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# Working Together, Planning Together! Evaluation of the Cross-Border Survey between Austria and Slovakia

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## 1 ABSTRACT

The Eastern part of Austria and the regions Bratislava and Trnava in Slovakia form an economic growing region (called Twin-City region). A steadily increase of cross-border traffic between these two countries is expected. However, no compatible transport demand and mobility data are currently available. In particular, in Slovakia no comprehensive mobility survey has been organised since 30 years, despite a lots of efforts in the past. Up to now, only in Austria mobility data has been collected on a regular basis, but comparable cross border data are missing.

In 2013 the Austrian and Slovakian Ministries of Transport decided to organise a cross-border survey conjointly. The aim of this survey was to quantify the number of people crossing the border at each cross-border station between Austria and Slovakia and to collect information about the purpose of the trip, the modes used as well as the trip's origin and destination. In total, information about more than 12.000 trips was collected at ten cross-border stations between Austria and Slovakia. The survey consisted of two parts: (1) manual traffic counts and (2) face-to-face interviews on trains and busses as well as on the street. Respondents could choose between bi-lingual questionnaires (German or Slovak language), additionally the interviewer offered translation into English, if requested.

The collected data were stored in an electronic database accessible from Austria and Slovakia. In order to avoid spelling problems more than 600 municipalities were pre-coded to be selected by the staff entering the data. To achieve a high level of quality, plausibility checks were included in the database. Reference data were used for weighting and grossing up: data of manual traffic counts, data of road site automatic count stations as well as passenger counts provided by the public transport operators were used to calculate average traffic volumes on workdays and Sundays.

In total, more than 50.000 persons cross the border between Austria and Slovakia on an average workday. More than four out of five of these trips are made by car, around one in ten by train and three percent by bus. The proportion of trips made by bicycle or on foot paths is negligible. On Sundays the share of car trips is even higher than on workdays. People crossing the border are mainly Slovakian citizens (more than 2/3 of all trips). The majority of trips is undertaken in order to get to or to return from work (about 50% on an average workday). It is remarkable that even on Sundays the share of work-related trips from Slovakia to Austria is almost 50%, which seems to be caused by weekly commuters. As the capital cities Vienna and Bratislava are the main hotspots of the regions and are located close to each other, one might assume that most of the traffic is generated between these two cities. However, the survey's results show that the regional traffic from the metropolitan area of Bratislava towards Austrian municipalities located close to the border is of high importance as well (e.g. the municipality of Hainburg in Austria). On workdays more than 20.000 trips are made between Bratislava and other Austrian regions than the city of Vienna. In comparison, approximately 10.000 trips are made between the two capital cities on an average workday.

## 2 INTRODUCTION

The border region between the two capital cities Vienna (Austria, AT) and Bratislava (Slovakia, SK) form a growing economic area called Twin City Region. Since both countries became members of the European Union (AT in 1995 and SK in 2004) and the Schengen Agreement became effective in the year 2007, cross-border traffic has been steadily increasing and cross-border transport planning has become a more and more important issue. However, no compatible transport demand and mobility data are currently available, so that the Austrian and the Slovakian ministry of transport decided to launch a common mobility survey at the border stations to get reliable data as basis for transnational transport infrastructure planning.


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Goal of the project Brawisimo (2011 – 2015) was to collect and process current compatible transport demand and mobility data and to make them available for a wide range of applications:

- the analysis and monitoring of transport and mobility development in the region, and its impact on the environment and safety;
- the evaluation of transport policies according to their effectiveness as well as sustainability;
- the improvement of the quality of cross-border transport demand models and
- mobility and social research.

Standardized surveys focusing on cross-border traffic guarantee the comparability of results and provide the basis for a coordinated transport policy and infrastructure planning on both sides of the border. The project was co-financed by the European Development Fund, Cross Border Cooperation, Slovakia - Austria 2007-2013 project ERDF.

## 3 CHARACTERISTIC OF THE REGION

The border region of Austria and Slovakia has been defined in the Brawisimo project as follows (Brawisimo region):

- Austria: The city of Vienna, the eastern parts of the Province of Lower Austria (6 districts) and the Northern parts of the Province of Burgenland (4 districts)
- Slovakia: City of Bratislava and its surroundings (3 districts) and the Province of Trnava (7 districts)

About 2.4 Mio people live in the Austria part and about 1.2 Mio people in the Slovakian part of the border region. Hotspots are the two capital cities Vienna (1.8 Mio inhabitants) and Bratislava (613,000 inhabitants). The distance between these two cities is not more than 80 km (from city centre to city centre), which is a unique situation in Europe (Figure 2 1).

