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## Improvement of Rural Mobility in European Regions Affected by Demographic Change

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### Abstract

Paper presents some of the specific mid-term results of RUMOBIL project. RUMOBIL is project funded by INTERREG CENTRAL EUROPE program. The main objective of RUMOBIL is to improve public transport in rural areas by better connecting them to the national and European transport networks. Project supports transnational cooperation between eight public authorities from Germany, Czech Republic, Poland, Hungary, Slovakia, Croatia and Italy, and their transport entities. These are confronted with a similar challenge to respond to pressures on regional public transport systems caused by demographic change in peripheral areas. Working together provide them with a platform to exchange knowledge, to generate learning through launching pilot applications of state-of-the art tools and solutions, and to revise their transport policies to better suit changing mobility needs. Quicker and more comfortable access by public transport positively contributes to the quality of life in rural areas and supports business activities there. To that aim, a set of evidence-based policy recommendations will be elaborated at the end of the project to improve the capacities of local and regional decision-makers responsible for the design and coordination of public passenger transport in Central European regions affected by demographic change. These recommendations will be presented in the form of the RUMOBIL Model which provides insights in already proven good practices and novel solutions. Main outputs of RUMOBIL project are pilot actions, the elaboration of a RUMOBIL strategy, and policy-decisions to implement this strategy in the eight partner regions through an improvement of their transport plans. Pilot actions allow testing a number of innovative applications during a period 2017-2018 how sparsely populated peripheral areas can be better linked to a primary, secondary or tertiary transport node (access to European and national passenger transport networks).

*Keywords:* rural area; mobility; public transport; on-demand service; service strategy, demographic change

## **1. Introduction**

During the last years there were a lot of policy guidelines and recommendations to encourage, regional, national and European policy makers to develop sustainable mobility in rural areas. As Clotteau (2014) outlined in the guidelines, local mobility has a strong impact on rural community, including local economy, cultural heritage, territorial cohesion, social inclusion or environmental protection. Rural areas present specific challenges, including large trip distances, scattered populations, a high proportion of elderly people, a high level of poverty and unemployment in some regions and often also remoteness from the main transport infrastructure. Many people cannot imagine their life without car because even in the relatively densely populated regions of Europe, rural areas tend to lack public transport and is thus a need for alternative public transport services to support car-free mobility in rural areas. Innovative schemes such as flexible or on demand transport services may be economically viable solutions. They can be efficient while at the same time environmentally friendly.

For RUMOBIL partner regions, which are affected by demographic change, this represents a considerable challenge as populations decline, services of public interest retreat from the periphery and economic activities cease to grow. Increasing distances to reach school, job, social services or shops lead to higher mobility demands of concerned inhabitants while links to national and EU passenger transport networks gain importance. With lower population funds to finance public transportation in rural areas are under pressure to be reduced and therefore need to be spent in the most efficient way possible. RUMOBIL project gives public authorities and their transport authorities the opportunity to address this challenge while at the same time actions to prevent a further population decline are taken.

It is widely believed innovative and creative solutions including ICT must be introduced to maintain and optimize public passenger transport linking peripheral areas most affected by demographic change to major towns which are nodes to passenger transport networks. A number of tools have already been identified by research projects to address this challenge, but lack actual implementation. They include e.g. real-time fleet management based on modern ICT, better coordination between transport modes, improved transport nodes, or flexible solutions to provide access to public transport where demand is low. RUMOBIL allows public authorities and entities responsible for the organization of public passenger transport to assess which solutions are suitable for their rural territories, coordinate those with all relevant actors, and integrate them in their regional public transport. Project aims to improve their planning capacities by an analysis of good practices available elsewhere in Europe, exchange of experiences and knowledge sharing. This enable transport planners to better understand how to optimise the organisation of public transport in peripheral areas affected by demographic change, and how to integrate new approaches and solutions in their strategic and operational transport planning. This approach will lead to the elaboration of a RUMOBIL Strategy (Model) consisting of policy recommendations how public transport is to be designed to better link peripheral areas to national and European transport. Some innovative solutions have been tested in the participating partner regions through pilot experimentations. The concrete results of these on-field experiences will later allow to enrich the model with well-aware guidelines for its practical implementation, depending on the different types of context.

## **2. Methodology**

### *2.1. Learning from Good Practices*

RUMOBIL was influenced and builds upon knowledge of different projects collecting especially information about the experience of innovative measures. To best benefits from already available knowledge, the RUMOBIL partners also realized a number of study-trips to proprietors of good practices in public transport policies and their implementation. The deliverable “Work paper: Learning from Good Practices” aimed at a joint analysis of good practices in Central Europe areas concerning the development of the transport connection between rural territories, in many cases also affected by an aging population, with the main TEN-T nodes. All study trips and good practices concerned at least one of the following project topics, which are the same according to which the project pilots are implemented:

- **new services** to better connect rural areas (e.g. new bus services, solutions to improve the intermodality, new rail services);
- **enhanced passenger information** to increase the quality of PT (public transport);
- **improvement of access points** to national and EU transport network (e.g. upgrading of train and bus stations).

