

Public Transport in Low-Density Territories: A Preliminary Study of the Taxibus Service in the Basso Ferrarese Inner Area

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1 Introduction

Within contemporary urban planning debates, the publicness of urban and territorial spaces—understood as the coexistence of diverse social groups in the same environment, enabling practices of interaction, exchange, and care—emerges as a key element in the construction of inclusive cities and regions (Donolo 2014). In this perspective, accessibility, more than mobility, becomes a crucial interpretive lens through which to address territorial inequalities, as public transport services may be reconfigured from mere technical supports into moving social spaces. While the mobility paradigm has historically focused on speed and congestion reduction, the accessibility paradigm emphasizes the equitable distribution of territorial opportunities, accounting for spatial, economic, and social factors (Martens 2017, Sheller 2018), and is regarded as a necessary, though not sufficient, condition for achieving fairer transport policies and redistributive opportunities that improve quality of life (Wachs & Kumagai 1973). Although most studies, policies, and resources focus on large cities and metropolitan areas, the most complex challenge arises in peripheral and fragmented territories, particularly in inner

areas (Bosworth et al. 2020, Camarero & Oliva 2019), where the issue is not limited to the technological efficiency of future mobility systems but extends to their broader social, economic, and environmental sustainability (Vitale Brovarone et al. 2022). Here, ensuring equitable access to territorial opportunities becomes essential to fostering more inclusive growth and preventing marginalization in an increasingly polarized Europe, caught between competitiveness and regional cohesion.

In such contexts, limited accessibility—understood as a multidimensional condition shaped by the spatial distribution of activities, individual capacities, and available resources (Moseley 1979, Levine 2020)—often results in hyper-mobility, induced by car dependency (Bosworth et al. 2020), with critical environmental and social consequences, especially for vulnerable groups such as the elderly, youth, women, and migrants (Vitale Brovarone et al. 2022). Promoting public transport in low-density areas, despite the challenges, should remain a priority of territorial agendas and be closely linked to the transition towards a genuinely sustainable mobility paradigm (Sheller 2018, Martens 2017). In these contexts, where a significant share of the European and Italian population still resides, the tension between accessibility and marginality is particularly acute (Camarero & Oliva 2019): demographic fragility, scarce services, and dependence on private cars heighten risks of isolation and exclusion, undermining social cohesion and well-being. Italian inner areas, such as the Basso Ferrarese—comprising seven municipalities with 54,000 inhabitants—represent this tension between accessibility and marginality. Despite the National Strategy for Inner Areas (SNAI) highlighting the need for integrated policies to counter demographic decline and improve access to essential services (Barca et al. 2014), the progressive concentration of resources according to demographic density has generated exclusionary effects, particularly for those without private vehicles, restricting freedom of movement and exacerbating risks of social isolation (Clark et al. 2020, Ferdman 2021).

The decisive challenge lies in combining technological innovation with broader social and economic sustainability, ensuring equitable access to opportunities and fostering inclusive forms of public transport (Sheller 2018, Kotef 2015). At the same time, it is necessary to reflect on the strategic role of local public transport as an infrastructure that guarantees the right to mobility (Martens 2017, Harvey 1973). Transport agencies, for their supra-local mandate, can act as key actors in coordinating vast and complex territories, linking local needs with wider-area visions, and experimenting with innovative models that go beyond traditional solutions. The experience of AMI Ferrara, operating in the Basso Ferrarese Inner Area, illustrates this potential: alongside managing

services, the agency promotes monitoring, research, and experimentation in collaboration with the university, paving the way for flexible and adaptive models of transport. These efforts demonstrate how public transport can evolve into an infrastructure of inclusion, where accessibility is affirmed as a public good and a necessary condition for more equitable and sustainable territorial futures.

2 Methods

Within this perspective, experimental and innovative territorial surveys can play a crucial role in revealing mobility needs and the challenges faced by communities relying on public transport services, while also capturing latent demands and shedding light on the complex social and cultural fabric of daily mobility. Within the framework of a research agreement between the University of Ferrara and AMI Ferrara (Agenzia Mobilità e Impianti), a monitoring program was launched on the demand-responsive Taxibus service operating in the Basso Ferrarese, with the aim of analysing demand dynamics and usage levels to assess system effectiveness and identify improvement strategies. Established in the early 2000s to ensure connectivity with the new hospital of Lajosanto, the Taxibus can be classified as a form of Demand Responsive Transport (DRT) and still today constitutes an intermediate solution between traditional public transport and private mobility, adjusting supply to actual demand. Currently, it operates across fourteen lines covering a broad territorial area, running on a reservation basis during weekdays (Figure 1).