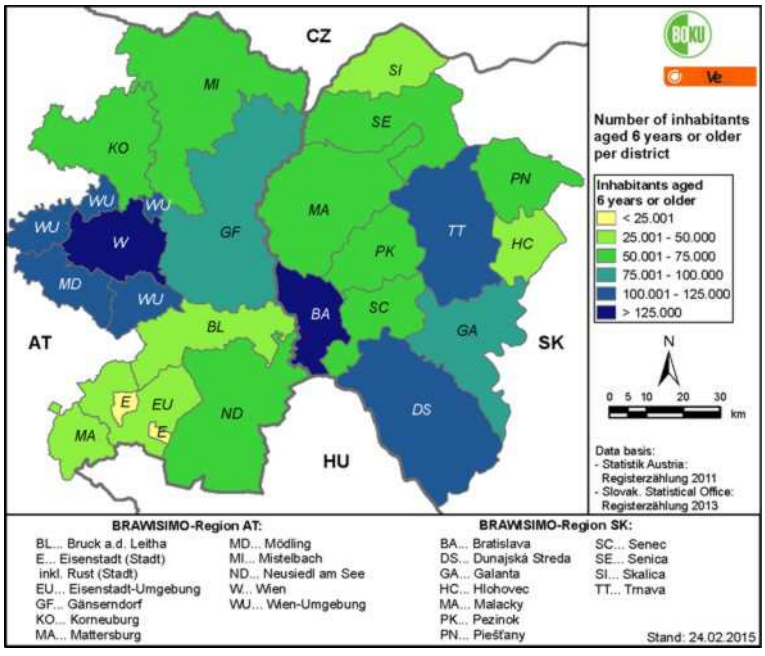


Figure 2 1: Distribution of the number of inhabitants living in the districts of the Brawisimo region

There are four road border crossings between Austria and Slovakia; three of them are located close to the City of Bratislava. The distance between these cross-border stations and the next road cross-border station in the north at Hohenau/Moravský Svätý Ján (B48/EV13) is about 60 km, without any road connection between the two countries, except a ferry at Angern an der March / Záhorská Ves operating daily between 5 am and 10 pm. Bus lines are operating between Austria and Slovakia via the cross-border stations at Berg / Petržalka (federal road B9/61) and Kittsee / Jarovce (motorway A6/D4). Two railway lines are connecting the two capital cities with each other; one via the cross-border station Marchegg / Devínska Nová Ves in the north of the river Danube, the other one via Kittsee / Bratislava - Petržalka south of the river Danube. Two cross-border stations are open for cyclists and pedestrians only (Figure 2 2).