In order to have a clear overview of the most important practices already implemented or planned in Central

Europe, 29 good practices, located in 17 areas and with 5 EU actions, were described and collected. The comparative analysis highlighted for each topic and for each practice:

- **sub-topic**, for a better identification of the main issues tackled;
- **type of location**, highlighting the type of context involved by the practices (e.g. rural areas and peripheral zones of a city);
- **target(s)** of the users which the practice is addressed to, which depends on the specific contexts and local characteristics of the actions;
- **need(s)** to be satisfied of the practice users, which can vary taking into account the local contexts and the population characteristics;
- **main characteristics** of the actions implemented;
- **standardised indicators**, in order to ease the comparison among the practices analysed.

The analysis of the good practices highlighted the following lessons learnt in order to develop an effective service to connect rural areas with their closer and larger cities, here listed in order of importance coherently with what emerged:

- to implement an **integrated and coordinate system** is the most important;
- to implement an **unified tariff system**;
- to **enlarge the network** to the surrounding cities or towns and also beyond country borders;
- to adopt **DRT services** (Demand Responsive Transport) in rural and peripheral areas;
- to involve **small transport companies or taxi services as subcontractors** to provide DRT services;
- to implement **on-demand bus services** organised with volunteer drivers;
- to improve the **information flow** for potential and actual passengers;
- to promote an **info-mobility system** also through web and mobile apps;
- to create an **intermodal systems** also favouring the **use of bike**;
- to cooperate with **the municipalities, regional district and regional PT companies**;
- to involve local **SMEs and private operators**;
- to aim at the **social cohesion**.

Detail comparative analysis is available in the project deliverable – Learning from good practices.

## 2.2. Stakeholder analysis and involvement

In all three project topics, novel technologies or solutions – pilots – in a rural environment have been undertaken in partners' regions during period August 2017 – August 2018. Project partners include different types of organisations as regional public authorities, transport operators (bus, rail), academia, and IT consultancies. However also other stakeholders – parties (organisations, individuals) that have an interest in a project, and can either affect or be affected by the mobility measure were addressed to participate in all three phases of each pilot: its preparation and technical specification, its implementation period of 12 - 18 months, and the following assessment of its success. Citizens and stakeholders involvement is a precondition for successful pilots, since long-term perspective of measure requires a high degree of support and acceptance. The main project stakeholder is a group of residents who are awaiting the arrival of a better transportation system and services in the region. Both individuals and groups of residents in this case are looking forward to the benefits they reap from quicker, more efficient transportation. Besides residents there can be different types of stakeholders in partners' regions. Potential stakeholders were divided into three categories:

- **Primary stakeholders:** who will ultimately be affected by new transport measures (e.g. different social groups — certain municipalities or village communities, elderly people, young people, employed or unemployed people, business branches, tourists, organisations, etc.).
- **Key actors:** who have: political responsibility (mayors, other authority levels); financial resources (public and private funds); the authority (by domain or territory); the skills and expertise (public administrations, universities, private sector) in transport and related domains (land use, environment, education, health, tourism, etc.).
- **Intermediaries:** who implement transport policy (PT and infrastructure operators, public administrations, police, etc.); who carry out major transport activities (PT operators); who represent pertinent interest groups (associations, chambers, cooperatives, networks, NGOs); who inform and report on transport (authorities, operators, local media).

The first step of stakeholder analysis was to brainstorm, who regional stakeholders could be. All piloting partners organised short internal meetings in their organisations with the aim to identify and map stakeholders.

