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The Devil is in the Timetable: Incorporating Accessibility Considerations into Basic Provision Standards for Rural Public Transport

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Abstract

Accessibility, defined as access to opportunities, is increasingly recognized as the purpose of transport and land use planning. In rural areas, where the availability of local jobs and services is limited, accessibility is often achieved through public transport connections to nearby towns and cities. This is particularly important for people without cars, who rely on public transport to reach desired destinations. Since rural public transport is heavily dependent on public funding, relevant authorities usually set basic provision standards regarding when, where, and how much service should be provided. The problem with such standards is that they are typically based on mobility indicators, while neglecting accessibility considerations. Applying such standards may result in a village having a daily bus service to the nearest town, without considering whether its residents can actually use it for everyday activities such as grocery shopping. This paper addresses this mismatch by exploring the use of accessibility tests as an alternative to mobility-based indicators in basic provision standards. Drawing on a series of studies published between 1951 and 2022 and complemented by a field study on Estonia's second-largest island, it demonstrates that accessibility tests can be used to define the minimum level of public transport provision needed for basic accessibility. Accessibility tests thus offer a simple way to incorporate accessibility considerations into basic provision standards.

Keywords: accessibility tests, basic accessibility, rural accessibility, rural public transport, public transport provision standards

Tout le problème est dans les horaires : intégrer les considérations d'accessibilité dans les normes de base des transports publics ruraux

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Résumé

L'accessibilité, définie comme l'accès aux opportunités, est de plus en plus reconnue comme un objectif fondamental de la planification des transports et de l'aménagement du territoire. En milieu rural, où l'offre d'emplois et de services locaux est limitée, l'accessibilité est souvent assurée par les liaisons de transport public vers les villes voisines. Ceci est particulièrement important pour les personnes sans voiture, qui dépendent des transports publics pour se rendre à destination. Les transports publics ruraux étant fortement dépendants des financements publics, les autorités compétentes définissent généralement des normes de base concernant les horaires, les lieux et la fréquence des services. Le problème de ces normes est qu'elles reposent généralement sur des indicateurs de mobilité, négligeant ainsi les considérations d'accessibilité. Leur application peut conduire à la mise en place d'un service de bus quotidien vers la ville la plus proche dans un village, sans se demander si ses habitants peuvent réellement l'utiliser pour leurs activités quotidiennes, comme faire leurs courses. Cet article s'attaque à ce problème en explorant l'utilisation de tests d'accessibilité comme alternative aux indicateurs de mobilité dans les normes de base. S'appuyant sur une série d'études publiées entre 1951 et 2022 et complétées par une étude de terrain menée sur la deuxième plus grande île d'Estonie, cette étude démontre que les tests d'accessibilité permettent de définir le niveau minimal d'offre de transports publics nécessaire à une accessibilité de base. Les tests d'accessibilité offrent ainsi un moyen simple d'intégrer les considérations d'accessibilité aux normes d'offre de base.

Mots-clés : tests d'accessibilité, accessibilité de base, accessibilité en milieu rural, transports publics ruraux, normes d'offre de transports publics

1.0 Introduction

For some time now, rural areas around the world have been faced with the ongoing closure of local facilities and their centralisation in urban centres (Higgs & White, 1997). This leads to greater distances to jobs and services, leaving many rural dwellers reliant on cars to reach them (Neumeier, 2016). At the same time, rising car use significantly affects the demand for public transport, trapping it in a vicious cycle of declining ridership, service cuts, and fare rises (Fiedeń & Štraub, 2023). Over time, this widens the accessibility gap between households with and without cars, contributing to growing disparities in access to jobs, services, and other opportunities (Dwyer & Hardill, 2011; Lucas, 2012).

As a result, across rural households, access to a car has become essential for leading a fulfilling life (Cloke et al., 1997; Marr, 2015). That said, there will always be households with people who are either too young or too old, or who are unwilling or unable to drive a car for various reasons, whether temporarily or permanently. In rural areas, these people are largely dependent on public transport (Banister, 1985). The question then becomes how to ensure that public transport provides a sufficient level of access to facilities comparable to that of the car (Vecchio & Martens, 2021).

This presents a challenge for the relevant authorities (hereafter referred to as public transport authorities), who are limited in the tools for addressing such gaps in accessibility. A common practice is therefore to define a set of normative standards regarding the minimum level of public transport provision (hereafter referred to as basic provision standards), often based on mobility indicators such as the minimum number of connections or travel times (see Ryan et al., 2025). Such indicators, while well suited to measuring people's ability to travel (i.e., mobility), are less useful for measuring their ability to reach desired destinations (i.e., accessibility). Furthermore, it is well established that increased mobility does not necessarily translate into improvements in accessibility, particularly at the lower end of the accessibility spectrum (Levine et al., 2019). Hence, basic provision standards end up specifying the attributes of the service itself, rather than whether it enables people to access the necessary activities.

This paper addresses this mismatch by exploring the possibility of incorporating accessibility considerations into basic provision standards through the use of so-called accessibility tests. It begins by introducing the concept of basic accessibility and outlining the most common ways to measure it, while highlighting their limitations, particularly in rural contexts. It then shifts its focus to accessibility tests, examining their indicators and criteria. Building on this, the paper develops a set of accessibility tests and applies them to Estonia's second-largest island, Hiiumaa. The results are then presented in the following section, followed by a conclusion and policy recommendations.

2.0 Theoretical Background

It is widely recognized that the purpose of public transport and the transport system in general is to provide access to various activities, that is, accessibility (Moseley et al., 1977; Metz, 2008; Martens, 2015; van Wee, 2016; Miller, 2018; Mouter et al., 2025). Conceptually, accessibility refers to a person's ability to reach desired destinations and opportunities through some combination of mobility and proximity (Hansen, 1959; Litman, 2017). Accordingly, improvements in accessibility are generally achieved through transport or land use policies, or a combination of both (Handy, 2002).