To outline the methodological framework of the research on the Taxibus demand-responsive service, undertaken to assess its effectiveness in the pilot area of the Basso Ferrarese, comparable national cases in low-demand contexts were first identified and examined. These experiences helped shift the focus from purely infrastructural and quantitative approaches towards methodologies capable of capturing the socio-demographic and cultural complexity of the areas under investigation, highlighting the need to move beyond supply-oriented models in favor of more integrated tools for monitoring and evaluation, sensitive to local specificities. The research methodology combined quantitative and qualitative techniques, including passenger flow data collection (boarding and descending disaggregated by age and gender) and a voluntary on-board survey capturing travel habits and user satisfaction (Figure 2). While the sample is not fully representative of the broader mobility dynamics of the province (also considering the seasonal nature of some coastal activities), it constitutes a first attempt at testing real-time, georeferenced survey methods and offers valuable insights into

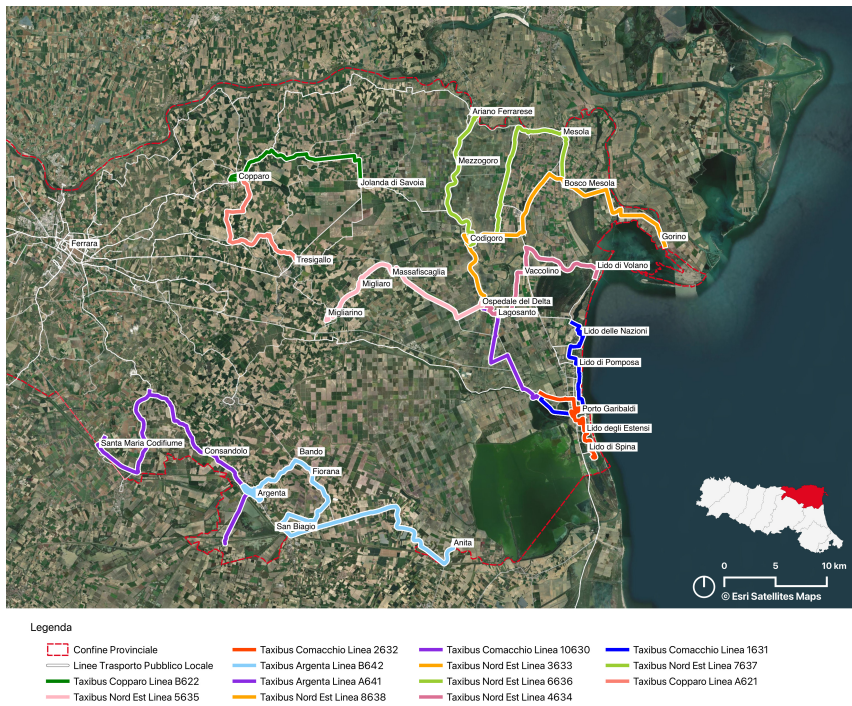


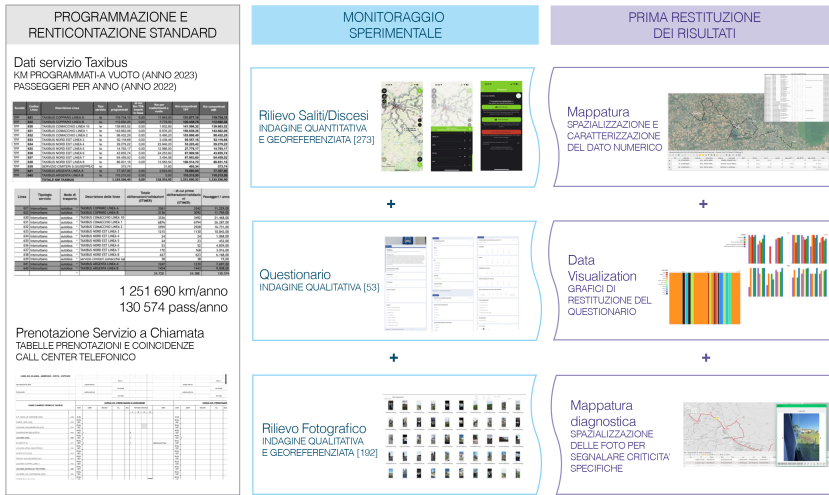
Figure 1

user needs and perceptions. The questionnaire also gathered socio-demographic data (age, gender, nationality, residence), destinations and purposes of travel, service use frequency, and perceptions regarding accessibility, comfort, scheduling compatibility, and booking processes. It further inquired about driver's license possession and the role of environmental sustainability in mobility choices.