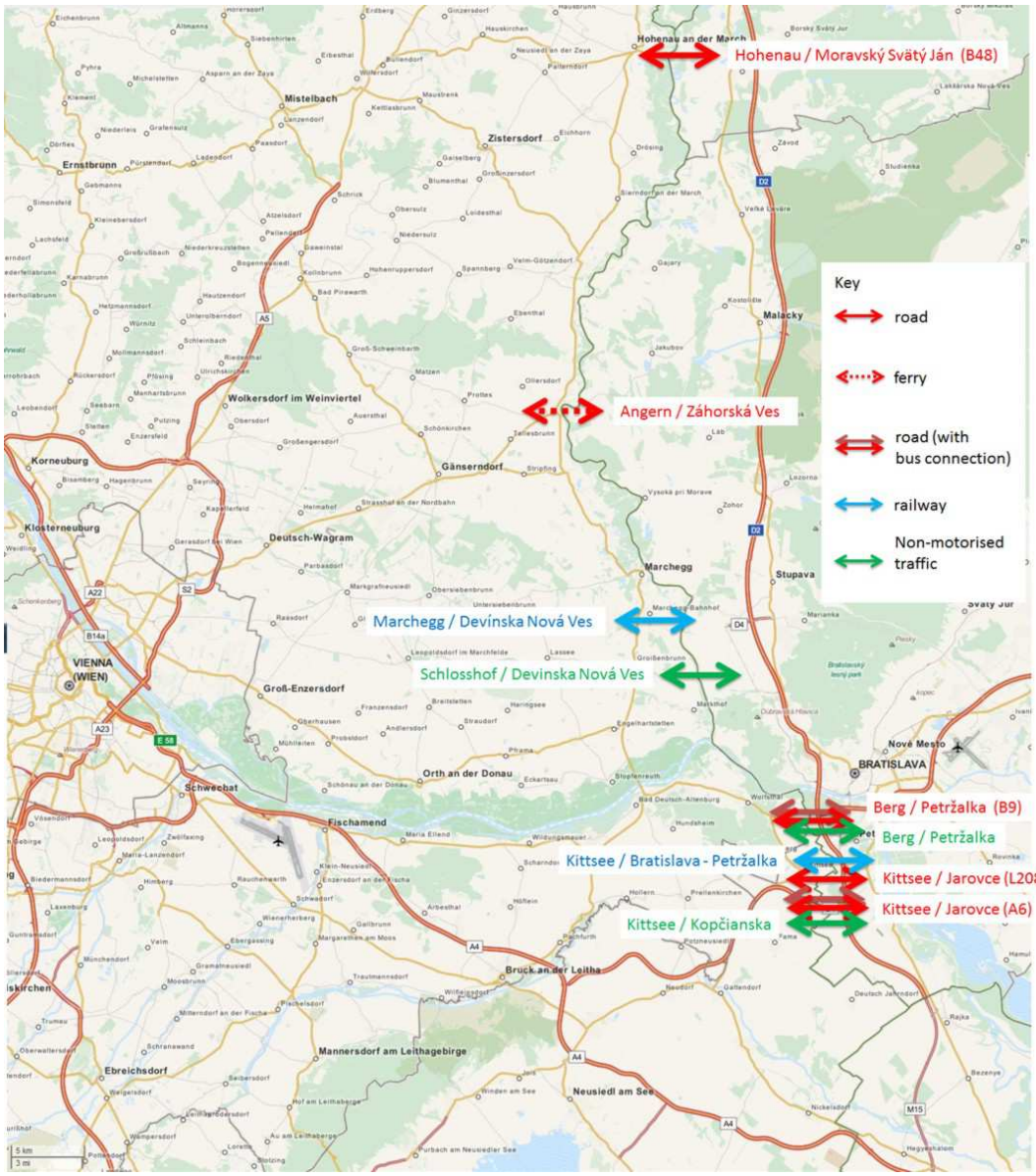


Figure 2 2: Cross-border station included in the cross-border survey between Austria and Slovakia covering different kind of modes (Source: own illustration based on http://www.openstreetmap.at)

## 4 CROSS-BORDER SURVEY DESGIN

Aim of the cross border survey was to quantify the following figures:

- number of people crossing the border between Austria and Slovakia on an average workday and on Sunday;
- share of modes used (car, public transport, walking and cycling);
- share of trip purposes and
- origins and destinations of cross-border traffic between Austria and Slovakia.

The cross-border survey consisted of two parts:

(1) Manual traffic counts at each cross-border station to get the numbers of vehicles and transport users passing and

(2) face-to-face surveys at each cross border station asking people about their origin and destination as well as trip purposes and other socio-demographic variables.

All people crossing the border by car, public transport, cycle or on foot were identified as target group. Trucks, delivery vans and coaches were counted, but not considered in the face-to-face survey. The survey was organised in October 2013 at the ten cross border station between Austria and Slovakia as described


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above (see Figure 2 2). At each cross border station people were asked on 4 half days at least; two on a workday (covering Tuesday to Thursday) and two on Sundays.

### 4.1 Manual traffic counts

Manual traffic counts were organised in order to quantify the traffic volume crossing the border between Austria and Slovakia. Staff were recruited and advised by the Technical University of Bratislava (Slovenská Technická Univerzita v Bratislave, STUBA). Traffic counts were organised in intervals of 15 minutes with the help of tally sheets. Apart from the number of vehicles passing a particular road cross-border station, the number of car passengers as well as pedestrians and cyclists was identified as well. At each road cross-border station direction-bound traffic counts were organised on four half days at least; two on a workday (covering Tuesday to Thursday) and two on Sundays. Counting periods were defined from 5 am to 1 pm and from 1 pm to 9 pm.

Counting sheets were used to collect the number of passengers using cross-border public transport. Survey stuff used the trains and counted all passengers when passing the border. Except early morning and late evening services all connections were recorded; i.e. 65 of 73 connections on workdays and 41 of 52 connections on Sundays. Counts of bus passengers were organised by counting the number passengers embarking and disembarking at particular bus stations. Out of 102 bus connections (three lines), the number of passengers was counted in 82 connections on a workday and 85 on Sunday (the supply doesn't not differ between workday and Sunday) (Figure 3 1). The survey period was the same as for the road border stations, i.e. four half days at least, as described above.