The focus of transport policy in rural areas is to ensure a certain minimum level of accessibility, commonly referred to as basic accessibility, particularly for

households without cars (Ryan et al., 2025). The idea of basic accessibility rests on the assumption that "there exists a minimum range of goods and services, employment, and social activities which must be consumed in order to achieve a normal standard of living" (Jordan & Nutley, 1993, p. 67). Basic accessibility is typically grounded in sufficientarianism (Martens, 2016). As a guiding principle, sufficientarianism holds that "everyone should be provided with 'enough', or a sufficient amount of some good" (Knight, 2025, p. 1). The goods in question typically include necessities such as food, healthcare, and housing. In the domain of transport, however, the relevant good is access (Martens, 2012). The key question then becomes where to draw the line for the sufficient level of access that should be guaranteed. While acknowledging that such a threshold is inevitably arbitrary, Martens et al. (2022) suggest considering three aspects: first, the sufficiency threshold should be context-specific; second, it should be based on a benchmark that reflects a sufficient level of accessibility in comparison to, e.g., the car; and third, it should represent a reasonable proportion of that benchmark.

While there is a multitude of ways to measure accessibility, the two most widely used are cumulative opportunity and gravity-based measures (El-geneidy & Levinson, 2022). Cumulative opportunity measures count the number of opportunities (typically jobs) that can be reached from a given location within a given travel time or distance (Handy & Niemeier, 1997). Such measures do not differentiate between nearby and distant opportunities, as long as they remain within the given travel time or distance threshold. Gravity-based measures, on the other hand, use a time or distance-decay function to account for the diminishing value of harder-to-reach opportunities (Santana Palacios & El-Geneidy, 2022). There are also several variations of these measures that take into account personal characteristics (such as age and income) and resources (for example, car availability), matching them to the spatial and temporal availability of jobs and other opportunities (Geurs & van Wee, 2004).

Both cumulative opportunity and gravity-based measures can be used to assess accessibility by public transport. These measures work well in urbanized areas, where public transport is relatively frequent and provides decent coverage. In rural areas, where public transport is limited in terms of both frequency and coverage, simply counting the number of jobs or other opportunities that can be reached within a given travel time or distance provides only a partial picture of accessibility (White, 2008). To illustrate this, think of a village with a daily bus service to the nearest town. The bus leaves the village at 7:00 am and returns from town at 3:00 pm, with the journey taking about half an hour. By taking the morning bus to town, villagers can potentially reach most of the necessary activities within a reasonable travel time. However, since the only return service leaves town at 3:00 pm, the actual range of accessible activities is much more limited. The grocery store, for instance, is reachable within half an hour, but a simple shopping trip would take about eight hours. This is because upon arriving at 7:30 am, the villager would have to wait until 8 or 9 am for the store to open, do the shopping, and then wait another five or six hours for the return bus, finally arriving home at around 3:30 pm. Even combining shopping with other errands, such as visiting the family doctor, would still leave long waiting times in town. Similarly, working a standard nine-to-five job would be difficult, as it would require getting off work early. This example demonstrates why it is necessary to consider the temporal dimension when measuring the accessibility provided by public transport in rural areas (Hernández Luis, 2002).

3.0 Accessibility Tests

Even though accessibility tests lack a clear definition, they can be described as a rural alternative to the often urban-centred accessibility indicators, providing a way to "evaluate the accessibility of specific settlements to a number of realistic urban destinations, or the ability of people to partake in various types of activity, by use of the available public transport system" (Jordan & Nutley, 1993, p. 121). This section reviews a selection of English-language studies published between the 1950s and 2020s that apply accessibility tests (see Table 1)[1]. The review is organized around the key indicators commonly found in these tests: access to jobs, services, leisure opportunities, and major towns and cities.

Table 1. *An Overview of the Selected Studies*

Author(s)	Publication type	Study area	Unit of analysis	Scope
Bracey (1951)	Journal paper	Rural Wiltshire, UK	Settlements	Local
Johnston (1966)	Journal paper	Rural Yorkshire, UK	Settlements	Local
Nutley (1980)	Journal paper	Rural Wales, UK	Parishes	Regional
Nutley & Thomas (1992)	Journal paper	Rural Northern Ireland, UK	Households and settlements	Local/regional
Jordan & Nutley (1993)	Journal paper	Rural Northern Ireland, UK	Wards	Regional
Anciães (2013)	Conference paper	Rural Portugal	Parishes	Regional/ national
Bibby (2022)	Conference paper	Rural Limerick, Ireland	Settlements	Regional

3.1 Access to Jobs

Access to jobs is the key indicator in accessibility tests. Bracey (1951) was the first to include it, assessing whether villagers could reach the nearest town by 8:00 am for manual work and 9:00 am for office work. Johnston (1966) adopted the same approach, using identical arrival times. However, neither study included a return journey. Nutley's (1980) test addressed this by requiring a service to arrive in a nearby graded town between 8:00 am and 9:00 am and depart between 5:00 pm and 6:00 pm. Nutley & Thomas (1992) used similar arrival and departure times but required access to both a small town (2,000–10,000 population) and a large town (over 10,000 population). Jordan & Nutley (1993) used noticeably wider time windows, requiring a service that arrives between 7:00 am and 9:00 am and departs between 5:00 pm and 6:45 pm. As in Nutley & Thomas (1992), they also applied a population threshold, arguing that towns with fewer than 5,000 residents tend to offer limited employment

[1] While comprehensive, I recognise the limitations of this inclusion criterion, as there is a sizeable body of research published in other languages (most notably, Polish; see, e.g., Fiedeń, 2022, p. 34, for an overview).

opportunities. Anciães' (2013) test required a service that arrived at one of mainland Portugal's 278 municipal capitals between 8:00 am and 9:30 am and departed between 5:30 pm and 7:30 pm, with a one-way journey of less than an hour. Bibby (2022) checked whether it was possible to reach Limerick City by 8:40 am and return after 6:00 pm. In most cases, this indicator requires a Monday-to-Friday service frequency.

