Interreg Alpine Space

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DEGREE4ALPS

D.1.1.1 State of the art report on digitalization of mobility for local communities

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1.Executive Summary

The territory interested by our pilots is characterized by uneven transport connections and mobility opportunities, across and within regions, between urbanized contexts, and rural and peripheral areas.

The project's common challenge is to improve accessibility and connectivity in rural areas through better integration of public transport networks with new digital solutions, building on joint development and implementation of governance, planning, digital and operational innovations.

DEGREE4ALPS will develop innovative digital services' concepts complementing regional mobility networks.

The project will improve digital services planning and delivery capacities of public authorities and operators.

A new generation of digital solutions to let transport services work will become functional and integral part of regional mobility networks, enhancing accessibility for citizens, territorial cohesion, and social inclusion. Integration is the key to the DEGREE4ALPS innovative approach, as digital solutions are mostly developed as stand-alone outputs to specific needs, the potential of scalable strategies and solutions is widely underestimated.

The project implementation builds on transnational cooperation to guarantee an adequate responsiveness and adaptability of project results to specific characteristics of mobility ecosystems across rural areas.

This document serves as a comprehensive report on the diagnosis of digital and operational approaches in the six pilot areas of the DEGREE4ALPS project.

The analysis examines key factors like territory, mobility context, existing services (public transport, DRT, carpooling, sharing), and operational models to identify gaps and specificities. The findings will be shared with stakeholders in Living Labs at the local level, helping to draft scenarios for DRT service development. Results from the six pilot areas will also be communicated through media to promote a more integrated approach to digital services.

The conclusions of this report on the "state of the art of the mobility digitalization approaches for social innovation and inclusion" in the project pilot areas provide useful takeaways that will be the primary input on which the activities of the DEGREE4ALPS Living Labs will build on.

2. Methodology for the development of the state-of-the-art report

This document is based on information collected through an online survey conducted among pilot areas' DEGREE4ALPS partners by Redmint.

The survey delves into inquiries about existing services, both in regular public transport and other new forms (e.g. carpooling, sharing mobility, DRT, others). It further details the socio-economic and cultural trends, relevant flows, and details about local public transport services, including traditional, flexible, and shared services. The survey encompasses existing services, their coverage areas, and the key challenges.

Finally, it is noted that the survey also investigates challenges and criticalities in planning and implementing new digital services, such as procuring appropriately sized vehicles, harmonizing the service with local public transport networks, and ensuring a secure operational environment (e.g., areas with limited internet connectivity).

The document analyses the survey results for each pilot area.

3. Pilot regions

3.1. Ausseerland (Altaussee, Grundlsee, Bad Aussee, Bad Mitterndorf)

Ausseerland is part of the political district of Liezen. Ausseerland consists of the four municipalities Bad Aussee, Altaussee, Grundlsee and Bad Mitterndorf.

3.1.1. Territory and mobility context

The territory and existing services

Bad Mitterndorf is a municipality with 5,000 inhabitants. It is embedded in the tourism region Ausseerland Salzkammergut. It is part of the political district of Liezen and is situated in the province of Styria, at the northern extends of the alps. It provides around 500 workplaces and gives home to 1,900 employees. Since 2001 the population is quite stable, with a smaller decrease in 2011, which reflects the common trend in the political district Liezen. In 2023 Bad Mitterndorf had a slightly negative population balance.

Altaussee has 2,000 inhabitants. The number of employees is around 800 and it provides 200 workplaces. Since 2001 the population stayed almost the same, only in 2011 there was a decrease in Altaussee and since 2021 it is increasing. The population balance in 2023 was positive.

The municipality Grundlsee has 1,000 inhabitants. There are approximately 400 people employed in Grundlsee and it is providing around 100 workplaces. Since 2001 the population is slightly decreasing. In

2023 the population balance was slightly negative.

Bad Aussee is home of 5,000 people. Around 2,500 people are employed in Bad Aussee, and it provides 500 workplaces. The population slightly decreases since 2001, with the lowest point in 2011. The population balance was slightly negative in 2023.

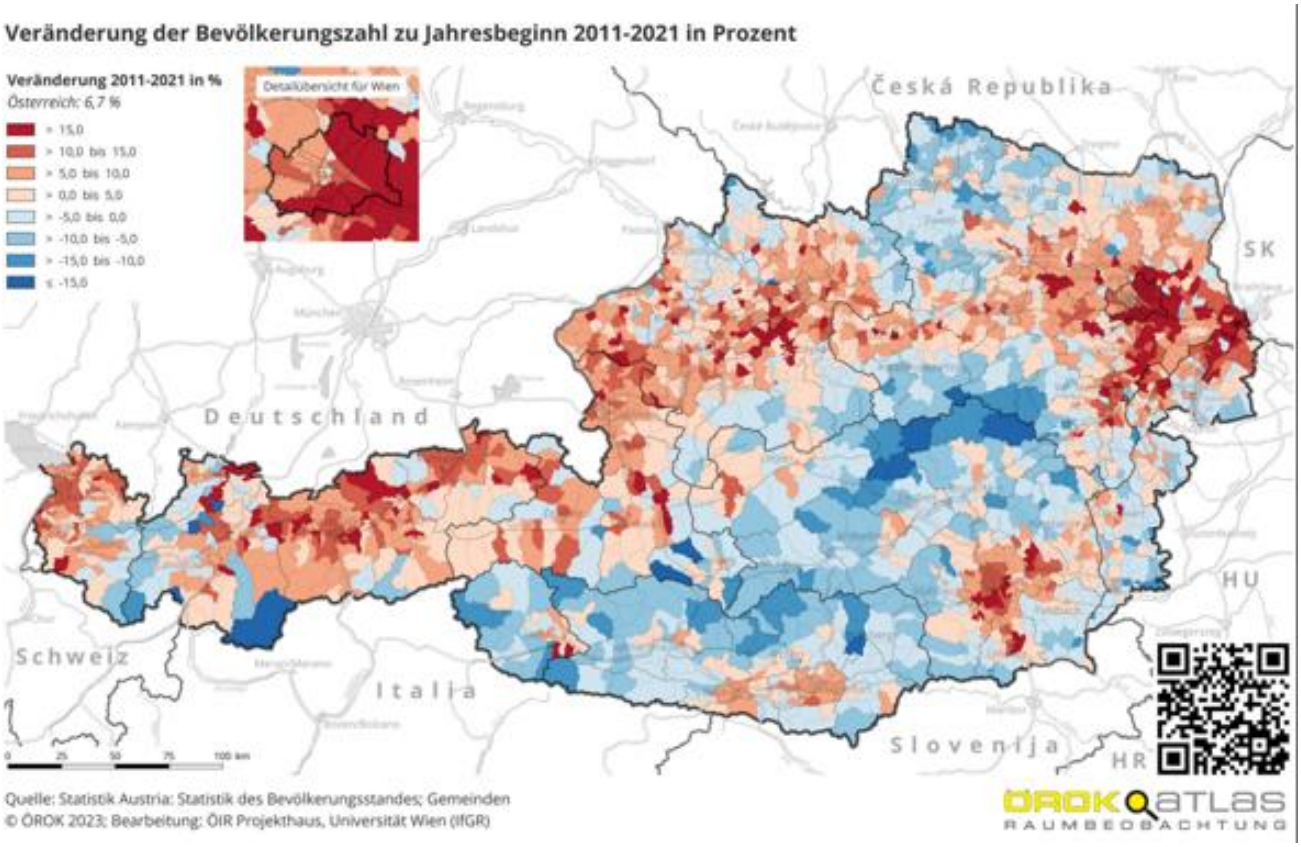

Figure 1: Change in population from 2011 to 2021 in percent (https://www.statistik.at/atlas/blick/?gemnr=61255, visited 13th of January 2025 (2))

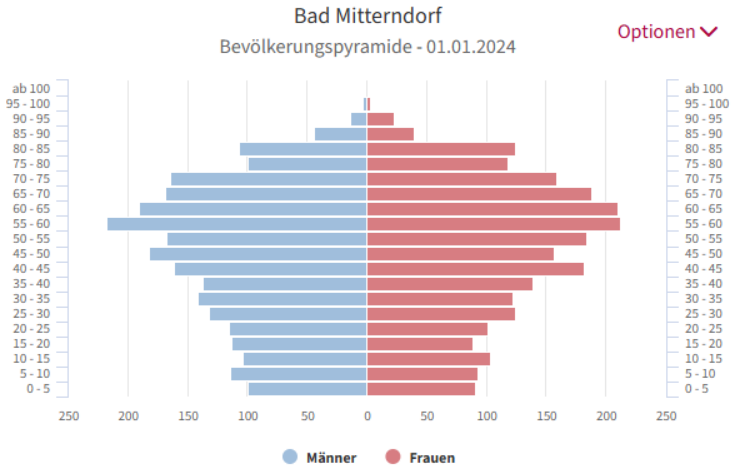

Figure 2: Age structure diagram (https://www.oerok-atlas.at/oerok/files/summaries/12.pdf, visited 13th of January 2025 (1))

Bad Mitterndorf: Its socioeconomic structure shows, that it has almost half of the population female and half male. The majority of the inhabitants count to the age groups of 55-60 and 60-65. It has a slight surplus of elderly people, just a little bit more than the county of Styria. In terms of development of the population the people in Bad Mitterndorf are slightly getting older, and fewer younger people live there. Around twelve percent of the inhabitants have no Austrian citizenship, whereof the majority has citizenship of a country of the EU.

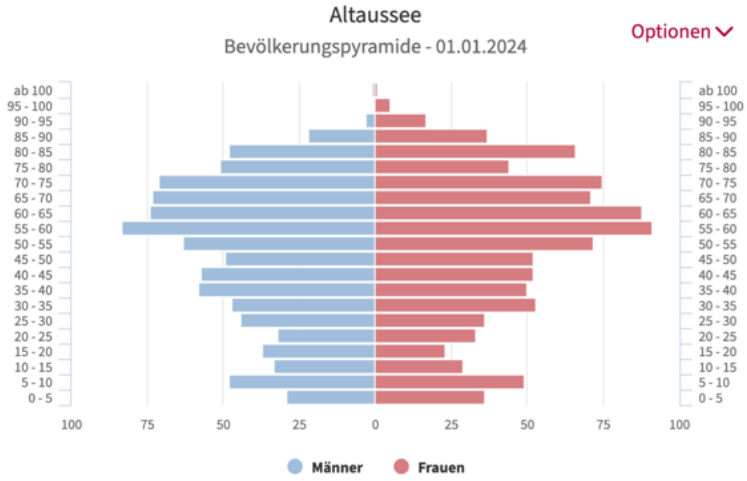

Figure 3: Age structure diagram (https://www.statistik.at/atlas/blick/?gemnr=61204, visited 19th of February 2025 (19))

Altaussee: Almost half of Altaussee's population are males, the other half are females. The most dominant age groups are 55-60 and 60-65. A slight surplus in people, who are older than 50, can be seen over the last 20 years. Fewer young people live in Altaussee. The population with no Austrian citizenship is about 10 percent of the whole population. The majority of those are citizens of member states of the EU.

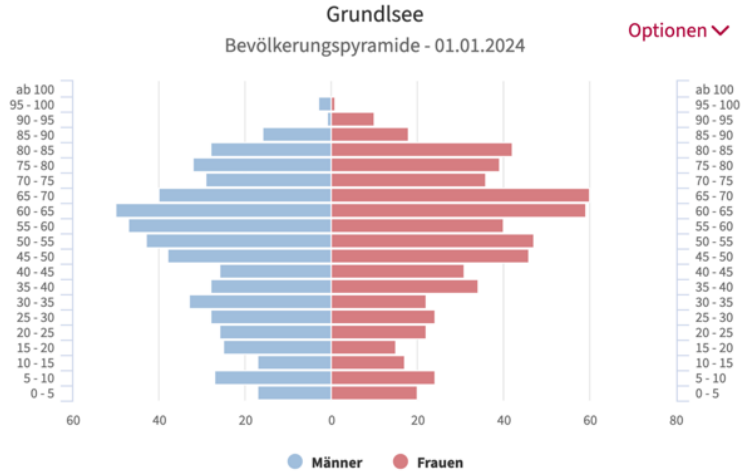

Figure 4: Age structure diagram (https://www.statistik.at/atlas/blick/?gemnr=61215, visited 19th of February 2025 (20))

Grundlsee: There are slightly more females (52,28 percent) than males living in Grundlsee. The majority of females are in the age groups 60-65 and 65-70, whereas the majority of males are in the age group 55-60 and 60-65. There are more elderly and fewer younger people living there than 20 years ago. Just slightly more than 5 percent of the population has no Austrian citizenship. Most of them are citizens of another country, which is in the EU.

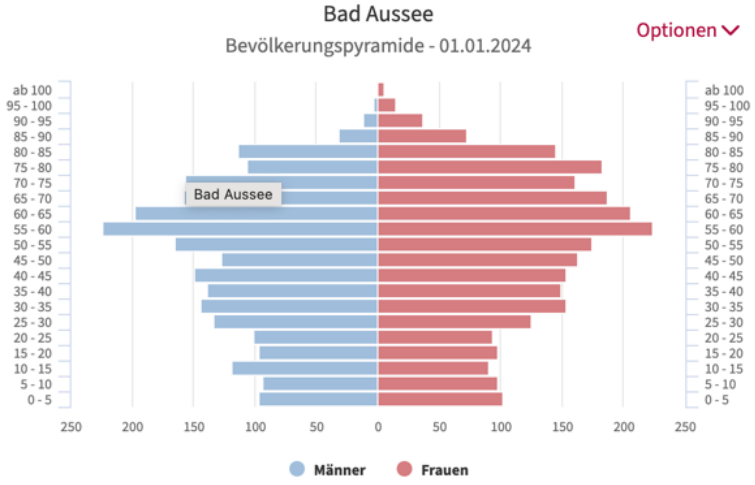

Figure 5: Age structure diagram (https://www.statistik.at/atlas/blick/?gemnr=61207, visited 19th of February 2025 (21))

Bad Aussee: There are slightly less males (47,34 percent) than females living in Bad Aussee. The majority of people are in the age groups 55-60 and 60-65. Over the last 20 years the population got slightly older. Almost 20 percent of the population has no Austrian citizenship. The big majority of them have citizenships of another EU-country.

In the whole region Ausseerland one can see a population consisting of half males and half females. Most of

the inhabitants are between 55 and 70 years old. Overall, there is a relatively small surplus in the older generation (over 50 years). The fraction of inhabitants, which have no Austrian citizenship is almost the same as the average in whole Styria.

The tourism in Bad Mitterndorf and its region is one of the main drivers for mobility needs. With its closeness to the mountains, the tourists mainly come to Ausseerland for outdoor activities, such as mountain biking, hiking, cycling and winter sports (skiing and cross-country skiing), as well for its thermal water, lakes and the bloom of the daffodils.

In 2023 the number of overnight stays in Bad Mitterndorf has reached its pre corona values, with 490,000 overnight stays per year. Each guest stays around four days per stay. The majority of guests stay in local hotels. Overnight stays per citizen are more than 35 in winter season, which is more than in municipalities in the south of Bad Mitterndorf, and which is the same as Grundlsee (north of Bad Mitterndorf) and the same as the region around Schladming.

The following image shows the overnight stays per citizen in winter:

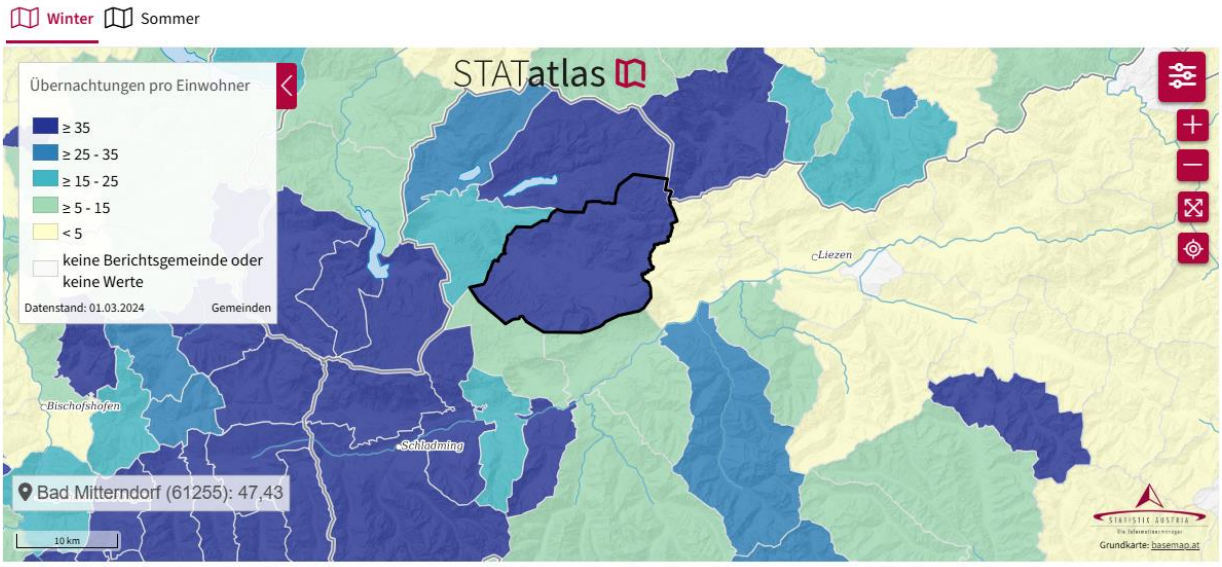

Figure 6: Number of overnight stays per citizen (https://www.statistik.at/atlas/blick/?gemnr=61255, visited 13th of January, 2025 (2))

In the district of Liezen, the motorization in 2023 was 634 cars per 1,000 inhabitants (slight increase from 2022: 630 cars per 1,000 inhabitants). The Styrian average 2023 is 622 (compared to 620 in 2022). Compared to other districts in Styria, Liezen already ranges has the fifth lowest motorization (other Styrian districts range from 470/Graz, to 719/Hartberg-Fürstenfeld and Südoststeiermark), but there is still potential to reduce motorization.

Source: https://www.arf.at/2024/11/29/vcoe-schere-zwischen-stadt-und-land-beim-autobesitz-geht-auch-in-der-steiermark-weiter-auseinander/, visited 13th of January, 2025 (3)

Due to a lack of an early countywide strategy to reduce urban sprawl, Bad Mitterndorf, Altaussee, Grundlsee und Bad Aussee face urban sprawl just like most of the Styrian municipalities. In the Styrian law for spatial

planning there is requested a priority for the development of settlement areas in the catchment area of public transport (Land Steiermark, 2016). Thus, new building land is only assigned, when the supply of public transport is guaranteed.

Traffic ways: Bad Mitterndorf has a federal road connection to the municipality of Trautenfels (B145 Salzkammergutstraße) in the east, and to the municipality Bad Aussee in the northwest. It is continued by the federal road Ennstalstraße B320 to the municipality Liezen, which is defined as a regional centre. In addition to that, Bad Mitterndorf are crossing two main roads: The L730 – Mitterndorferstraße direction east-west and the L729 Paßsteinstraße direction north-south.

The main relevant flows in the pilot area are direction west (Bad Aussee) and direction east (Liezen). The B145 Salzkammergutstraße (B145) has a AADT (annual average daily traffic) of 8,100 cars in the crossroads of Trautenfels, with a share of heavy traffic of 7%. In Bad Mitterndorf, on the bypass street, the AADT is a little bit lower: 6,100 cars, 6% heavy traffic. Daily distribution of traffic shows slight peaks in the morning and evening hours, which can be related to commuter's traffic. (Source: MOBILITÄTSKONZEPT STEIRISCHES SALZKAMMERGUT, Regionalverein Ausseerland, 2022 (5); all Numbers from 2019)

The railway is stretching east-west through the region. So far, it just serves as a regional connection. The railway Salzkammergutbahn connects Stainach-Irdning im Ennstal to Attnang-Puchheim (situated on the western railway „Westbahn").

In terms of accessibility of the next regional center (Liezen) the Ausseerland shows an accessibility rate of 40 to 60% (see image).

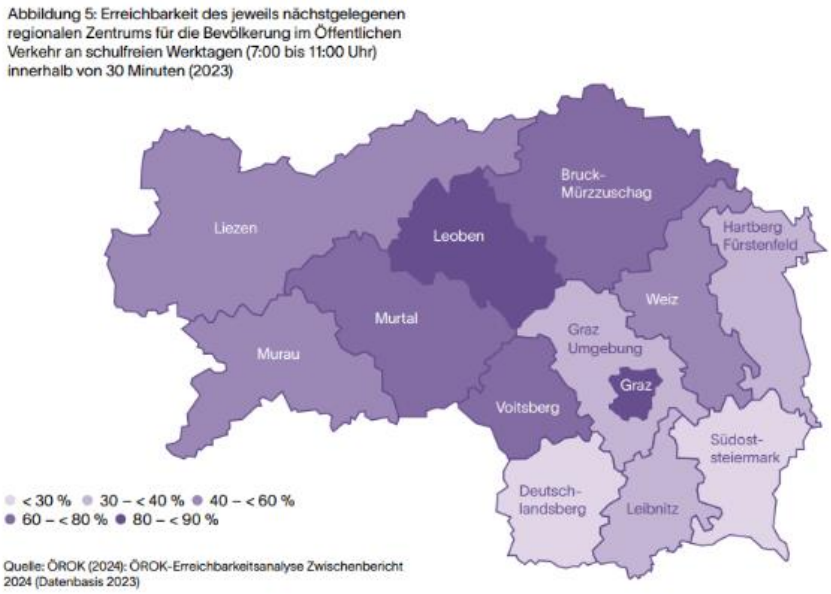

Figure 7: Accessibility of the respective closest regional center via public transport on school free workdays (Land Steiermark (Hrsg.) (2024) Mobilitätsstrategie Steiermark 2024+, Abteilung 16, Verkehr und Landeshochbau (4))

In 2022, in Bad Mitterndorf, around 73% of the inhabitants have access to a bus stop or a train station within 300 meters.

