CENTRAL STATISTICAL OFFICE
Statistical Office in Rzeszów

TRANSBORDER AREAS SURVEY

Survey of goods and services turnover in border traffic

Methodological book approved by CSO Methodological Commission

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CENTRAL STATISTICAL OFFICE
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PREFACE

Due to integration processes in Europe, Poland's accession to the European Union and the Schengen zone, statistic of transborder areas acquires particular importance. It corresponds to the increasing demand for information on areas located on both sides of the border and, at the same time, also serves to promote regional development and transborder cooperation.

An essential element of the research works in transborder areas is to create a coherent information infrastructure for these areas. However, there are many problems, including those originating from the methodological differences, the limited availability of data for areas located on both sides of the border, a low degree of comparability of data which relate to economic issues in particular, and lack of information on a given level of aggregation in different countries.

In 2008, the Centre of Transborder Areas Survey and Statistics for Euroregions was formed in the Statistical Office in Rzeszów. Building a coherent research system for these areas, the Centre initiated publishing a series on the methodology of their research. This methodological book is devoted to the survey of goods and services turnover – unregistered in customs declarations – in border traffic at crossings where passengers are subject to border control.

By presenting you this publication, we hope that it will be useful both in carrying out surveys, as well as useful to users of statistical information.

At the same time, we wish to express our gratitude to the Reviewers and all persons who have contributed to the production and improvement of this book.

Director
of the Statistical Office in Rzeszów

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INTRODUCTION

Information on expenses incurred by foreigners in a visited country and by citizens of a given country abroad are the point of interest of bank and statistical central institutions as well as governing bodies, not only in Europe, but also in the world. These data are an important, supplementary source of information for the balance of payments and national accounts. They are also used in defining principles for regional policy and in analytical studies. Data on border traffic which are used to estimate these expenses are provided by administrative sources or collected during counting passing vehicles (by pollster or measuring devices). For this purpose also information on interbank or credit card settlements, as well as findings of questionnaire surveys (carried out at borders, places of stay during a trip, household surveys) are used. In many countries, the system for gathering data is based on sample surveys (of which including these carried out at border crossings), that is on gathering data directly from respondents. Organization and methodology of border surveys which are conducted in countries with "open" state borders (with no border control) differs from the ones which are used for surveys conducted at the borders with compulsory control. Since the accession of Poland into Schengen zone at the end of 2007, there have been both "open'" borders, which are the European Union's internal borders, and borders where individual and vehicle traffic is controlled by respective services.

The aim of this book is to elaborate on the methodology of a survey of goods and services turnover (unregistered in customs declarations) in border traffic at the controlled crossings.

Until 1989 departures of the Poles abroad and arrivals of foreigners at our country were strictly controlled by the state, and they were on a small scale. Due to political transformation passport and visa policy has changed, what triggered off increase in individual and vehicle traffic volume at Polish borders. This caused a demand for information on border traffic phenomena to arise.

In request for information demands, Central Statistical Office launched questionnaire surveys at the borders in the first half of the nineties. Preceded by preparatory works in 1993, foreigners' expenses survey in Poland was carried out in the years 1994-2002. The questionnaire survey was carried out at north-eastern, eastern and western land borders, whereas maritime border was surveyed in 1998 for the first time. In the first year of the survey, only citizens of the countries adjacent to Poland who were leaving were included in the survey, and, starting from the second year of the survey, all foreigners leaving Poland

were covered by the survey. In 1997, the survey was extended to cover Polish citizens returning from abroad (within the same scope as foreigners) which enabled export and import unregistered in the SAD customs declarations (Single Administrative Document) to be compared[1]. The survey was carried out at selected border crossings seven times every half year, on selected days in a way that every day of the week was present once in a given half year. During the interview respondents provided information, among other things, on the amount of expenses incurred on the purchase of goods according to assortment groups, purpose of trip, distance from the place of residence to the border and the place of the purchase. The findings were estimated on the basis of data gathered from questionnaires and the Border Guards' information on the number of Poles and foreigners crossing the border.

In 2000, a pre-pilot border survey on travellers' expenses (the Poles returning from abroad and foreigners leaving Poland) and border trade was conducted by Central Statistical Office as part of the cooperation with Eurostat.[2] In the course of preparatory works which preceded the survey, Poland was accepted as the only country out of eight examined PHARE countries where a substantive border trade was observed and Statistical Office had experience of carrying out surveys at the border. The pre-pilot survey was conducted in two stage manner with the aim of establishing the best method of collecting data, improving the design of the questionnaire, examining procedures in the filed and possibilities of gaining information on border trade. The results of the survey were summed up by the EU experts, CSO representatives and customs services. Among other things, it was established that the objectives of the border survey in Poland and the survey on travellers' expenses and border trade conducted by EUROSTAT overlap to some extent and the works could have be continued[3].