3.2 Access to Services

Access to services, or simply the ability to make shopping trips, is another widely used indicator. Johnston (1966) focused on shopping trips to the nearest town, requiring a return service between 9:00 am and 5:30 pm that allowed for at least a one-hour stay. According to Johnston (1966, p. 33), this time window reflects both shop opening hours and "the times when the housewife normally expects to be at home." The one-hour minimum stay in town reflects the fact that such trips typically do not require a long stay. His analysis shows, however, that in many cases "the minimum stay possible is four hours or more," which is arguably too long for shopping trips (Johnston, 1966, p. 33).

Nutley (1980) went further by distinguishing between low- and high-order shopping. A low-order shopping service should allow a two-hour stay in a nearby town on six days a week, which Nutley (1980, p. 33) described as "essentially a test of the ability to satisfy everyday needs." A high-order shopping service, on the other hand, requires a four-hour stay in a major town or city at least once a week, and tests the feasibility of making trips to larger and often more distant towns and cities, albeit less frequently. Nutley & Thomas (1992) also distinguished between shopping trips to small and large towns. Shopping trips to a nearby small town should allow a stay of two to four hours, while those to a large town should allow three to five hours before returning home. Jordan & Nutley (1993) required a four-hour stay in a town of at least 5,000 residents, providing "opportunities for everyday shopping plus personal business such as administrative and financial duties and also visits to the doctor" (Jordan & Nutley, 1993, p. 125). To make these opportunities accessible to those working nine-to-five jobs, their test also required a service to run at least six days a week. Anciães (2013) examined whether a service arrives at one of the municipal capitals between 8:00 am and 2:00 pm and departs between 2:00 pm and 7:30 pm at least five days a week, allowing for a minimum stay of two hours. Bibby (2022) took a different approach, checking instead whether it was possible to arrive at the central hospital for a doctor's appointment scheduled for 2:00 pm.

3.3 Access to Leisure and Evening Activities

Access to leisure is another common indicator, although it tends to be defined more loosely than access to jobs and services. It generally refers to access to a wide range of activities taking place outside normal working hours, such as evening classes and shift work. Bracey (1951), for example, examined whether villagers can return from town after 10:15 pm, particularly on Saturdays. Similarly, Johnston (1966) checked whether it is possible to return from town after 9:30 pm on weekdays, using the typical closing times of cinemas as a reference. He also considered whether it is possible to make a return trip to town on Sundays, without specifying any temporal considerations.

Nutley (1980) checked whether there was an evening service leaving town after 10:00 pm at least once a week. Given that Sunday services have been particularly susceptible to withdrawal from rural areas, he also examined whether it is possible to make a return trip to town on Sundays. Nutley & Thomas (1992) assessed whether there was an evening service returning from town after 9:30

pm at least once a week, and whether it is possible to make a return trip on Saturdays or Sundays. As in Johnston (1966) and Nutley (1980), they did not specify any temporal considerations for weekend services. Jordan & Nutley (1993) checked for an evening service returning from town after 10:00 pm at least three days a week, as well as a Sunday service to any town that allowed a two-hour stay before returning.

3.4 Access to Major Towns and Cities

The last of the commonly used indicators is access to major towns and cities. In Wales, Nutley (1980) examined whether it is possible to make a return trip to Cardiff, allowing a stay of two to four hours before returning. In Northern Ireland, Nutley & Thomas (1992) assessed whether there is a weekly service to Belfast, without specifying any time constraints. Also in Northern Ireland, Jordan & Nutley (1993) checked separately for access to the capital, Belfast, and the smaller regional centre, Londonderry, which requires a service that allows a four-hour stay at least once a week. Although Bibby (2022) did not include a separate test for access to a regional centre, his study focuses on access to Limerick, Ireland's third-largest city, serving as a regional centre for the surrounding area.

3.5 Related Approaches

While the studies reviewed share similarities in their approaches, some depart from this general pattern. Rather than testing for access to a specific set of activities, Ochojna & Brownlee (1977) constructed an index based on two indicators: the number of different times at which people can leave the village and the lengths of time they can spend in town. Departure times between 9:00 am and 6:00 pm are divided into eighteen 30-minute intervals, while dwell times are divided into fourteen 10-minute intervals, with each assigned weights based on studies of shopping behaviour in urban areas, reflecting people's preferences for the timing and duration of shopping trips (Ochojna & Brownlee, 1977). By combining departure and dwell times, their index provides an overview of people's opportunities to access urban functions at different times of day and for varying lengths of stay.

The same year, Moseley et al. (1977) published their seminal work on rural transport and accessibility. To account for the fact that different groups have different accessibility needs, they use social groups rather than settlements as the unit of analysis. Their study therefore focuses on five social groups (economically active males and females (the latter split into full- and part-time), female homemakers, and the retired) and their access to a set of basic activities, including work, shops, health, finance and administration, and leisure. For each activity, they develop a set of accessibility criteria, based "in part [on] conversations with people engaged in 'supplying' the various activities, [and] in part [on] … common sense" (Moseley et al., 1977, p. 176). This approach, dubbed „personal accessibility," allows them to assess whether particular groups in specific locations can reach key destinations by public transport while taking into account area-specific considerations, such as shop opening hours or hospital visiting hours. However, as highlighted by Nutley (1980, p. 36), one of its major limitations is that since it involves "fairly detailed and lengthy analysis and careful fieldwork," it is necessarily limited to relatively small study areas. This prompted several authors, most notably Nutley himself, to develop simpler and more scalable techniques while retaining the essential principles of personal accessibility. Nevertheless, Moseley et al.'s (1977) approach remains highly influential and has helped to lay the groundwork for more recent developments, such as the work on mobility strategies (see Fiedeń, 2025).