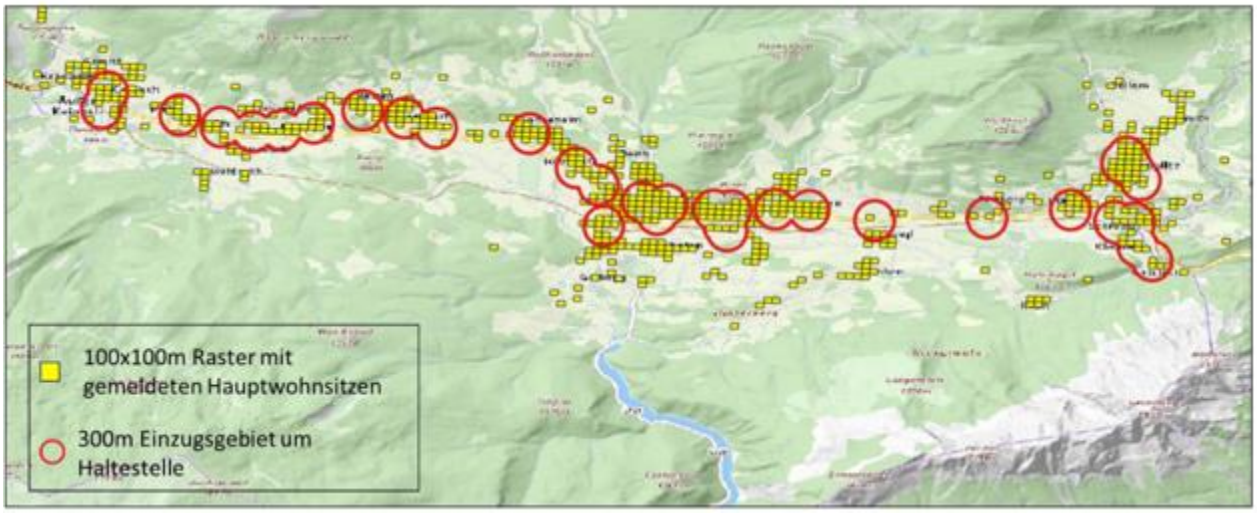

Figure 8: Catchment area for the public transport (MOBILITÄTSKONZEPT STEIRISCHES SALZKAMMERGUT, Regionalverein Ausseerland, 2022 (5))

The policies of the municipalities of Bad Mitterndorf, Altaussee, Grundlsee and Bad Aussee (the Ausseerland) are affected by the mobility strategy of federal state Styria (Land Steiermark [Hrsg.] [2024] Mobilitätsstrategie Steiermark 2024+, Abteilung 16, Verkehr und Landeshochbau) (4), as well as the county's strategy for DRT (STS und verkehrplus [2016]: Mikro-ÖV Strategie Steiermark, im Auftrag des Landes Steiermark, Graz im Dezember 2016) (9), and the county's pedestrian traffic strategy (Land Steiermark [Hrsg.] [2023] Fußverkehrsstrategie Steiermark 2030+, Amt der Steiermärkischen Landesregierung, Abteilung 16 Verkehr und Landeshochbau, Graz im Oktober 2023) (10) as well as the county's bicycle strategy (Land Steiermark [Hrsg.] [2016] Radverkehrsstrategie Steiermark 2025, Amt der Steiermärkischen Landesregierung, Abteilung 16 Verkehr und Landeshochbau, Graz im Juni 2016) (11). The Styrian Salzkammergut region has developed a regional mobility plan. Bad Mitterndorf, Altaussee, Grundlsee and Bad Aussee are part of this region. In addition to the regional strategies, Bad Mitterndorf committed to join the „Bewegungsrevolution", a project of the Provincial Government of Styria with the goal to raise (sportive) activities amongst the population. Thus, active mobility forms, like walking and cycling, plays an important role here.

Due to the geographical situation, most of the traffic occurring in Bad Mitterndorf is through traffic, direction Bad Aussee, Altaussee and Grundlsee.

The trip purposes are mainly: touristic, commuting, education.

LOCAL TRANSIT

In winter season, the tourism association Ausseerland Salzkammergut operates a ski bus. Whereas in summer times, this service is replaced by a regular bus with summer timetable.

Figure 9: Infrastructure interested by the public transport in the area

Skibus (winter season):

The ski bus operates from Bad Mitterndorf Mautstelle and reaches out to the cable car Mitterstein and further to Tauplitzalm. Owner of the ski pass (at least half day ticket for skiing, snowboarding and cross-country skiing) are allowed to use the ski bus for free. It has to be pointed out, that the KlimaTicket Styria is not accepted for this bus line.

- Territorial scope/governance level: regional (Bad Mitterndorf <> Tauplitz), Bad Mitterndorf – Mittersteinbahn – Tauplitzalm
- Main actors: operated by Tourismusverband Ausseerland Salzkammergut, municipalities of Bad Mitterndorf and Tauplitz
- Main target groups: Tourists

Bus Bad Mitterndorf – Tauplitzalm (summer season):

This bus is more expensive than the skibus, that is operating in winter and approaching the same directions. This bus does not operate on Sundays, neither on holidays. It has to be pointed out, that the KlimaTicket Styria is not accepted for this bus line.

- Territorial scope/governance level: regional (Bad Mitterndorf <> Tauplitz), Sonnenalm - Bad Mitterndorf – Tauplitzalm
- Main actors: operated by private company Tauplitzalm Alpenstraße GmbH & Co KG, municipalities of Bad Mitterndorf and Tauplitz
- Main target groups: Tourists, inhabitants (leisure)

Ski bus (Altaussee, Bad Aussee, winter season):

There is also a ski bus, which takes owners of a ski pass or in ski gear from Bad Aussee over Altaussee to the ski region Loser for free.

- Territorial scope/governance level: regional (Bad Aussee <> Altaussee)
- Main actors: operated by Postbus and Verbund Linie
- Main target groups: Tourists, inhabitants

Regio-Bus Linie 950: Stainach-Irdning Bahnhof (Vorplatz) – Altaussee Kurhaus

The region bus line 950 is a common bus line in the region, which does not serve specific stations in winter in Tauplitz until 10th of April 2025 (Tauplitz Berglift Talstation, Dorfplatz). It neither operates on weekends. It serves the bus stop in Bad Mitterndorf ten times a day, with lacking connections after 8 am to 11:30 am, as well after 5:30 pm.

- Territorial scope/governance level: regional (Stainach-Irdning Bahnhof (Vorplatz) <> Altaussee Kurhaus
- Main actors: operated by Verbundlinie Steiermark (Österreichische Postbus AG)
- Main target groups: commuters, inhabitants, pupils, tourists

Regio-Bus Linie 952: Bad Aussee - Bad Goisern (Upper Austria):

This region bus line does not serve specific stations in winter. It operates from Monday to Friday. It stops at nine different bus stations in Bad Aussee. Most of them it served eight times a day. Some of them nine times and two only one time (school). The connections lack between 5:30 pm and 6am.

- Territorial scope/governance level: regional (Bad Aussee <> Bad Goisern (OÖ))
- Main actors: operated by Verbundlinie Steiermark (Österreichische Postbus AG)
- Main target groups: commuters, inhabitants, pupils, tourists

Regio-Bus Linie 955 Bad Aussee – Altaussee (- Losermaut):

The regio-bus line 955 serves specific stations in the skiing season. There are up to eleven bus stations served in Altaussee and eight in Bad Aussee. It operates from Monday to Sunday, but more often from Monday to Friday than on Saturday, Sunday and on holidays. The stations are served between one and 19 times a day (due to summer break and skking season) and there is a lack in the connection between 6:30 pm and 6 am/7:30 am from Monday to Friday (some stations are not served between 6 am and 7:30 am others are). On Saturdays it serves two to seven times a day with a lack between 6 pm and 7 am. On Sundays and holidays, it serves two to six times a day (due to summer break and skiing season) with no connections between 4:30 pm and 7 am/8:45 am (depending on the station again).

- Territorial scope/governance level: regional (Bad Aussee – Altaussee (- Losermaut)
- Main actors: operated by Verbundlinie Steiermark (Österreichische Postbus AG)
- Main target groups: commuters, inhabitants, pupils, tourists

REGIONAL BUSES

Regio-Bus Linie 956 Bad Aussee – Grundlsee – Gößl (- Wienern):

The regio-bus line 956 serves no specific stations in the skiing season. There are eight stations served in Bad Aussee and seven stations served in Grundlsee. From Monday to Friday it operates more frequently than on the weekends and holidays. On Monday to Friday it serves nine to eleven times a day depending on whether schools are open ore not and is lacking of connections between 6:30 pm and 6:30 am. On Saturdays, Sundays and holidays it serves four to six times a day depending on summer break and skiing season with no connections between 6:30 pm and 8 am.

- Territorial scope/governance level: regional (Bad Aussee – Grundlsee – Gößl (- Wienern))
- Main actors: operated by Verbundlinie Steiermark (Österreichische Postbus AG)
- Main target groups: commuters, inhabitants, pupils, tourists

Regio-Bus Linie 957 Bad Aussee – Radling:

This line only operates from Monday to Friday and serves no specific stations in the skiing season. It serves seven stations in Bad Aussee, each of them three to four times a day, depending on if schools are open or closed. There are no connections between 2 pm and 6:45 am.

- Territorial scope/governance level: regional (Bad Aussee – Altaussee (- Losermaut)
- Main actors: operated by Verbundlinie Steiermark (Österreichische Postbus AG)
- Main target groups: commuters, inhabitants, pupils, tourists

Overall, there are four regional bus lines operating in the Ausseerland.

The following image shows an analysis of the accessibility of the train and bus stations in Styria and with Ausseerland (Bad Mitterndorf, Altaussee, Grundlsee and Bad Aussee) in the northern west.

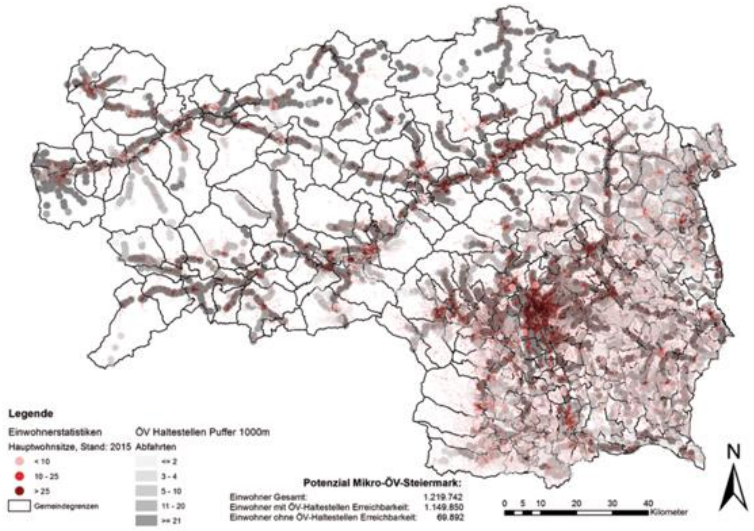

Figure 10: Accessibility of public transport stops in Styria, workdays during school time (STS und verkehrplus (2016): Mikro-ÖV Strategie Steiermark, i.A. des Landes Steiermark, Graz, Dezember 2016 (9)\)

The stations for public transport have different quality and accessibility categories in Austria. In Bad Mitterndorf, the stations range from “no category” to VI (train stations) and VIII. The accessibility of the regions stations is categorized in mainly G (basic), and rarely E (very good basic accessibility) and F (good basic accessibility).

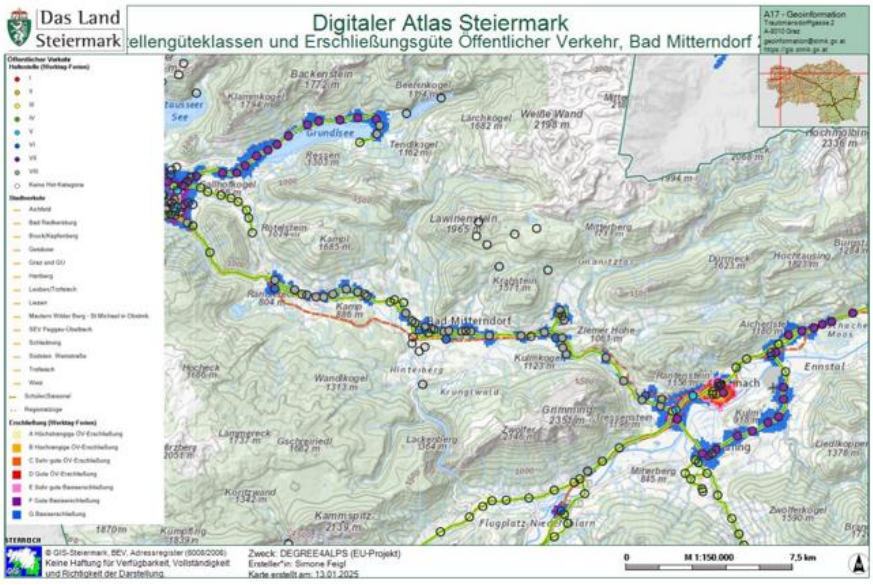

Figure 11: Quality and accessibility of public transport stops (https://gis.stmk.gv.at/wgportal/atlasmobile/map/Bilder%20-%20Karten/Orthofoto, exported on 13th of January 2025 (18))

In Altaussee the stations range from “no category” to VII and VIII. The accessibility of the regions stations is categorized in mainly G (basic) and F (good basic accessibility).

In Grundlsee the stations range from “no category” to VII and VIII. The accessibility of the regions stations is categorized in mainly G (basic) and F (good basic accessibility).

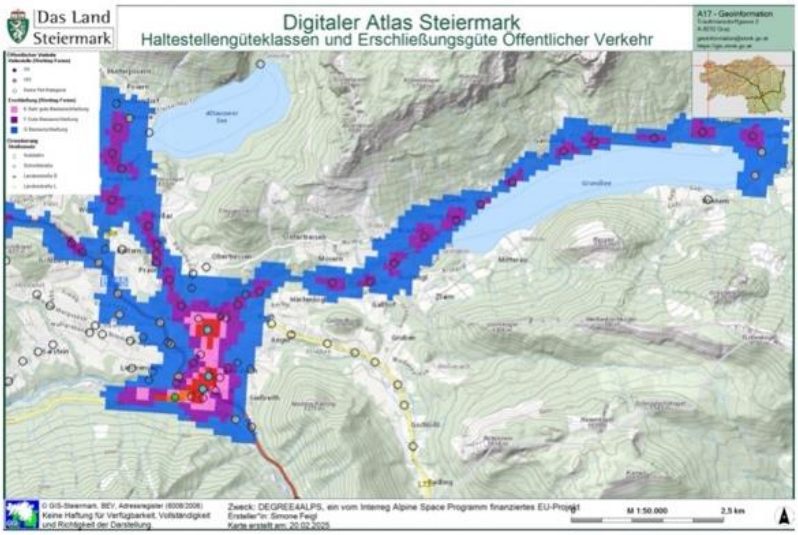

Figure 12: Quality and accessibility of public transport stops (https://gis.stmk.gv.at/wgportal/atlasmobile/map/Bilder%20-%20Karten/Orthofoto, exported on 20th of February, 2025 (18))

In Bad Aussee the stations range from “no category” to IV, V, VI, VII and VIII. The accessibility of the regions stations is categorized in mainly G (basic), and rarely E (very good basic accessibility) and F (good basic accessibility). The center even has stations with accessibilities of the category D (good public transport accessibility) and C (very good public transport accessibility).

Overall the accessibility of most stations in Ausseerland are in the categories F (good basic accessibility) and G (basic). Only in Bad Aussee there exists a higher category station. The stations themselves are mainly ranged in “no category” or category VII or VIII. Exceptions are to be found in Bad Aussee.

REGIONAL TRAINS

Regional railway R70 and REX70:

The region has train stations available in Pürgg, Tauplitz, Bad Mitterndorf, Bad Mitterndorf Heilbrunn and Kainisch. The train operates as Salzkammergutbahn and has an approximate frequency of 1.5 trains every hour in direction Attnang-Puchheim and Stainach-Irdning on work days. Bicycles can be transported most of the train connections. Connections to the county’s capital Graz are available every two hours.

In Bad Aussee there is also a train station, which gets served by the Salzkammergutbahn. Altaussee and Grundlsee do not have any railway stations.

- Territorial scope/governance level: regional (Attnang Puchheim – Stainach Irdning)
- Main actors: ÖBB (national train company)
- Main target groups: commuters, inhabitants, tourists

TAXI

In Bad Mitterndorf there exist 3 taxi companies: prime taxi e.U., situated in Bad Ischl but also operating in Bad Mitterndorf, and Robert Konrad Zwetti, both are operating like a regular taxi company that can be called by phone if their services are needed. The third taxi company is Franz Pressl, a company that offers non-emergency medical transport.

- Territorial scope/governance level: local/regional (Bad Mitterndorf/Bad Ischl – Bad Mitterndorf)
- Main actors: operated by the designated taxi companies
- Main target groups: inhabitants, tourists and people that need transportation to medical institutions, vulnerable groups

In Altaussee there is one taxi company located called HCW Verkehrsbetriebe GmbH. It can be called by phone and also offers other services like cars that can be rented. They focus on oldtimer bus renting. Taxi Gasperl, Zwetti Bus und Taxi and Taxi Iscula Verdil are also operating in Altaussee.

- Territorial scope/governance level: local/regional
- Main actors: operated by the designated taxi companies
- Main target groups: tourists, inhabitants, vulnerable groups

In Grundlsee no taxi company is located, but two are operating there: Taxi Gasperl and Zwetti Bus und Taxi.

- Territorial scope/governance level: local/regional
- Main actors: operated by the designated taxi companies
- Main target groups: tourists, inhabitants, vulnerable groups

There two taxi companies available and situated in Bad Aussee: Taxi Gasperl and Zwetti Bus und Taxi.

- Territorial scope/governance level: local/regional
- Main actors: operated by the designated taxi companies
- Main target groups: tourists, inhabitants, vulnerable groups

Overall there are six taxi companies operating in the Ausseerland.

DRT SERVICES

Salzkammergut Shuttle-Service – Ausseerland

This daily service operates on five different routes in the region (810, 820, 830, 840, 850). It operates from 7 am to 10 pm. The service costs 6 EUR/route (children from 6 to 14: 3 EUR/route) with price reductions for families and/or shorter trips. It is an on-demand service, that can be ordered either by phone or by the otaxi app at least one hour before the trip.

- Territorial scope/governance level: regional (Altaussee, Grundlsee, Bad Aussee, Bad Mitterndorf Tauplitz)
- Main actors: Salzkammergut Tourismus
- Main target groups: Tourists

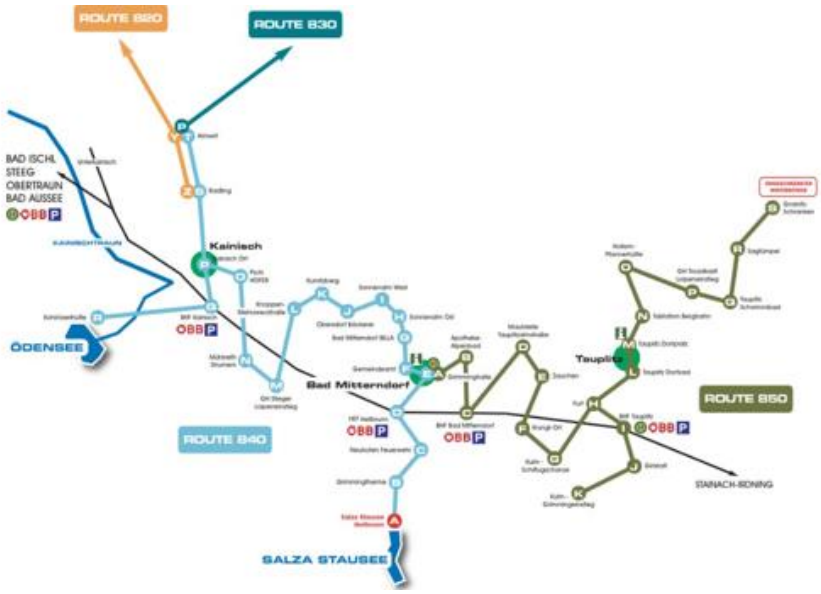

Figure 13: Shuttle Services (https://www.salzkammergutshuttle.at/ausseerland.html, visited 13th of January 2025 (12))

Skishuttle Tauplitz:

The skishuttle transports guests from specific spots to the valley station of the cable car in Tauplitz.

The skishuttle has to be ordered by phone but provides a timetable as orientation.

- Territorial scope/governance level: local
- Main actors: Tauplitz Bergbahnen GmbH
- Main target groups: tourists

CARPOOLING

LIMO is a service operating in the district of Liezen. It is a local online/app service for the inhabitants to organize carpooling. So far, the demand for the app is low, although the app provides also a gamification and motivational aspect: greencents.

Source: https://limo.rml.at/, visited 15th of January 2025 (13)

- Territorial scope/governance level: district (Liezen)
- Main actors: operated by Regionalmanagement Liezen
- Main target groups: commuters, inhabitants

Other services available are blablacar.de (App and web) and mitfahrboerse.st (web), but those do not offer trips for the tested time frame in the pilot's area.

CAR SHARING

Although, there exist lot of carsharing operators in Styria, none of them is available in Bad Mitterndorf, Altaussee and Grundlsee. The closest carsharing pick-up spots are in Bad-Ischl and Stainach-Irdning (railanddrive from the national train company ÖBB) and "Miete dein Auto" (E-cars) in Irdning-Donnersbachtal.

Source: https://www.railanddrive.at/ (14), https://www.mietedeinauto.at/carsharing/, visited 14th of January 2025 (15)

- Territorial scope/governance level: local
- Main actors: none
- Main target groups: inhabitants, tourists

In Bad Aussee an e-carsharing project was started in 2014.

- Territorial scope/governance level: local
- Main actors: Municipality of Bad Aussee, Klima- und Energiemodellregion - Dr. DI Kopsguter Thomas (not existing anymore)
- Main target groups: inhabitants, tourists

Source: https://www.klimaundenergiemodellregionen.at/ausgewaehlte-projekte/best-practice-projekte/showbpp/106, visited on 21st of February 2025 (22)

Source: https://www.familyofpower.com/news/62/Stadtgemeinde-Bad-Aussee-Eroeffnung-FAMILY-e-Carsharing, visited on 21st of February 2025 (23)

Summed up there can be said that only in Bad Aussee there is a carsharing car available, coordinated by the municipality.

BIKE SHARING

In Austria, there a several conventional bike sharing services operating, where nextbike is one of the biggest companies. Also, the national train company ÖBB offers bike sharing, but only in two train stations. Thus, there is the know-how and the companies offering bike sharing available. Nevertheless, in Bad Mitterndorf,

Altaussee, Grundlsee and Bad Aussee there is no such service offered.

Nevertheless, in each of those four municipalities and the surrounding municipalities there are several hotels and sport shops that rent (e-)bikes for leisure purposes.

MICROMOBILITY: No service available in the whole Ausseerland.

Policies and ticketing

In Styria, people can buy the KlimaTicket Styria for EUR 499 per year (as of January 2025) which provides access to public transport all over Styria, also in Bad Mitterndorf. In addition to that, Bad Mitterndorf provides four tickets of the transferable KlimaTicket Styria to its inhabitants to be borrowed for a cheap price, with a maximum rental time of three days in a row. They can reserve the ticket for a specific day by using an online calendar.