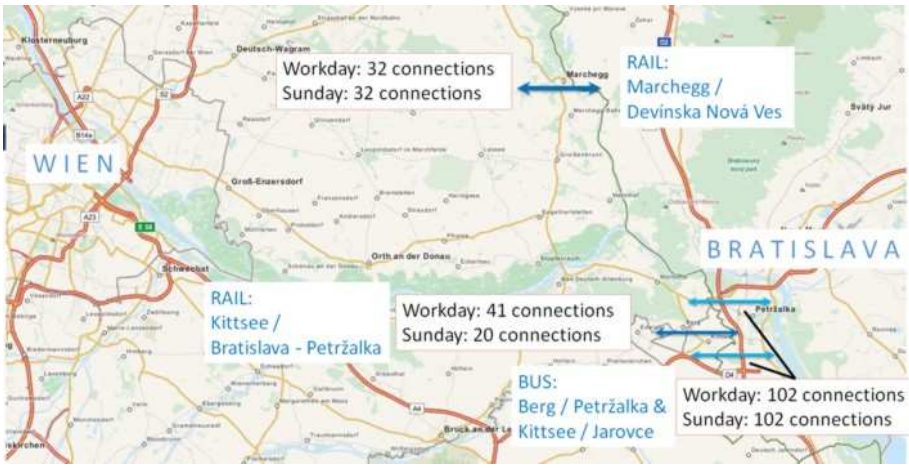


Figure 3 1: Public transport service between Austria and Slovakia

### 4.2 Face-to-face survey among border crossing people

At the same time as the traffic counts, face-to-face surveys were organised based on a random sample. Main goal of this survey was to collect information about origin and destination as well as trip purposes of border crossing trips. The survey collected this information by using a short questionnaire; not only for the trip currently undertaken, but also for the trip in the opposite direction, which could be the outbound or the return trip; i.e. information of two trips were collected at the same time. Respondents were selected randomly at each border station, independently of the origin or destination of the trip, the home town or the nationality of the persons. A trip was defined from the origin to the final destination without considering transfers between different modes / stages of different modes (see example in Figure 3 2).

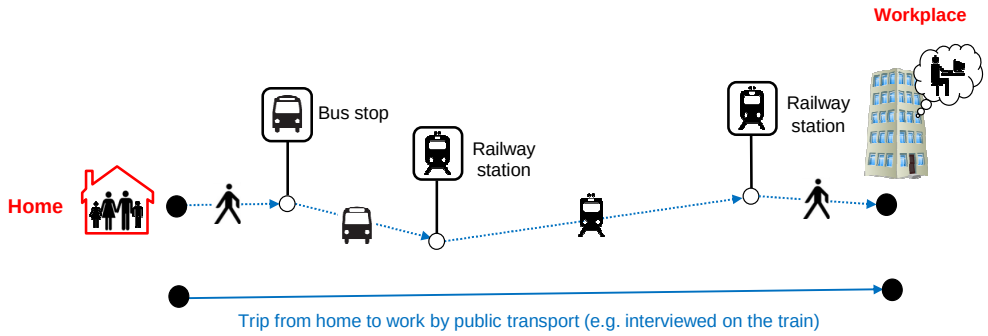


Figure 3 2: Public transport trip to work (including stages of the trip not considered in the survey)

The survey was conducted by using a standardised questionnaire collecting the following trip information:

- origin and destination (country, district, municipality);
- purpose of the trip;
- feeder transport to main mode;
- date, purpose and mode of the trip in the opposite direction.

Additionally, socio-demographic variables have been collected:

- place of residence of the respondents;
- age of the respondents (estimated by the interviewer);
- gender of the respondent (filled in by the interviewer);
- car driver or passenger;
- car occupancy;
- nationality and district in AT and SK of the license plate.

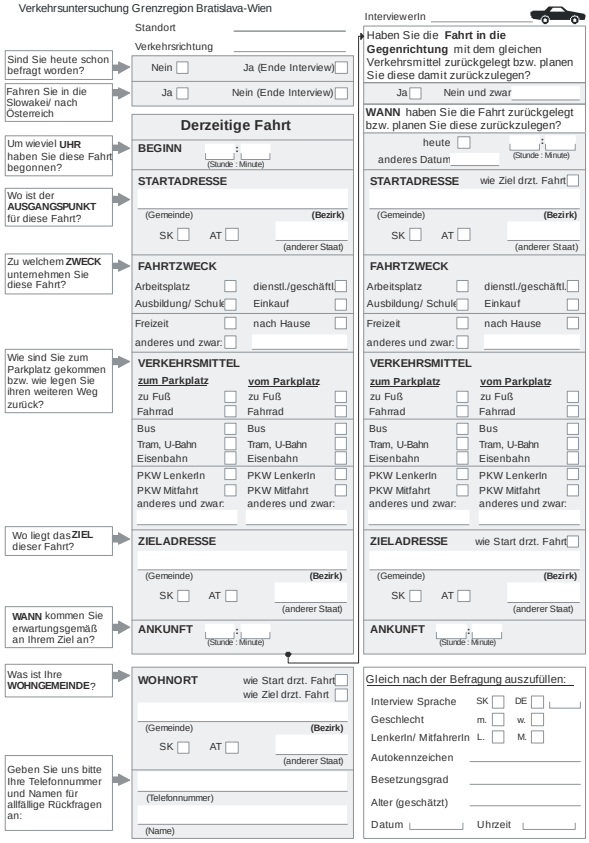


Figure 3 3: Questionnaire for car trips in German language


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The questionnaire was produced for each mode in German and Slovakian language. Additionally, the interviewer offered translation into English, if required (Figure 3 3).