Apart from that, there is a growing number of studies that use some variations of accessibility tests as part of a broader methodology. For example, Stentzel et al. (2016) assessed rural older adults' access to primary healthcare by examining whether they could use public transport to arrive at a family doctor's appointment scheduled for 11:00 am on a Tuesday. Similarly, Lange & Norman (2018) evaluated rural older adults' access to a broader range of everyday services by assessing whether they could make a return trip to town between 8:00 am and 6:00 pm, allowing at least a two-hour stay before returning. More recently, Macuchova & Brandt (2026) examined young people's ability to participate in social activities based on the availability of evening bus services to municipal centres. In a related study, Haamer & Aasa (2026) explored whether public transport aligned with people's observed commuting patterns by checking whether it was possible to reach the corresponding employment centre between 7:00 am and 9:00 am, and depart between 3:00 pm and 7:00 pm. But despite their flexibility and broad applicability, accessibility tests are rarely, if ever, used by public transport authorities, which continue to rely almost exclusively on mobility indicators, even when addressing accessibility problems.

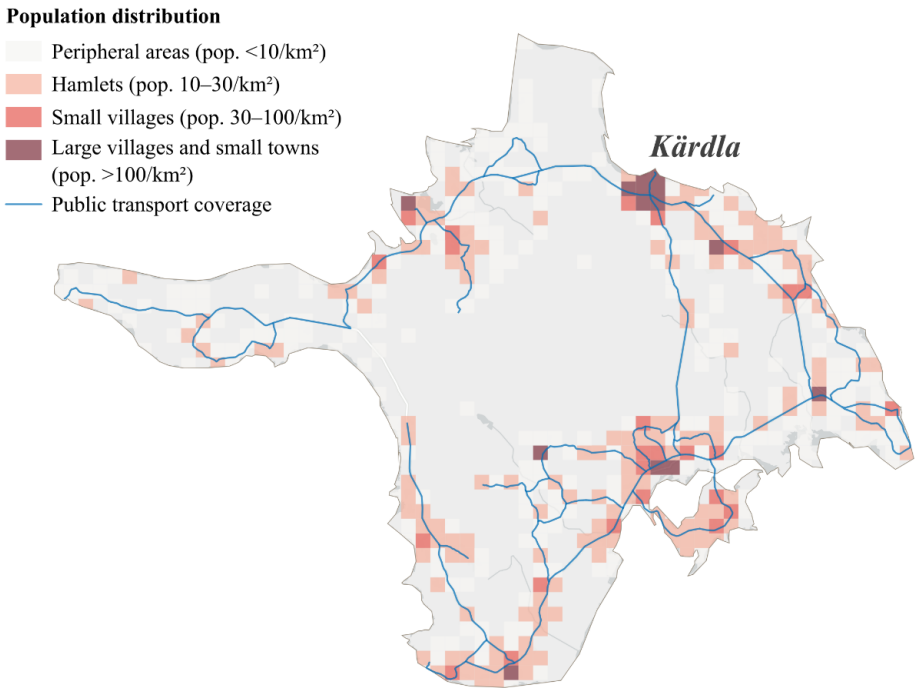
4.0 Accessibility Considerations in Basic Provision Standards

Ryan and Martens (2023) suggested that among the reasons why public transport authorities are reluctant to incorporate accessibility considerations into their practices is that accessibility is difficult to define and measure. Accessibility tests can partially address this problem by providing a simple way to measure accessibility in rural areas. Furthermore, they can serve as the basis for basic provision standards. The following section demonstrates this by developing a set of accessibility tests that serve as basic provision standards and applying them to Estonia's second-largest island, Hiiumaa.

Hiiumaa lies roughly 20 km west of the Estonian mainland, just an hour's ferry ride away. The island covers approximately 1,000 km^2 and is home to almost 10,000 people, giving it a population density of about 10 people/km^2. Of course, the population is not distributed evenly across the island: about a third live in its only town, Kärdla, which serves as the island's service and retail hub (for this reason, Kärdla is not included in the analysis). The island also includes several small boroughs, the largest being Käina (population 700), which provides everyday goods and services to residents in the southern part of the island. A large share of the population is concentrated along the coastline, as shown in Figure 1.

Since 2000, Hiiumaa's population has remained relatively stable at 9–10 thousand. However, its age structure has changed significantly: the share of young people (under 20) has decreased from 25% to just 17% (a drop from roughly 2,500 to 1,500), while the share of older adults (65 and above) has increased from 14% to 27% (a rise from roughly 1,400 to 2,200). There have also been changes in what people do for work: in 2000, approximately 55% were employed in the service sector, 33% in industry, and the remaining 12% in agriculture. By 2025, the share of those employed in the service sector had risen to 65%, while industry and agriculture now account for 30% and 5% of jobs, respectively (Statistics Estonia, 2025, author's calculations). The rising prominence of the service sector, as well as the increasing share of older residents, can be attributed to Hiiumaa's growing popularity as a summer home destination following the restoration of independence in 1991, particularly among the wealthy (Raagmaa, 2023).

Figure 1: Population distribution of Hiiumaa.



Source: Author's elaboration based on the 2021 census data (Statistics Estonia, 2021) and GTFS data obtained from Estonia's national journey planner at peatus.ee/gtfs (as of August 2025). Basemap: Light Gray Canvas (Basemap sources: Esri, TomTom, Garmin, FAO, NOAA, USGS, © OpenStreetMap contributors, and the GIS User Community)

Note: The middle part of the island is a nature reserve and therefore uninhabited.

Hiiumaa makes for a suitable study area for three reasons. First, it is Estonia's smallest county (i.e., first-order administrative unit) in terms of both area and population, making data analysis more manageable. Second, being an island, it is a geographically bounded and hence clearly defined unit of analysis. As a result, the majority of everyday travel takes place within the island, as evidenced by the most recent census data (Statistics Estonia, 2021). Finally, there is no overlap with neighbouring regions' public transport networks, meaning there is no need to account for services operated by other authorities.

The accessibility tests developed for the basic provision standards combine insights from the reviewed studies. Most importantly, they follow Nutley's (1980) original formula by combining the destination, timing, and frequency of access to key activities. Taken together, these tests represent the basic accessibility threshold (see Table 2).

For simplicity, it is assumed that all five activities should be reachable daily. Since this may not always be the case and to avoid making a binary assessment (i.e., whether access is provided or not), the results of each test are grouped into three categories based on frequency: daily, on weekdays (Monday to Friday), and at least once a week. The only exception is access to jobs, which requires at least a weekday frequency. These are summarized in Table 3 and illustrated in Figures 2–6.