Questionnaire surveys are also carried out by the Institute of Tourism. In 2008, foreign tourists leaving Poland and same-day visitors (who were leaving Poland), as well as those returning to Poland after one day stay abroad were covered by the survey. There were eight rounds of the surveys with two rounds in each quarter. Each round covered selected

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[1] The SAD document is used within the EXTRASTAT system to register turnover with third countries which are not member countries of the European Union. It was originally introduced as an obligatory document in EEC countries and since 1 January 1992 is also required in Poland. Since 1 May 2004 Polish units which participate in turnover of goods with the EU countries are not required to submit the SAD document. The turnover between the EU countries is registered on the basis of the INTRASTAT declaration. The INTRASTAT system in Poland has been operating since 1 May 2004, and in the European Union since 1993.

[2] For the need of this survey, the border trade was defined as non-formal transport of goods through national borders in order to resell them at a profit on the difference in prices in different countries. Source: *Wydatki podróżnych i handel przygraniczny. Raport końcowy z badania przedpilotażowego*, EUROSTAT 2001.

[3] *Wydatki podróżnych i handel przygraniczny – Badanie przedpilotażowe. Raport z trzeciej misji, 19-21 lutego 2001*, EUROSTAT 2001.

road, air and maritime border crossings at each of Poland's borders. The findings were estimated on the basis of the Border Guard's data and measurements of border traffic carried out by the Institute of Tourism, as well as monthly data of Central Statistical Office on the number of foreigners using collective tourists accommodation facilities.

Border surveys are of considerable importance in new circumstances, especially since Poland's accession to the Schengen Agreement[4], and after signing an Agreement between the Government of the Republic of Poland and the Cabinet of Ministers of Ukraine on the principles of local border traffic, which was on 28 March 2008. Due to demand for information on border areas, Central Statistical Office – SO Rzeszów resumed the survey of goods and services turnover in border traffic in the third quarter of 2008, primarily at the Polish-Ukrainian border. The present methodology was reviewed, modified and adapted to current conditions and needs.

The methodology of the survey was presented in this book. The first chapter discusses the special character of questionnaire surveys at the border. In the next one the objective as well as subjective and objective scope of the survey was presented. The third chapter explores the major part of the methodology – a description of the survey method. The following two chapters describes research tools and applied variables. The organization of the survey and presentation of data are provided in the sixth chapter, and the seventh chapter discusses the publication of results.

This book was prepared using, among other things, experience gained during pilot survey of goods and services turnover in border traffic at the Polish-Ukrainian border in the third and fourth quarter, and comments of the CSO Methodological Commission made on 24 October 2008.[5] As a supplement and clarifications, there were aimed at reducing likelihood of incorrect interpretation of the survey results. The Methodological Commission ordered that the survey of goods and services turnover in border traffic should include each of the European Union external border in Poland, therefore it should be included in the survey programme of official statistics starting from 2009. In December 2008, SO Rzeszów put forward proposals for entry into Statistical Surveys Programme of Official Statistics:

- for 2009 – "The survey of goods and services turnover in border traffic at the Polish-Ukrainian border, including the so called small border traffic" as a new survey,

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[4] With effect from 21 December 2007; in airports the control at the internal borders was abolished on 30 March 2008.
[5] Report No 2. from the plenary session of Methodolgy Commission on 24 October 2008.

- for 2010 – „ The survey of goods and services turnover in border traffic at the European Union's external border in Poland" as a permanent survey, continued at the Poland's border with the Ukraine, and extended to the European Union's external border in Poland, that is extended by the borders with Belarus and Russia. The survey was included into PBSSP project for 2010.

I. SPECIAL CHARACTER OF QUESTIONNAIRE SURVEYS AT THE BORDER

Questionnaire surveys are the basic way in which goods and services turnover in border traffic is surveyed. The ones that are carried out at borders are considered to be unique and this quality considerably affects the organization of the survey, as well as the limitation of survey method selection.

The most important and, at the same time, the most difficult element of the questionnaire surveys at the borders is to recruit a respondent. Out of persons crossing the border the ones who should be covered by the survey (the Poles or foreigners respectively) need to be selected and interviewed. It is not simple in the border surveys since the persons undergoing the survey are the ones who are travelling, are on the way, are crossing the border, usually in a rush. They are also irritated by awaiting customs clearance and passport check. Huge traffic intensity is an additional burden. Time pressure plays a role especially when the survey is carried out after passport check and customs clearance, and travellers wish to leave the crossing as quick as possible.

During the pilot survey at the Polish-Ukrainian border in 2008, it was observed that the personnel of a border crossing, and the presence of additional control patrols in particular, influence the traffic intensity distribution. In periods of more rigorous control the border traffic war lower. Depending on the subjective judgement of the situation at the border made by persons crossing the border, the border traffic was increasing or decreasing. Especially persons who often cross the border were inclined to wait near the crossing few hours to cross the border, despite no technical difficulties were observed to do it.

