Early considerations for a transport system in the Gaza Strip: A short-term, sustainable mobility proposal

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Abstract

This paper presents early considerations for a short-term, sustainable transport strategy for the Gaza Strip, developed using the Dar Al Omran – Rasem Badran Master Plan as a long-term spatial framework. Given the urgent need for rapid, low-cost mobility solutions that can support reconstruction while ensuring social inclusion, the proposed system integrates multiple modes, including Bus Rapid Transit (BRT), community taxis, active mobility infrastructure, and shared mobility services. Five key mobility hubs—Beit Hanoun, Gaza City, Deir al-Balah, Khan Yunis, and Rafah—serve as structural anchors for a scalable network. Two alternative BRT configurations are examined. These options are complemented by feeder services, cycling facilities, and innovative shared mobility solutions such as cargo bikes and drone-enabled deliveries. The proposal emphasizes the importance of coordinated land use–transport integration to ensure that mobility interventions respond to community needs and adapt as new data becomes available. Overall, the proposal offers a pragmatic path from immediate recovery to long-term, resilient urban mobility development in the Gaza Strip.

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Keywords

Sustainable mobility, Bus rapid transit, Mobility hubs

Introduction

Effective reconstruction requires transport systems that can quickly restore mobility, support social inclusion, and lay the foundations for long-term urban development. In this context, the Dar Al Omran – Rasem Badran Gaza Master Plan (Dar Al Omran – Rasem Badran, 2025) provides a strategic vision for the reconstruction of the Gaza Strip, outlining major infrastructural and connectivity goals. Building upon this framework, this paper presents early considerations for a short-term, sustainable transport proposal that can be implemented rapidly and at relatively low cost while remaining compatible with the medium- long-term spatial plan. The proposal focuses on sustainable modes, equity, and scalable interventions that can evolve into more advanced mobility systems over time.
Given the current lack of detailed mobility data, the analysis presented here is intentionally preliminary. The recommendations emphasize flexible and incremental strategies to be refined as new information on travel patterns, land use, and community needs becomes available.

Rationale and approach

The Master Plan by Dar Al Omran – Rasem Badran provides a long-term vision for mobility and spatial development in the Gaza Strip. Its primary transport components include:
1. Expansion of roadway infrastructure to strengthen internal and regional connectivity.

2. Development of a regional railway along the eastern side of the Strip for passenger and freight movement.
3. Reactivation of the former airport in the southeastern area.
4. Introduction of a coastal water-taxi service linking major cities from north to south.

These strategies articulate a high-capacity, multi-modal system envisioned for full reconstruction and regional integration. However, many of these infrastructures require substantial investments and medium-long implementation timelines. Consequently, immediate mobility needs must be addressed through pragmatic, low-cost, and scalable solutions that preserve compatibility with future expansions. Short-term reconstruction contexts face constraints in funding, time, materials, and institutional capacity. The proposal presented here is guided by four principles:

- Ensure trips within Gaza and connections with the West Bank: prioritizing public transport, cycling, and shared mobility to reduce congestion, emissions, and infrastructure costs.
- Accelerated implementation: deploying systems that can be operational within 1–2 years and require minimal specialized construction.
- Social inclusion: ensuring equitable access to opportunities, by expanding affordable and reliable transport options.
- Economic development: enabling labor mobility, supporting reconstruction logistics, and fostering local entrepreneurship.

Early stage planning also requires understanding local mobility habits, community preferences, and the spatial distribution of households and services. As these data are not yet available at scale, the proposal adopts modular and adaptable design principles.

Proposed short-term mobility system

Mobility hubs as structural anchors

Five primary mobility hubs—Beit Hanoun, Gaza City, Deir al-Balah, Khan Yunis, and Rafah—are proposed as the backbone of the system, aligned with major population centers and access points. These hubs function as intermodal nodes integrating:

- Bus Rapid Transit (BRT) services
- Community taxis
- Active mobility infrastructure
- Shared mobility services
- Urban delivery logistics

Hubs enable efficient network organization, community accessibility, and phased expansion as future data becomes available.

Bus rapid transit (BRT)

A BRT network represents the core public transport solution due to its low capital cost, high capacity, and rapid implementation (Lambas et al. 2017). The system features protected lanes, high passenger capacity, traffic signal priority, sheltered stations with real-time information, and accessibility for passengers with reduced mobility.

Two alternative configurations are considered for the initial deployment of the Bus Rapid Transit system. Option 1 (Figure 1) envisions a network composed of two distinct lines, each serving complementary segments of the Strip. The Red Line would connect Beit Hanoun in the north to

Deir al-Balah in the central region, while the Green Line would extend southward from Deir al-Balah to Rafah. Together, the two lines would operate through a system of 13 stations, comprising the five main terminal hubs and eight secondary stations strategically placed along the corridor. With 10-minute headways, corresponding to six buses per hour, the system would ensure frequent and reliable service throughout the day. Commercial speeds are expected to range between 20 and 25 km/h, enabling efficient movement even in constrained urban conditions. To broaden coverage beyond the main corridor, a set of feeder buses would connect key residential and activity nodes to the BRT stations, thus forming an integrated network. This configuration offers a balanced geographic distribution of services and high operational frequency, making it particularly suitable for the early stabilization phase of the reconstruction process. Option 2 (Figure 2) proposes a more streamlined configuration centred on a single, continuous north–south line. This line would traverse the entire length of the Strip, connecting all five terminal hubs through a sequence of approximately 40 stations. A distinctive feature of this option is its cargo-hitching capability, in which articulated buses tow modular trailers that can accommodate both passengers and freight. This dual-purpose system would support not only personal mobility but also small-scale logistics during the reconstruction period. The line would operate with 15-minute headways—about four buses per hour in each direction—supported by a fleet of approximately 50 articulated vehicles equipped with trailers. This option emphasizes continuity, logistical efficiency, and ease of deployment across the entire corridor.