In Altaussee inhabitans can borrow two KlimaTickets Styria for a maximum of three days per month for a very cheap price and in Bad Aussee three KlimaTickets Styria can be borrowed for free.

Only in Grundlsee no KlimaTickets Styria can be borrowed.

3.1.2. Digitalization of mobility services to improve accessibility for all citizens

When it comes to digitalization, Austria in a whole has a quite broad network coverage of data and mobile network. The map below shows the network coverage quality of the pilot area.

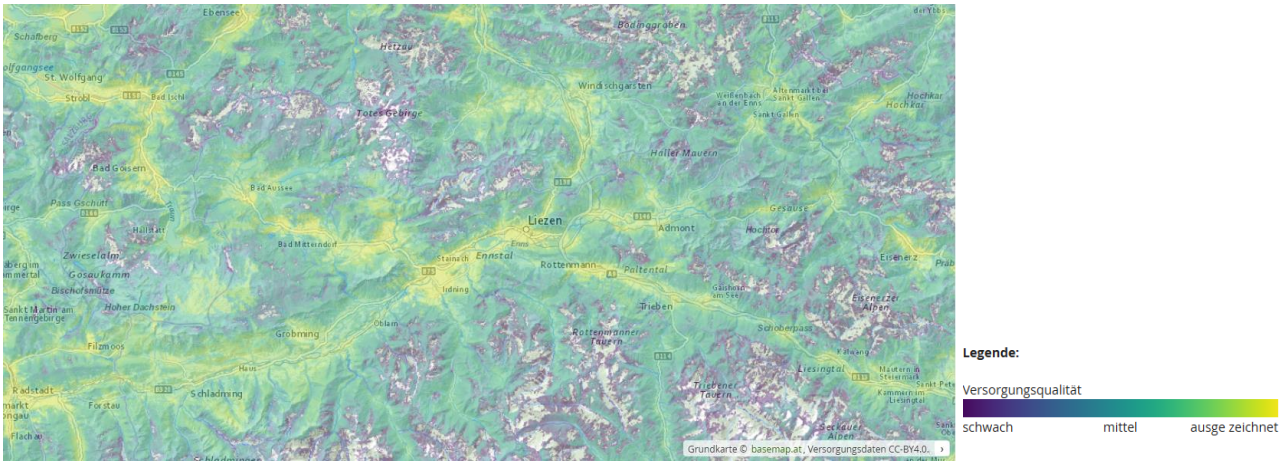

Figure 14: Service quality (https://frq.rtr.at/de/, visited 13th of January 2025 (16))

What is already in place, in terms of digitalization in the municipality of Bad Mitterndorf: The municipality is providing the app “Gemeinde24”, which is an app-service for their inhabitants.

Altaussee provides information for their inhabitants on the App “Altaussee” (by the murbit GmbH) since 2020 and on their own website. Grundlsee has no app, but a well-structured website. The municipality Bad

Aussee uses the App “GEM2GO” as well as a website.

Criticalities/challenges for the existing services in the pilot area

- Low bus and train frequency
- No broad carsharing-system available (only one car in Bad Aussee), and if there was a carsharing, people would need a car to get to the carsharing point.
- Insufficient bicycle infrastructure for commuters (only Salzkammergutradweg available, which is mainly touristic)
- No interregional timetables (no coordination of different players)
- No concept for last mile: Public transport is not easily accessible for around one third of the population (Source: MOBILITÄTSKONZEPT STEIRISCHES SALZKAMMERGUT, Regionalverein Ausseerland, 2022 (5))
- Two times, the long lasting implementation of DRT already have failed before in Ausseerland.
- Cost efficiency of public transport

Expected changes to be introduced in the next 3 years to face the abovementioned criticalities/challenges (within and beyond the DEGREE4ALPS project)

Implement a transport system for the last mile, that is used by the people.

Implement measures referred to in the regional strategies “Mobilitätskonzept Steirisches Salzkammergut“ and „Radverkehrskonzept Steirisches Salzkammergut“ from 2022.

Find a cooperative financing for cross regional measures.

LEVELS OF DIGITALIZATION

Functionality / Service	Description	Trip planning	Booking	Ticketing	Payment	Billing	Real Time
Ski bus and Summer service	Web and app-tool Scotty by ÖBB	■					
Regio-Bus Linie	“	■		■	■	■	■
Regional railway	“	■		■	■	■	
Taxis / Private Hire							
DRT	DRT system still relies on manual bookings via phone calls (similar service - PROSTOFER)						
Carpooling	Limo App	■	■	■	■	■	■
Car Sharing	Rail and Drive and Miete dein Auto apps		■	■	■	■	
Digital Ticket	KlimaTicket Styria - Ticket can be booked in the online calendar			■		■	

Main service scope/target groups of flexible mobility services in the area

Scope/target group	Type of service	Level of digitalization
First last/mile connections within traditional transport networks	DRT (Mikro-ÖV), but it failed so far, new effort will be done	Not defined yet
Integration of traditional transport networks in off peak off season	The summer bus provides fewer connections than the skibus.	No level of digitalization.
Stand-alone services for regular users/commuters (workers, students)	n. a.	
Non-Emergency Medical Transport (NEMT)	Franz Pressl, a private taxi company	No level of digitalization
Accessibility for specific target groups (e.g. elderly, disabled, etc.)	Skibus and summer bus for tourists, no other service available	No level of digitalization

Criticalities /challenges regarding digitalization of the existing services in the pilot area

Acceptance of the LIMO app was low in general. Tourists often don't know the digital services that are available. No, or low digitalization of existing services (e. g. bike rental, local bus services, KlimaTicket Styria).

Expected changes to be introduced in the next 3 years to face the abovementioned criticalities/challenges (within and beyond the DEGREE4ALPS project)

Find the reason for the bad acceptance of the app, make services known. Make digital services know amongst inhabitants and tourists. Educate them how to use the services. Establish digital services with a well working and intuitive user interface.

3.1.3. Digitalization of mobility services to enhance green mobility operations

When it comes to green energy in the pilot region, we can take a look at the private energy communities that are currently arising all over Austria. Although, there do not yet exit energy communities in Bad Mitterndorf or the region's municipalities, there are two energy communities situated in the north-east of Bad Mitterndorf: Energiegemeinschaft Altaussee and Schattseitn.

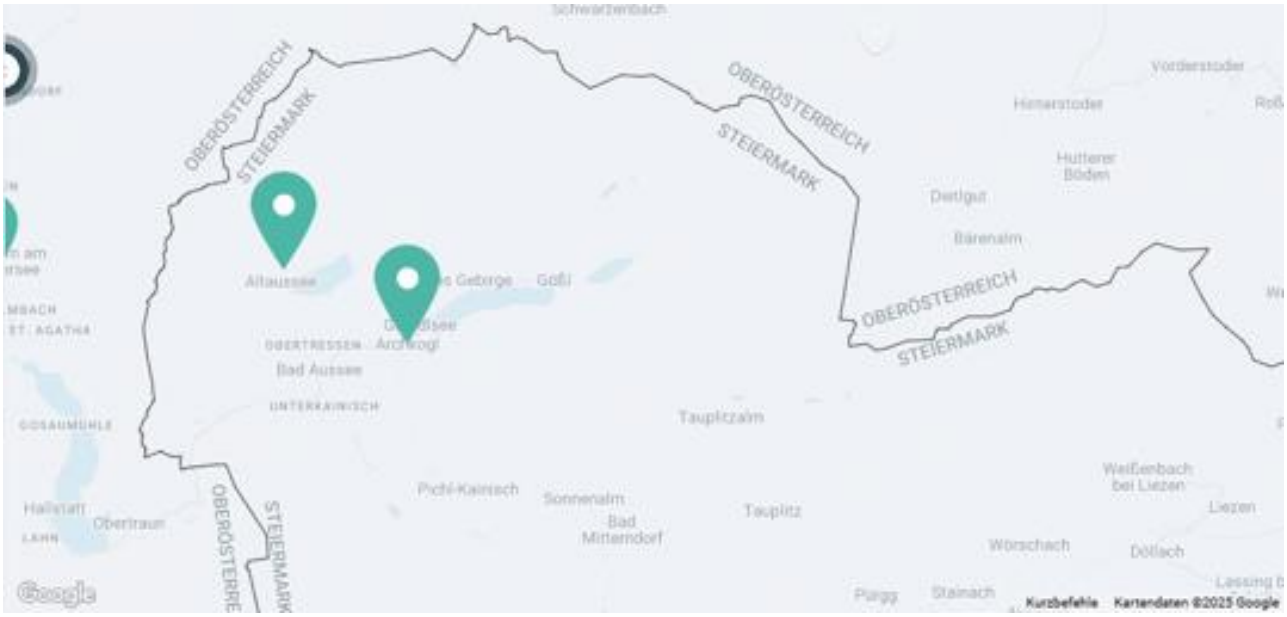

Figure 15: Energy communities (https://energiegemeinschaften.gv.at/landkarte/, visited on 15th of January 2025 (17))

3.2. Province of Belluno

The pilot area covers the province of Belluno, located in the Veneto region of northern Italy. This mountainous area, which includes the Dolomites, is characterized by a mix of rural landscapes, small towns, and a growing tourism sector.

3.2.1. Territory and mobility context

Territory and existing services

The province of Belluno has a population of approximately 205,000 residents, while the city of Belluno itself has around 35,000 residents and is accessible via regional roads, train connections, and bus networks. However, public transport often struggles to meet demand, particularly during peak tourist seasons and winter sports events. Investments in infrastructure are limited due to financial constraints at the local level.

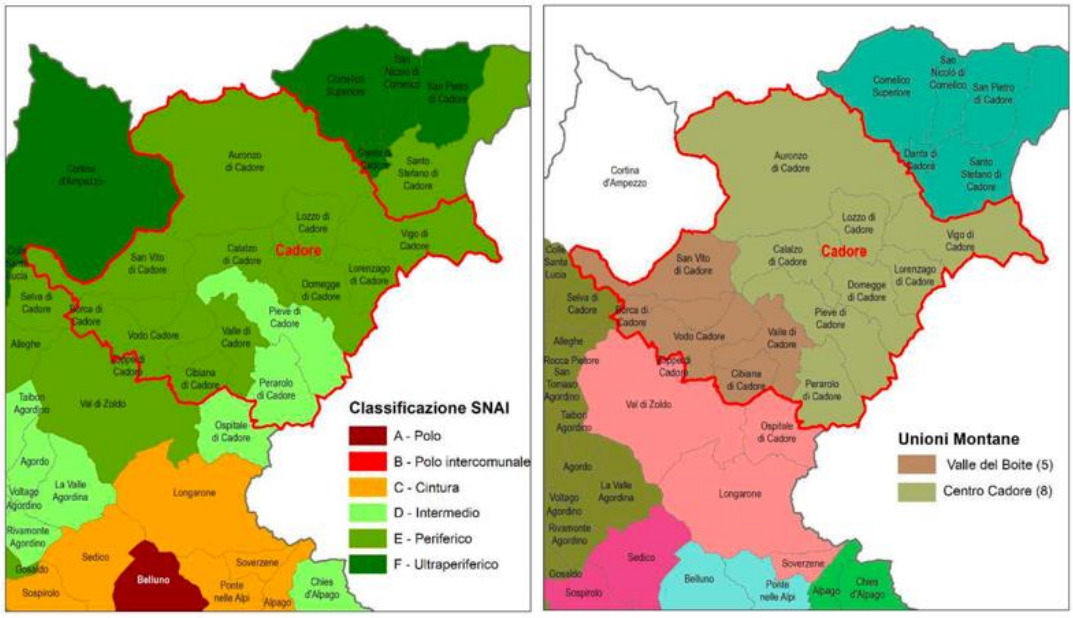

Figure 16: DOCUMENTO DI ANALISI TERRITORIALE E DI CONTESTO DELL'AREA INTERNA CADORE - Versione 1 del 31.10.2023 - Mappa dell'area interna Cadore

One of the most significant trends affecting the Belluno area is the increasing aging of the population, with a rising proportion of elderly residents compared to younger age groups. This demographic shift is influencing mobility patterns, with a higher reliance on private vehicles due to the limited availability of flexible public transport solutions in rural areas. Younger people, when possible, tend to move to larger cities for work and study, further contributing to this trend.

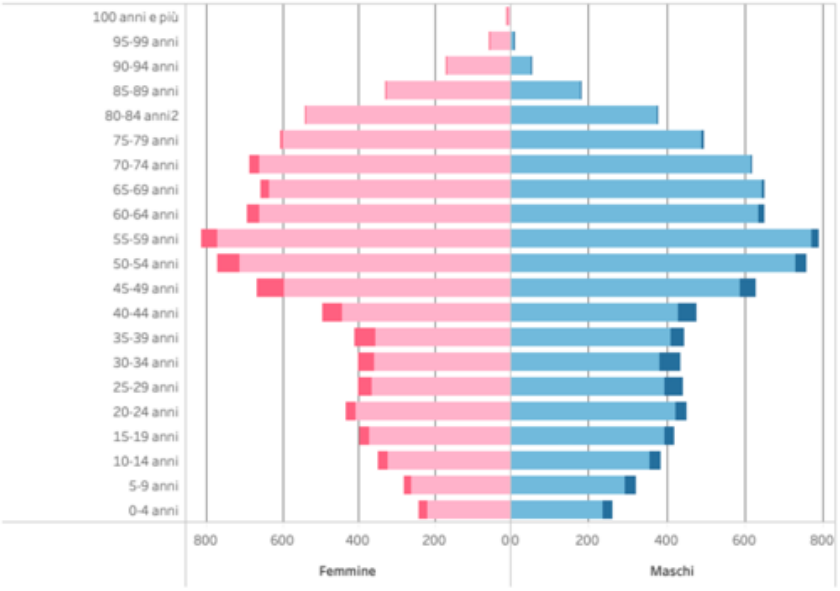

Figure 17: Age structure diagram
(DOCUMENTO DI ANALISI TERRITORIALE E DI CONTESTO DELL'AREA INTERNA CADORE - Versione 1 del 31.10.2023 - Distribuzione Popolazione)

At the same time, Belluno is experiencing growing tourism, driven by its natural beauty and outdoor activities such as skiing, hiking, and cycling. The upcoming 2026 Winter Olympics, scheduled for February and co-hosted by Milan and Cortina, will significantly impact the region. The event is expected to generate a substantial influx of workers, visitors, and investments in infrastructure. While this presents opportunities for economic growth and improved mobility solutions, it also poses challenges in managing transportation demand, environmental impact, and ensuring long-term benefits for local communities.

Figure 18: TomTom Traffic Index 2024: Veneto Area (average traffic in 7 days)

In recent years, mobility-sharing options such as e-scooters, bicycles, and car-sharing services have gained popularity in urban centers, but their presence remains limited in rural areas like Belluno. These services are often available only in restricted zones with designated pick-up and return points, limiting their

convenience for residents in dispersed settlements. As a result, private car ownership remains the primary mode of transport, particularly among younger residents who need flexibility for commuting and daily activities.

Addressing these mobility challenges will require coordinated efforts between local authorities, private stakeholders, and regional governments, especially in the context of the 2026 Winter Olympics. Strategic investments in public transport, infrastructure expansion, and sustainable mobility solutions will be crucial to ensuring that the region can efficiently accommodate both residents and the increasing number of visitors.

Generally, the main traffic flows in the province of Belluno occur on weekdays from rural areas to urban centers for work, education, and essential services. However, on weekends, the dynamic reverses as tourists and visitors travel from larger cities to the Dolomites for leisure activities such as hiking, skiing, and sightseeing.

The main relevant flows for the pilot are the routes between public transport hubs, such as train and bus stations, and key tourist destinations, including hiking trails, ski resorts, and natural parks in the valleys. Ensuring efficient connectivity between these points is essential for supporting sustainable tourism and improving mobility in the region.

LOCAL TRANSIT

Dolomiti Bus S.p.A, part of Autoguidovie group, is the local bus service provider. The main actor is Autoguidovie and its main target groups are the population of the area as well as tourists to the area. Excluding the network of the urban area of Belluno and Feltre, in the area of the pilot it is available a small network of old lines in the town of Pieve to empower the service during peak hours (students).

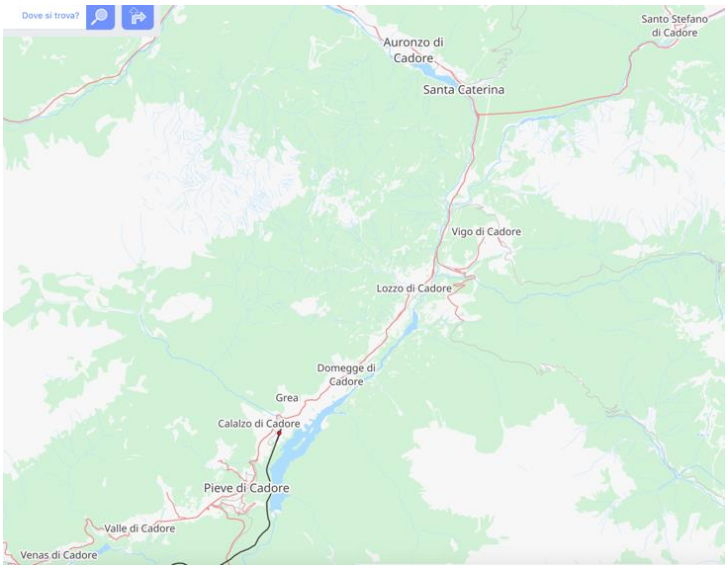

Figure 19: Openstreetmap (PT layer) - Cadore PT lines

REGIONAL BUSES

Dolomitibus operates several regional bus routes in the province of Belluno, including key connections to tourist destinations. Among its services, it manages routes 31 and 33, which connect Cortina d'Ampezzo, Auronzo di Cadore, Santo Stefano di Cadore, and Belluno, providing essential links for both residents and visitors.

ATVO (Azienda Trasporti Veneto Orientale) is a public transport company operating in the Veneto region, including connections to the province of Belluno. The company provides scheduled bus services linking major cities, airports, and tourist destinations. Its primary target groups are local residents, commuters, and tourists traveling to and from the Dolomites. ATVO operates long-distance routes connecting Belluno with Venice, Treviso, and major transportation hubs, ensuring efficient mobility for both daily passengers and seasonal visitors.

Freccialink is a high-quality intermodal transport service operated by Trenitalia, designed to connect high-speed railway stations with popular tourist destinations. In the province of Belluno, Freccialink offers direct coach connections from Venice and other major Italian cities to Cortina d'Ampezzo, facilitating access to the Dolomites. The service is targeted at tourists and high-speed train passengers, ensuring seamless transfers between rail and road transport. Freccialink coaches are comfortable, modern, and integrated with Trenitalia's Frecciarossa train network, offering a premium travel experience.

FlixBus offers connections in the province of Belluno, serving key destinations including Cortina d'Ampezzo, Longarone, Tai di Cadore, Borca di Cadore, and San Vito di Cadore. These routes provide easy access for both residents and tourists looking to visit the Dolomites and surrounding areas. FlixBus strengthens its service to these locations, especially during peak tourist seasons, offering a convenient option for travel to and from the region.

Active since 2000, Dolomiti Travels and Service provides coach, van, and minibus rental with a driver. It manages the urban transport network in Borgo Val Belluna and offers transport services for disabled people in partnership with healthcare companies. The company operates in the areas of Belluno, Feltre, Agordo, Cadore, and Cortina d'Ampezzo.

Monego Viaggi e Turismo provides rental services for buses, coaches, camper vans, and cars, with or without a driver. The company also offers airport and corporate transfers, as well as chauffeur-driven car rental services for up to 8 passengers.

REGIONAL TRAINS

Belluno is connected to the regional railway network through Trenitalia services, offering important links to key cities in Veneto and beyond. The main railway connections include:

Belluno – Padua: A direct regional train service connecting Belluno with Padua via Feltre and Bassano del Grappa.

Belluno – Venice (via Conegliano): Passengers can travel to Venice by taking a regional train to Conegliano, where they can transfer to a direct train to Venice Santa Lucia.

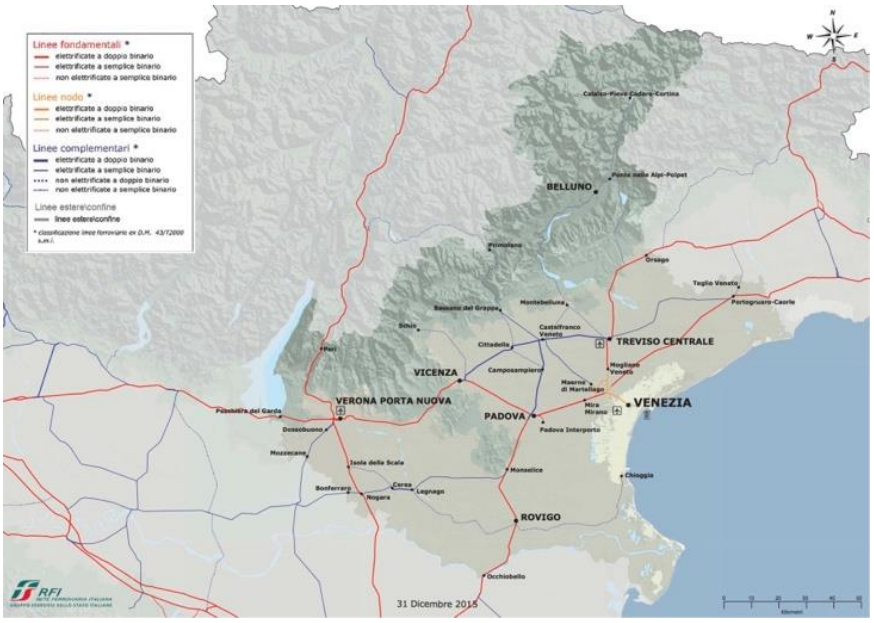

Figure 20: RFI PIR 2024

Belluno – Treviso: Some regional services provide a direct connection between Belluno and Treviso, allowing further links to Venice and other destinations.

Belluno – Calalzo di Cadore: A regional train service connects Belluno with Calalzo Pieve di Cadore Cortina station, the main railway hub for reaching the Dolomites. This route is frequently used by tourists heading to Cortina d'Ampezzo and other mountain destinations, with bus connections available from Calalzo.

On weekends and public holidays, some Trenitalia train services to and from Belluno are replaced by substitute buses to ensure continued connectivity. These buses operate along the same routes as the trains, maintaining access to key destinations and railway connections.