Interviewers were recruited by the Technical University of Bratislava (STUBA). The instruction of the staff was organised by the Technical University in Bratislava and the Institute for Transport Studies of the University of Natural Resources and Life Science Vienna (BOKU) to ensure appropriate language skills. Additionally, comprehensive guidelines were produced, describing background information of the survey as well as the course of the interview distinguish between different modes in a very detail way.

At road border crossings cars, cyclists and pedestrians were stopped by the local (Slovakian) police. Transport users were interviewed by the interviewers subsequently at the road site. At border crossings which are open for cyclists and pedestrians only, people were contacted by the interviewers directly. At the border crossing at Angern an der March / Záhorská Ves the interviewer asked people who were waiting for the ferry boat without any help of the police as well. Passengers of the train connections between Vienna and Bratislava where interviewed on the trains, as the staff had the permission to ride on the train for free. Particular attention was paid for a random selection procedure to ensure that all passengers of a coach (from door to door) had the same chance to be interviewed. According to the law, for safety reasons it is not allowed to change places in bus while the vehicle is in motion. Therefore, it was decided to interview people waiting for the bus at selected bus stops. If embarking persons agreed, they were interviewed as well.

## 5 DATA ENTRY

The completed questionnaires were transferred into a digital secure data base. Access were provided via an encrypted server at the Institute for transport Studies in Vienna. Staff in Bratislava as well as from BOKU had access to the database on different secure levels. The input screen was designed in the same way as the paper version of the questionnaire and included mainly tick boxes to ensure an easy data entry procedure. In order to avoid phonetic and spelling problems with names of municipalities, more than 600 municipalities of the border region were pre-coded to enter origins and destinations by a drop down button. In case a municipality was not pre-coded, staffs were allowed to add names in a free box (Figure 4 1). In total 12,103 trips of 6,193 persons were coded in the data base.

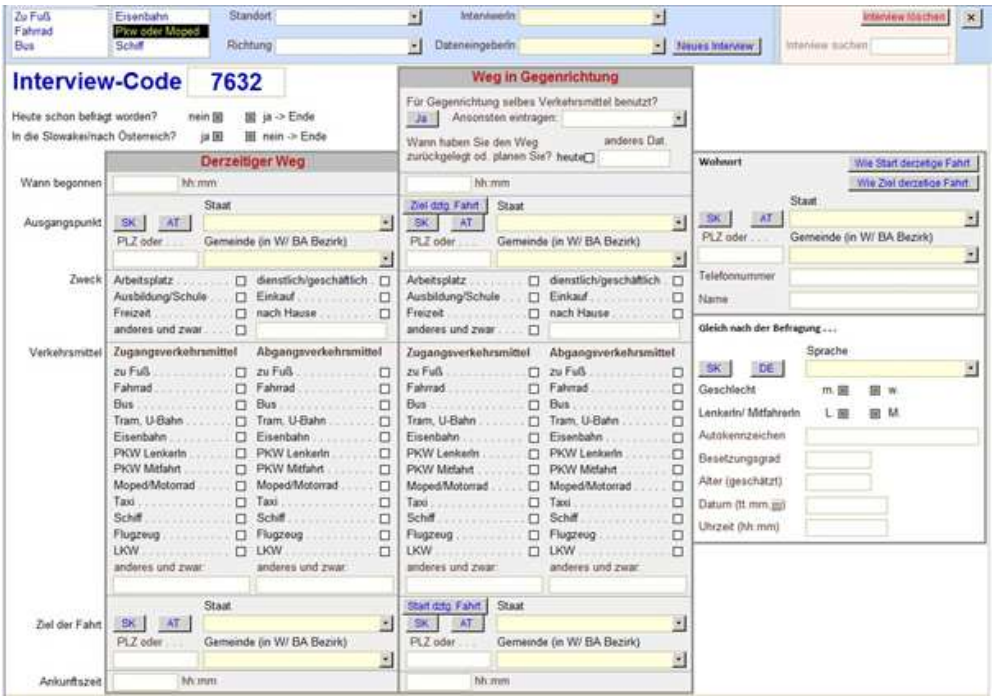


Figure 4 1: Data entry mask of the face-to-face survey

## 6 CROSSING UP PROCEDURE

The manual traffic counts provided data of the hourly road transport volume from 5 am to 9 pm. References data of automatic traffic counts were available for all four road border crossings. Based on the distribution as percentage the remaining traffic volumes during the night hours (from 9 pm to 5 am) were calculated to

provide data for an average daily traffic volume (ADTw, ADTso), an example is shown in Figure 5 1. Finally, all distributions calculated were checked for plausibility.