Both options meet urgent mobility needs with low emissions, limited construction disturbance, and scalability toward future tramway or metro systems.

Figure 1 – BRT proposal - Option 1 (basemap from the Master Plan by Dar Al Omran – Rasem Badran)

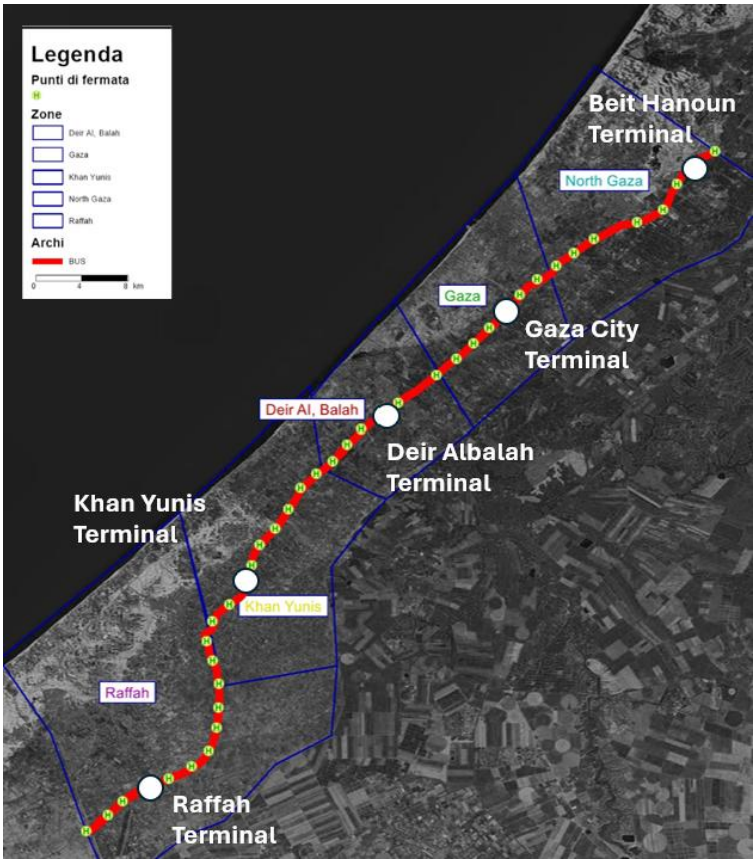

Figure 2 – BRT proposal - Option 2 (Basempap ESRI)

Community taxi system

In parallel with the BRT network, a community taxi system would play a complementary role by extending mobility into residential areas and neighbourhoods not directly served by the main corridor. Operated locally by residents, these services would offer flexible, demand-responsive connections from BRT stations to surrounding districts. Beyond improving physical accessibility, the model carries

significant social and economic benefits. It can provide affordable mobility for users who may not have access to private vehicles, while simultaneously creating employment opportunities and fostering small-scale entrepreneurship among local drivers. Because routes can be adapted to the unique spatial patterns and social dynamics of each neighbourhood, community taxis also help reinforce social interaction and cohesion. This system is particularly valuable in fragmented urban settings, where fixed-route services alone may be unable to accommodate the fine-grained mobility needs of dispersed communities.

Cycling infrastructure

To strengthen sustainable transport options, we propose to introduce a continuous and legible cycling network designed to promote active mobility as a viable everyday mode. Segregated cycle tracks along major arterial roads would provide safe, predictable corridors for longer trips, while shared, traffic-calmed environments in residential areas would encourage cycling within local streets. Complementary infrastructure—such as bike parking and racks at terminals, public facilities, and commercial areas—would support routine use and reduce barriers to multimodal travel. Ensuring seamless first- and last-mile connections to BRT stations further integrates cycling into the wider mobility ecosystem. As a low-cost and rapidly deployable mode, cycling offers health and environmental benefits while expanding mobility opportunities for populations that may be underserved by motorized transport, or experiencing fuels shortage.

Shared Mobility and Urban Deliveries

Finally, we propose a suite of shared mobility solutions intended to diversify available modes and support flexible, user-oriented travel. Bike-sharing systems at major transit hubs would facilitate short trips and last-mile movements also for those who cannot afford a private vehicle, while cargo bike rentals would provide an efficient option for small-scale deliveries, especially within dense urban neighbourhoods. Scooter-sharing services at key nodes would offer additional lightweight and accessible personal mobility. For freight logistics, we envision the development of vertiports for drone operations both at major hubs (Marinelli et al., 2025) and at the southern airport site, enabling rapid, low-impact transport of essential goods in short time and allowing to reach the most remote regions, also in case of infrastructure disruption.

Conclusions: Toward a coordinated mobility–land use strategy

Beyond immediate reconstruction, the proposed system contributes to a broader urban strategy centred on coordinated land-use planning, equity, and community-driven development. Integrating transport and land use ensures that residential areas, services, and economic hubs remain well connected, reducing spatial inequality. The participatory dimension of the solutions (such as community taxis and shared services) helps align transport interventions with daily movement needs and local mobility cultures. Together, these innovations contribute not only to improved accessibility of the region but also to the establishment of a "Living Lab" environment in which experimental and advanced mobility technologies can be tested and refined to meet local reconstruction needs.

References

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