

are directly linked to Sustainable Development Goal 8. Although technologies change, the primary advantage lies in the balanced combination of transport modes. Every step toward integrating transport modes yields real savings, not just theoretical improvements. Such systems do not merely adapt to global trends but establish a new level of efficiency. As a result, a number of countries are already seeing progress precisely because they have reimagined transport integration.

It is important to use the latest solutions to reduce harmful emissions from seagoing vessels. This approach helps meet UN goals, particularly 9.4 and 13. Even small changes yield noticeable results; through the gradual modernization of the fleet, we gain economic and environmental benefits. The time for implementing solutions for technical upgrades is becoming increasingly urgent.

The most effective approach is a system that combines logistics, technology, and digital tools. This approach increases productivity in the transportation sector while fulfilling Goals 8.2 and 12.6 of the Sustainable Development Goals.

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**PASSENGER TRANSPORTATION IMPROVEMENT ON ROUTE NO. 1609**

**«KHARKIV – MEREFA»**

This article provides a comprehensive analysis of suburban passenger transportation along route No. 1609 «Kharkiv – Merefa», which serves as a critical transport artery connecting Kharkiv’s Kholodna Hora metro station with the towns of Merefa and surrounding settlements (Utkivka, Yakovlivka, and the remote “Selekcine” district). Based on schedule data, route mapping, and operational information collected from municipal transport sources, this paper evaluates the current state of service, identifies key areas for improvement, and proposes a set of actionable recommendations to enhance service quality, reduce passenger wait times, and improve the overall efficiency of the route. The analysis pays special attention to schedule optimization, fleet modernization, and the integration of modern information technologies.

The suburban connection between Kharkiv and Merefa is a vital transportation link serving thousands of passengers daily. Merefa, a city with over 21,000 residents, is part of the Kharkiv conurbation. In recent years, due to active housing construction and the development of the suburban area, passenger traffic between Kharkiv and Merefa has been steadily increasing . This creates new challenges for transport providers: ensuring timely delivery of passengers, providing comfortable travel conditions, and optimally balancing the schedule with passenger flows .

Route No. 1609 is operated by private entrepreneur Kornienko A.M. and connects the Kholodna Hora terminal in Kharkiv with the “Selekcine” area of Merefa, with transit through the city center. The route also includes specialized departures to the villages of Utkivka and Yakovlivka .

This research is based on an analysis of the official route schedule as of June 2023, fare data as of April 2026, and field observations conducted by transport specialists .

#### *Current State of Route No. 1609*

*Service Area and Stops* The route starts from the suburban terminal at the Kholodna Hora metro station in Kharkiv. After departing, the route follows the Kharkiv-Merefa highway. Within Merefa, three main stop groups can be distinguished:

- Merefafa (Center) – the main stop in the city’s central area.
- Merefafa (Selekcine) – the final destination on the city’s outskirts.
- Utkivka and Yakovlivka – branches with limited service frequency .

The route is served by a mixed fleet of vehicles: large buses (e.g., BAZ-079 “Etalon”, Ataman A092H6) and minibuses (Mercedes-Benz Sprinter, Fast Scoler) .

*Schedule Analysis* The schedule for route No. 1609 has a complex, multi-layered structure:

*Weekdays (Monday–Saturday).* Morning departures from Kholodna Hora begin at 06:35 and continue at 15–30-minute intervals until 20:20. The peak morning hours (07:00–09:00) see increased departure frequency—up to 4–5 buses per hour, which is critically important for transporting workers and students.

From Merefafa (Selekcine), the first bus departs at 05:40, which is very convenient for early morning shifts. Evening departures continue until 19:10.

*Sundays and holidays.* Sunday service starts later—first departure at 07:30—with a reduced number of trips. A similar reduction is observed on the final runs from Merefafa .

Transit trips. A significant portion of trips have the note “transit via Merefafa.” This means that after arriving in Merefafa, the bus continues to “Selekcine” and/or further to Utkivka and Yakovlivka. This is important for passengers whose destinations lie beyond Merefafa .

