Repair Station Equipment and Its Functions

Equipment	Main Function	Maintenance Activity
Air pump	Provides air pressure to bicycle tires	Tire inflation
Allen keys	Loosens and tightens hexagonal bolts	Adjustment of bicycle components
Spanners	Loosens and tightens nuts and bolts	Basic mechanical maintenance
Screwdrivers	Adjusts compatible screw-based components	Minor component adjustment
Chain lubricant	Reduces friction between chain components	Chain maintenance
Spare inner tubes	Replaces damaged inner tubes	Minor tire-related repair
Spare chains	Replaces damaged or unsuitable chains	Chain replacement
Maintenance instructions	Provides information on tool use and basic repair procedures	Independent learning and guided practice

The equipment arrangement demonstrates that the facility is intended to support basic maintenance rather than comprehensive bicycle servicing. This distinction is important because not all mechanical problems can be addressed using the proposed equipment. More complex problems, such as wheel alignment, bearing replacement, or advanced drivetrain adjustment, require specialized tools and technical competencies.

Accordingly, the proposed facility should be understood as a basic maintenance station. Its primary function is to provide accessible equipment for minor repairs and routine maintenance, while more complex mechanical problems should be referred to professional bicycle repair services. This functional limitation helps establish realistic expectations regarding the facility's operational capacity.

Educational Function of the Bike Repair Station

.

The educational potential of the Bike Repair Station is supported by the relationship between repair activities and practical knowledge development. The literature indicates that bicycle maintenance involves the development of technical understanding, tool-handling skills, and the ability to identify mechanical problems (Tummons, 2023; Valentini & Butler, 2023).

In the school context, these activities can be integrated into informal learning practices. Students can learn to recognize insufficient tire pressure, identify a detached chain, understand the basic function of bicycle brakes, and determine the appropriate tools for simple maintenance tasks. Such activities provide practical experiences that connect mechanical knowledge with everyday transportation needs.

The educational function can be strengthened through the provision of information panels or illustrated instructions placed near the equipment. These materials should explain the function of each tool, the sequence of basic maintenance activities, and the safety precautions that users need to consider. Supervised practice can also be provided to ensure that students understand the appropriate procedures before carrying out repairs independently.

This approach is consistent with the findings of Valentini and Butler (2023), who demonstrate that bicycle repair spaces can facilitate knowledge exchange and practical learning through assisted self-repair. However, the educational benefits of the proposed Bike Repair Station at SMAN 1 Trenggalek should be regarded as potential contributions that require further evaluation through actual implementation.

The provision of a Bike Repair Station can be interpreted as an effort to strengthen the supporting infrastructure required for school-based cycling. While bicycle lanes provide space for movement, maintenance facilities address the operational needs of bicycle users. Both elements contribute different functions within the broader cycling environment.

Studies of active school transportation emphasize that cycling promotion requires a combination of infrastructure and educational support (Agyeman et al., 2023; Chanpariyavatevong et al., 2024). In this context, a Bike Repair Station can complement school cycling facilities by reducing the practical limitations associated with minor bicycle problems and providing opportunities for students to develop maintenance skills.

The proposed facility at SMAN 1 Trenggalek reflects this approach. Its equipment is intended to support basic bicycle maintenance, while its instructions and educational materials are designed to encourage students to understand and perform simple repair activities. Thus, the facility connects the physical provision of infrastructure with the development of individual competencies.

Nevertheless, the availability of a Bike Repair Station should not be interpreted as sufficient evidence of increased bicycle use or reduced transportation emissions. Cycling behavior is influenced by several factors, including travel distance, traffic safety, road conditions, parental considerations, and the availability of cycling infrastructure. Therefore, the contribution of a Bike Repair Station to sustainable mobility should be understood as supportive rather than as a single determinant of travel behavior.

Bike Repair Station as Supporting Infrastructure for Sustainable School Mobility Conceptual Implications for SMAN 1 Trenggalek

The literature synthesis provides a basis for positioning the Bike Repair Station at SMAN 1 Trenggalek as a facility with interconnected infrastructure and educational functions. The proposed design is relevant because it combines basic maintenance equipment with information and guidance for bicycle users.

However, several aspects need to be considered to ensure that the facility can operate appropriately. First, the selection of equipment should correspond to the types of minor mechanical problems commonly experienced by bicycle users. Second, the facility should provide clear instructions to reduce the risk of incorrect tool use. Third, equipment storage and maintenance should be considered to ensure that tools remain available and functional. Fourth, the use of the facility should be supported by appropriate supervision, particularly when students are learning unfamiliar repair procedures.