The substitute buses are equipped to transport bicycles, making them a convenient option for cyclists traveling to the Dolomites. The service is designed to accommodate both local commuters and tourists, providing a seamless travel experience even when trains are not running. Passengers can board these buses at designated railway stations and continue their journey without disruption.

<u>TAXIS and PRIVATE HIRE</u>

Radio Taxi Belluno offers reliable taxi services across the province of Belluno. The company provides 24/7 coverage, catering to both local residents and visitors. Their fleet includes standard taxis and larger vehicles for group transport, making them a flexible choice for a variety of travel needs. Radio Taxi Belluno also offers specialized services, such as airport transfers, transportation to ski resorts, and transfers to nearby cities. With a strong reputation for punctuality and professionalism, they ensure a smooth and comfortable ride throughout the area.

Taxi Cortina operates mainly in Cortina d'Ampezzo and the surrounding areas of the Dolomites. The company provides local and long-distance taxi services, catering to both tourists and residents. Taxi Cortina is particularly known for its services to popular mountain destinations, ski resorts, and connections to

transportation hubs like train stations and airports. The company's fleet is equipped to accommodate a range of passenger needs, from solo travellers to groups, offering comfortable and reliable transport throughout the province.

Taxi Agordo offers transportation services in and around the town of Agordo, as well as to nearby destinations. The company provides 24-hour taxi services, catering to residents, tourists, and those traveling to ski resorts, train stations, and airports. Taxi Agordo's fleet includes both small and larger vehicles, making them suitable for individuals, families, and groups. They also offer transportation for events, such as business trips and guided tours in the Dolomites, ensuring that their customers have comfortable and efficient travel experience.

Taxi San Vito di Cadore operates in San Vito di Cadore and the surrounding Dolomite area. This taxi service specializes in transfers to mountain resorts, ski areas, and local tourist destinations. The fleet includes standard taxis and larger vehicles for group transport. Taxi San Vito di Cadore is known for offering personalized services, including transport to and from airports, train stations, and long-distance travel to nearby cities. Their experienced drivers ensure that passengers enjoy safe, punctual, and comfortable trips throughout the region.

These taxi services provide essential transportation options in the province of Belluno, catering to a variety of needs, from local commutes to longer, specialized trips in the mountainous area. They offer flexibility and comfort, making them an ideal choice for travellers seeking a hassle-free way to explore the region.

Dolomiti Transfer specializes in NCC services in Belluno, providing passengers with private transportation options to explore the Dolomites and surrounding areas. Whether it's a transfer to ski resorts, an airport shuttle, or a customized tour, Dolomiti Transfer offers a tailored approach to meet the needs of both tourists and local residents. The company prides itself on offering flexible, high-end services with professional drivers to ensure a smooth and relaxing journey.

BMC Viaggi offers NCC services across Belluno and beyond. The company provides private transport for individuals and groups, including transportation to ski resorts, tourist destinations, and business trips. BMC Viaggi's fleet includes cars, minivans, and larger buses, and they cater to a variety of transportation needs, from airport transfers to corporate events. With a focus on comfort and reliability, BMC Viaggi ensures that clients enjoy a premium and hassle-free travel experience in the region.

DRT SERVICES

Trillo is a Demand-Responsive Transport (DRT) service that is still active in the province of Belluno. This service is part of an innovative transportation network aimed at providing flexible, on-demand rides, especially in rural and mountainous areas that are less accessible by regular public transport.

Trillo operates by allowing passengers to book a ride through an app or by phone, and it can pick them up from specific locations and drop them off at their desired destinations. This service covers various parts of Belluno, including towns and smaller villages, and helps improve mobility for both residents and tourists.

If you're looking for flexible transport solutions, Trillo could be a great option for getting around in the province, particularly in areas with limited traditional public transportation options.

CARPOOLING

Aside from BlaBlaCar, supported in the area but targeting long-range travellers, several carpooling initiatives have been launched in the province of Belluno in recent years, with varying levels of success and continued activity:

"Caro Taxi" (2021) aimed to encourage carpooling in rural areas but was discontinued after a short period due to low participation and operational challenges.

Belluno Mobilità Sostenibile (2020) remains active as part of the broader efforts to promote sustainable mobility in the region, though specific data on carpooling passengers is not publicly available.

Cortina Green Mobility (2022) continues to operate, especially during peak tourist seasons, focusing on sustainable transport options like carpooling in Cortina d'Ampezzo. However, detailed passenger numbers are also not available.

Local carpooling platforms launched by various municipalities between 2020 and 2023 are still operational, providing flexible transport solutions in more remote areas, although exact figures on carpooling usage are not provided.

Alpimobility (2021), promoting sustainable transport in the Dolomites, is also active, but like other initiatives, specific passenger data has not been released.

CAR SHARING

Several car sharing initiatives have been introduced in the province of Belluno in recent years:

CarSharing Belluno (2020) provided an accessible shared car service, but details on passenger numbers and success are scarce.

E-motion Carsharing (2021) introduced electric carsharing as an eco-friendly alternative, but similar to others, it lacks detailed user statistics.

The **Municipality of Feltre Carsharing Initiative** (2022) aimed to reduce car ownership and promote sustainable mobility within the local community, though there is no public data on usage.

Other local car sharing services (2020-2023) have been launched in various towns, focusing on specific regional needs, but again, detailed passenger data is not readily available.

While these carsharing, projects are still active and reflect the region's growing interest in sustainable transport, there is limited publicly accessible data on the number of users or the success of these programs. To gain specific insights into their effectiveness, it would be necessary to contact the local authorities or organizations managing these services.

BIKE SHARING

The province of Belluno has seen the introduction of several bike-sharing initiatives aimed at promoting sustainable transportation:

BikeSharing Belluno (2020) was introduced to offer residents and visitors the option to rent bikes for short-

term use in Belluno city, but detailed data on usage is not available.

Cortina BikeSharing (2022) launched in Cortina d'Ampezzo, allowing tourists and locals to rent bicycles to explore the area, but, again, detailed statistics on the number of users are not readily accessible.

Feltre BikeSharing (2021) was implemented to provide a bike rental service to residents and visitors, though data on its success or passenger numbers is limited.

Various other local bike-sharing projects (2020-2023) have been launched across smaller towns in the province, focusing on sustainable mobility, but concrete data on passenger numbers remains scarce.

While these bike-sharing initiatives are active and contribute to the region's sustainable transport efforts, detailed statistics on the number of users and the overall success of the programs are generally not publicly available. To obtain more precise information, contacting the local municipalities or the organizations managing the services would be necessary.

MICROMOBILITY

Lime Scooters Pilot (2021) was introduced in Belluno as a test project to offer electric scooters for short trips, but there is no available data on its continuation or user uptake.

Cortina Green Mobility - Electric Scooters (2022) introduced a scooter-sharing service in Cortina d'Ampezzo, particularly targeting tourists, though detailed statistics on its success or passenger numbers are not available.

Feltre E-Scooter Rental (2023) offers electric scooter rentals to locals and tourists, but data on its effectiveness or the number of users is not shared publicly.

LIFTS

While ski lift systems are heavily used during the winter, with high passenger numbers expected during the peak season (December to March), during summer as well the number of passengers is increasing year by year. Here the main actors:

Cortina d'Ampezzo Ski Resort (Dolomiti Superski) offers extensive ski lift connections, with multiple gondolas and chairlifts, making it one of the busiest and most renowned ski destinations in the Dolomites.

Alleghe Ski Area (Civetta Ski) features numerous ski lifts connecting to the Civetta mountain, offering over 80 kilometers of slopes for skiing and snowboarding, along with summer use for hikers and mountain bikers.

San Vito di Cadore Ski Resort provides ski lift access to a smaller, family-friendly area that is connected to the larger Dolomiti Superski network, especially appealing for cross-country skiing.

Falcade Ski Area (San Pellegrino) boasts ski lifts that provide access to the San Pellegrino Pass area, attracting visitors during both the winter and summer seasons.

Val di Zoldo Ski Area (Pian del Crep), part of the Civetta Ski network, offers ski lifts that connect the area to other ski destinations and provide a variety of slopes for different skill levels.

3.2.2. Digitalization of mobility services to improve accessibility for all citizens

The challenges in the province of Belluno encompass various aspects, such as traveling from train and public transport stations to points of interest (e.g., hiking trails leading to mountain peaks) in the valleys. Key issues include the last mile problem, irregular or non-existent bus connections, inconsistent tariffs (particularly cross-border), restrictions on transporting sports equipment (such as skis or bikes), and limitations in public transport capacity during weekend peaks due to increased demand from day excursions. Furthermore, each municipality has its own mobility concept or app, leading to isolated and fragmented solutions. Beyond the DEGREE4ALPS project it is now under development a solution to install displays at the stops (around 50) to show waiting times for the next buses. New digital enhancement to introduce alternative payment methods for either single tickets or customized solutions of ticketing via current apps of Dolomiti Bus is another big step to take in the near future.

LEVELS OF DIGITALIZATION

Functionality / Service	Description	Trip planning	Booking	Ticketing	Payment	Billing	Real Time
Local Transit	New Dolomitibus App	■	■	■	■		
Regional buses	Each operator has minor implementations in its App, Trenitalia buses has the best	■	■	■	■	■	
Regional railway	Trenitalia App	■	■	■	■	■	■
Taxis / Private Hire	No web/app available						
DRT	Trillo App	■					■

Main service scope/target groups of flexible mobility services in the area¢

Scope/target group	Type of service	Level of digitalization
First/Last Mile Connections	Dolomitibus Bus Routes: Connections to and from train stations (Belluno, Feltre) to key destinations in the province, including ski resorts and hiking paths.	Digital ticketing available online, real-time schedule tracking to be enlarged, dedicated mobile app for route planning, and up-to-date service alerts.
School and Peak Hour Services	Dolomitibus School Routes: Bus routes serving local students, particularly during peak hours.	Online ticketing for student passes, real-time service information accessible through app and website.
Tourism & Leisure Services	Dolomitibus Tourist Services: Seasonal and year-round services connecting tourists to destinations like Cortina d'Ampezzo, Auronzo, and other mountain resorts.	Digitalized ticketing for tourists, information on schedules and routes available online, and integration with major tourism platforms for ease of use.
Ski Resort and Recreation Mobility	Dolomitibus Ski Shuttle Services: Seasonal services for visitors traveling to ski resorts.	Online timetables, ticket booking options, and ski-related transport information available through website and app. Activate partnership to sell combined tickets.
Public Transport Network	Dolomitibus within Belluno's Transport	Digital integration with local and regional public

Integration	Network: Part of a broader network that connects urban and rural areas in Belluno, integrating with regional transport options.	transport schedules, online timetables, and payment systems for a seamless travel experience.
Real-Time Information and Updates	Dolomitibus Mobile App: Provides real-time tracking, service updates, and schedule changes.	Mobile app with notifications, updates, and route tracking.

Criticalities /challenges regarding digitalization of the existing services in the pilot area

The goal is to introduce a first/last mile solution in the area between Pieve di Cadore and Lozzo di Cadore. This would help bridge the gap between local bus services and key transport hubs, such as train stations, ensuring smoother connections for both residents and visitors. Implementing such a solution would address existing mobility challenges, particularly in more remote areas, and enhance accessibility to the broader transport network in the province of Belluno.

Expected changes to be introduced in the next 3 years to face the abovementioned criticalities/challenges (within and beyond the DEGREE4ALPS project)

Within DEGREE4ALPS:

Digital integration of first/last mile services between Pieve di Cadore and Lozzo di Cadore in navigation apps and public transport platforms. This would provide seamless access and coordination for users traveling between local areas and key transport hubs.

The complementary objectives for the mobility improvement in the area between Pieve di Cadore and Lozzo di Cadore include:

1.Implementation of Digital Bus Stops: We will introduce bus stop infrastructures equipped with digital screens to display real-time waiting times for passengers. This will enhance user experience by providing clear and up-to-date information at key locations.

2.Expansion of Payment Methods: We will improve the number and variety of payment options available via mobile apps for public transport tickets. This will enable passengers to easily purchase tickets through their smartphones, making the process more convenient and accessible.

3.Real-Time Monitoring of Routes: The Dolomitibus application will be enhanced to allow passengers to track bus routes in real time. This feature will provide greater transparency and reliability, ensuring users are always informed about the status of their rides.

3.2.3. Digitalization of mobility services to enhance green mobility operations

Some Dolomitibus bus fleets in the Belluno area are equipped with hybrid or electric motors, contributing to the reduction of emissions and enhancing environmental sustainability. These buses are part of the company's ongoing effort to modernize its fleet and provide greener transportation options for local residents and tourists.

In addition, the Trenitalia trains operating in the region are set to be electrified in the next five years. Currently, these trains run on diesel fuel, but the company is actively testing hybrid drive technology as part of a broader push toward sustainable rail transport. This move will help reduce the carbon footprint of the region's public transportation system and align with environmental goals.

A key challenge in the Belluno area is the lack of bus frequency and connections, which limits accessibility and convenience for residents and visitors. Additionally, there is insufficient integration among transport modes, particularly in terms of information and ticketing, making it harder for passengers to seamlessly transition between different modes of transport. Another challenge is the lack of dedicated lanes on highly trafficked roads for buses and shared mobility vehicles, which results in delays and inefficiencies, particularly during peak hours. Addressing these issues would significantly improve the overall efficiency and appeal of public and shared transportation in the province.

Connecting mobility data and integrating various transport options is crucial to addressing the traffic challenges caused by widespread reliance on private motorized vehicles. By creating a unified system that links real-time data, schedules, and ticketing across different transport modes, we can offer more efficient and flexible alternatives to private cars. This integration not only helps to reduce congestion but also promotes the use of public and shared transport options, contributing to a more sustainable and accessible mobility system in the Belluno area.

3.3. Maribor

3.3.1. Territory and mobility context

The pilot area of the Municipality of Maribor is characterized by several key socioeconomic and cultural trends that significantly influence mobility patterns and the development of the pilot project:

Territory and existing services

1. Commuting patterns

Maribor, as the second-largest city in Slovenia, has experienced gradual urban sprawl, with suburban areas expanding beyond the city core. This trend has led to increased commuting distances and a greater reliance on private cars, contributing to congestion during peak hours. Peripheral neighborhoods and surrounding municipalities face limited public transport options, particularly in low-density residential zones.

2. Population aging

The city's demographic structure shows a notable increase in the proportion of elderly citizens, resulting in a growing need for accessible and flexible transport services. Seniors often rely on public transport for access to healthcare and other essential services, emphasizing the importance of enhancing demand-responsive transport (DRT) options in peripheral and suburban areas.

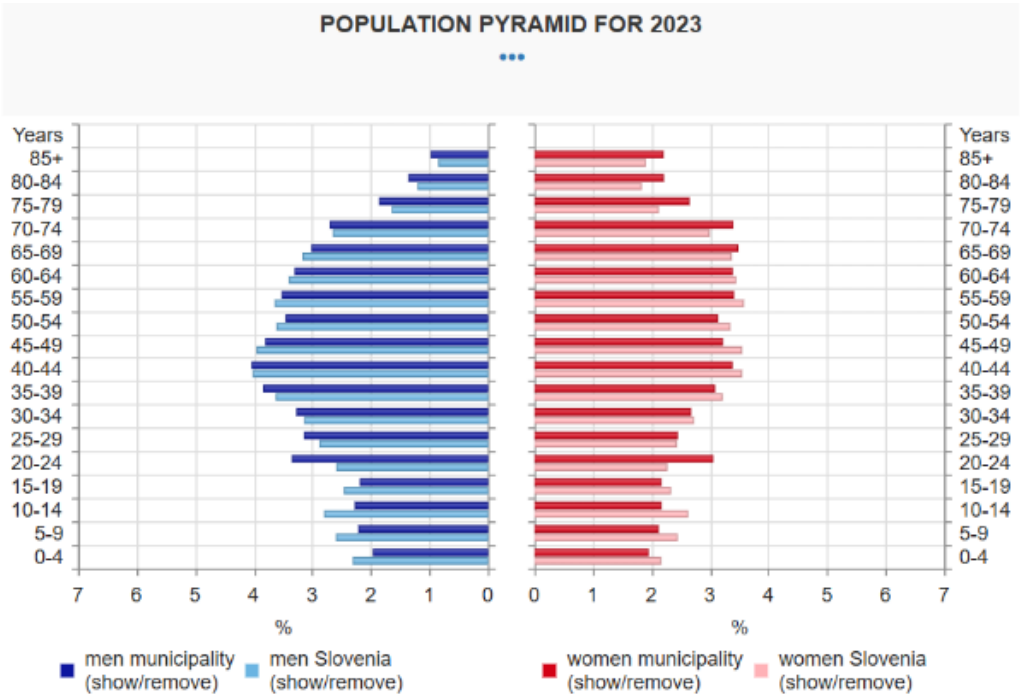

Figure 21: Age structure diagram
(Authors' elaboration based on national population registers and Eurostat demographic data (2023).)

3. Motorization and traffic congestion

Maribor has a relatively high motorization rate with many households owning multiple vehicles. This has led to increased congestion, especially on routes leading to major traffic generators such as healthcare facilities, educational institutions, and business districts which are mainly located in the city centre. The integration of digital journey planning and real-time information tools can support a modal shift from private car use to more sustainable public transport options.

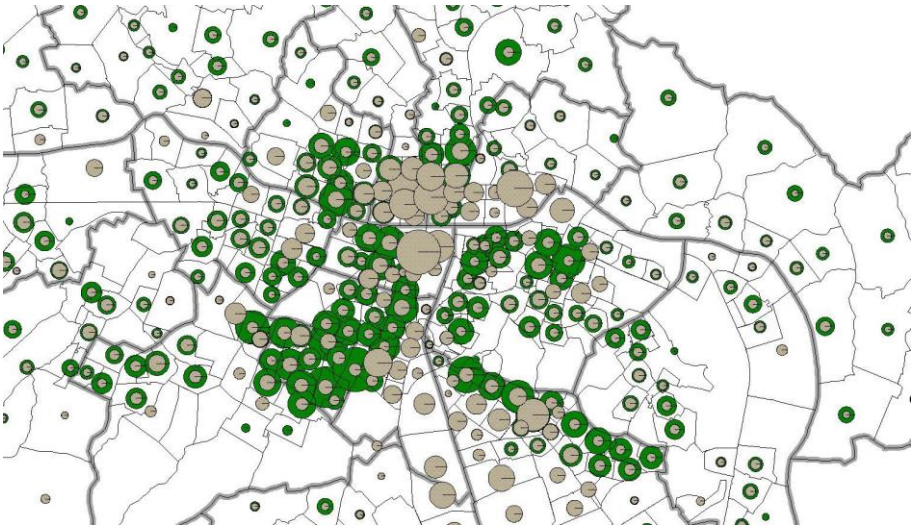

Figure 22: Trip production (green) and trip attraction (brown) of Maribor

4. Socioeconomic disparities

The city has diverse socioeconomic conditions, with some neighborhoods experiencing higher unemployment rates and limited mobility access. This makes the development of affordable and inclusive transport solutions essential to support social inclusion and economic participation.

5. Sustainable mobility and environmental awareness

Growing environmental awareness among residents has prompted the city to adopt sustainability-focused initiatives, such as the promotion of cycling and public transport. The introduction of energy-efficient e-buses and digital mobility tools aligns with these efforts and supports the city's broader climate goals, as outlined in its Sustainable Urban Mobility Plan (SUMP).

In the pilot area of the Municipality of Maribor, several key mobility flows have been identified, reflecting the daily commuting patterns and transport demands of residents, workers, and visitors. The most relevant travel destinations are as follows:

1. Residential areas to the city center

Commuters traveling from suburban neighbourhoods (e.g., Tezno, Pobrežje, Studenci, Tabor, …) to the city center for work, education, and administrative purposes. Main bus routes along Titov road and Revolution square facilitate these flows, with significant demand during morning and afternoon peak hours.

2. Residential areas to educational institutions

Schoolchildren, university students, and academic staff traveling from various city districts to educational hubs located mostly in the city centre. Morning and afternoon peaks are particularly pronounced.

3. Peripheral areas to healthcare facilities

Residents, particularly elderly and vulnerable groups, traveling to the University Medical Centre Maribor for medical appointments and treatments. Demand is especially high from the southern suburbs (Tezno and Tabor) and from nearby municipalities. The hospital is a critical mobility generator, and improved DRT services aim to address accessibility gaps here.

4. Residential and industrial zones to business districts

Employees commuting to the Tezno industrial Zone, Melje industrial zone, and retail centers like Europark Maribor. These flows are characterized by peak-hour congestion and an increasing need for efficient public transport services that accommodate shift workers.

5. Intermodal flows - train station in the city center

Passengers arriving by train at Maribor main station and transferring to city buses or walking to their final destinations. The station serves both regional commuters and long-distance travellers, with a growing number of users transitioning to buses or DRT services or other mobility solutions (MBAJK, Avant2GO).