Based on an analysis of schedules, passenger feedback, and fare levels, the following problems can be identified:

<b>Issue</b>	<b>Description</b>	<b>Recommended Solution</b>
Insufficient frequency during evening peak hours	After 18:00, the interval between buses increases sharply, creating overcrowding and wait times of up to 40 minutes.	Introduce additional trips at 18:15, 18:45, 19:15.

Unregulated wait times at “Selekcine”	Buses often wait 10–20 minutes at the final stop without a clear schedule, inconveniencing passengers in cold or rainy weather.	Implement a clear “time-of-departure” schedule for the final stop.
Fare increase pressure	As of April 2026, the fare is fixed, but rising fuel costs could force further increases .	Introduce flexible electronic payment with discounts for regular passengers.
Lack of real-time information	At stops in Merefa and Kholodnaya Gora, there are no interactive displays showing actual departure times.	Integrate the route into digital tracking systems (e.g., CityBus, Google Maps).

*Ways to Improve Passenger Service*

*Schedule Optimization* The current schedule generally meets passenger needs during morning peak hours, but the situation worsens in the evening. The following changes are recommended:

1. Add trips at 18:15, 18:45, and 19:15 from Kholodna Hora to cover post-work passenger demand.
2. Shorten the stop time at “Selekcine” by creating a dispatch point and adhering to fixed departure times.
3. Introduce express service during peak hours (07:30–08:30 and 17:00–18:00) with intermediate stops only in Merefa, bypassing Ukrvka and Yakovlvka, which would shorten travel time to 30 minutes .

*Fleet Modernization* To improve passenger comfort, it is advisable to replace the most worn-out minibuses (e.g., older Mercedes-Benz Sprinter models) with low-floor

buses of the Etalon type, which are more comfortable for the elderly, passengers with limited mobility, and parents with strollers .

*Digitalization and Information Support* Modern passengers expect real-time information about vehicle locations. Therefore, it is essential to:

- Equip all buses with GPS trackers and transfer data to online services (Google Maps, CityBus).

- Install interactive displays at the main stops “Kholodna Hora” and “Merefa Center” showing departure times and arrival predictions.

- Create a Telegram-bot with the current schedule and the ability to track a specific trip by its tail number.

*Fare Policy Optimization* Maintaining an acceptable fare and offering discounts will help retain regular passengers. It is advisable to implement:

- Electronic travel cards with a cumulative discount system (e.g., every 10th trip free).

- Separate fare for transit trips to Utkivka/Yakovlivka, balancing the cost with the distance traveled .

*Conclusion* Route No. 1609 plays a key role in connecting Kharkiv and Merefa, serving thousands of passengers daily. However, its current state does not fully meet modern needs. Key challenges include uneven schedule intervals during evening peak hours, long and unregulated waits at the final stop, a lack of digital passenger information tools, and fare sensitivity.

Implementing the proposed measures—adding evening trips, updating the fleet, digitalizing the route, and creating a flexible fare system—will significantly improve the quality of service, increase passenger loyalty, and reduce social tension in the suburban community.

Experience shows that timely optimization of suburban routes significantly relieves the load on the Kholodna Hora transport hub, reduces the number of private cars in the city center, and improves the environmental situation in Kharkiv .

Recommendations for further study: It is advisable to analyze passenger traffic distribution by trip in real time using contactless fare validators, which will allow for

more precise schedule adjustments and the optimal distribution of bus types by departure time.

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## THE SECRET COSTS OF "STUFF": UNDERSTANDING INVENTORY COSTS

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Inventory is often seen as a simple asset on a company's balance sheet. More stock means more products ready to sell, which should mean more revenue, right? In reality, inventory is a double-edged sword. While necessary to meet customer demand and ensure smooth operations, holding stock comes with a complex web of hidden expenses that can quietly drain a company's profits. These are the secret costs of "stuff"—the expenses that go far beyond the simple purchase price of the goods.

This article aims to demystify inventory costs by breaking them down into their core components. We will explore the difference between direct and indirect costs, introduce the classic triad of holding, ordering, and shortage costs, and finally, discuss how businesses can use this understanding to unlock significant savings.

*The Iceberg of Inventory Costs* To visualize the problem, imagine an iceberg. The tip, visible above the water, represents the direct cost of the inventory—the price paid to the supplier for the goods. This is the figure that appears on the invoice and is most obvious to management.