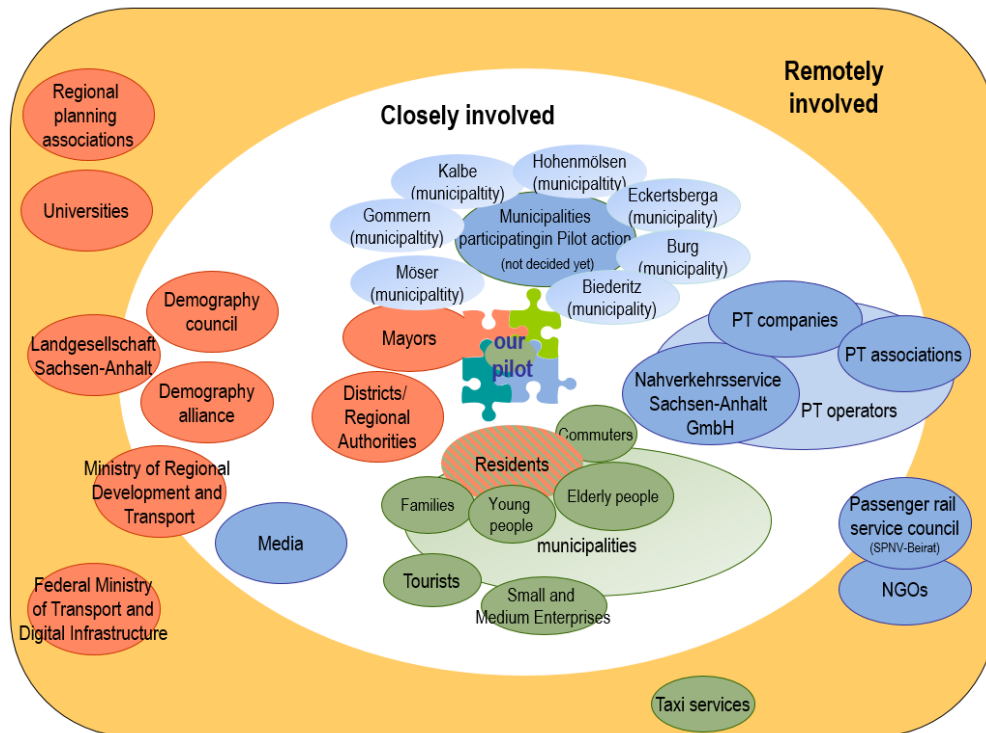


Fig. 1 Example of stakeholder map from Saxony-Anhalt pilot region, Source: RUMOBIL project, Stakeholder involvement report

At Fig. 1 – the stakeholder map<sup>†</sup> – each potential stakeholder occupies a colour-coded bubble (colours stand for the different kinds of stakeholders: green – primary stakeholder, orange – key actor, blue – intermediary). Stakeholders are moved around the pilot project, putting them closer or further away (the proximity indicates the strength of relationship need to be built with them, and their importance). When partners had the list of potential stakeholders they invited them to contribute. Partners tried to involve especially those highly influential and primary stakeholders. Once partners collected the list of stakeholders and created the map, they recorded data in the stakeholder register. Beside basic data as stakeholders’ names and other organisational details also all relevant information about stakeholders such as their interest, influence, expectations, and requirements related to pilot measure were recorded. It was suggested that stakeholders should meet at least three times during pilot implementation. To raise their awareness and to promote their participation in all pilot phases, a transnational publicity campaign has been rolled out too. Moreover, transport policy decision-makers from all partner territories were invited to take part in study trips and other project activities to learn more about RUMOBIL pilots being implemented elsewhere to consider their possible transfer.

### 2.3. Monitoring indicators

Since spring 2017 partners have been performing pilot projects in selected areas as experimental trials, small-scale, short-term projects, which can help them to learn how a larger-scale project might work in practice, in future, in whole region. In this way organizations can test measure, prove its value, feasibility and reveal deficiencies before spending a significant amount of time, energy or money on a larger-scale project. Due to fact that there are various types of pilots, the common comparable set of 50 obligatory indicators was defined. While some indicators are unique or tailored to a specific pilot context, some common indicators were required, with the aim to compare results among partners. Indicators are quantitative and qualitative and divided into five groups. Selected **geographical indicators** describe the location where the pilot action takes place, which can be useful to understand spatial implications, relationship between urban and rural environment etc. These indicators describe geographical features of pilot regions and can be used to compare them among partners.

**Demographic and social** factors are very influential on the public transport demand. Population growth, as a leading factor, and population characteristics (e.g., age structure, the declining proportion of young people, ageing)

<sup>†</sup> RUMOBIL approached stakeholder mapping by the tool developed by the 7<sup>th</sup>FP research project – Changing Behaviour – <http://www.energychange.info>.

have a big impact on the use of public transport in rural regions. Without understanding the transport system dynamics and more importantly, the behaviour of public transport travellers, it would be difficult to make accurate transport demand forecasts, which are necessary for marketing, service planning and fare policy purposes. Selected indicators determine the size of population in covered area and basic groups of population by age distribution. Those groups are related to the potential trend of travel demand in regions. Some partners made more detailed distribution according to social aspects (economic active, pensioners, students, tourists, unemployed...).

**Operational or performance indicators** are widely used in transport planning. Every transportation agency should develop an appropriate set of data that are collected consistently, suitable for planning and evaluation purposes. Performance measurement can support public transport planning in rural areas in many ways. Respecting the aims of RUMOBIL project, selected operational indicators allow to determine if resources were used efficiently and equitably, identify potential problems and wins, and to verify whether a particular pilot achieves its predicted targets.