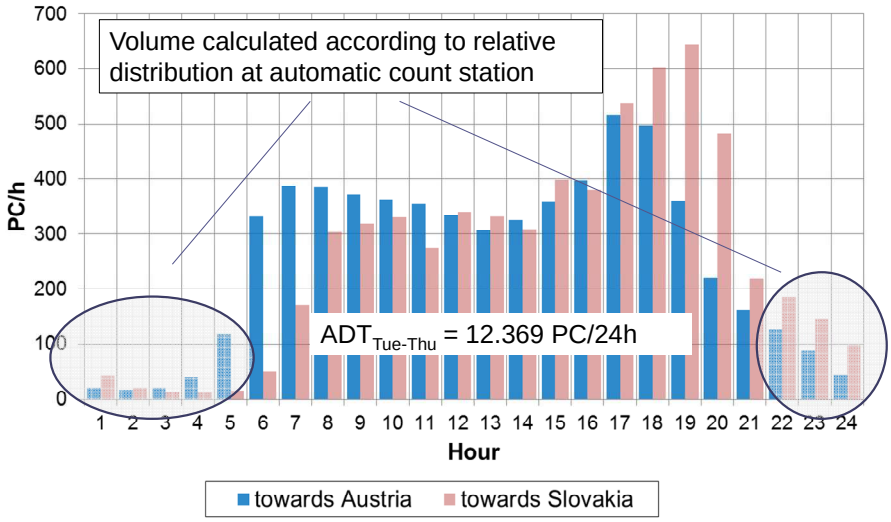


Figure 5 1: Hourly number of passenger cars at the border crossing in Berg/Petržalka (workday, October 2013)

Passenger counting on trains and busses covered almost all connections between Vienna and Bratislava. In order to be able to calculate the remaining train connections, reference data of manual counts of the Austrian railway operator were provided. The share of these connections was calculated in order to estimate the number of passengers using these connections based on the manual counts organised within the Brawisimo project. Thus, the number of passengers for an average workday and Sunday could be provided for both train lines, north and south of the River Danube. In the same way, the number of bus passengers was estimated. However, references data were available for the bus connections operated by the ÖBB-Postbus GmbH und Slovak Lines only.

## 7 MOBILITY FIGURES

### 7.1 Modal Split

About 50,000 people are crossing the border on an average workday in both directions. More than four of five trips are made by car; every tenth trip is made by train and 3 % by bus. The share of cyclists and pedestrians are negligible. The traffic volume on Sunday is slightly less than on workdays (49,000 persons) and the share of car trips on Sundays is even higher. The share of bus users stays at the same level (Figure 6 1).

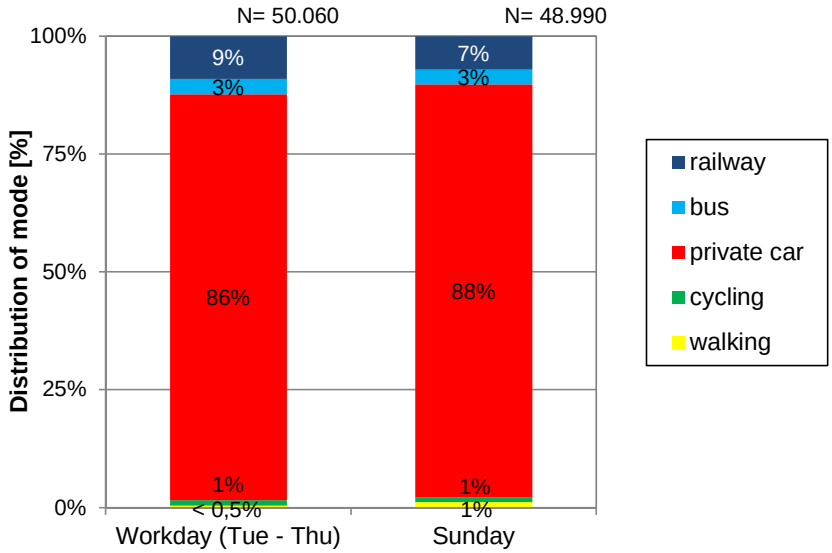


Figure 6 1: Modal Split of cross border traffic (workday, Sunday)


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## 7.2 Trip purposes

The following figure shows the share of the purpose (activity) at the destination; i.e. return trips back home are not included. On an average workday differences are mainly related to the purpose shopping and leisure. Towards Austria more shopping trips are made than in the opposite direction. On Sunday the difference in the share of trips to work are noticeable. The high share of trips to work towards Austria is presumable caused by weekly commuters. Main purpose of crossing the border towards Slovakia is for leisure and shopping, which might be caused by open shops on Sunday in Bratislava.