These considerations indicate that the development of a Bike Repair Station should not be limited to the physical construction of the facility. Its design should also consider equipment suitability, user safety, accessibility, and the educational information provided. Such an approach can strengthen the role of the facility as a supporting component of sustainable mobility education in schools.

The conceptual relationship between the facility, maintenance practices, education, and sustainable mobility is summarized in Figure 1.

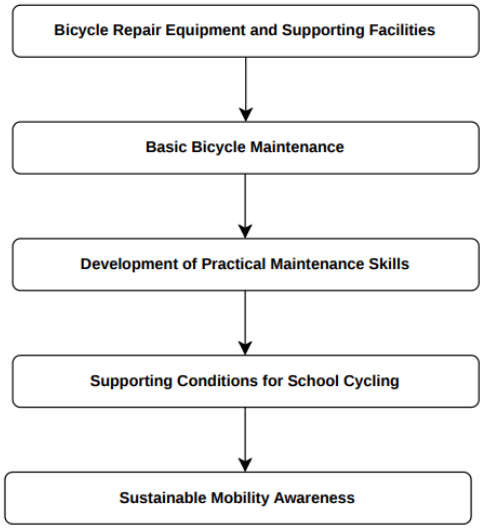


Figure 1. Conceptual Framework of Bike Repair Station Fungctions in School Environment

CONCLUSION

This study identifies the Bike Repair Station as a supporting facility that connects bicycle maintenance infrastructure with practical education and sustainable mobility awareness in school environments. The literature synthesis indicates that bicycle repair facilities can

provide access to basic maintenance equipment, facilitate minor repairs, and create opportunities for users to develop practical maintenance skills through assisted learning. The proposed Bike Repair Station at SMAN 1 Trenggalek reflects these functions through the provision of an air pump, basic mechanical tools, chain lubricant, spare parts, and maintenance instructions. Its contribution can be understood through three dimensions: infrastructure support, practical skill development, and support for school-based cycling activities.

However, the facility should be positioned as a basic maintenance station rather than a substitute for professional bicycle repair services. Furthermore, its potential contribution to increased cycling participation and reduced emissions cannot be established through literature synthesis alone. Future research should evaluate the actual utilization of the facility, students' maintenance knowledge and skills, and changes in cycling behavior following its implementation.

ACKNOWLEDGEMENTS

The authors would like to acknowledge State University of Surabaya LPPM and SMAN 1 Trenggalek for their support and cooperation in developing the proposed Bike Repair Station.

REFERENCES

Aasvik, O., & Bjørnskau, T. (2021). Cyclists' Perception of Maintenance and Operation of Cycling Infrastructure—Results From a Norwegian Survey. *Frontiers in Psychology*, *12*(July), 1–11. https://doi.org/10.3389/fpsyg.2021.696317

Agustin, I. W., & Khoirunnisa, R. (2025). The Quality of Bicycle Infrastructure in Yogyakarta City: A Case of Suroto Bicycle Lane. In *Journal of the Eastern Asia Society for Transportation Studies* (Vol. 16).

Agyeman, S., Alimo, P. K., Donkoh, V., & Cheng, L. (2023). Toward cleaner production of walking school buses and bicycle trains: A systematic review. *Journal of Cleaner Production*, *426*, 139031. https://doi.org/10.1016/J.JCLEPRO.2023.139031

Chanpariyavatevong, K., Champahom, T., Se, C., Jomnonkwao, S., & Ratanavaraha, V. (2024). The intervention design to promote active travel mode among children and adolescents: A systematic review. *Heliyon*, *10*(4). https://doi.org/10.1016/j.heliyon.2024.e26072

Paulusová, I., & Sharmeen, F. (2025). School bikeability–what is it, and why is it important? An overview of key indicators and measurement. *Transport Reviews*, *45*(1), 49–76. https://doi.org/10.1080/01441647.2024.2405218

Quan, Z., Zainol, R. B., & Md Dali, M. B. (2026). Child-friendly school commuting: A systematic literature review of frameworks, key determinants, and future directions. *Cities*, *170*, 106654. https://doi.org/10.1016/J.CITIES.2025.106654

Tummons, J. (2023). Theorising the everyday work of cycle mechanics. *Research in Post-Compulsory Education*, *28*(2), 313–329. https://doi.org/10.1080/13596748.2023.2206712

Valentini, D., & Butler, A. (2023). Bike Kitchens and the sociomateriality of practice change: exploring cycling-repair relations. *Urban, Planning and Transport Research*, *11*(1). https://doi.org/10.1080/21650020.2023.2259235