**Selected economic indicators** reflect to the costs of pilot. They provide information about the feasibility of the pilot and also about its effectiveness during operation. E.g. subsidy rate presents if this kind of new service is highly dependent on the external financing.

**Qualitative indicators** describe the level of satisfaction with a new or existing public transport service and allow passengers to evaluate pilots. Information will be gathered from the survey on the specific sample of respondents using pilot results in area where the operation takes place.

#### *2.4. Demographic change and transport demand in partner regions*

Planning any mobility intervention as well as long-term mobility plans rely on the availability of accurate data. Data gaps and limited administrative capacities for maintaining transport data and using transport demand models limit the ability of decision-makers to evaluate whether a transport project is beneficial if compared with alternative options. Knowing who customers are, where and when they require specific transport services helps to shape a system that is based, above all, on the needs of travellers. Hence collecting reliable information and predicting is an essential task in estimating demand for potential transport services in future.

However, it is not easy to predict future data, since EU is facing unprecedented demographic changes. According to Gløersen et al. (2016), the core long-term structural demographic change in Europe is ageing. This significant demographic change is mainly caused by the transition to a new model of reproductive behaviour of the majority of population. The observation at the NUTS2 and NUTS3 levels between 2000 and 2014 reveals demographic decline across large parts of Europe, especially in: Eastern Europe, Baltic States, Bulgaria, Romania, eastern Germany, or Croatia. In most of these areas, “islands” of demographic growth can be observed just around capital or metropolitan cities. Western European regions experience more limited demographic decline observable at the regional level for instance in: southern Italy, eastern part of the Iberian Peninsula, inner parts of France or northern Scandinavia.

E.g. **Saxony-Anhalt** – RUMOBIL partner region – is the eastern German State with the most unfavourable population development. The demographic situation is characterized by dynamic ageing and pronounced depopulation, especially in remote and sparsely populated rural regions (Fig. 2). Strong and selective out-migration (young adults, and especially young women) is the most important driver of both depopulation and ageing. These trends result in a distorted age- and sex-structure of the population. This region is also burdened with socio-economic problems like unemployment as well as structural economic weaknesses as weak innovative potential of the regional economy, or low wage level, both resulting in low tax revenues.

Each RUMOBIL partner should finish his regional transport demand prognosis in 2018, estimating the number of vehicles and people that will use a specific transportation facility in the region in future. Traffic forecasting has begun with the collection of data on current traffic. Traffic data will be combined with other data, such as population, employment, trip rates, travel costs, etc., to develop a traffic demand model for the current situation. Then future traffic will be estimated by feeding model with predicted data for future.

