

THE CURRENT STAGE AND PERSPECTIVE OF SCHOOL MOBILITY RESEARCH

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The scientific literature covers various aspects of school mobility, including commuting. Regarding commuting, there is no clear definition of the “school mobility” concept. We can also come across terms such as “school / academic commuting”, “school travel”, “school journey” and others. According to [1], school mobility explores the transport mode choice of students (on foot, by public transport, micromobility vehicles, or private cars) during their home-school journeys. It is worth noting that the participants in school mobility are not only students of educational institutions (e.g., preschools, schools, universities) but also their parents, academic staff, and other stakeholders.

The study of school mobility is of significant interest in developing transport policies for safety, urban planning, reducing urban traffic and air pollution, and promoting public transport and active travel as an accessible and sustainable way to get to and from school [2].

The impact of school mobility on the city’s transport system is significant. According to [3], the share of school traffic in different European Union countries is approximately 15 % of total urban traffic, and the share of students taken to school by car ranges from 30 to 60 % (depending on the country and school grade).

It is equally important to study school mobility in terms of the impact of how children and adolescents get to school on their physical and mental health, cognitive abilities, academic performance, and level of socialization [2].

The main data source for school mobility research comes from travel behavior, national health surveys [4], and research on child mobility [2]. Since the mid-2000s, attention has increased to the importance of active school mobility, including walking and usage of non-motorized micromobility means [4].

Research on child mobility primarily focuses on several sub-fields [2]: child mode use, independent mobility, environmental factors that affect the use of active modes, interventions to promote active travel, associations between child travel and child health status, methods of capturing children’s independent mobility, children’s mobility / school travel in general, and also multiple review sections in empirical studies on mode use or independent mobility.

One of the key and perspective areas of school mobility research is the study of travel behavior patterns among younger generations, emphasizing the long-term potential for sustainable travel options.

The formation of transport behavior is shaped not only by early exposure to sustainable modes of transportation but also by various factors [4]. Acquiring skills

such as cycling, participating in initiatives like the “Walking Bus”, or utilizing public transport from a young age can help overcome psychological and practical barriers (e.g., navigating available routes, understanding payment systems, or developing independence in travel, etc.) and increases the propensity to use sustainable transport modes in adult life [5].

Existing research on school mobility faces some limitations, such as the lack of a standardized approach to collecting and processing information on school mobility, limited geographical and age coverage, neglect to consider city heterogeneity, and a limited number of studies on the benefits of different school mobility forms (especially active school mobility) that can influence the development transport policy [4].

According to the [6], the first school mobility research in Ukraine was conducted as part of the “TUMI: The Way to School” project in Zhytomyr. Still, this study aimed to improve transport infrastructure on the way to school rather than analyzing school mobility as the project's main object. One of the recent examples focused on school mobility was a case study conducted in Kharkiv [7], which aimed to investigate the characteristics of school mobility in the pre-war state by interviewing secondary school students, including the mode of transport, journey times and other relevant factors influenced the mode choice. The “SMOOTH: Sustainable Modes to School” project [8], currently being implemented in Uzhhorod, aims to improve the safety of children’s journeys on the way to school and involves the development of a School Mobility Plan.

Given the significant impact of school mobility on urban transport systems and the health of children and adolescents, further research is essential to create safer, more accessible, and sustainable mobility solutions for society. Understanding the factors that shape students' travel behavior can provide helpful information for policymakers, educational institutions, and local authorities.

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MODERN METHODS FOR TREATING WASTEWATER CONTAINING CHROMIUM (VI)

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Introduction. Chromium (VI) in industrial wastewater poses serious environmental and health risks due to its high solubility and persistence (Bashir, 2021). Used in electroplating, tanning, and metal processing, improper disposal leads to soil and water contamination (Nahid et al., 2020). Unlike the less toxic Cr (III), Cr (VI) is a strong oxidizer linked to respiratory diseases and carcinogenicity even at low concentrations (Shekhawat et al., 2015; Barakat, 2010). Treatment is challenging due to its high toxicity and mobility (Ziwen et al., 2020), interference with biological methods (Shekhawat et al., 2015), and the risk of secondary pollutants from chemical treatments (Pilipenko & Spassonova, 2020).

Methods for Chromium (VI) Removal

Chemical Precipitation and Reduction. The most common industrial method involves reducing Cr (VI) to Cr (III) using reducing agents such as sodium bisulfite, sulfur dioxide, or ferrous sulfate (Wiryawan et al., 2018). The reduced Cr (III) precipitates as chromium hydroxide in an alkaline medium. This method is cost-effective but increases the salinity of treated water, requiring further purification (Jayarathna et al., 2015).

Electrochemical Treatment. Electrochemical processes, including electrocoagulation and electrochemical reduction, effectively convert Cr (VI) into Cr (III) (Pilipenko & Spassonova, 2020). These methods offer high efficiency but require significant energy input and specialized equipment (Suvorin et al., 2019).

Adsorption Techniques. Adsorption is a widely studied method due to its simplicity and effectiveness (Barakat, 2010). Various adsorbents, including activated carbon, clay minerals, and biochar, have shown high efficiency in Cr (VI) removal (Gorshkova et al., 2015). However, adsorbent regeneration and disposal remain challenges (Jayarathna et al., 2015).