Cona	BrG	BDZ	Ce2	Ce1	IvC	Kam	KoV	Lim	Mag	MaR	NoV	Pek	Pob	Rad	Raz	Stu	Tab	Tez	DUPL	HOČE	KUNG	LENA	MIKL	PESNI	RUŠE	SELNI	
BrG	41	28	150	167	110	38	131	45	161	18	92	26	137	97	36	118	155	173	24	153	9	53	32	66	22	20	2.033
BDZ	23	84	264	242	171	36	167	40	281	44	142	26	310	126	76	150	282	434	37	236	13	82	49	101	33	31	3.373
Ce2	103	233	1.041	761	784	177	693	155	898	168	624	113	1.137	466	160	567	875	1.066	327	2.074	117	720	434	891	293	271	14.812
Ce1	104	206	732	1.120	660	171	702	156	988	147	596	112	928	482	156	567	849	1.003	320	2.029	114	704	424	872	287	265	14.384
IvC	80	158	832	741	752	135	597	123	777	112	432	81	744	358	149	450	691	857	155	984	55	342	206	423	139	129	10.264
Kam	31	38	232	246	166	58	185	46	233	26	117	27	195	118	47	153	209	238	29	183	10	63	38	79	26	24	2.748
KoV	88	153	697	747	576	642	141	136	777	105	437	92	719	394	150	525	699	841	169	1.073	60	373	224	461	152	140	10.330
Lim	38	44	185	203	144	47	170	84	227	28	154	44	209	153	54	174	237	263	42	265	15	92	55	114	37	35	3.031
Mag	98	219	791	904	657	161	685	162	1.422	140	673	116	1.087	497	195	652	1.124	1.105	303	1.921	108	667	402	826	271	251	15.120
MaR	18	55	247	222	150	28	139	30	218	45	97	19	235	90	53	111	200	297	20	125	7	43	26	54	18	16	2.490
NoV	62	120	581	588	395	91	408	114	721	72	438	72	577	374	163	426	745	783	83	530	30	184	111	228	75	69	7.858
Pek	20	26	126	136	89	26	106	40	153	16	93	33	129	110	38	106	159	174	23	145	8	50	30	62	21	19	1.892
Pob	94	248	1.037	891	664	151	668	162	1.137	155	577	107	1.349	498	243	602	1.034	1.382	208	1.319	74	458	276	567	186	172	13.917
Rad	68	116	478	529	358	98	411	122	595	71	423	95	556	503	152	425	691	725	123	778	44	270	163	334	110	102	8.156
Raz	29	80	192	197	173	46	182	52	276	46	219	40	328	181	148	186	344	463	81	511	29	177	107	220	72	67	4.337
Stu	79	135	557	589	432	119	518	133	735	87	449	88	641	401	149	553	707	786	138	877	49	305	184	377	124	115	9.113
Tab	102	230	784	798	615	158	638	176	1.153	140	716	124	1.022	594	246	649	1.258	1.332	244	1.546	87	537	323	664	218	202	14.224
Tez	133	384	1.074	1.059	855	207	864	226	1.277	222	868	160	1.550	720	378	818	1.503	2.440	335	2.125	120	738	444	913	300	278	19.474
DUPL	24	37	325	318	154	29	168	42	301	20	83	23	207	122	80	137	242	333	0	1.213	41	290	160	371	114	104	
HOČE	156	240	2.113	2.067	1.002	186	1.093	270	1.957	127	540	148	1.343	793	521	894	1.575	2.164	768	0	264	1.862	1.024	2.383	732	669	
KUNG	9	13	117	115	56	10	61	15	108	7	30	8	74	44	29	50	87	120	43	435	0	104	57	133	41	37	
LENA	54	83	729	713	346	64	377	93	676	44	186	51	464	274	180	308	544	747	266	2.697	91	0	355	825	253	232	
MIKL	31	47	418	409	198	37	216	53	387	25	107	29	266	157	103	177	311	428	156	1.584	54	379	0	485	149	136	
PESN	66	102	894	874	424	79	462	114	828	54	228	63	568	335	220	378	666	916	327	3.322	113	794	437	0	312	285	
RUŠE	22	34	297	291	141	26	154	38	275	18	76	21	189	112	73	126	222	305	108	1.099	37	263	144	336	0	0	
SELN	20	31	268	262	127	24	139	34	248	16	69	19	171	101	66	113	200	275	99	1.004	34	240	132	307	0	0	
	1.593	3.144	15.161	15.189	10.199	2.844	10.075	2.661	16.809	1.953	8.466	1.737	15.135	8.100	3.865	9.415	15.609	19.650									

Figure 23: Vehicle trips matrix (inner trips - blue, origin and destination trips - orange, transit - gray); working day, 24 hours, 2016

6. Recreational flows - city center to Maribors Pohorje

Residents and tourists traveling to Pohorje sports and recreation center, especially on weekends and during tourist seasons. Direct bus lines connecting the city center with the cable car station at Pohorje support this flow (bus route G6).

LOCAL TRANSIT

- Territorial scope: Local – covers the Municipality of Maribor.
- Governance: Local level (Municipality of Maribor).
- Main actor: Marprom d.o.o. – operates 21 bus lines connecting residential neighbourhoods with the city center and key urban zones.
- Target groups: General public, commuters, students, and elderly residents.

REGIONAL BUSES

- Territorial scope: Regional – connects Maribor with surrounding municipalities in the Podravje region.
- Governance: Regional level (coordinated by regional transport authorities).
- Main actor: Nomago d.o.o., Arriva d.o.o., AP Murska Sobota d.o.o. – provides intercity connections to and from Maribor.
- Target groups: Commuters traveling for work, students attending regional schools, and leisure travelers.

REGIONAL TRAINS

- Territorial scope: Regional and national – Maribor serves as a key rail hub.
- Governance: National level (Slovenian Railways).
- Main actor: Slovenske železnice (SŽ) – operates rail services to Ljubljana, Ptuj, Murska Sobota, and abroad.
- Target groups: Commuters, students, and long-distance travellers.

LONG DISTANCE BUSES

- Territorial scope: National and international – intercity services across Slovenia and neighbouring countries.
- Governance: National level (regulated by the national transport authority).
- Main actors: FlixBus, Arriva Slovenia, Nomago, AP Murska Sobota.
- Target groups: Tourists, long-distance commuters, and occasional travellers.

TAXIS

- Territorial scope: Local and regional.
- Governance: Local level (licensed by the Municipality of Maribor).
- Main actors: Multiple small taxi operators.
- Target groups: General public, particularly users requiring flexible transport outside public transport schedules.

DRT SERVICES

- Territorial scope: Local – primarily serving peripheral areas.
- Governance: Local level (Municipality of Maribor).
- Main actor: Marprom d.o.o. (pilot activity – DEGREE4ALPS).
- Target groups: Elderly residents, individuals with reduced mobility, and patients accessing healthcare services.

CARPOOLING

- Territorial scope: Regional and intercity.
- Governance: Private sector initiatives with municipal support.
- Main actors: Informal carpooling networks and apps like Prevoz.org.
- Target groups: Commuters traveling to Ljubljana and other cities.

CAR SHARING

- Territorial scope: Local and regional.
- Governance: Private sector initiatives.
- Main actors: Avant2GO.
- Target groups: Tourists and occasional drivers.

BIKE SHARING

- Territorial scope: Local – city center and key neighbourhoods.
- Governance: Local level (Municipality of Maribor).
- Main actor: MBajk – city bike-sharing system.
- Target groups: Daily commuters, students, and tourists.

3.3.2. Digitalization of mobility services to improve accessibility for all citizens

The existing transport services in the pilot area of the Municipality of Maribor face several critical challenges that impact efficiency, accessibility, and sustainability of mobility. The following key challenges have been identified:

1. Limited frequency and coverage of PT

- In peripheral and low-density residential areas, bus services are infrequent, especially during off-peak hours, making public transport less attractive.
- Elderly residents, healthcare patients, and individuals without private vehicles face difficulties accessing essential services.

Pilot: The introduction of a digitalized DRT system will improve service availability in these underserved areas by offering flexible, on-demand services.

2. Insufficient integration across transport modes

- The integration between buses, trains, and other modes of transport is suboptimal, leading to inefficient connections and prolonged travel times.
- Passengers transferring between modes, particularly at Maribor train station, experience delays and a lack of real-time information.

Pilot: A digital trip planner will be introduced to improve the coordination of transport modes and provide real-time updates on schedules and connections.

3. Accessibility barriers for vulnerable groups

- Mobility services are not always fully accessible to elderly passengers and individuals with disabilities.
- These groups often struggle with accessing healthcare facilities, such as the University Medical Centre Maribor, particularly when using standard public transport services.

Pilot: The DRT system will prioritize services for these groups, offering door-to-door transport and improving access to essential destinations.

4. E-bus energy efficiency

- While the city has introduced electric buses (route G6), the energy flow management and charging infrastructure lack optimization.
- Inefficient charging practices increase operational costs and reduce the environmental benefits of the electric fleet.

Pilot: The pilot will implement an energy flow monitoring system to optimize charging schedules, particularly through opportunity charging strategies at high demand stops.

5. High Dependency on Private Vehicles

- Car dependency remains high, particularly in suburban areas with limited public transport options.
- This contributes to congestion, especially during peak commuting hours.

Pilot: The development of more reliable and flexible public transport services will encourage a modal shift towards public transport.

The Municipality of Maribor in collaboration with University of Maribor, plans to introduce several key changes to address the criticalities identified in its transport system. These changes will be driven by the activities within the DEGREE4ALPS project as well as broader municipal and regional mobility strategies. The expected changes include:

1. **Enhancement of Demand-Responsive Transport (DRT) Services**
   - Implement digital tools for scheduling and optimizing DRT services.
   - Increase service frequency and expand coverage in areas with low population density.
   - Pilot real-time trip planning features to enhance service reliability and accessibility.

2. **Improved multimodal integration**
   - Install digital information displays at major intermodal hubs, such as Maribor Train Station.
   - Coordinate schedules between city buses, regional buses, and train services to reduce transfer times.

3. **Energy flow optimization for e-buses**
   - Deploy a monitoring system to track energy consumption and optimize charging schedules.
   - Implement new opportunity charging infrastructure at strategic stops to extend operational range.
   - Explore the integration of renewable energy sources, such as solar power, for bus depots.

4. **Promotion of sustainable mobility practices**
   - Expand cycling infrastructure and install new bike-sharing stations across the city.
   - Organize public awareness campaigns on the environmental and health benefits of active mobility.
   - Collaborate with local employers to promote carpooling, carsharing and public transport use among employees.

5. **Digital infrastructure development and integration**
   - Upgrade the existing ticketing system to support contactless and mobile payments (in collaboration with Margento).
   - Develop a user-friendly transport application with real-time information, journey planning, and ticket purchasing features.
   - Integrate mobility-related data into the city's digital twin platform to support long-term planning.

6. **Accessibility improvements for vulnerable groups**
   - Introduce step-free access to more bus stops, particularly those serving healthcare facilities.
   - Train public transport staff in assisting passengers with special needs.

Provide educational workshops to familiarize older adults with new digital tools.

LEVELS OF DIGITALIZATION

Functionality / Service	Description	Trip planning	Booking	Ticketing	Payment	Billing	Real Time
Local Transit	A mobile application allows passengers to plan routes across the city's bus lines	■		■	■	■	■
Regional buses		■		■	■		
Regional railway		■		■	■	■	■
Taxis / Private Hire							
DRT	DRT system still relies on manual bookings via phone calls (similar service – PROSTOFER)						

Main service scope/target groups of flexible mobility services in the area

Scope/target group	Type of service	Level of digitalization
First last/mile connections within traditional transport networks	Demand-Responsive Transport (DRT)	Currently limited to manual booking via phone calls (PROSTOFER). DEGREE4ALPS will introduce a digital booking system with real-time updates.
Integration of traditional transport networks in off peak off season	Public bus services and DRT	Some real-time schedule information is available online, but schedules are static during off-peak

		times. New tools will enhance responsiveness.
Stand-alone services for regular users/commuters (workers, students)	Fixed-line public transport	Online trip planning and mobile ticketing are available.
Non-Emergency Medical Transport (NEMT)	Specialized DRT for healthcare access	Currently available only by phone booking. The pilot will introduce an app-based booking system for improved convenience.
Accessibility for specific target groups (e.g. elderly, disabled, etc.)	DRT with accessibility features	No digital accessibility information is currently provided. New tools will include stop accessibility data and text-to-speech features.
Other:	Seasonal shuttle services (e.g., Pohorje)	Trip planning and ticketing services are available via the city's website.

Criticalities /challenges regarding digitalization of the existing services in the pilot area

The pilot area faces several critical challenges related to the digitalization of its existing public transport services. These challenges impact the effectiveness, accessibility, and user acceptance of the current system, particularly in the context of flexible mobility services. The key criticalities are as follows:

1. Limited user acceptance, particularly among elderly users

- Older adults, who constitute a growing portion of the city's population, often find it difficult to use existing digital platforms for public transport services.

2. Fragmented digital infrastructure

- The existing systems for ticketing, trip planning, and real-time information operate independently.

3. Inconsistent real-time information

- Real-time bus arrival and departure information is available only at selected stops.

4. Limited availability of digital options for flexible services (DRT)

- Booking DRT and non-emergency medical transport services still requires manual phone calls.

5. Accessibility gaps for persons with disabilities

- The current digital tools provide minimal information regarding accessible stops and transport services.

6. Limited awareness and low engagement with digital tools

Many residents are unaware of the full functionality of the existing mobile app and digital services.

Expected changes to be introduced in the next 3 years to face the abovementioned criticalities/challenges (within and beyond the DEGREE4ALPS project)

We have outlined a series of key changes over the next three years to address the criticalities and challenges related to the digitalization of public transport services. These changes, supported by the DEGREE4ALPS project and other ongoing initiatives, aim to improve accessibility, efficiency, and user satisfaction across the mobility network. The expected changes include:

Challenge	What	How	Impact
Unified mobility platform	Integrate trip planning, ticketing, DRT booking, and real-time information into one platform.	Connect existing systems, upgrade GPS tracking, and improve user interface.	Simpler and more user-friendly transport experience.
Digitalization of DRT Services	Enable app-based booking for demand-responsive transport (DRT).	Develop a booking app, implement route optimization, and offer flexible service options.	Better service in peripheral areas and for healthcare-related trips.
Real-time information improvements	Provide accurate, real-time bus information.	Upgrade GPS systems, install more info displays, and enhance app functionality.	Reduced waiting times and smoother transfers.
Accessibility upgrades	Improve access for elderly and disabled passengers.	Add accessibility info in the app, introduce audio/text guides and organize workshops.	Increased independence for vulnerable groups.
Energy monitoring system	Optimize energy use in the e-bus fleet.	Install monitoring devices, implement predictive charging models and integrate renewable energy.	Lower operational costs and reduced emissions.
Public awareness and education	Increase public awareness of new transport tools.	Organize events, create guides, and engage with schools.	Higher adoption of digital services, especially among elderly users.

Timeline Overview (2024-2027)

- Year 1 (2024-2025): Pilot launch of DRT digital services and implementation of energy flow monitoring system.
- Year 2 (2025-2026): Expansion of DRT services, launch of the integrated transport app, and installation of multimodal information displays.
- Year 3 (2026-2027): Full-scale optimization of DRT services, final deployment of energy optimization tools, and continued infrastructure improvements.

3.3.3. Digitalization of mobility services to enhance green mobility operations

The Municipality of Maribor is leveraging digital monitoring tools and renewable energy integration to improve energy efficiency and reduce the carbon footprint of its public transport network. The DEGREE4ALPS project will play a crucial role in optimizing these processes and promoting sustainable, technology-driven mobility solutions.

Monitoring of fleets and their consumption

Subject Responsible: Marprom d.o.o. (PT operator)

Digital Solution:

- Installation of telematics systems on all buses to monitor fuel and energy consumption.
- Integration of GPS tracking with real-time consumption data.

Functional Objectives:

- Optimize driving behavior through eco-driving analysis.
- Identify inefficient driving patterns to reduce fuel consumption.
- Support maintenance planning by monitoring engine performance and energy use.

Provide training to drivers to encourage energy-efficient driving practices.

Monitoring energy flows in charging stations:

Subject Responsible: Municipality of Maribor & Marprom d.o.o.

Digital Solution:

- Deployment of energy monitoring software at charging stations used for e-bus charging.
- Installation of smart meters to track energy input, consumption, and losses.

Functional Objectives:

- Optimize charging schedules to reduce peak-time energy consumption.
- Enable real-time monitoring to detect potential system malfunctions.
- Integrate charging infrastructure with solar energy sources where available.

Support long-term planning by analyzing energy flow trends.

Additional key-success-factors:

Subject Responsible: Municipality of Maribor (Mobility Department)

Digital Solution:

- Implementation of a digital energy management platform to link solar panel production with e-bus charging.

- Development of predictive algorithms to forecast energy demand and supply.

Functional Objectives:

- Maximize the use of locally generated solar power for public transport operations.
- Reduce dependency on the conventional power grid.
- Support municipal sustainability goals by reducing carbon emissions.

Provide real-time insights into energy production and usage for city planners.

3.4. Šmartno pri Litiji

3.4.1. Territory and mobility context

Territory and existing services

The pilot area of **Šmartno pri Litiji**, a municipality with about 5730 inhabitants across 95 square kilometers, reflects the typical challenges of rural and peri-urban territories characterized by dispersed settlements and reliance on neighboring municipality for essential services. Several socioeconomic and cultural trends significantly influence mobility in this area:

Depopulation and aging population

- The rural settlements surrounding the town center are sparsely populated and are home to many older residents who rely on public or free transport services.
- Aging trends increase the demand for accessible and flexible transport options, especially during weekdays when existing services are operational.
- The lack of weekend transport leaves older adults isolated and unable to access essential services or engage in social activities.

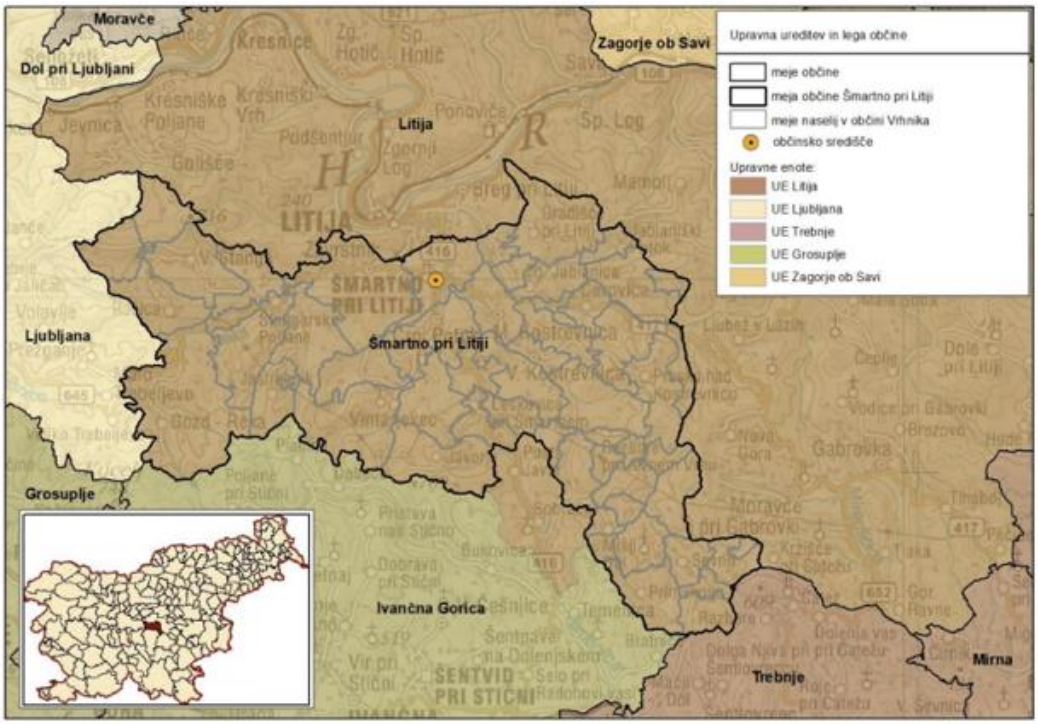

Figure 24: Načrt preskrbe z zemljišči v občini Šmartno pri Litiji, Lučka, okoljske in prostorske študije, Vanja Šendlinger s.p. (https://obcina.smartno.si/wp-content/uploads/2023/05/Nacrt-preskrbe-Smartno-III-faza-25.04.2023.pdf)

Urban-rural connectivity

- The municipality lacks key services such as a health center, large administrative offices, or major retail outlets. Residents must travel to the neighboring municipality of Litija for these necessities.
- Litija's railway station serves as the primary link to larger cities like Ljubljana, making inter-municipal mobility critical for socioeconomic activities.

Motorization and car dependency

- Private car use dominates due to the lack of frequent, reliable public transport options, especially for reaching remote settlements or tourist sites.
- Local events and festivals exacerbate this trend, as participants drive to venues, resulting in insufficient parking spaces and higher carbon emissions.
- Parents heavily rely on private vehicles to transport children to sports clubs or extracurricular activities, which creates logistical burdens and environmental impacts.

Digital divide and lack of automation

- The free transport service for elderly residents is managed manually, requiring significant human resources and coordination.
- Absence of digital tools for booking and coordinating transport limits scalability and efficiency, restricting the system's ability to respond to growing mobility needs.

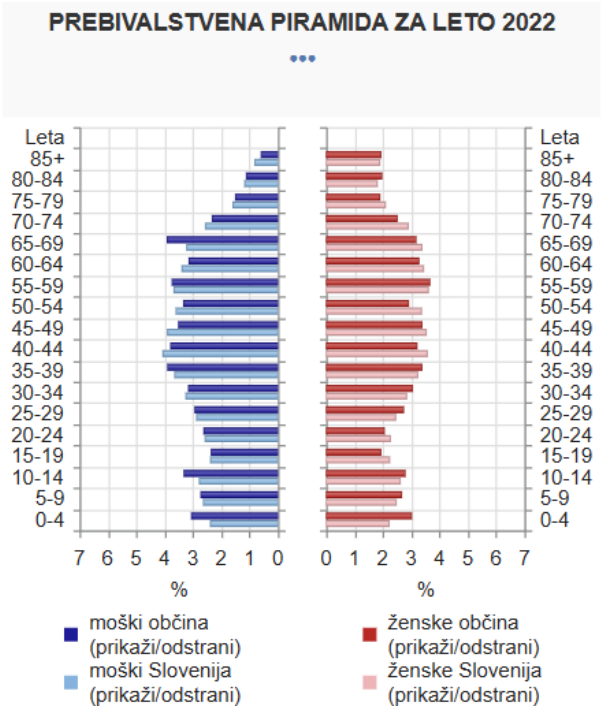

Figure 25: Statistical Office of the Republic of Slovenia: https://www.stat.si/obcine/sl/Municip/Index/178

Tourism and accessibility challenges

- Local tourist attractions are poorly connected to public transport, making them difficult to access without a private car.
- This limitation hampers tourism potential and economic development while discouraging sustainable mobility practices.

Social and cultural preferences

- Car-centric habits are deeply ingrained, even for local trips and event attendance.
- Parents and families are accustomed to driving children to activities, but this creates inefficiencies and limits the ability of some children to participate fully in extracurricular opportunities.

Addressing these trends through the implementation of digital, flexible, and on-demand transport solutions (e.g., DRT systems) is essential. The solutions must cater to the mobility needs of:

- Older adults requiring better access to health, social, and recreational activities.
- Families needing support with school-related and extracurricular transport.
- Event attendees and tourists who need alternative modes of transport to reduce reliance on private cars.

By integrating modern digital tools and fostering behavioral shifts towards shared and sustainable transport options, the pilot can improve mobility inclusivity, reduce carbon footprints, and enhance the quality of life for all residents.

RELEVANT FLOWS

Residential areas to Litija train station

A significant flow occurs between residential areas and the Litija train station, which serves as a gateway to the regional and national transportation network. Many residents rely on the train station to commute to larger cities like Ljubljana for work, education, or other activities. These trips are most frequent during morning and evening peak hours, corresponding to commuting patterns.

Residential areas to Litija town center

Another flow is between residential areas in Šmartno pri Litiji and neighboring municipality Litija. Access to essential services unavailable in Šmartno pri Litiji, including administrative services, healthcare (Common Health Care Centre), and shopping (larger stores). Regular flow during working days particularly for elderly residents using their own car, the **Sopotnik** free transport service or limited inter-municipal public bus services.