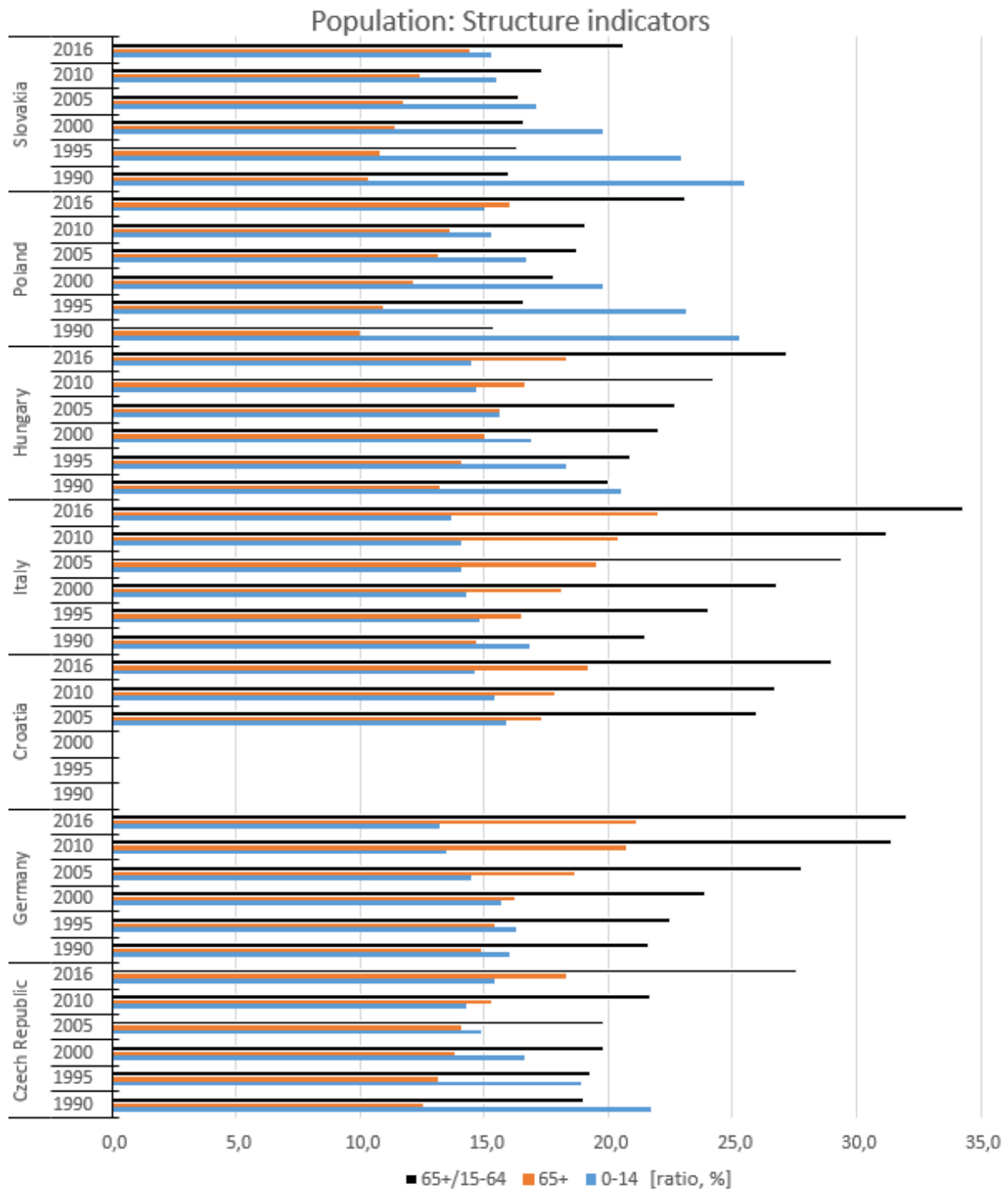


Fig. 2 Population structure indicators by age population groups (group aged 0 - 14 [%], group aged 65 [%], old dependency ratio - population 65 and over to population 15 to 64 years [64+/15-64]), Data source: Eurostat

Fig. 2 shows trend of ageing and population decline in RUMOBIL partner countries. However, there are differences among them. In Slovakia or Poland proportion of population aged 0 - 14 years declined between 1990 and 2016 about 10 %, while in Italy and Germany less than 5 %. Proportion of population aged 65 years and more increased rapidly in all countries. The trend is also visible when compare old dependency ratio (population 65 and over to population 15 to 64 years). The ageing of population together with other factors changed also the households' structure (Fig. 3). Family units are smaller. There are more single persons without children, couples without children or single seniors. So that social institutions will be required more and more to replace family care together with new types of mobility services.

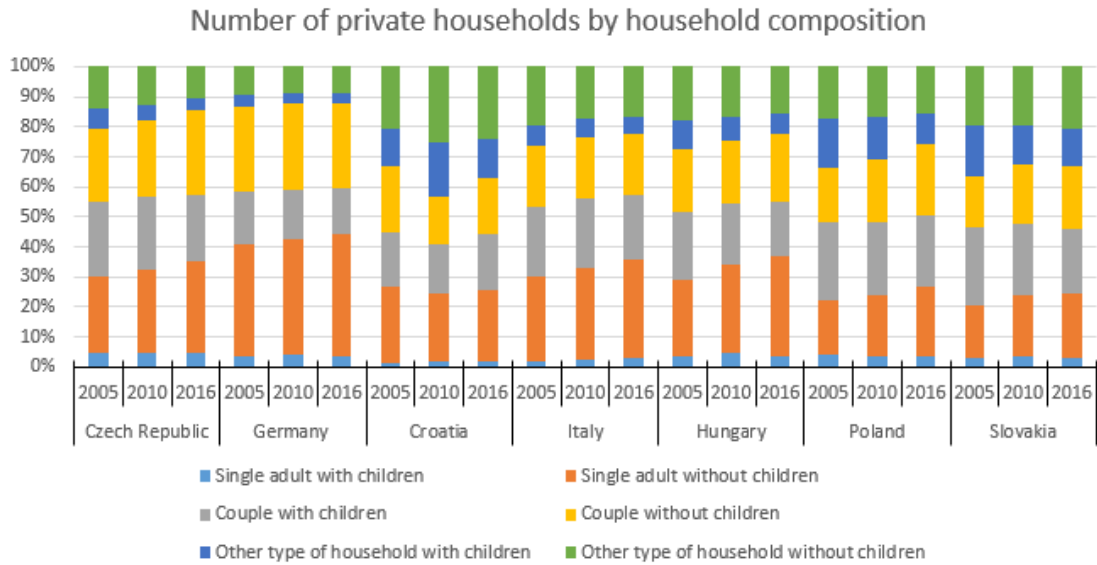


Fig. 3 Households composition trend in RUMOBIL partner countries, Data source: Eurostat