Table 2. *An Overview of the Accessibility Indicators and Criteria Presented as Normative Statements, Serving as the Basis for Basic Provision Standards*

Indicator	Criteria
Access to jobs	*It should be possible to make a return trip to the regional centre, Kärdla, arriving between 7:00 am and 9:00 am and returning between 5:00 pm and 7:59 pm.* This test examines the possibility of working traditional hours based on the Estonian Time Use Survey (Statistics Estonia, 2012).
Access to local services	*It should be possible to make a return trip to a nearby town (Kärdla or Käina, whichever is closer), allowing a 1–2-hour stay.* This test examines the possibility of making short, quick trips to a nearby town to access everyday services.
Access to regional services	*It should be possible to make a return trip to the regional centre, Kärdla, allowing a 2–6-hour stay.* This test examines the possibility of accessing less frequently used but well-being-enhancing services, such as hospitals, shopping centres, and government service offices, all located in Kärdla.
Access to leisure	*It should be possible to return from Kärdla after 8:00 pm.* This test examines the possibility of participating in evening activities, such as leisure, social gatherings, shift work, etc.
Access to Tallinn	*It should be possible to make a day trip to the country's capital, Tallinn.* This test examines the possibility of making a day trip to Tallinn, arriving before noon and returning the same evening. For villages without a direct coach service to Tallinn, this test also serves as an indicator of public transport network connectivity, showing how well regional public transport is integrated into the national network (i.e., whether it is possible to use a local bus to reach the ferry heading to the mainland).

Following Nutley (1980), the test results are combined into a single basic accessibility index. Unlike the tests, the index sums the exact number of days on which each of the five activities is accessible, giving a maximum of 35 points (5 indicators × 7 days). For example, if access to jobs is provided daily (7 points), access to local services twice a week (2 points), and access to regional services once a week (1 point), but there is no access to leisure or Tallinn, the resulting score would be 10 points out of 35. The basic accessibility index is depicted in Figure 7.

The next step is to calculate the actual level of public transport provision for each settlement. Because settlements vary in size and population, bus stops are

used as the unit of analysis[2]. Public transport timetable data are available through the national journey planner at *peatus.ee* or in GTFS format from *peatus.ee/gtfs*[3]. The accessibility tests can be carried out manually by checking the timetables, or the whole process can be automated (see, e.g., Pereira et al., 2023, for a list of tools). In this study, test scores for each of the 155 bus stops were calculated manually, and the results were visualised in QGIS. The ORS Tools plugin was used to draw a 1 km catchment area around each stop, which was then used to calculate the number of people living within it. In cases of overlapping catchment areas, the population was divided between them to ensure no person was counted twice.

5.0 Results

This section presents the results of the accessibility tests, illustrating how they can be used as the basis for setting basic provision standards. The figures presented here indicate the share of the rural population able to access each of the five activities by public transport. The rural population excludes residents of Kärdla and Käina, giving a total of around 5,000.

The accessibility tests show that most rural dwellers (91%) can reach Kärdla in the morning and return in the evening, whereas about a third (34%) can do so on any day of the week (see Figure 2). Almost everyone (89%) can make a quick trip to the nearest town, whereas 71% can do so daily, 7% only on workdays, and 11% at least once a week (see Figure 3). About 82% can spend two to six hours in Kärdla, whereas 76% can do so daily and 6% at least once a week (see Figure 4). However, only a small portion of rural dwellers (19%) can return home from Kärdla after 8:00 pm, thanks to a connecting bus service which waits for the two coaches arriving from Tallinn (see Figure 5). Speaking of which, 78% of rural dwellers can arrive in Tallinn in the morning and return the same evening, whereas 69% can do so on any day of the week (see Figure 6). The results are summarised in Table 3.

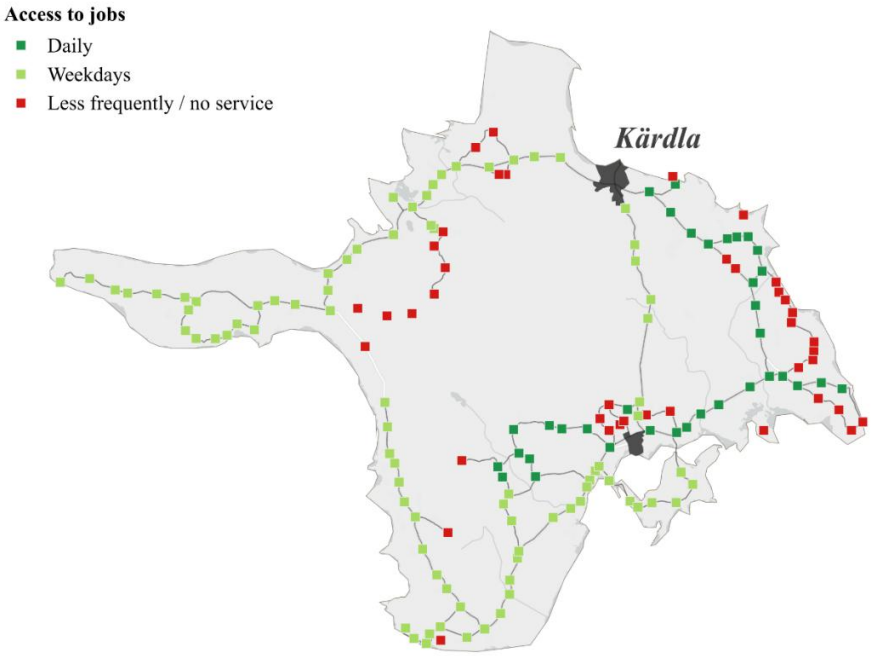
Table 3. *Access to Basic Opportunities by Public Transport Among Rural Dwellers*

Indicator	**Frequency**			
	Daily	Weekdays	At least once a week	Less frequently / no service
Access to jobs	34%	57%	—	9%[a]
Access to local services	71%	7%	11%	11%
Access to regional services	76%	<1%	6%	18%
Access to leisure	19%	0%	0%	81%
Access to Tallinn	69%	2%	7%	22%