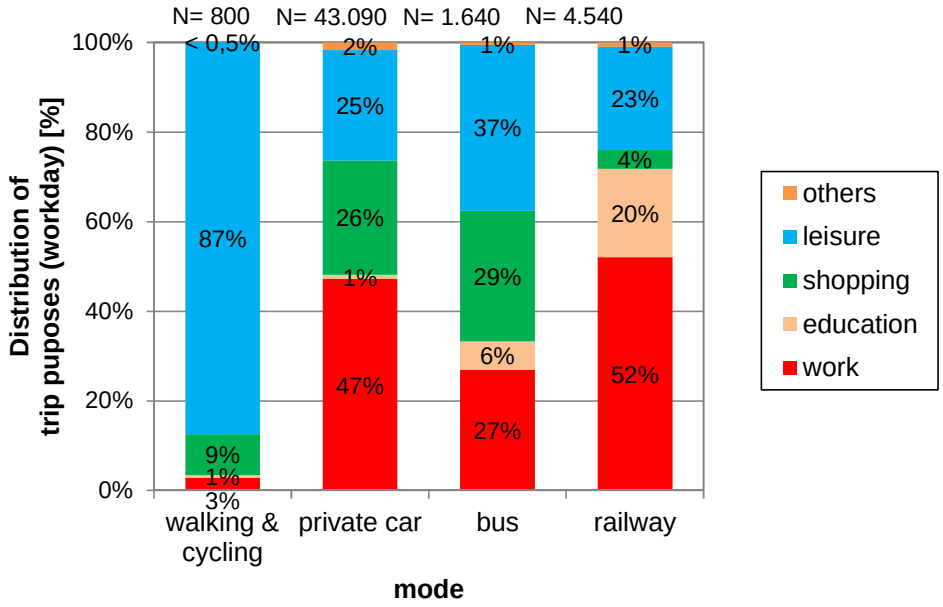


Figure 6 2: Share of purposes (activities) at destination according to mode, trips back home are not included (workday, n= 7.289 trips)

## 7.3 Traffic volume at the border stations

Most of the trips are made within the border region defined in the Brawisimo project (see Figure 2 1). On an average workday 41,100 trips have the origins or destinations within this region (82 % of the total number of trips) and on Sunday about 32,200 trips (66 % of the total number of trips).

### 7.3.1 Road traffic

In total, almost 40,000 people are crossing the border in both directions near the City of Bratislava at three road cross-border stations (federal road, state road, and motorway). It is remarkable that more people are using the federal road at Berg / Petržalka than the motorway, which shows the regional context of the Austrian municipality Hainburg at the border and Bratislava. Considering the total number of people crossing the border by car, the cross-border station at Hohenau / Maravský Svätý Ján and the ferry crossing at Angern / Záhorska Ves plays a minor role (Figure 6 3). Traffic volume on Sunday shows a different picture at the cross-border stations near Bratislava, as the traffic volume on the motorway is about 20 % higher than on a workday (21,580 persons / 24 h), whereas the traffic volume at the federal round decreases slightly (17.920 persons / 24 h). This proves again the regional importance of e.g. the municipality of Hainburg, in particular for shopping trips and trips to work on a workday. On the motorway national and regional weekly commuter traffic towards Austria seems to be overlapped.

### 7.3.2 Public Transport

Despite the fact that the supply of the north connection is less than on the south the connection, more people are using the train connection via Marchegg / Devínska Nová Ves (Figure 6 4). One reason might be that this train line connects both city centres directly (main station to main station), whereas the terminal station of the connection via Kittsee / Petržalka is in the peripheral district Petržalka south of the city centre of Bratislava. On Sunday the north line is mainly use as the supply is almost the same as on workdays (2.600 persons / 24 h). The supply on Sunday on the south line is by far less and the demand is decreasing

remarkable (850 persons / 24 h). The bus connections between Vienna and Bratislava (via Berg / Petržalka und Kittsee / Jarovce) show almost the same demand on a workday as on Sunday (Figure 6 4).


Figure 6 3: Number of people crossing the border by car (persons / 24 h, workday)


Figure 6 4: Number of people crossing the border by public transport (persons / 24 h, workday)

### 7.3.3 Non-motorized traffic

Cyclists are mainly using the border crossing at Berg / Petržalka, which is part of the cycle path along the River Danube (250 persons / 24 h). Due to the higher traffic volume on workdays than on Sunday one might assume that the bicycle is used not only for leisure trips but also for trips to work or shopping. Pedestrians prefer to use the bridge at Schlosshof / Devinska Nová Ves (see also Figure 2 2), which is open for cyclists and pedestrians only. As the number of users is significant higher on Sunday, this area is mainly used for cross border recreational activities (130 persons / 24 h on workday, 530 persons / 24 h on Sunday).