Other major demographic processes and challenges in partner regions include: polarisation, i.e. a concentration of population in urban and metropolitan centres combined with demographic decline in remote rural areas; “thinning out” of population in rural areas; and extra- and intra-European migration. Contrasts are accentuated between regions perceived as offering attractive living environments on the one hand, and declining areas on the other. These combined developments imply that economic recession and lower growth rates tend to accentuate the challenge of population shrinkage at the regional level.

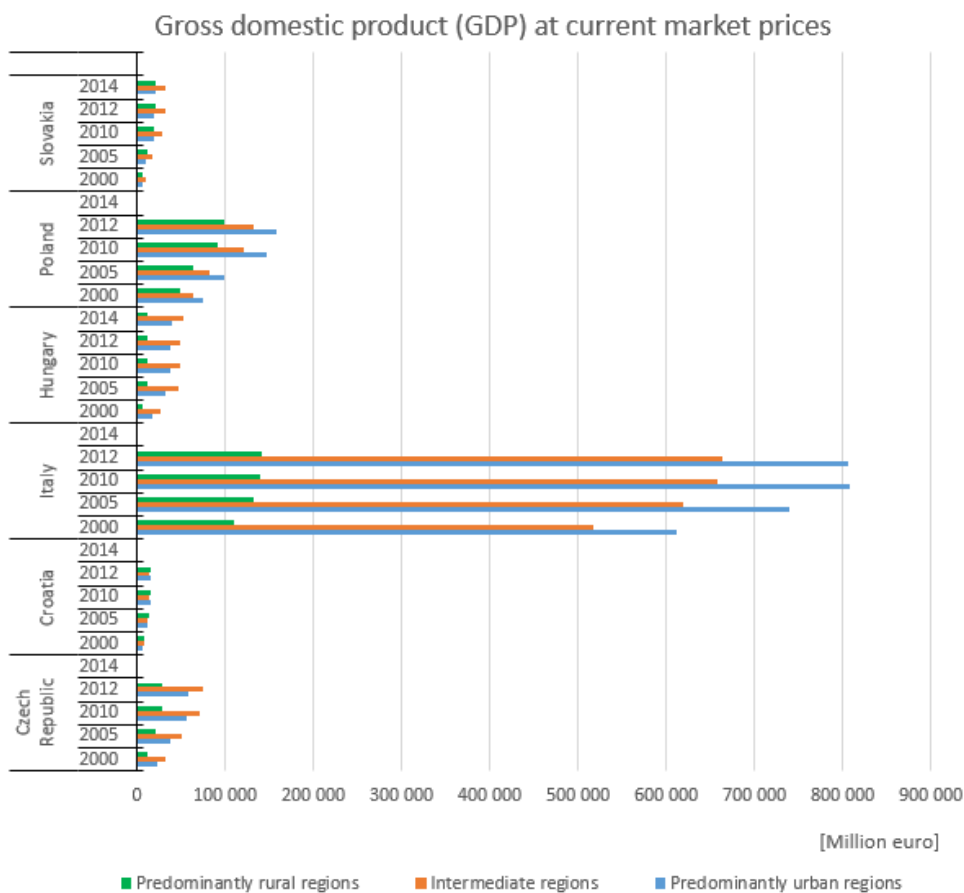


Fig. 4 Gross domestic product at current market prices by urban-rural typology, Data source: Eurostat

Many of the EU's rural areas face a common challenges, their capacity to create high-quality, sustainable jobs is behind that of urban areas; incomes are lower than in cities, there are fewer job opportunities also because of narrower range of economic activities. Differences among RUMOBIL partner countries (excluding Germany) are visible also at Fig. 4, where Gross domestic product, as one of the main economic indicator, at current market prices by urban-rural typology is examined for period 2000 – 2014. In Italy and Poland the highest GDP was recorded in urban regions, while intermediate regions are on top in Czech Republic, Hungary and Slovakia. GDP in rural and urban regions is balanced in Slovakia and Croatia, while there is a multiple difference in Italy. Selective migration generates local, regional and national differences in human capital having consequences on socio-economic development potentials in Europe. Differentiating between demographic trends in metropolitan, urban and rural areas illustrates the diversity of challenges and opportunities rural regions are confronted with. In future demographic change in individual regions will depend among others on their capacity to attract the working-age population. In the light of these challenges it is important to review and adapt existing transport policies on all levels since demographic changes will have important impact on the future demand on all forms of transport. More resources will be needed for structures and services dedicated to elderly people. Their specific needs will have to be addressed in urban planning, infrastructures and services design.

