

**ПІДВИЩЕННЯ ЕФЕКТИВНОСТІ ПАСАЖИРСЬКИХ ЗАЛІЗНИЧНИХ  
ПЕРЕВЕЗЕНЬ ЗА ДОПОМОГОЮ ІНТЕГРОВАНІХ ІНТЕРМОДАЛЬНИХ ХАБІВ І  
ТЕХНОЛОГІЙ УПРАВЛІННЯ РИЗИКАМИ**

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**ENHANCING PASSENGER RAIL TRANSPORTATION EFFICIENCY THROUGH  
INTEGRATED INTERMODAL HUBS AND RISK MANAGEMENT TECHNOLOGIES**

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Enhancing passenger rail transportation efficiency in Ukraine in 2024 would require a multifaceted approach, integrating intermodal hubs and risk management technologies, which should take into account the following main strategies.

1. Intermodal hubs: Introduce integrated intermodal hubs at key transportation nodes, strategically located in urban centres and major transportation corridors, to address the increasing need for efficient and competitive passenger rail transportation in Ukraine. These hubs serve as vital junctions connecting various modes of transportation such as trains, buses, trams, and metro systems. Among the challenges posed by periods of martial law, ensuring smooth movement of passengers becomes paramount, particularly within integrated transfer complexes. Coordinating the arrival and departure of suburban and interregional trains, along with the scheduling of city transport to coincide with station stops, requires a sophisticated approach. Implementing a smart passenger orientation system and synchronised schedules for city transport can streamline passenger movement within intermodal hubs. To effectively facilitate this coordination, the development of complex mathematical models that should accurately depict the dynamics of passenger traffic, from platform boarding to city transportation stops, enabling efficient management and optimisation of passenger flow within the integrated transportation network [1].

2. Infrastructure Upgrades: Invest in upgrading the rail infrastructure to improve speed, reliability, and capacity. This includes modernising railway tracks, stations and signalling systems. High-speed rail projects can be considered on heavily trafficked routes to reduce travel times and attract more passengers to rail transportation.

3. Technology integration: Implement advanced technologies to optimise rail operations and enhance passenger experience. This includes the following:

- Real-time monitoring systems. The deployment of state-of-the-art monitoring systems enables continuous tracking of train movements, allowing operators to ensure efficient scheduling and minimise delays. By accessing real-time data, operators can respond promptly to incidents and maintain smooth operations throughout the network [2, 3];

- Predictive Maintenance Algorithms. Utilising predictive maintenance algorithms helps prevent potential breakdowns by identifying maintenance needs before they escalate. By analysing data on equipment performance and wear patterns, operators can schedule maintenance activities proactively, reducing downtime, and enhancing reliability;

- Digital ticketing solutions. Implementing digital ticketing solutions facilitates seamless booking and boarding processes for passengers. By offering online booking options and mobile ticketing apps, operators can streamline ticket purchase, eliminate the need for physical tickets, and improve overall passenger convenience;

- Onboard Connectivity. Enhancing amenities such as Wi-Fi and entertainment systems can significantly enhance passenger satisfaction. Providing reliable Wi-Fi connectivity allows passengers to stay connected during their journey, while entertainment systems offer additional comfort and entertainment options, enhancing the overall travel experience.

By integrating these advanced technologies into rail operations, operators can optimise efficiency, minimise disruptions, and improve the quality of passenger service. This not only

improves operational performance, but also improves passenger satisfaction and encourages a modal shift toward rail transportation.

4. Risk Management Technologies: Utilize risk management technologies to enhance safety and security in rail transportation. This includes the installation of CCTV cameras, access control systems, and emergency response mechanisms at stations and onboard trains. Additionally, the use of predictive analytics and AI-based algorithms can help identify potential risks and mitigate them proactively.

5. Public-private partnerships (PPPs): Foster partnerships between government, private sector, and international organisations to finance and implement rail transportation projects. PPPs can bring in additional funding, expertise, and innovation to accelerate the development of intermodal hubs and deploy cutting-edge technologies.

6. Promotion and marketing: Launch promotional campaigns to raise awareness of the benefits of rail transportation and encourage the modal shift from road to rail. Highlighting the environmental advantages, cost effectiveness, and reliability of trains can attract more passengers and reduce highway congestion.

7. Regulatory Reforms: Streamline regulations and procedures to facilitate the integration of intermodal hubs and the adoption of new technologies. This includes reviewing licencing requirements, tariff structures, and safety standards to create a conducive environment for investment and innovation in the rail sector.

By implementing these strategies, Ukraine can significantly improve the efficiency, reliability, and sustainability of its passenger rail transportation system in 2024 and beyond.

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### ДОСЛІДЖЕННЯ ТРАНСПОРТНОЇ ВТОМИ ПАСАЖИРІВ ПРИ ПЕРЕМІЩЕННІ АВТОМОБІЛЬНИМ ТРАНСПОРТОМ В УКРАЇНІ

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### STUDY OF TRANSPORT FATIGUE OF PASSENGERS WHEN TRAVELING BY MOTOR VEHICLE IN UKRAINE

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Пасажирські перевезення під час нестабільної ситуації в Україні мають важливе стратегічне значення. Такі перевезення під час війни можуть виконувати різноманітні важливі функції, сприяючи як безпеці та захисту громадян, так і забезпеченню нормального функціонування суспільства в умовах війни. Функції, які виконують пасажирські перевезення є різноманітними. Основні з них: евакуація цивільного населення з місць