[a] *for access to jobs, this figure includes service below the frequency threshold (weekdays)*

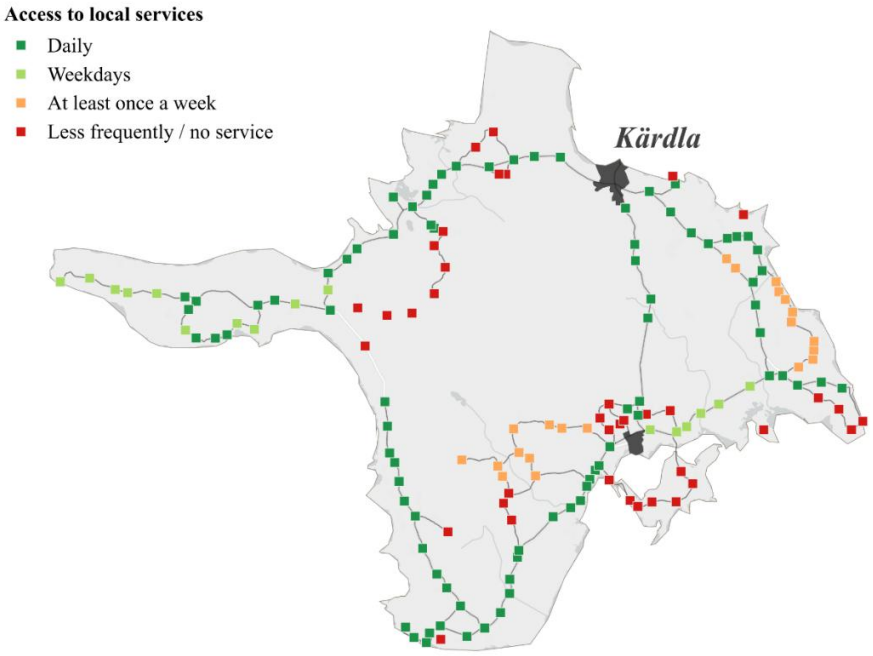
[2] In practice, most settlements are served by a single bus stop, which is treated as the settlement's central point.
[3] The GTFS has been relocated to https://eu-gtfs.remix.com/estonia_unified_gtfs.zip

*Hence*Access to jobs (defined as the possibility of arriving in Kärdla between 7:00 am and 9:00 am and returning between 5:00 pm and 7:59 pm).



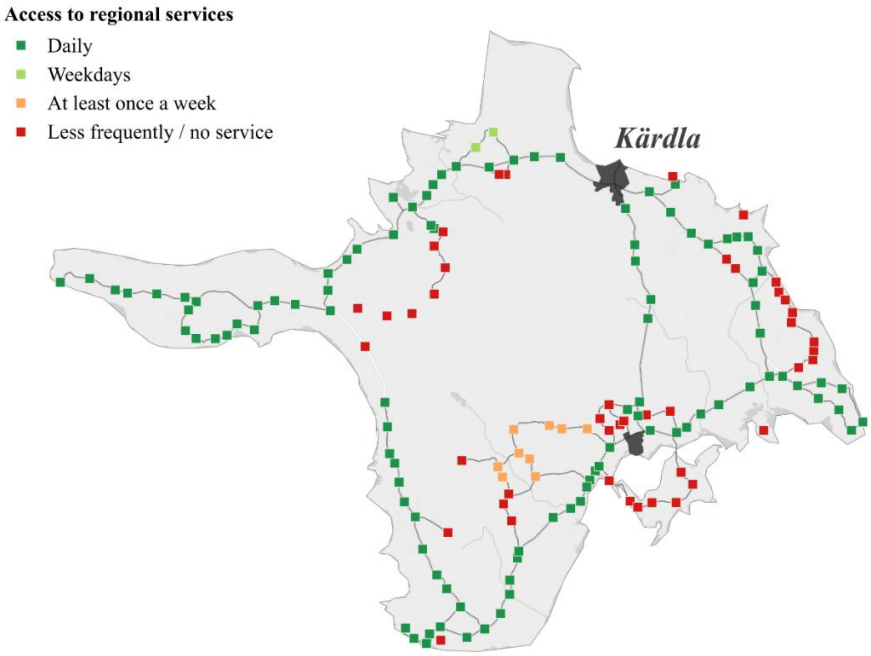
Source: Author's elaboration based on GTFS data obtained from Estonia's national journey planner at *peatus.ee/gtfs* (as of August 2025). Basemap: Light Gray Canvas (Basemap sources: Esri, TomTom, Garmin, FAO, NOAA, USGS, © OpenStreetMap contributors, and the GIS User Community)

Figure 3. Access to local services (defined as the possibility of spending 1–2 hours in the nearest town)



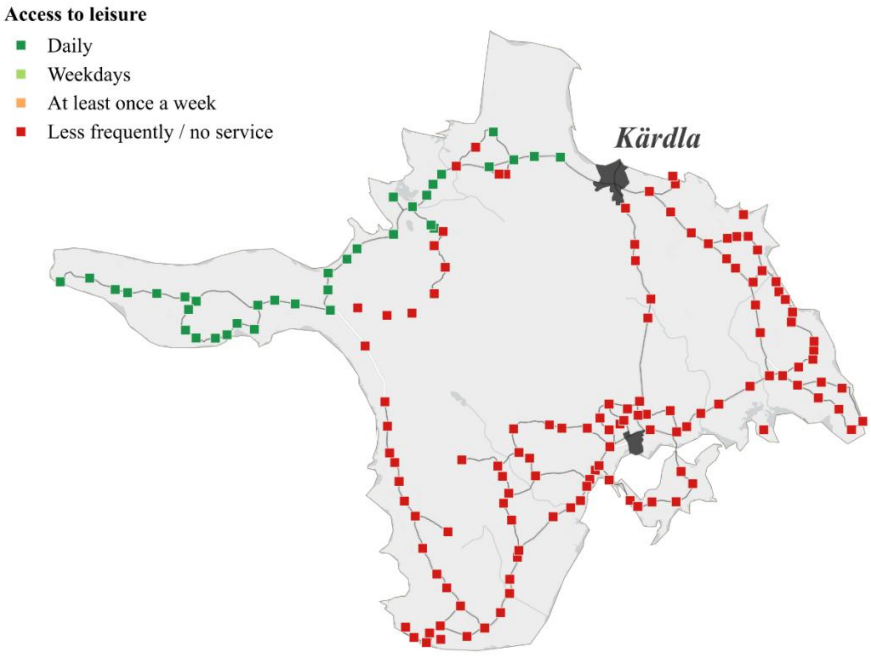
Source: Author's elaboration based on GTFS data obtained from Estonia's national journey planner at *peatus.ee/gtfs* (as of August 2025). Basemap: Light Gray Canvas (Basemap sources: Esri, TomTom, Garmin, FAO, NOAA, USGS, © OpenStreetMap contributors, and the GIS User Community)