## 8 ORIGIN-DESTINATIONS

The analysis of the origins-destinations of trips shows the regional importance of the border station at Berg / Petržalka (B9). Only 15 % of all trips made by car towards Austria have their destination in the City of Vienna. All other trips are within districts of the border region, in particular, the municipality of Hainburg (Figure 7 1). On the contrary, the motorway has a national function as more than 50 % of all trips towards Austria have their destination in Vienna, one fifth is going outside the Brawisimo region (other districts in Austria or abroad) (Figure 7 2).


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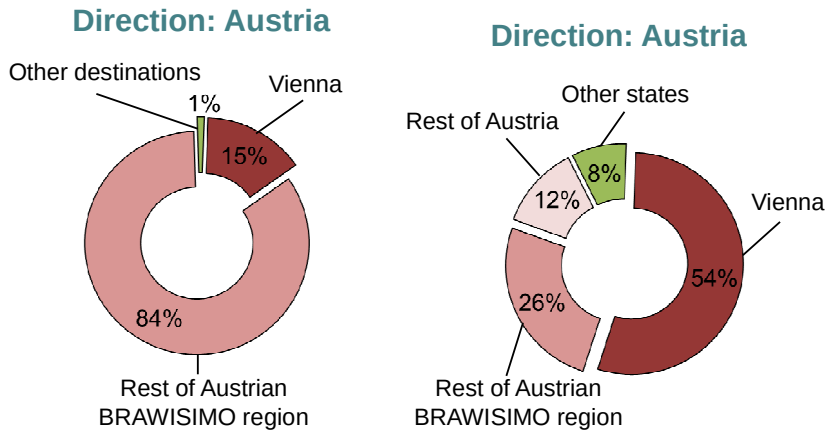


Figure 7 1 (left): Distribution of destinations of trips towards Austria at the border stations Berg / Petržalka, federal road (workday).
Figure 7 2 (right): Distribution of destinations of trips towards Austria at the border stations Kittsee / Jarovce, motoway (workday)

The railway connects mainly the two capital cities. 88 % of all trips towards Austria via Strecke Marchegg / Devínska Nová have their destination in Vienna. Due to minor shopping or working facilities along the line only 5 % of the trips have their destination in a district of the Brawisimo region. As the train terminates at the main station in Vienna 7 % of the people are using this transfer hub to reach other Austrian districts outside the Brawisimo region or other countries. Similar figures are shown for trips towards Slovakia. About one third are using Bratislava main station as transfer station (Figure 7 3). Due to the isolated location of the terminal station of the south connection 91 % of the trips towards Slovakia have their destinations in Bratislava.

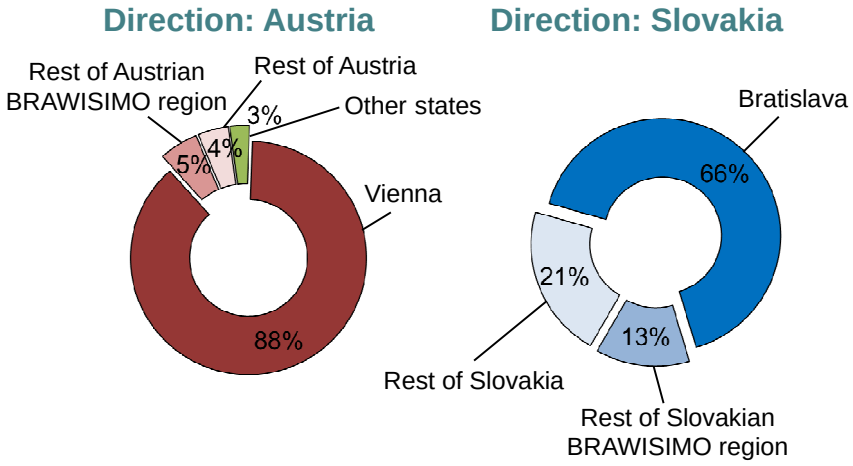


Figure 7 3: Distribution of destinations of trips using the connection via Marchegg / Devínska Nová Ves (workday, both directions)

## 9 CONCLUSIONS

As a result of the cross-border survey, data of cross border traffic between Austria and Slovakia are available in a unique and comparable form for the first time. These data provide a solid basis for transnational transport planning and infrastructure investments, but also for improving a transnational transport demand model, which is currently established by the Technical University Vienna (Emberger G. et al. 2012).

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