## 2.5. Pilots

RUMOBIL partners aim to improve the public transport connectivity between major transport networks and peripheral rural areas to make them more attractive places to live and work. Quicker and more comfortable access by public transport will also support business activities there. Focus of the pilots is on innovative approaches and modern public transport solutions. These started to be tested in the participating partner regions through experimentations since spring 2017. Eight different measures have been implemented. Three of them are presented in this paper.

North-western part of **Mazovia** comprises the major part of the pilot project in Poland. This area is mainly agricultural, underdeveloped, with the average population density app. 60 people/km<sup>2</sup>. Region is characterized by a high rate of motorization app. 700 cars per 1000 inhabitants. Public transport is ensured by railway and bus service. The number of passengers in trains is low. Until now, passengers using the railway in rural areas of the Mazovian voivodship never knew if their train is late or on time, making the train journey less attractive. As part of a pilot project implemented by the Marshall Office of the Mazovian voivodship in cooperation with Koleje Mazowieckie (Mazowieckie Railways), GPS transmitters were installed in the trains running on lines 27 (Nasielsk - Sierpc) and 33 (Sierpc - Płock – Kutno).

In addition, a software was programmed to make the positioning information usable for passengers. At two main railway stations in Sierpc and Płock, digital info kiosks now give real-time information on the trains' arrival times (Fig. 5). The kiosks also show how the trains connect to further departures of Mazowieckie Railways. The devices are equipped with a large touch screen and a traditional keyboard and adapted for people with disabilities. The black button on the left side of the machine allows users to raise or lower the device to the required height. Since August 2017 passengers can download the app "tropKM" for their mobile iOS or Android smartphones or tablets. Once the app has been installed, the passenger receives an access to the train tracking system on the railway line number 27 (Nasielsk - Sierpc) and number 33 (Sierpc - Płock – Kutno) as shown at Fig. 5.

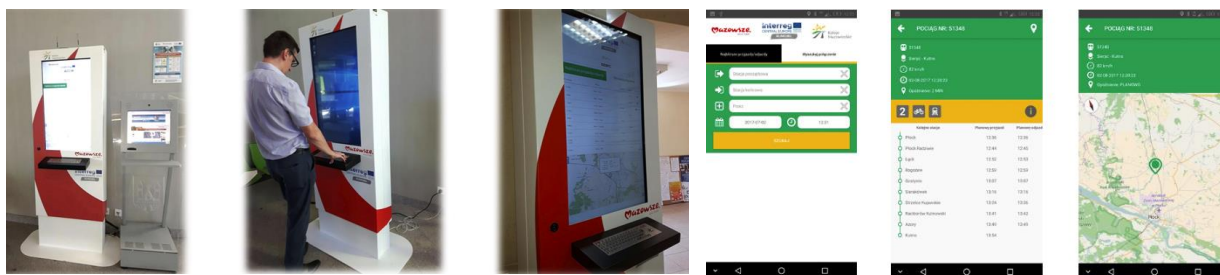


Fig. 5 Info kiosks and app

The City of **Castelfranco Emilia** in Modena province, site of the pilot project, is located east of Modena about 13 km along the axis of the Via Emilia, which is one of the main national roads of Italy. The territory of the municipality is entirely flat and very extensive. It includes eight minor villages in predominantly rural areas.



No relevant production facilities of industrial type are present in the territory. The proximity to two important towns as Modena and Bologna, the low cost of housing, the presence of services and the good train service, has fostered a strong demographic growth in the last 25 years (although not due to an increase in industrial activities) and a significant growing in commuting. A portion of the increase was initially in the small villages around Castelfranco and this, some years ago, has created a kind of repopulation of rural-agricultural areas that were more attractive than the main city. This attractiveness is actually reversing also due to the difficulty, principally for elder people, to access the main services located in the town. The original demographic trend towards the country side occurred on a wide and dispersed territory, and the actual decrease of interest for these areas highlighted the need to provide transport services that would enable the connection of the minor villages to the main attractive center of the town with the hospital, shops and markets, the railway station intermodal node and administrative services.