Figure 4. Access to regional services (defined as the possibility of spending 2–6 hours in Kärdla)



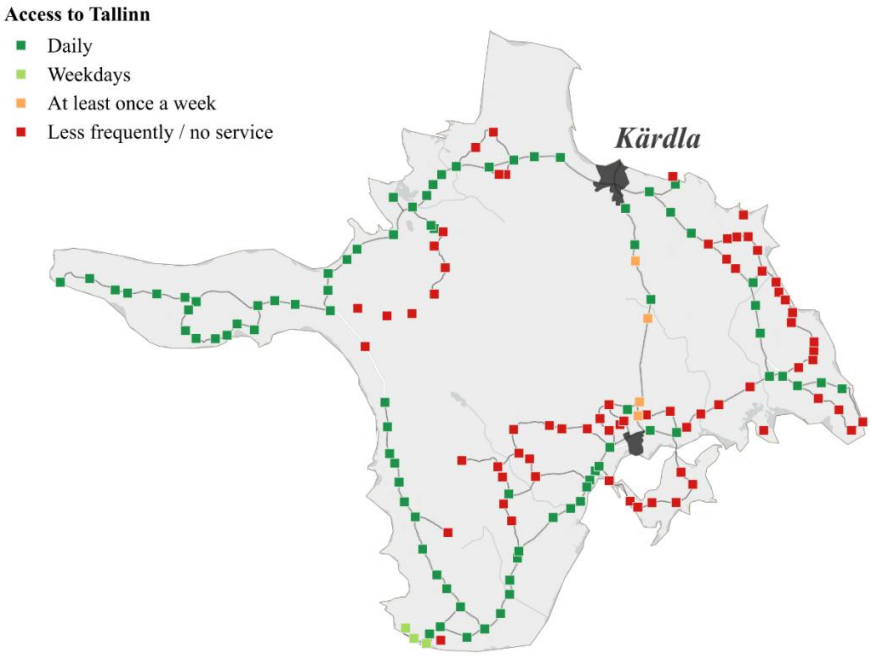
Source: Author's elaboration based on GTFS data obtained from Estonia's national journey planner at *peatus.ee/gtfs* (as of August 2025). Basemap: Light Gray Canvas (Basemap sources: Esri, TomTom, Garmin, FAO, NOAA, USGS, © OpenStreetMap contributors, and the GIS User Community)

Figure 5. Access to leisure (defined as the availability of a return journey from Kärdla after 8:00 pm)



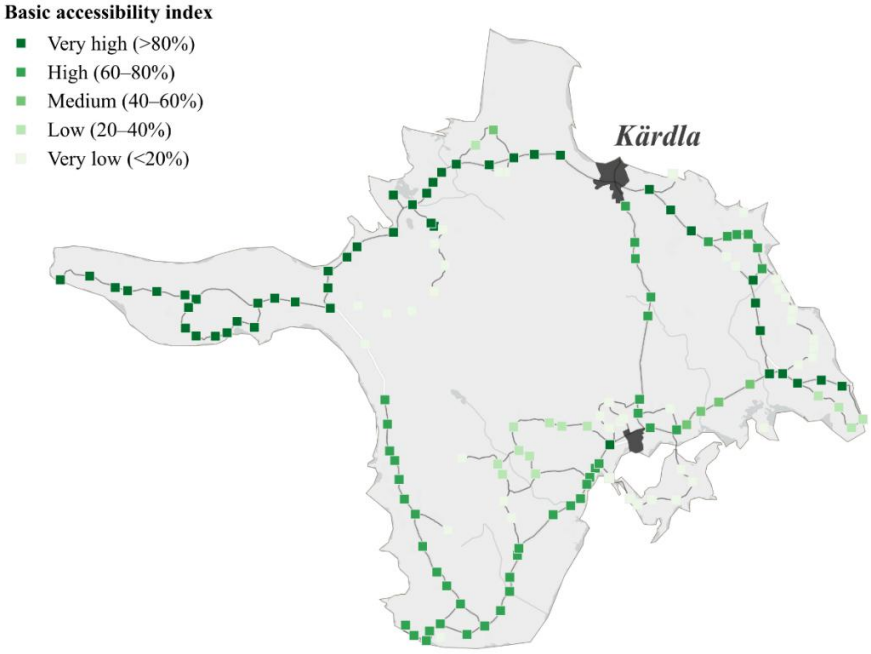
Source: Own elaboration based on GTFS data obtained from Estonia's national journey planner at *peatus.ee/gtfs* (as of August 2025). Basemap: Light Gray Canvas (Basemap sources: Esri, TomTom, Garmin, FAO, NOAA, USGS, © OpenStreetMap contributors, and the GIS User Community)

Figure 6. Access to Tallinn (defined as the possibility of making a day trip to Tallinn, arriving before noon and returning the same evening)



Source: Author's elaboration based on GTFS data obtained from Estonia's national journey planner at *peatus.ee/gtfs* (as of August 2025). Basemap: Light Gray Canvas (Basemap sources: Esri, TomTom, Garmin, FAO, NOAA, USGS, © OpenStreetMap contributors, and the GIS User Community)