Residential areas to Šmartno pri Litiji town center

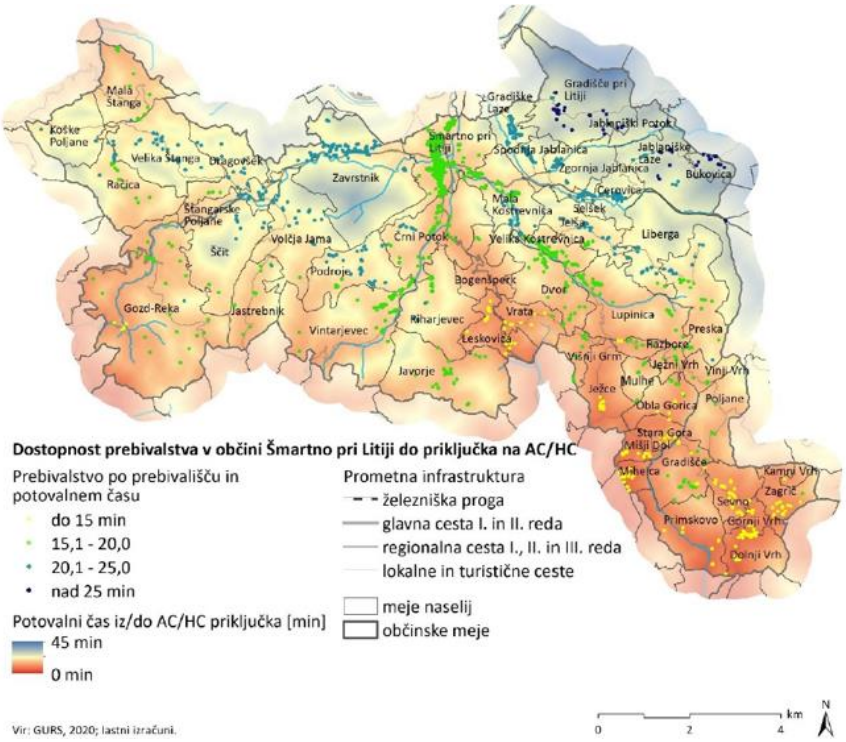

Figure 26: Accessibility of the population of the municipality to a highway or expressway connection. Source: GURS, 2020

Within Šmartno pri Litiji municipality, flows between residential areas and the town center are vital for access to work, local school, municipal services, and smaller local shops. These trips occur daily and involve a broad spectrum of the population, including students, workers, and older residents. However, the limited frequency of public transport outside peak hours often necessitates private car use, which increases congestion and environmental impact. A notable flow exists for children traveling from residential areas to school, local sports clubs and extracurricular activities. Parents frequently transport their children to school, practices, matches, or lessons, creating a substantial logistical burden. In some cases, parents must dedicate significant time to transport, leading to inefficiencies and environmental costs. The lack of shared or coordinated transport options for these activities poses a barrier to equitable access.

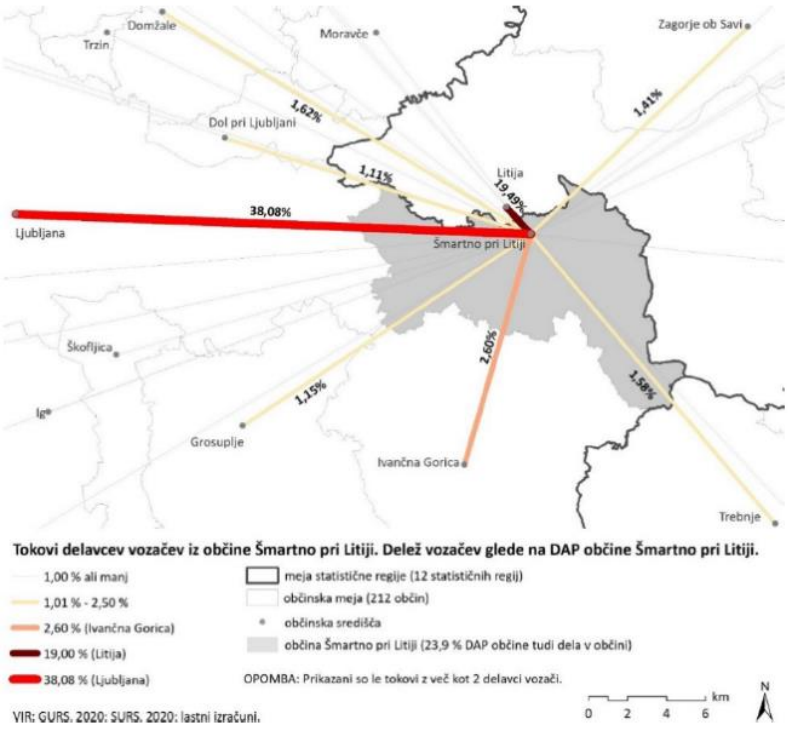

Figure 27: Traffic flows of workers from the municipality of Šmartno pri Litiji - Source: GURS, 2020: SURS 2020

Event-related flows to remote locations

Event-related flows are a significant mobility challenge. Many local events and festivals occur in remote rural locations or in the town center, drawing large numbers of attendees. During such events, private cars are the predominant mode of transport, resulting in parking shortages and traffic congestion. These issues are exacerbated by the lack of public transport options that connect the train station in neighboring municipality to event locations (Bogenšperk).

LOCAL TRANSIT

Local public transport in the pilot area is primarily inter-municipal, with buses connecting Šmartno pri Litiji to neighboring Litija. This service operates only on weekdays, with more frequent trips in the mornings and reduced services in the afternoons. It is managed at the local level, and the target group includes commuters, students, and other residents traveling for daily activities.

REGIONAL BUSES

Regional bus services are not directly available in Šmartno pri Litiji but can be accessed in the neighboring municipality of Litija. These services provide essential connections to other municipalities within the region, catering to commuters and individuals traveling for work or education. While they are operated by larger bus companies, they are coordinated at the national level within the Integrated Public Passenger Transport (IJPP) system.

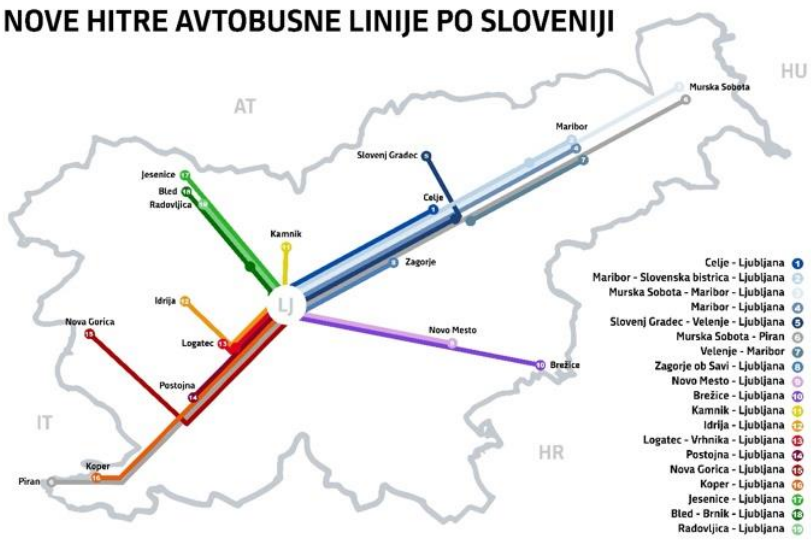

Figure 28: Public bus lines from Litija.
(Source: Ministrstvo za infrastrukturo (https://www.gov.si/novice/2019-06-19-uporabnikom-prijaznejsi-in-hitrejsi-javni-prevoz/#group-26110-2))

REGIONAL TRAINS

The Litija train station, located in the neighboring municipality, provides regional and suburban railway services. Managed at the national level by Slovenske železnice (Slovenian Railways), it connects the area to major cities, including Ljubljana. This service is essential for daily commuters and students traveling to larger urban centers.

DRT SERVICES

Demand-Responsive Transport (DRT) is provided through the **Sopotnik** service, which offers free transport for the elderly. However, this service operates only during weekdays, with limited hours, and is reliant on volunteer drivers. It is governed at the local level and specifically targets elderly residents.

CARPOOLING

Carpooling in the pilot area occurs informally and is often organized within local communities or among parents transporting children to sports or extracurricular activities. Additionally, carpooling is common among coworkers commuting to work in Ljubljana, as many residents of Šmartno pri Litiji travel to the capital for employment. Despite its prevalence, there are no formal platforms or initiatives promoting or supporting carpooling in the area, leaving these arrangements to be coordinated informally among individuals.

BIKE SHARING

The "Po kolo" bike-sharing system operates in the pilot area as part of a unified bicycle rental scheme spanning three municipalities in central Slovenia: Litija, Dol pri Ljubljani, and Šmartno pri Litiji. The system offers a total of 15 bicycles, including one equipped with an auxiliary electric drive. Users can rent these bicycles with a valid annual or daily package. Each municipality hosts a rental station equipped with 10 electrified bike locks, suitable for securing conventional bicycles and charging electric ones.

3.4.2. Digitalization of mobility services to improve accessibility for all citizens

The pilot area faces several critical challenges related to its existing transport services, significantly affecting mobility and accessibility for residents. While there is an operational connection between Šmartno pri Litiji and Litija through inter-municipal buses, these services primarily cater to the town center. Buses run approximately every half an hour during morning and afternoon rush hours and hourly in between. However, for residents of more remote settlements surrounding Šmartno pri Litiji, connections are highly irregular, with only two buses per day at inconvenient times. This creates a reliance on private cars to access the town center before connecting to other modes of transport, undermining the accessibility of the existing public transport system.

The underdevelopment of transport digitalization also poses challenges. The free transport service for the elderly lacks an automated system for managing ride requests and scheduling. Instead, the process relies on manual data entry and coordination, which is both time-intensive and inefficient. Additionally, the availability of volunteers to provide this service is limited, further restricting its reach and reliability.

The pilot area also lacks robust sustainable transport options. While the "Po kolo" bike-sharing system includes some conventional and electric bikes, its limited scale and availability fail to address the broader mobility needs of residents. There are no formal systems for car-sharing or carpooling, which could otherwise serve as viable alternatives to reduce reliance on private vehicles.

Transport challenges are particularly acute during local events and festivals, especially those held in remote areas. In the absence of tailored public transport or event-specific services, visitors depend on private vehicles, leading to traffic congestion, parking shortages, and increased carbon emissions. These problems are further exacerbated by the lack of sustainable travel options to local tourist sites, which often remain inaccessible without a car, thereby limiting visitor numbers and discouraging environmentally friendly travel.

Another pressing issue is the fact that children who train in local sports clubs often face significant challenges when traveling to matches, as this responsibility typically falls on their parents. In some cases, one parent may transport several children, while in others, a parent may drive only their child. This arrangement is not only time-consuming for parents, who often have demanding schedules, but also adds to the carbon footprint, particularly when rides are not shared efficiently. Similarly, children attending extracurricular activities face difficulties in accessing transportation to these activities and returning home. This dual burden places a significant strain on parents, who frequently have to rely on grandparents for

assistance—an option that is often not viable due to mobility limitations. The logistical difficulties associated with transporting children to matches and activities can even lead to children missing out on opportunities to participate.

Over the next three years, we aim to introduce transformative improvements to address critical mobility challenges and enhance transportation services within the pilot area. The overarching goal is to complement and upgrade existing services with innovative, integrated solutions that effectively meet the diverse needs of the community.

A noteworthy change that has already been implemented at the start of the project is the addition of an electric vehicle to supplement existing public transport options. This step represents a significant milestone, providing an immediate improvement to the mobility landscape. While the current impact is measurable—through data comparing pre-implementation conditions and the interim benefits of the electric vehicle, further integration with digital systems remains essential. A comprehensive analysis of the overall change will be developed during later project phases, once physical and digital solutions are fully integrated.

Our primary focus is to develop a unified digital system that will integrate and enhance existing services. This system will encompass features such as the ability to book transport with the electric vehicle, schedule free transport for the elderly, coordinate volunteers, access inter-municipal service timetables, and receive real-time updates on delays.

The goal is to make transport services more accessible and efficient for everyone. Older adults will benefit from improved accessibility to essential services, with easier booking options for free transport and the new electric vehicle service. Tailored mobility solutions will enable sports clubs to easily organize group travel to matches and provide reliable transport for children attending after-school activities. This will alleviate the burden on parents and promote sustainability by reducing reliance on private vehicles. Local events and festivals will be supported with enhanced transport options, especially for visitors traveling by train to Litija, addressing the last-mile connectivity challenge and helping reduce parking and pollution issues caused by private car use.

Lastly, we aim to complement and improve public transport in areas where it is currently insufficient or inadequate, ensuring that the mobility needs of all community members are met effectively.

With reference to the main services described in the previous section, we aim to implement digital solutions that could enhance accessibility, efficiency, and user experience for all citizens, including those in underserved areas. While we are committed to pursuing these improvements, the full realization of these goals will depend on various factors, including available resources, technological feasibility, and community response.

Our intention is to develop a unified digital platform that integrates various mobility services into a single accessible system. This platform is envisioned to include features such as:

- **Transport booking and scheduling**: A system where users can book rides with the electric vehicle, schedule free transport for the elderly, and coordinate trips to events or extracurricular activities.
- **Real-time information**: Updates on inter-municipal bus schedules, delays, and changes to improve reliability and planning for users.

- **Volunteer coordination**: Streamlining the organization of free transport services for elderly users by simplifying the process of assigning and managing volunteers.
- **Multi-modal integration**: Connecting different transport modes to facilitate smoother transitions, such as between buses, electric shuttles, and walking routes.

We aspire to design the platform to be inclusive and user-friendly, particularly for elderly users. Features such as larger text, simplified interfaces, and alternative booking methods (e.g., call centers or SMS) will be considered to ensure accessibility for all.

We also aim for the system to include analytical tools to collect and analyse data on mobility demand, user demographics, energy consumption, and feedback. These insights would help us refine the services over time, tailoring them to better meet community needs.

While these plans represent our vision for digitalizing mobility services, their full implementation remains an ambition. Practical constraints, such as funding and technical challenges, may require adjustments or prioritization of certain elements. However, our commitment is to make as much progress as possible toward achieving a more accessible, efficient, and inclusive mobility system.

LEVELS OF DIGITALIZATION

Functionality / Service	Description	Trip planning	Booking	Ticketing	Payment	Billing	Real Time
Local Transit							
Regional buses							
Regional railway	Slovenian Railways application						
Bike Sharing							
DRT							
Car Pooling							

Main service scope/target groups of flexible mobility services in the area

Scope/target group	Type of service	Level of digitalization (describe if suitable)
First last/mile connections within traditional transport networks	Local Public Transport and Bike Sharing ("Po Kolo" system).	Local Public Transport: No digitalization, fixed timetables, and physical tickets. Bike Sharing: Moderate digitalization, with digital payment and user login at bike stations. No real-time updates or trip planning features. Operates seasonally (spring-autumn).
Integration of traditional transport networks in off	Local Public Transport and Flexible services to complement transport	Local Public Transport has no digitalization: Fixed schedules and no real-time updates. Flexible services are

peak off season	during low-demand periods (future need).	not yet implemented but could leverage digital tools for demand-based scheduling and real-time user information.
Stand-alone services for regular users/commuters (workers, students)	Local Public Transport (currently) and Flexible services for daily commuters (future need).	Local Public Transport: No digitalization, no real-time tracking or user profiles. Flexible services could include digital booking systems, real-time updates, and commuter-focused platforms for improved service.
Non-Emergency Medical Transport (NEMT)	Sopotnik program (free transport for elderly individuals).	Currently manual: Phone-based reservations and spreadsheet coordination; digital booking platforms could simplify the process, improve efficiency, and enhance user experience.
Accessibility for specific target groups (e.g. elderly, disabled, etc.)	Sopotnik and Flexible transport services designed to meet specific needs, such as door-to-door services.	Sopotnik is manual: Phone-based reservations and coordination via spreadsheets. Flexible transport could benefit from digital platforms to streamline booking and improve accessibility for all users.
Other:	Shuttle services to popular destinations, local festivals, and events, as well as transport for sports clubs to matches and activities (not yet implemented).	No digitalization: These services are needed but currently unavailable. Digital solutions could include booking systems, real-time updates, and scheduling for group transport (e.g., sports clubs).

3.4.3. Digitalization of mobility services to enhance green mobility operations

Many existing mobility services in the pilot area, such as Sopotnik (free transport for the elderly) and local public transport, lack digital platforms for booking, scheduling, or real-time updates. This absence hinders efficient coordination and limits service accessibility.

Older adults and individuals unfamiliar with digital technologies may resist adopting digital solutions. Ensuring user-friendly interfaces and providing alternative options (e.g., phone support) is crucial to overcoming this challenge. Even where some digital options exist, like the bike-sharing system Po Kolo, the interface may not be fully intuitive for all users. For example, the process of logging in at a computer terminal or mobile app may pose difficulties for less tech-savvy individuals.

Currently, there is no centralized platform that integrates all mobility services (e.g., local transport, regional transport, bike-sharing, and free transport for the elderly). This fragmentation complicates user navigation and limits the efficiency of service coordination.

Developing and maintaining digital platforms require financial resources, technical expertise, and staff training, which may not always be readily available.

Implementing digital systems raises questions about the collection, storage, and management of personal data, particularly for vulnerable groups like the elderly.

Addressing these criticalities will require tailored solutions, including digital education campaigns, hybrid booking systems (digital and manual), infrastructure upgrades, and the development of a unified mobility platform.

We aim to create a unified platform to integrate electric shuttle service, local public transport, Sopotnik services, regional transport and other. This platform would streamline booking, scheduling, and coordination

of services, improving user experience and service efficiency.

To accommodate users less familiar with digital technology, we plan to implement hybrid booking systems that combine digital platforms with traditional methods, such as phone-based support for older adults using Sopotnik or similar services.

We aim to introduce pilot projects for on-demand transport services with integrated digital booking and real-time tracking to test their feasibility and scalability.

Cooperation with municipalities, transport providers, and local communities will be intensified to co-design digital solutions that meet diverse needs and ensure successful implementation.

We intend to regularly assess the impact of introduced digital solutions through data collection and feedback mechanisms to refine services and address emerging challenges

Integrated platforms that combine route optimization, ridesharing, and on-demand services can reduce the number of vehicles on the road, thereby lowering emissions. These platforms enable users to access multiple transport options, such as electric shuttles, bike-sharing, and public transport, in a seamless and environmentally friendly manner.

EMS integrated with mobility services can optimize the use of renewable energy sources for electric vehicle (EV) charging. For example, smart charging stations powered by solar or wind energy could dynamically adjust charging rates based on energy availability and demand.

Collecting and analysing real-time data on traffic patterns, energy usage, and service demand can enable proactive adjustments to reduce congestion, energy waste, and emissions. This includes dynamic scheduling of transport services to align with peak demand times.

Contactless and digital ticketing reduces paper waste and encourages the use of public transport and shared mobility options. These systems also streamline operations, making green mobility more appealing.

Apps and platforms can inform users about the environmental impact of their transport choices, encouraging shifts toward sustainable options. Gamification features, such as tracking CO2 savings, can further motivate greener behaviours.

Monitoring of fleets and their consumption

Subject responsible (e.g. PT operator, car sharing company, private company, infrastructure manager, etc.): Local municipality, public transport operator, or the entity managing the fleet.

Description of the digital solution:

- **Spreadsheets with digital input forms:** Drivers enter mileage, energy usage, and trip details into a cloud-based spreadsheet or mobile app form.
- **Basic fleet tracking apps:** Use affordable tools like Google Maps Timeline or entry-level GPS apps that provide simple data on routes and energy use.
- **Smartphone eco-driving apps:** Leverage existing apps (like Fuelio or Drivvo) that track fuel or energy consumption based on user inputs or basic vehicle sensors.
- **QR code check-in/out system:** Install QR codes on vehicles for drivers to scan, logging the start and end of trips with timestamps and basic trip data.

Functionalities objectives (eco-driving, energy efficiency, integration of renewables, etc.):

- Eco-driving: Encourage more efficient driving through app-based tips and feedback.
- Energy efficiency: Track fleet usage trends with digital logs and simple data analytics.

Although electric vehicles (EVs) are part of the mobility mix, their availability is still limited in the pilot area, and there is insufficient infrastructure for charging them. The lack of a comprehensive network of EV charging stations and the absence of real-time information about available charging points make it difficult for residents to rely on EVs for everyday mobility, limiting the overall impact of green mobility solutions.

There is a general lack of awareness among the local population regarding the benefits of green mobility options. Many people are still unaware of the available services (e.g., electric vehicle rental, bike-sharing), which results in low adoption rates. Additionally, traditional transport modes, like personal cars, are often more convenient or familiar to users, making it harder to shift habits toward more sustainable modes of transport.

The **digital divide** remains a challenge, particularly for older adults and residents with limited access to technology. The transition to digital systems, such as booking, trip planning, and tracking, may exclude certain groups of the population who are not comfortable with or lack access to digital platforms. Ensuring that green mobility services are accessible to all requires addressing these barriers and creating user-friendly interfaces for less tech-savvy users.

The cost of developing and maintaining digital platforms for green mobility services can be a barrier to their implementation, especially for smaller municipalities or private service providers. Limited funding and resources may hinder the adoption of comprehensive digital solutions that could enhance the efficiency and attractiveness of green mobility services.

One of the primary goals is to create an **integrated digital platform** that connects various green mobility. This platform will enable users to plan their trips, book services, and access real-time information on transport availability, delays. This integration will streamline mobility options, making it easier for users to choose sustainable transport methods and reduce reliance on private cars.

The project will work towards better coordination between traditional and green mobility services.

To promote the adoption of green mobility options, **awareness campaigns** will be launched to educate the local population about the benefits of sustainable transport. This will include information on available services, how to use them, and the environmental impact of choosing green mobility. Incentives such as discounts or free trials may also be introduced to encourage people to switch from private car use to more sustainable options.

3.5. Ticino

3.5.1. Territory and mobility context

Territory and existing services

Canton Ticino faces significant mobility challenges, which are deeply influenced by a combination of aging demographics, urban sprawl, and the region's complex geography, characterized by numerous valleys, mountains, and small, scattered towns. The mountainous terrain creates natural barriers for efficient transportation networks, leading to uneven public transport coverage, especially in rural and peripheral areas. In contrast, more urbanized areas like Lugano, Bellinzona, and Locarno have relatively well-developed infrastructure, but even these urban centers struggle with congestion and a growing demand for sustainable solutions.