Prontobus (DRT) service is currently active in Castelfranco Emilia performed by SETA – PT operator for the Province of Modena. For travel within the area of Castelfranco Emilia the Prontobus is active from 7.00 to 12.00 and from 14.30 to 19.30. The service is available with reservations that can be made through a call centre. Before pilot implementation this call centre handled reservations manually and no information about service was provided to users. Prontobus carries about 10.000 passengers a year - about 3 travelers per trip, and is mainly used for connections with the train station and the hospital. The service is underused mainly due to the lack of knowledge and a difficult access to information on the service. Pilot measure intervenes in these two aspects, significantly improving accessibility to the DRT service. A new dedicated software started to be developed, based on web. The new application will meet the following requirements:

- Make available real-time information about the reservations of Prontobus service “translating” them in a timetable.
- Being a support tool for the management and registration of Prontobus services used directly by call centre employees.
- The tool developed will be connected to a web information portal that will supply to the users all the information about the local public transport services available in the province of Modena, with details about the DRT services. It will support also integration of the various public transport modes existing in the territory and the quality of public transport offered.

Via the web site of the public transport operator, the real-time Prontobus reservations will be accessible, indicating the origin-destination and time of trips, in the same way it is possible to do with ordinary bus lines. User registration will be made possible asking to the user information such as an area and a time period of interest. These data will allow to send information by mail or SMS on existing Prontobus available services for the next day giving to the person, if interested, the possibility to use them then making the reservation. The registration of the trips on the new system will allow the call centre to produce automatically the relevant reports about the performed services.

**Ozalj** is a town in central Croatia (Karlovac County), located north of Karlovac and southwest of Jastrebarsko, on the Kupa River. The number of inhabitants in Croatia is in decline in the last decade (16 % in Ozalj) and railway passenger number as well (around 40 % in the last 4 years). Trains are operated on the basis of timetables adjusted especially to needs of students and workers, and are subsidized by the state (the state is financing a minimum service package). No operator offers market based services because there is no demand. Operators are cutting marketing/promotion budgets and focusing their efforts on getting the state subsidies. The implementation of pilot



Fig. 6 Regional train to Ozalj and tourist animator

focuses on the rail line linking peripheral areas of Karlovac County – Ozalj region, with Karlovac and Zagreb,

hence an area most affected by depopulation and where the improvement of transport access to the national and European transport network is seen as a strategic mean to confront this challenge. City of Ozalj was willing to organize campaign to attract more people to use trains. HŽ Putnički prijevoz – railway operator has introduced new train services. Service was designed to suit both the needs of commuters and the itineraries of tourists to generate additional users. In period March 25 – August 19, 2017, 14 thematic excursion trains were introduced and 630 tickets sold (average 45 passengers per train).

A total of 35 trains are scheduled to run until the end of pilot testing. Tickets for some of the trains were sold out several days in advance, which shows how interesting this new offer is to tourists. The majority of passengers are families with small children and pensioners. Pilot measure supports also local business and community. City of Ozalj shows increase of overnight staying with guests from Zagreb and surrounding area. More tickets were sold in regional museums together with local products. Each train is thematic, e.g. train on Saturday, June 10, 2017 was scheduled under the title “Ozalj eco-story”. Excursion participants could walk the tourist path of Slava Raškaj, a famous painter from Ozalj, visited the Ozalj Heritage Museum, and then Viki agro tourism and Krnić eco beekeeper farms, where they could see environmentally-friendly production of agricultural products and honey, and purchase local food producers’ products.

### 3. Conclusions

In August 2017 pilots were in their starting phase, and there were no final results available when writing this paper. The authors would like to provide detail description of regional experimentations at the conference. All pilot measures will be presented to show the difficulties encountered and solutions found including: Operation of citizen bus, driven by volunteer drivers, running between the city of Osterburg and its surrounding peripheral villages in Germany; Mobile application available for train passengers in Mazovia, Poland; Thematic trains in Ozalj region, Croatia; New bus services to launch the integrated system “Public Transport of Vysocina”, Czech Republic; technical solution of DRT service Prontobus in Modena region, Italy; Enhancing services at rural multimodal transport hub in spa Rajecské Teplice, Slovakia; Modern information system at bus stops in Szabolcs-Szatmár-Bereg County, Hungary; New bus lines connecting rural region with express trains in South Bohemia, Czech Republic. At the end of the project a set of evidence-based policy recommendations – RUMOBIL model – will be elaborated to improve the capacities of local and regional decision-makers responsible for the design and coordination of public passenger transport in Central European regions affected by demographic change. Proposed measures will be based on assessed good practices or transnational learning from regional experimentations and focus on financially feasible solutions to better link peripheral areas to European and national transport networks. A study outlining the broader macro-economic effects of improved public transport networks will accompany the presentation the RUMOBIL Model. Project activities will also enhance the capacities of partners’ regional public authorities and their transport entities and enable them to achieve a total of 8 improved (revised) regional public transport strategies affecting a territory of more than 10 million inhabitants of Central Europe. The revised public transport strategies will better link peripheral partner regions affected by demographic change to national and European passenger transport networks and increase the numbers of persons having access and using collective transport in the participating regions.

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