Figure 7. Basic accessibility index (on a scale of 0–35, shown as % of maximum score)



Source: Author's elaboration based on GTFS data obtained from Estonia's national journey planner at *peatus.ee/gtfs* (as of August 2025). Basemap: Light Gray Canvas (Basemap sources: Esri, TomTom, Garmin, FAO, NOAA, USGS, © OpenStreetMap contributors, and the GIS User Community)

The resulting basic accessibility index (see Figure 7), which is based on the exact number of days (up to seven) on which each of the five activities is accessible, indicates that about a third of rural dwellers (31%) have basic access to activities and services by public transport (a score of "high" or "very high"). However, at the other end of the accessibility spectrum, a smaller but still substantial proportion of rural dwellers (27%) have minimal access to activities and services by public transport (a score of "low" or "very low"). The analysis also identified a small number of rural dwellers (less than 5%) who either live more than 1 km from the nearest bus stop[4] or near a stop without any service.

6.0 Conclusions and Policy Implications

While basic accessibility is increasingly included in national policy documents, the concept remains vague, particularly when it comes to defining and measuring it. As a normative concept, it seeks to establish an "accessibility sufficiency threshold" below which people, particularly those without cars, should not fall. In urbanized areas, such a threshold can be defined as the share of jobs or other opportunities that can be reached by walking, cycling, or taking public transport, compared to driving. In rural areas, however, such an approach may prove impractical due to the limited extent of public transport services, often coupled with the need to travel long distances to access even the most basic services. The approach described in this paper, while not without its limitations, offers a simple and effective way to set the basic accessibility threshold and translate it into public transport basic provision standards.

The policy implications of adopting such standards can be far-reaching. For one, this would facilitate the integration of some of the most basic accessibility indicators into public transport planning practices that have traditionally been dominated by mobility-centred approaches and metrics. For another, such standards would provide a practical basis for evaluating rural public transport in terms of the accessibility gains it provides rather than its actual use. This is in line with Martens & Di Ciommo (2017), who posit that "the amount of accessibility gains reaped by a person should be perceived as *independent* of the actual level of trips made by a person and of the range of activities the person is currently engaged in" (p. 13, emphasis in original). This contrasts with the conventional view that the usefulness of public transport, whether it is an express train connecting two major cities or a Saturday shopping service, is determined primarily by its usage. The proposed approach, on the other hand, supports the view that rural public transport should be considered a policy instrument compensating for the lack of locally available opportunities. Accordingly, at least at the basic provision level, it should be evaluated on whether it provides the socially necessary level of access to facilities, rather than how many people actually use it.

This is not to suggest that accessibility tests should replace mobility-based indicators in public transport provision standards altogether. There are a few reasons why this cannot be the case. The most obvious is that accessibility tests are most useful at the basic provision level, where there is only a handful of connections. In such cases, it makes sense to reframe the basic provision level in terms of basic accessibility. However, where public transport is frequent

[4] As pointed out by one of the reviewers, the adoption of a 1 km threshold as the maximum walking distance to the bus stop is debatable, since rural residents are often accustomed to covering greater distances and the threshold may be too restrictive. While people may use bicycles to reach more distant bus stops, the analysis assumes that bus stops should be reachable within a 15–20 minute walk without relying on a bicycle or any other mobility aid. Given that rural areas often lack walking infrastructure (e.g., footpaths), 1 km seems a reasonable threshold.

throughout the day, it is preferable to set provision levels based on service frequency and to use cumulative opportunity measures to assess accessibility. Another reason is that, like basic accessibility itself, accessibility tests are intrinsically normative. Such a top-down approach to setting basic accessibility standards can be seen as paternalistic and may neglect those who are worst off in terms of accessibility (Stanley, 2023). This risk can be mitigated by involving the local community through various co-creation activities when formulating the accessibility tests and their criteria. Finally, carrying out accessibility analyses can be resource-intensive. While there are several helpful tools that can speed up the process, public transport authorities may not always have the resources to measure and monitor accessibility changes using these tests, particularly over larger areas. It is therefore critical to plan several steps ahead to make sure that the selected accessibility tests and their criteria can actually be measured and monitored given the available resources.

A final remark is that while this paper focuses specifically on basic accessibility standards for rural public transport, public transport is merely a means to an end, that is, access to activities and services. Therefore, accessibility can be achieved through other means (Preston & Rajé, 2007). As noted by Handy (2002), these essentially fall into two categories: transport and land use. In the case of rural households, aside from private cars and public transport, accessibility can be improved through subsidized or community-based ride- and car-sharing schemes, as well as informal arrangements such as lifts from neighbours or relatives (Barajas & Wang, 2023). Demand-responsive transport (DRT) in particular is increasingly presented as a panacea for rural accessibility problems. However, what is often overlooked is that DRT covers a wide spectrum of service models with varying degrees of flexibility, ranging from simple deviations from a fixed route at one end to fully on-demand services such as paratransit at the other, with numerous variations in between (Engels & Ambrosino, 2004). Regardless of the service model, it is important to avoid putting the cart before the horse, i.e., committing to a specific type of DRT service model before considering alternative options that might be better suited to enhancing accessibility. More broadly, the internet enables people to work, shop, and participate in other activities from home, thereby reducing the need for travel. Similarly, land use policies that favour the densification of already established rural settlements functioning as service centres can bring people and services closer together, thus reducing the distances between activities and increasing the viability of walking and cycling. In some cases, local authorities even subsidize essential local services, such as grocery stores or pharmacies, to prevent their closure in the first place. It would seem, therefore, that there is no shortage of means to provide accessibility. A key advantage of basic accessibility standards is precisely that they specify what kind of activities should be accessible without prescribing the means by which access is to be provided. The choice of the right tool for the job ultimately depends on the local context, as rural areas vary greatly in their geographic, demographic, and institutional characteristics, and hence there is no one-size-fits-all answer to rural accessibility problems.

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