The region's aging population is another key factor, with older adults requiring specialized mobility services and more accessible transport options. This demographic shift places additional pressure on both public transport systems and the demand for services like Demand-Responsive Transport (DRT). Urban sprawl further complicates mobility, as increasing distances between residential and commercial areas reduces the efficiency of public transport and promotes a higher reliance on private vehicles, contributing to traffic congestion and pollution.

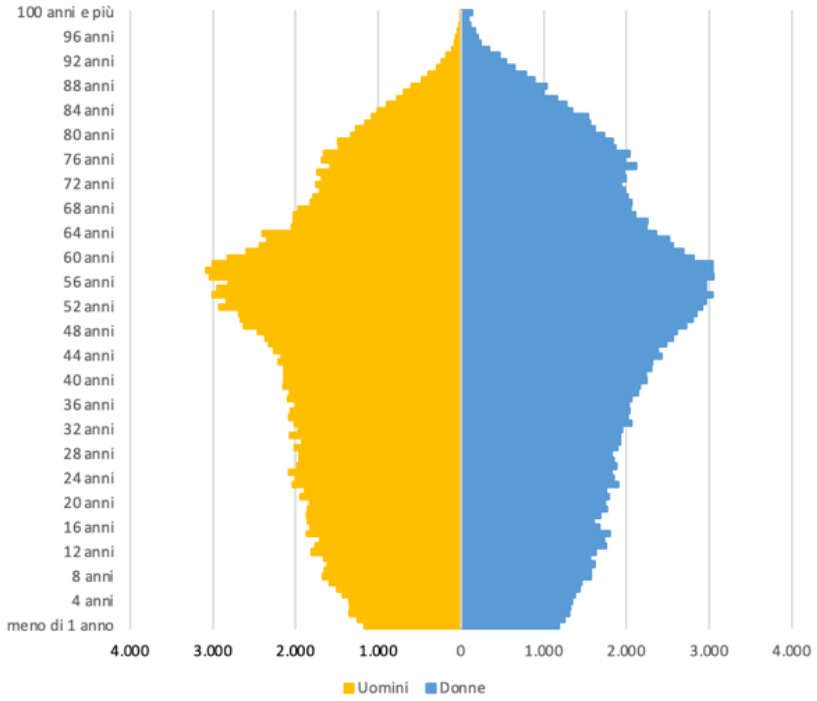

Figure 29: Age structure diagram until 2009 (ESPOP, from 2010 STATPOP, UST)

Moreover, depopulation in rural areas, particularly in the southern and mountain regions, exacerbates these mobility challenges. As younger people move to urban centers for better employment opportunities, the

remaining residents, often elderly, are left with limited mobility options. This situation is compounded by motorization trends, where private car ownership remains high, but public transport options are insufficient to meet the needs of the population, particularly in off-peak and non-urban areas.

These factors together create a fragmented and uneven mobility landscape in Canton Ticino, where accessibility and connectivity between rural and urban areas remain significant challenges. Bridging these gaps through digital and innovative mobility solutions is crucial for fostering greater equity, social inclusion, and environmental sustainability in the region.

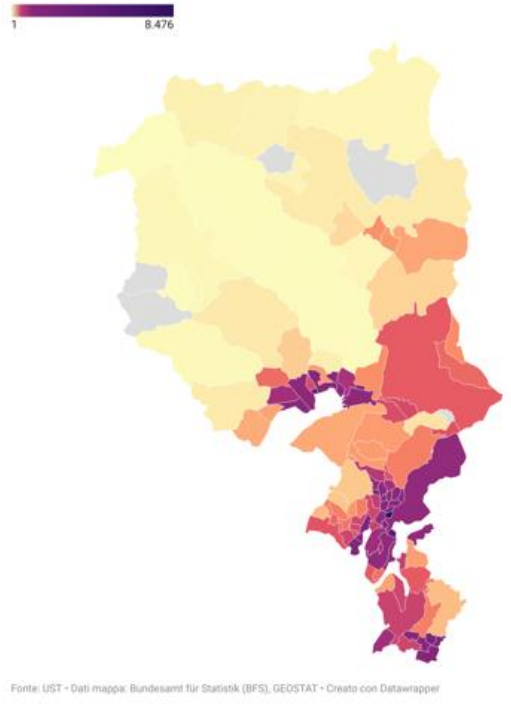

Figure 31: Population per Municipality BSF-GeoStat

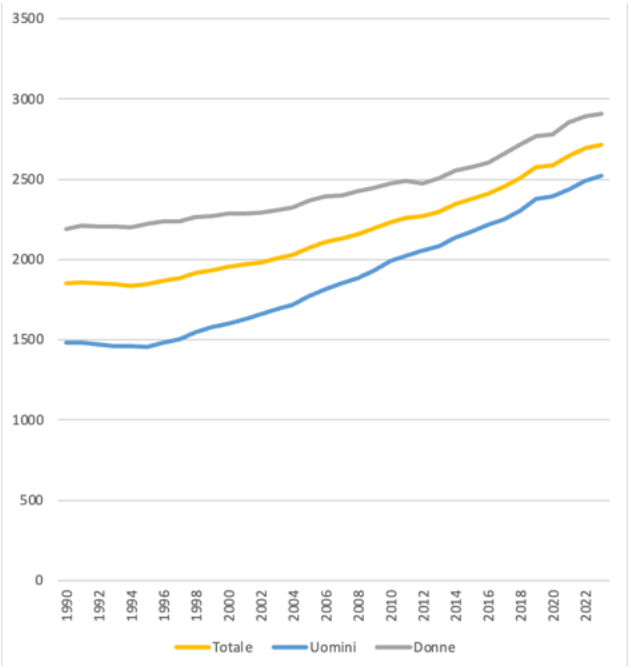

Figure 30: Seniority Index – source: until 2009 RSPOP, from 2010 STATPOP, UST

The most relevant travel flows in Ticino are primarily shaped by the region's urban and rural dynamics. A significant portion of daily travel involves commuting between residential areas and the major urban centers of Lugano, Bellinzona, and Locarno, where employment, education, and commercial activities are concentrated. These flows reflect a clear centralization of economic opportunities in these cities, with many residents from surrounding towns and villages traveling daily to access them. In addition to these local commuting patterns, there are important cross-border flows, particularly with Italy. The proximity of Ticino to northern Italy creates a high volume of cross-border commutes for both work and leisure, with residents traveling south to the Lombardy region and vice versa, creating pressure on transport networks.

Another key aspect of the travel landscape in Ticino is the movement towards the region's tourist destinations in the Alps. The region is renowned for its scenic beauty, with areas like the Lago Maggiore and the nearby mountains attracting large numbers of visitors throughout the year. This includes both domestic tourism within Switzerland and international visitors, particularly from Italy. Key nodes in this network include the main train stations in Lugano, Bellinzona, and Locarno, which serve as hubs for both local and

international travel. The seamless connectivity between these urban centers and the wider regional and international transport networks—particularly the Swiss Federal Railways (SBB) system and cross-border train services—plays a crucial role in facilitating these travel flows.

As such, optimizing the transport infrastructure around these key travel flows, ensuring efficient integration of different modes of transport, and expanding digital tools for better connectivity will be essential for improving mobility within the region. These travel patterns highlight the need for both efficient public transport solutions and integrated digital services that cater to commuters, cross-border travelers, and tourists alike.

LOCAL TRANSIT

Local public transport in Ticino includes buses operated by regional and municipal transport agencies. The governance is primarily local and cantonal. These services cater to daily commuters, students, and tourists. The **Comunità tariffale Ticino e Moesano**, also known by its marketing name arcobaleno, is a Swiss tariff network covering the whole of the canton of Ticino, together with the Moesano district of the canton of Graubünden. Arcobaleno offers various kinds of tickets, from single tickets to annual season tickets, which are valid on the buses, trains and boats of the operators that are members of the network. Tickets are only valid within the arcobaleno area, and a few operators have further restrictions on which tickets are accepted on which services. Ticket prices are based on zones, with 49 zones covering the whole of the arcobaleno area, whilst season tickets use a coarser zone structure of only 16 zones. Tickets are available from the offices of the operators. Ticket machines sell a range of tickets at railway stations and urban bus stops. Where ticket machines are not available at bus stops, tickets may be obtained from the bus driver.

REGIONAL BUSES

Regional buses link smaller towns and villages to urban centers, operated by cantonal authorities.

- Autolinee Bleniesi (ABL)
- Autolinea Mendrisiense (AMSA)
- Autolinee Regionali Luganesi (ARL)
- Ferrovie Autolinee Regionali Ticinesi (FART)
- PostBus Switzerland
- Trasporti Pubblici Luganesi (TPL)

REGIONAL TRAINS

The suburban railway network, part of the Swiss Federal Railways (SBB), connects Ticino's cities and integrates with the national and international rail system, targeting all population segments.

- Swiss Federal Railways (FFS)
- Treni Regionali Ticino Lombardia (TILO)
- Ferrovie Luganesi (FLP)

LONG DISTANCE BUSES

Long-distance buses are mostly targeting tourists and occasional travellers. In Ticino, FlixBus connects the

region to major cities and destinations in Switzerland, Italy, and other European countries. Popular routes include connections to Milan, Zurich, and other cultural and business hubs.

TAXIS & Private Hire Vehicles

Private hire vehicles such as Uber are limited, primarily due to strict regulations. According to the Swiss legislation, Uber drivers must be considered as employees and not autonomous workers. Traditional taxi services operate in urban areas but are relatively costly.

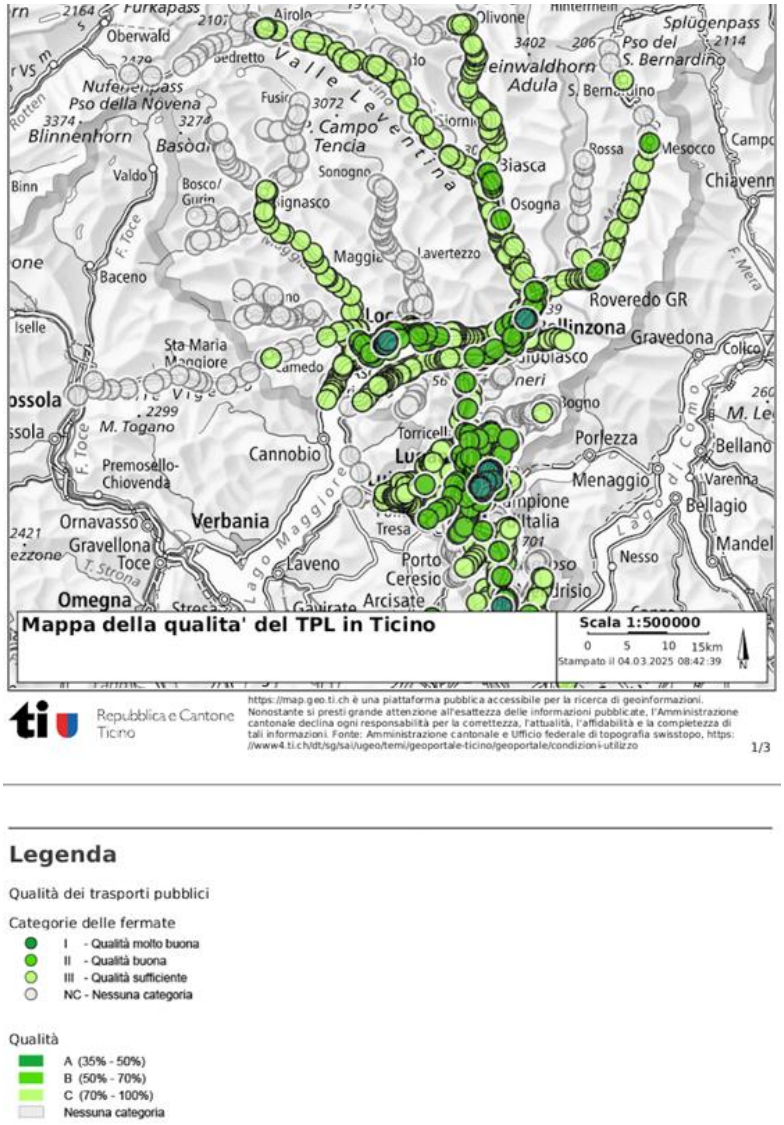

Figure 32: Canton of Ticino, Department of Territory – Public Transport Quality Map, geoportal data (2025).

DRT SERVICES

Demand-responsive transport (DRT) services are underdeveloped but are being piloted in some rural areas, targeting elderly and low-mobility users (i.e. Vallemaggia).

CARPOOLING

Carpooling platforms exist but have limited uptake due to cultural preferences for private vehicles. **BePooler** is based in Lugano and is an innovative platform designed to connect commuters with similar routes, enabling seamless carpooling solutions. The platform automatically calculates travel costs and matches users based on schedules and itineraries. To encourage adoption, BePooler provides incentives such as reserved parking spots, fuel vouchers, and dedicated stop areas. It also tracks key metrics like CO2 emissions saved, the number of carpools formed, and user satisfaction, contributing to sustainable mobility goals. For more details, visit BePooler.

CAR SHARING

Car sharing services like Mobility operate in urban areas, targeting environmentally conscious users and those without personal vehicles.

BIKE SHARING

Bike sharing is available in larger cities such as Lugano, targeting commuters and tourists. However, coverage is limited outside urban areas.

- Publibike - Bike sharing Mendrisiotto e Basso Ceresio
- Bike Sharing Locarno VELOSPOT
- Bellinzona e-bike sharing

Publibike - Bike sharing Lugano

NAVIGATION AND LIFTS

Other services include not only specialized transport for individuals with disabilities but also a variety of other transportation options available in Ticino, such as lake navigation services, funicular railways, and other unique means of mobility that enhance connectivity and accessibility across the region

- Funicolare Locarno - Madonna del Sasso (FLMS)
- Navigazione Lago Maggiore (NLM)
- Società Navigazione del Lago di Lugano (SNL)

3.5.2. Digitalization of mobility services to improve accessibility for all citizens

Critical issues in Canton Ticino's mobility landscape include the insufficient frequency of public transport services in rural and peripheral areas, which leaves many residents dependent on private vehicles. This limited-service frequency affects access to employment, education, healthcare, and social activities, particularly for vulnerable groups such as the elderly and low-income households. Additionally, there is a notable lack of integration across various transport modes, including buses, trains, and emerging shared mobility options like car sharing and bike sharing. This fragmentation creates inefficiencies in trip planning, ticketing, and seamless connections between modes, discouraging the use of public and shared transport.

Another significant challenge is ensuring **reliable last-mile connectivity**, especially in remote areas and neighbourhoods that are poorly served by existing infrastructure. This gap often forces commuters and travellers to rely on cars for short trips, further contributing to traffic congestion and environmental issues. Addressing these issues requires coordinated efforts to improve service frequency, enhance multimodal integration, and develop innovative solutions like demand-responsive transport (DRT) or active mobility options, such as bike-sharing networks and pedestrian-friendly infrastructure. These changes are essential for creating a more inclusive, efficient, and sustainable mobility system in the region.

Over the next three years, mobility initiatives in Canton Ticino will prioritize improving the **integration of transport services**, piloting innovative digital tools for trip planning and ticketing, and expanding Demand-Responsive Transport (DRT) services to better serve rural and underserved areas. These efforts align with the goals outlined in the DEGREE4ALPS framework, which focuses on enhancing accessibility, social inclusion, and sustainability through innovative mobility solutions.

Service integration will be a cornerstone of these initiatives. For example, integrating regional buses, local trains, and bike-sharing networks into a unified platform will allow passengers to seamlessly plan trips across different modes of transport. Such efforts may leverage platforms like Mobility-as-a-Service (MaaS. Successful MaaS implementations in Swiss urban regions provide a model for Ticino to follow - MaaS Alliance), which has been successfully implemented in other regions of Switzerland. This approach aims to reduce dependency on private vehicles while improving convenience for users.

Digital tools will also play a key role in enhancing user experience and accessibility. Pilots are expected to test mobile applications that combine real-time information, route planning, and ticket purchasing in a single interface. For instance, expanding the capabilities of the Arcobaleno app (Arcobaleno's ongoing development of integrated ticketing for buses and trains provides a foundation for further digital innovation - Arcobaleno Official Website) to include multimodal trip planning and contactless payment options could streamline mobility for residents and tourists alike. Additionally, these tools could include features such as real-time updates on vehicle availability for car sharing or bike-sharing services.

Demand-Responsive Transport (DRT) services will be expanded to address the mobility needs of rural communities. These services, which provide flexible, on-demand transport, are particularly beneficial in areas with low population density where fixed-route public transport is not economically viable. Similar initiatives, such as PostBus's PubliCar service in rural Switzerland (DRT solutions implemented in rural Switzerland demonstrate how flexible transport services can improve access for underserved populations - PostBus Website), have shown promise in improving mobility for elderly residents, those without access to

private vehicles, and individuals with limited mobility. In Ticino, pilot projects may test app-based DRT systems, allowing users to book rides dynamically, thus improving accessibility and efficiency.

In addition to improving mobility services, these initiatives will also align with **sustainability goals**. Enhancing service integration and expanding DRT can reduce reliance on private cars, contributing to lower greenhouse gas emissions. Moreover, integrating renewable energy sources into mobility infrastructure, such as solar-powered charging stations for e-bikes or electric buses, will further support Ticino's efforts toward greener transport solutions.

LEVELS OF DIGITALIZATION

Functionality / Service	Description	Trip planning	Booking	Ticketing	Payment	Billing	Real Time
Local Transit	SBB app and Arcobaleno app	■		■	■		■
Regional Buses	"	■		■	■		■
Regional railway	SBB App	■	■	■	■	■	■
TAXI	App of each taxi provider/cooperative		■		■		
DRT	Piloted apps for route optimization	■	■				■
Car Pooling	Platforms like BlaBlaCar or BePooler enable ride-sharing.	■	■		■	■	■
Car Sharing	App Mobility	■	■		■	■	
Bike Sharing	App Publibike	■	■		■	■	

Main service scope/target groups of flexible mobility services in the area

Scope/target group	Type of service	Level of digitalization (describe if suitable)
First last/mile connections within traditional transport networks	DRT, bike sharing, car sharing	Limited app-based services (e.g., Mobility for car sharing, Publibike for bikes).
Integration of traditional transport networks in off peak off season	Regional buses, suburban railway (limited)	Limited options; existing services rely on manual planning rather than real-time digital integration.
Stand-alone services for regular users/commuters (workers, students)	Suburban railway, carpooling, and DRT	Apps like BlaBlaCar or Bepoooler for carpooling and DRT pilots; real-time updates sometimes unavailable.
Non-Emergency Medical Transport (NEMT)	Specialized transport for elderly/disabled	Mostly non-digital; booking via phone; no real-time tracking.
Accessibility for specific target groups (e.g. elderly, disabled, etc.)	Specialized buses, DRT	Digitalization limited to pilot phases.
Other:	Cross-border carpooling (Italy), rural access services	Apps exist but lack widespread adoption.

Criticalities /challenges regarding digitalization of the existing services in the pilot area

- Acceptance by specific user groups: Older residents and rural populations often face difficulties

adopting digital solutions due to a lack of familiarity or trust in technology.
- Bad user experience: Existing digital platforms sometimes lack intuitive interfaces or multilingual support, reducing accessibility for non-native speakers.
- Limited availability of digital options: Certain areas, particularly rural regions, suffer from poor internet connectivity, hindering the use of digital tools like real-time tracking and app-based bookings.

Integration issues: Current mobility services are not fully integrated, leading to fragmented ticketing and trip planning systems.

Expected changes to be introduced in the next 3 years to face the abovementioned criticalities/challenges (within and beyond the DEGREE4ALPS project)

- Enhanced Digital Tools: Development of user-friendly, multilingual apps that provide integrated trip planning, ticketing, and payment solutions.
- Increased Connectivity: Investments in digital infrastructure (e.g., expanding 4G/5G networks) to improve coverage in rural and remote areas.
- User Training Programs: Initiatives to educate older and less tech-savvy users about digital mobility tools, fostering broader acceptance.
- Service Integration: Implementation of platforms that integrate multiple modes of transport (e.g., buses, trains, and shared mobility) into a single digital ecosystem.

Pilot Programs Expansion: Scaling up pilot projects for Demand-Responsive Transport (DRT) to improve rural access and optimize resources.

3.5.3. Digitalization of mobility services to enhance green mobility operations

We identified the following topics:

- Fleet Monitoring and Optimization;
- Energy Flow Monitoring at Charging Stations

AI-Driven Solutions for Predictive Maintenance, Renewable Energy Integration Platforms and Mobility-as-a-Service (MaaS) Platforms.

Fleet monitoring is conducted by public transport operators using digital tools to optimize routes and reduce fuel consumption.

Objectives: Reduce energy use, lower emissions, and support eco-driving practices.

Energy monitoring at charging stations is managed by energy companies to ensure efficient integration with renewable sources.

Objectives: Improve energy efficiency and support the use of green energy in e-mobility.

Other solutions include the use of AI for eco-driving and predictive maintenance, Renewable Energy

Integration Platforms and Mobility-as-a-Service (MaaS) Platforms.

Objectives: Extend the lifespan of vehicles and reduce emissions caused by inefficiencies, decarbonize energy supply for electric vehicle operations and promote a shift from private car usage to shared and sustainable mobility modes.

Key challenges include high upfront costs, interoperability issues, and limited public understanding of green solutions.

Future changes will emphasize expanding charging infrastructure, integrating renewable energy sources, and increasing awareness of green mobility options.

3.6. München Oberland

3.6.1. Territory and mobility context

Territory and existing services

The pilot area reaches the south of Munich including the Bavarian Pre-alps, a still largely rural region and consists of five counties. The region is one of the strongest economically in Germany today: small and medium sized companies are located in the north, tourism, agriculture and forestry characterizes the south. More than 500k people live in this region, which can be reached by various motorways, regional train network or via bus connections. Public transport reaches its capacity limits on weekends with sunny weather forecasts on its lines towards the alps. Measures to extend the current infrastructure network (longer trains, more frequent connections) are currently at their limit. In the near future the regional train network will not be able to further develop due to limited county financial resources (Metropolregion München. n.d.).