3 Results

The first part of the study has been focused on four lines with distinct characteristics: lines Argenta 641 and 642, which, though formally demand-responsive, run with regular services, and lines Codigoro 621 and 622, which operate exclusively on request. Over ten survey days, around 230 users were recorded (over 270 boarding and descending events mapped), with a questionnaire response rate exceeding 25% (Figure 3). Preliminary findings point to noteworthy insights: habitual users constitute a significant share, suggesting that the service functions as essential infrastructure for certain resident groups. Gender distribution shows

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occasional cancellations. Suggestions included relocating stops closer to commercial hubs, providing a waiting area at Codigoro station, and more flexible booking systems. A complementary photographic survey highlighted further issues: isolated stops on busy roads without lay-bys or lighting, and urban stops lacking shelters or seating. These shortcomings affect perceptions of quality and risk discouraging public transport use in favor of private mobility.

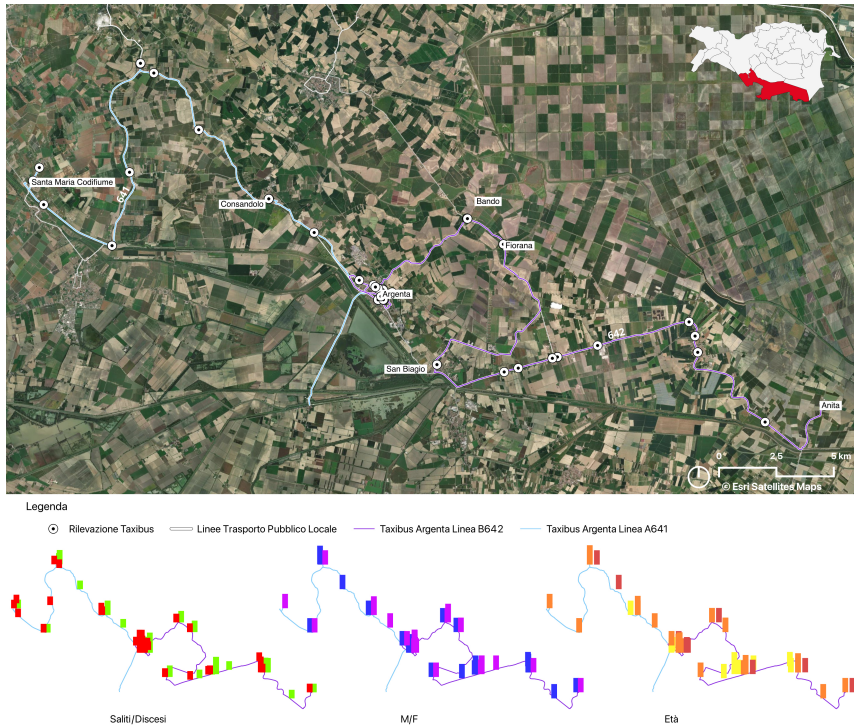


Figure 3

4 Discussion and Conclusion

These preliminary findings provide a foundation for further investigation across the entire service area and underscore the need to explore accessibility in low-density territories. They highlight the role of public transport not merely as a mobility service but as an integrated socio-technical infrastructure (Gray et al. 2006), serving as a tool for social inclusion and cohesion based on local community needs (Manzini 2021). Building on this pilot phase, the study will

be expanded to the full provincial Taxibus network to verify existing data and identify unmet needs, thereby improving understanding of the actual user base (Hay 1995, Harvey 1973). Assessing accessibility justice not only in terms of service provision but also in its capacity to address diverse user needs may help prevent the perpetuation of existing inequalities. In this context, research on adaptive public transport systems offers opportunities to support policies that combine efficiency and inclusion, guaranteeing the right to mobility, territorial accessibility, and enhanced quality of life in low-density areas (Vitale Brovarone et al. 2022).

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