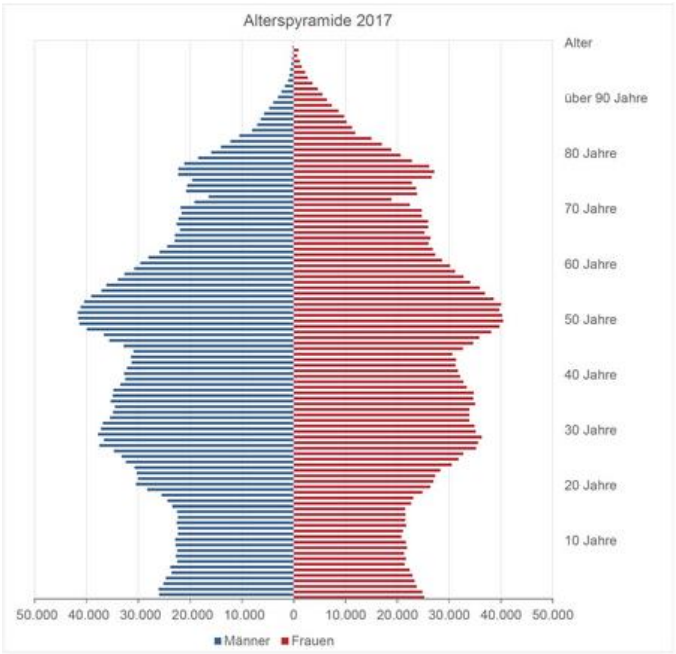

Figure 33: Population Development from 1980 to 2017 in Percent

The urban territory itself is one of the largest areas in Germany (in terms of employee's subject to social security contributions) for the automotive industry (more than 1,000 companies, car producers such as BMW, Mini, Audi are located there); about 5,000 cars are produced in the Munich Metropolitan Region on average per day (Metropolregion München. n.d.).

Since recent years' mobility sharing offers such as e-scooters, bicycles or cars/transporters have been trending, especially in the urban areas. However, these short time rental solutions are only available in very small numbers in the rural region and only with fixed pick up/return points.

(Younger) People in the rural region tend to own their own motorized vehicles (due to the limited availability

of public transport options as well as due to social structures) compared to the same age groups in urban areas.

Generally, the main traffic flows are on weekdays from the rural region to the urban area of Munich but on the weekends the dynamic is reversed since leisure travel from the city to the mountains takes place.

The main relevant flows for the pilot are the routes between public transport such as train or bus stations and tourist points of interest (e. g. hiking paths to peaks) in the valleys.

LOCAL TRANSIT

The Gemeindewerk Garmisch-Partenkirchen is the local bus service provider. The main actor is the Garmisch-Partenkirchen council and its main target groups are the population of the area as well as tourists to the area (Gemeindewerk Garmisch-Partenkirchen, n.d.).

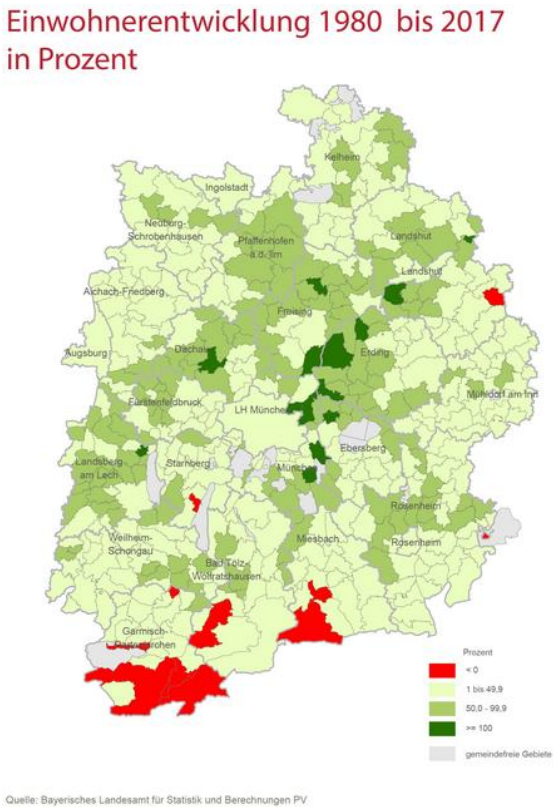

Figure 34: Population Development from 1980 to 2017 in Percent

RoVG is the public transportation service provider for Rosenheim and its surrounding areas. The main actor is the private "Rosenheim Verkehrsgesellschaft mbH". The main target groups are people who life in or near Rosenheim without a driving license or a parking spot in the inner city (Rosenheim Verkehrsgesellschaft mbH, n.d.).

Omnibus H. Wengler is a private local bus service provider. The main actor is the "Wengler Reisen" company. Its main target group is the population of and in the surrounding areas of Traunstein (Wengler, n.d.).

Brodschelm Verkehrsbetrieb GmbH is a private local bus service provider. The main actor is the "Brodschelm Verkehrsbetrieb GmbH" company. Its main target group is the population of and in the surrounding areas of Traunstein (Brodschelm Verkehrsbetrieb GmbH, n.d.).

Hövels GmbH & Co.KG is a private local bus service provider. The main actor is the "Hövels GmbH & Co.KG" company. Its main target group is the population of and in the surrounding area Traunstein (Hövels GmbH & Co. KG, n.d.).

The Münchner Verkehrs- und Tarifverbund GmbH (MVV) is a private limited liability company. The company coordinates the cooperation of the transport companies (trams, buses, subways, S-Bahn and regional trains) in the Bavarian capital Munich, the surrounding districts of Bad Tölz-Wolfratshausen, Dachau, Ebersberg, Erding, Freising, Fürstenfeldbruck, Miesbach, Rosenheim and Starnberg as well as the independent city of Rosenheim (Münchner Verkehrs- und Tarifverbund GmbH, n.d.).

REGIONAL BUSES

RVO is the regional bus transportation service provider for upper Bavaria. The main actor is the "Deutsche Bahn". Its main target group is the population in the entirety of upper Bavaria without a driver´s license (Deutsche Bahn, n.d.).

SUBURBAN BUSES

Chiemgauer Lokalbahn is a regional train association that was founded with the aim of putting the Bad Endorf – Obing railway line back into operation, maintaining it and starting regular tourist traffic. The main actor is the "Chiemgauer Lokalbahn e.V." association (Chiemgauer Lokalbahn e.V., n.d.).

BRB (Bayerische Oberlandbahn GmbH) is a regional train service provider. The main actor is the "Transdev GmbH" company. Its main target group is the population in the area of München-Oberland (Transdev GmbH, n.d.).

DB Deutsche Bahn is the national railway company of Germany, and a state-owned enterprise under the control of the German government. The main actor is the "DB Fernverkehr AG" and "DB Regio" with its public sector client Bayerische Eisenbahngesellschaft (BEG) (https://www.bahn.de/).

PRIVATE HIRE VEHICLES

Garmisch-Partenkirchen: Private local taxi services.

Bad Tölz-Wolfratshausen: Private local taxi services.

Miesbach: hoibehoibe-Taxi is a project that aims to make user groups with special support needs in rural areas more mobile. It works with subsidised taxi vouchers and the main target groups are young people (14 - 26 years), senior citizens (aged 65 and over) and holders of a disabled person's pass. The main actor is the county of Miesbach (Landkreis Miesbach, n.d.).

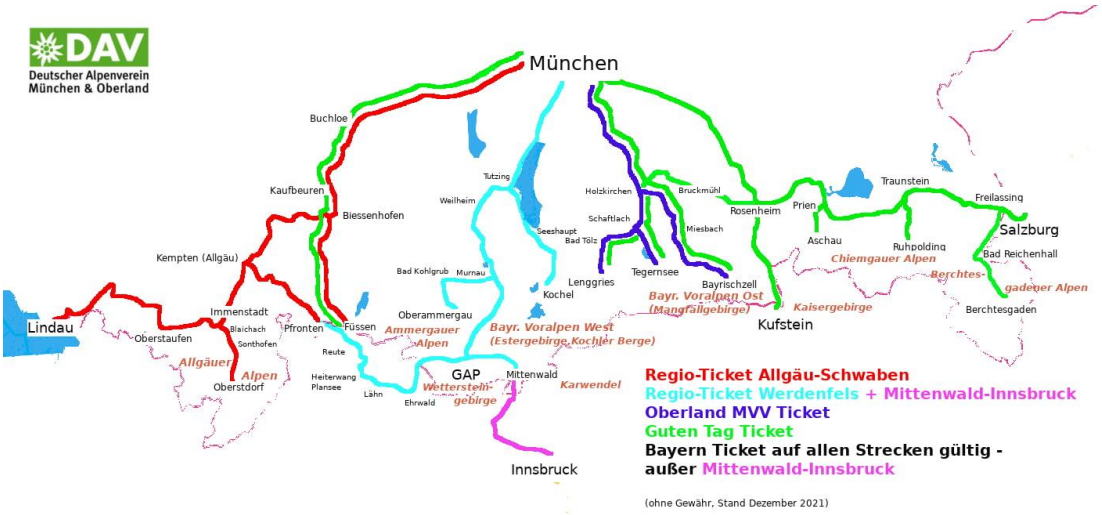

Figure 35: Deutscher Alpenverein (DAV) München & Oberland, regional rail ticket map.

DRT SERVICES

The "Blaue Land Bus" is a local DRT service in the region of Garmisch-Partenkirchen. It is a mixture of bus and taxi and can be ordered independently from other bus timetables by app or telephone. The main actor is the county of Garmisch-Partenkirchen. Its main target groups are people who want to use the public transport service independently from timetables (Landkreis Garmisch-Partenkirchen, n.d.; omobi, n.d.).

The hoki+ is a local DRT service in the region of Miesbach. It is a bus but can be ordered independently from other bus timetables by app or telephone. The main actor is the county of Miesbach. Its main target groups are people who want to use the public transport service independently from timetables (Landkreis Miesbach, n.d.).

Rosi is a local DRT service in the region of Rosenheim. The special thing about the buses is that they are electric. There is no fixed route: the passengers can decide the starting point, destination and time of the journey. Its main target groups are people who want to use the public transport service independent from timetables or fixed routes. The main actor is the Rosenheimer Verkehrsgesellschaft m.b.H (Rosenheimer Verkehrsgesellschaft mbH, n.d.).

Rosenheimer AST is a shared call taxi service that allows passengers to travel to their exact destination from early in the morning until late at night, seven days a week. People can hop on at any bus stop with an AST sign. The main target groups are people with restricted mobility who do not drive or do not have access to a private car and are not able to take the bus. The main actor is Stadtwerke Rosenheim GmbH & Co. KG (Stadtwerke Rosenheim GmbH & Co. KG, n.d.).

Rupi Bus is a local DRT service in the region of Traunstein. The main actor is the county of Traunstein. It can be ordered independently from other bus timetables by app or telephone. Its main target groups are people who want to use the public transport service independently from timetables (Landkreis Traunstein, n.d.).

CARPOOLING

Moobly is a project by the travel agency of the German Alpince Club (DAV Summit Club). It is currently in its development phase and operates as a start-up (DAV Summit Club, n.d.).

CAR SHARING

Garmisch-Partenkirchen: private local and national carsharing services.

Bad Tölz-Wolfratshausen: private local and national carsharing services.

Rosenheim: Private local and national car sharing services.

Stattauto Isarwinkel is a carsharing association, which also drives senior citizens who do not (or no longer) wish to drive themselves. The service can be booked via telephone. The main target group are senior citizens. The main actor is Stattauto Isarwinkel e.V. (Stattauto Isarwinkel, n.d.).

The car sharing project of the municipality of Neubeuern is an initiative whereby the municipality makes its own e-Golf, used for official purposes by the town hall, and which is also available to the public. The service can be booked via an app. The main target group are the citizens of Neubeuern. The main actor is Market town of Neubeuern (Marktgemeinde Neubeuern, n.d.).

Traunstein: private local and national carsharing.

BIKE SHARING

The Markt Neubeuern provides a bike sharing service for its inhabitants. The main actor hereby is the village council of Markt Neubeuern. The main target population are people with shorter transportation distances or tourists in the region (Marktgemeinde Neubeuern, n.d.).

The MVV is a regional public transportation service which also offers bike sharing (Münchner Verkehrs- und Tarifverbund GmbH, n.d.). The main actor is the “Münchner Verkehrs- und Tarifverbund GmbH“. The main target group is the population of the areas which are part of the MVV and use the bikes for transportation or commuting.

OTHER

Approximately 50 tramping benches in Garmisch-Partenkirchen, Bad Tölz-Wolfratshausen, Miesbach, Rosenheim and Traunstein are going to be positioned by the Alpenverein München & Oberland in 2025. The main target groups are people who do not have access to a privately-owned car and do not have a public transportation option on a regular basis. The tramping benches serve as an addition to existing connections. (Alpenverein München-Oberland. (n.d.). DAV Mitfahrbankerl).

3.6.2. Digitalization of mobility services to improve accessibility for all citizens

Criticalities/challenges for the existing services in the pilot area

The challenges comprise of various aspects such as getting from public transport stations to points of interest (e.g. hiking paths to peaks) in the valleys: last mile, irregular or no bus connections, inconsistent tariffs (cross border), inability to take sports equipment (skies, bikes), as well as limits in public transport capacity during weekend peaks (day excursions). Moreover, every county has its own mobility concept/app, resulting in isolated solutions.

Expected changes to be introduced in the next 3 years to face the above-mentioned criticalities/challenges (within and beyond the DEGREE4ALPS project)

Installation of 40 to 50 passenger benches to bridge the last mile between the tour starting point and, for example, the train station; Installation at highly frequented tour starting points and hiking parking spaces, which are currently difficult to reach by public transport, e.g. due to limited offers and overcrowding on certain routes (e.g. Walchensee, Eibsee, Spitzingsee);

The Münchner Bergbus and Bergbus Eng, both lines which are organized or supported by the Alpenverein München & Oberland will again operate for the hiking season in 2025.

In December 2025, an interregional important bus line will start operating, the “Alpenbus”. The Alpenbus creates the connection from Rosenheim to the Oberland without having to go through Munich. It will enhance the accessibility of rural areas (Stadt Rosenheim, n.d.).

The district of Garmisch-Partenkirchen is going to join the MVV in order to improve integration into the regional transport network and offer citizens and guests standardized tariffs and coordinated timetables (Münchner Verkehrs- und Tarifverbund GmbH, n.d.).

LEVELS OF DIGITALIZATION

Functionality / Service	Description	Trip planning	Booking	Ticketing	Payment	Billing	Real Time
Local Transit	App and Website of the MVV	■	■	■	■	■	■
Regional buses	App and Website of the RVO	■	■	■	■	■	■
Regional railway	App and Website of the BRB	■	■	■	■	■	■
Taxis / Private Hire	Only UBER						
DRT	Trips can be scheduled for the respective areas where the DRTs drive via the app but the ride can’t be tracked in real time	■	■	■	■	■	

Car Pooling	Only BlaBlaCar						
Car Sharing	Each individual service has its own app						
Bike Sharing	Each individual service has its own app						

Main service scope/target groups of flexible mobility services in the area

Scope/target group	Type of service	Level of digitalization (describe if suitable)
First/last mile connections within traditional transport networks	Caritas Fahrradstation Gleis 1: Is a bicycle parking garage in Rosenheim, where (privately owned) bikes can be stored or rented. Though the costs of storing one's own bike there is much cheaper than renting one. The garage can be accessed 24/7 via a chip system and daily, monthly or yearly tickets can be purchased (Caritas, n.d.). Bike & Ride Box: The Bike & Ride Box in Traunstein is a green box at the train station in which commuters can store their privately-owned bikes. The box can only be accessed with a security card. (Stadt Traunstein, n.d.).	Tickets can only be bought in person from the service team, who work at the garage during the service times from Monday to Friday. Though the chip system is completely digitalized placing it in the mid-range of digitalization. The card must be bought in person at the townhall. But as above the rest is digitalized so it's in the mid-range of digitalization.
Integration of traditional transport networks in off peak off season	Supra-regional: Chiemseeringlinie, is a seasonal bus (summer), free for owners of the cards "Gästekarte" in the region of Rosenheim and the "Gästekarte" of the Traunstein region (Chiemsee Alpenland Tourismus, n.d.).	This is the only integrated service.
Stand-alone services for regular users/commuters (workers, students)	MiO - Mitfahren im Oberland: Carpooling platform for employees of participating companies (MiO - Mitfahren im Oberland, n.d.). Traunstein: PENDLA is a search engine for commuters in the Traunstein region (Traunstein PENDLA, n.d.). Nationwide: Pendlerportal is a website as well as an app through which commuters can search for other people with the same route. After the commuter found a fitting route he/she can contact the other person through the app/website and create a commuter carpool (Pendlerportal, n.d.).	Available as apps or at least websites for matching/reserving trips.
Non-Emergency Medical Transport (NEMT)	Supra-regional: Fahrdienst Bavarian Red Cross (BRK) Transport of elderly, sick or injured people without the need for immediate medical care to and from doctor's appointments or home from hospitals, (Bavarian Red Cross, n.d.)	The DRK has an app that displays nearby locations and services. However, the app only has contact information displayed, without the possibility to book directly through the app. So, the level of digitalization is moderate. This is the only digitalized service for NEMT, but it covers a large part of the services in the area.
Accessibility for specific target groups (e.g. elderly, disabled, etc.)	Transport services that are equipped for special needs and can transport people in wheelchairs for example. **Rosenheim Region:** There are multiple taxi services in Rosenheim that offer transportation for people with disabilities or other bodily restrictions. One example: the Inn-Taxi-Behindertenfahrdienst. Modern wheelchairs can be transported in every car	The taxi can be ordered completely online via their website. So, it is in the mid to high range of digitalization. The level of digitalization from the other companies ranges from low to mid.

	of the taxi service. Cars for special needs passengers, for example electronic wheelchairs or if the person wants or needs to sit in the wheelchair are also available (Inn-Taxi Rosenheim, n.d.).	
	Bad Tölz-Wolfratshausen Region: There are multiple taxi services in the region of Bad Tölz-Wolfratshausen that offer transportation for people with disabilities or other bodily restrictions. E.g. Much-Taxiunternehmen. The company offers special rides for elderly or disabled people with specialized cars (Much-Taxiunternehmen, n.d.).	On their website there is the possibility to order the Taxi via WhatsApp so it is in the lower to middle range of digitalization. The level of digitalization from the other companies ranges from low to mid.
	Miesbach Region: There are multiple taxi services in the Miesbach region, that offer transportation for people with disabilities or other bodily restrictions. E.g. Oberland Taxi, which offers wheelchair transportation or services for elderly people, for example to drive them to their doctor's appointments (Taxi Oberland, n.d.).	On their website there is a contact form through which rides can be ordered, placing it in the mid-range of digitalization. The level of digitalization from the other companies ranges from low to mid.
	Traunstein region: There are multiple taxi services in the Traunstein region, that offer transportation for people with disabilities or other bodily restrictions. E.g. Taxi Simal, which offers wheelchair transportation or services for elderly people, for example to drive them to their doctor's appointments (Taxi Simal, n.d.).	On their Website there is a contact form through which rides can be booked, so it's in the mid-range of digitalization. The level of digitalization from the other companies ranges from low to mid.
	Garmisch-Partenkirchen region: There are multiple taxi services in the Garmisch-Partenkirchen region, that offer transportation for people with disabilities or other bodily restrictions. E.g. Gerum Taxi, which offers wheelchair transportation or services for elderly people, for example to drive them to their doctor's appointments (Gerum Taxi, n.d.).	The taxi company is not digitalized since it doesn't have a website or an app. The level of digitalization from the other companies ranges from low to mid.

Criticalities /challenges regarding digitalization of the existing services in the pilot area

Every county has its own mobility concept/application, resulting in isolated solutions, where concentration or availability of all transport options on all applications would be needed.

Expected changes to be introduced in the next 3 years to face the above-mentioned criticalities/challenges (within and beyond the DEGREE4ALPS project)

Within DEGREE4ALPS:

Digital integration of tramping benches in navigation apps/products, outdoor route planning apps/websites, in carpooling websites /offers/apps and in further public transport navigation apps.

Beyond DEGREE4ALPS:

As part of the MVV integration and the updating of the local transport plan, the implementation of digital passenger information systems is planned in many districts in the region. These should provide real-time data on departure times, delays and connections and be available via mobile apps and digital display boards (IVU Traffic Technologies, n.d.).

Multimodal mobility platforms: To make it easier to switch between different modes of transport, the district is planning to introduce multimodal mobility platforms. These digital platforms link different mobility services and enable users to plan their routes flexibly across several modes of transport. This requires mobility companies to provide real-time data and appropriate technical interfaces (MVV, 2024).

Miesbach: In line with the initiative “Smarte Tourismusregion” real-time data on parking occupancy, traffic flows, the usage of tourist hotspots (such as cable cars and ski resorts), and public transport are collected on a digital platform. AI-based forecasts of visitor numbers for the coming days are to be generated from real-time data, as well as existing data on regional occupancy, mobile phone data, visitor data, and weather data. The goal is to enhance the recreational value of a day-trip destination, reduce traffic congestion, and alleviate overcrowding and the strain on the region caused by day tourism (Bayerisches Staatsministerium für Wohnen, Bau und Verkehr, n.d.).

Garmisch-Partenkirchen: Digitale Gästekarte: Guests in Garmisch-Partenkirchen shall be able to use a digital guest card that offers various services and discounts. The card enables free use of public transport in the region and thus contributes to the promotion of environmentally friendly mobility (GaPa Tourismus, n.d.).

3.6.3. Digitalization of mobility services to enhance green mobility operations

Regarding the hardware: some bus fleets operate with a hybrid or electric motor. The trains of BRB will be electrified in the coming 5 years as they operate on fossil fuels such as Diesel and are testing on hydrogen drive technology (Bayerische Regiobahn (BRB) n.d.). A main critical point is the lack of bus frequency and connections as well as insufficient integration among transport modes regarding information and ticketing. Also, the lack of separate lines in highly occupied motorways/streets for buses/shared vehicles represent a challenge. In the coming3 years we expect to connect mobility data and options which tend to be the key element to the solutions of the traffic challenges produced due to the motorized private transport.

4. Conclusion

Alpine regions face significant mobility challenges, including seasonal fluctuations in transport demand, urban sprawl, and a heavy reliance on private vehicles due to insufficient public transport options, particularly in rural and peripheral areas. These issues create accessibility gaps, especially for vulnerable groups such as the elderly, teenagers, and individuals without private car access. Financial constraints often limit municipalities' abilities to implement dedicated mobility services, making regional cooperation essential for improving cross-regional connectivity. Digitalization offers a transformative opportunity to address these challenges by optimizing fleet operations, integrating renewable energy, and enhancing service accessibility through smart trip-planning tools and demand-responsive transport solutions. However, uneven digital infrastructure, user acceptance, and service integration remain key barriers to fully realizing these benefits. Expanding digital infrastructure, fostering seamless multimodal transport networks, and prioritizing user engagement will be crucial steps toward creating a more inclusive, efficient, and environmentally sustainable mobility ecosystem. Through continued investment, innovation, and cross-regional collaboration, these areas can serve as models for sustainable mobility solutions in other mountainous and geographically complex regions.

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