Another problem is the risk related to situations dangerous for pollsters, at late hours and at night in particular. Persons under the influence of alcohol who disturb the calm and order are also occasionally observed. They hinder execution of working tasks at the border crossing and affect the people around in a negative way, as well as the pollster's work and the way in which information is received from respondents. The most serious difficulties are

experienced during the interview with persons who are travelling by train. An additional barrier is the fact that potential respondents travel in sleeping carriages.

Interviews at the border are usually carried out in the open, in different atmospheric conditions (heat, coolness, wind, rainfall, etc.) what additionally hinders the pollster's work and recruitment of respondents. Unfavourable weather conditions are the reason why some of the drivers – potential respondents – do not open windows in cars, what prevent an interview to be conducted.

The pollsters at the border crossing should be visible and properly marked, e.g. equipped with an identification badge with a photograph, uniform vests, fluorescent elements.

It is a principle in surveys at border crossings that the border and customs service officers do not participate directly in the process of questionnaire survey. It gives respondents more freedom in answering the questions.

The questionnaire itself, as an element of a survey, is of great importance. In order to achieve a proper effect, the questionnaire should be designed in a simple and clear way. It should be relatively short and comprehensible, and it should contain clearly formulated questions. Ii should be also easy to fill in. The one which is lengthy, includes many questions, the one which is complicated and not clear discourages potential respondents, and, in practice, has a negative effect on the findings of a survey. In case foreigners are covered by the survey, the questionnaire must be available in suitable language versions.

Suitably trained, experienced and professional pollsters are required for the border survey so as to assure good quality of collected data.

II.   PURPOSE OF THE SURVEY

2.1.   PURPOSE AND USEFULNESS OF THE SURVEY

The purpose of the survey of goods and services turnover in border traffic is to collect information from foreigners leaving Poland and Poles returning to the country on the amount of expenses incurred on the purchase of goods and paying for services along with specifying the structure of incurred expenses, connected with the stay in Poland and abroad respectively. The survey covers turnover that not registered in customs declarations at the controlled land border crossings.

Additionally, the survey is supposed to provide information on the distance from the place of residence and the place of purchase to the border, on how often the border is being crossed, purpose and duration of a stay, country of residence (in the case of foreigners) and country of stay (in the case of Poles). In the case of foreigners, the survey is also aimed at gathering information on possessing the Card of the Pole.[6]

The results of the survey of goods and services turnover in border traffic are, at the same time, helpful in answering the following question:

1. Does the phenomena connected with border traffic influence economy and life conditions in border areas, and to what extent?

2. What size is the area influenced by phenomena connected with border traffic? – An attempt to delimitate areas under influence of the border

3. What will by the influence of the entry into force of regulations on small border traffic at external land borders of the European Union in Poland?[7]

The results of the survey will also be used to shape regional policy. Collected information serves, among other things, governing bodies and self-government authorities in border regions to define the principles of the development strategy.

The findings can be useful in estimating import and export volume which is not registered in the customs declarations, they are also a supplement to statistical information on turnover in official foreign trade at the border sections which are surveyed.

2.2.   SUBJECTIVE SCOPE OF THE SURVEY

The survey covers persons who cross the Europe Union external border in Poland, that is foreigners (who permanently reside abroad) leaving Poland and the Poles (who permanently reside in Poland) returning to the country.

The survey covers persons who cross the border overland: by cars, coaches, motorbikes, on foot and by train. Persons who cross the border on foot also include cyclists and disabled persons using wheelchairs.

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[6] Concern citizens of countries listed in the Law on the Card of the Pole of 7 September 2007, Journal of Laws of 28 September 2007, no 180, item 1280, with later amendments, i.e. Republic of Armenia, Republic of Azerbaijan, Republic of Belarus, Republic of Estonia, Georgia, Republic of Kazakhstan, Kyrgyz Republic, Republic of Lithuania, Republic of Latvia, Republic of Moldova, Russian Federation, Republic of Tajikistan, Turkmenistan, Ukraine or Republic of Uzbekistan.

[7] Regulation (EC) No 1931/2006 of the European Parliament and of the Council of 20 December 2006 laying down rules on local border traffic at the external land borders of the Member States and amending the provisions of the Schengen Convention (Official Journal L 29/3, 21/06/2003). Agreement between the Government of the Polish Republic and the Cabinet of Ministers of Ukraine on the principles of local border traffic of 28 March 2008.

Persons who cross the Polish eastern border by air are not covered by the survey of goods and services turnover in border traffic since it will not influence considerably the results of the survey in the regional context. The airports in voivodships of eastern Poland currently do not have direct connections with eastern neighbours.[8]

2.3.   OBJECTIVE SCOPE OF THE SURVEY

The survey covers:

– expenses incurred by foreigners in Poland and the Poles abroad on the purchase of goods as well as other expenses (of which, among other things, on covering accommodation and gastronomic services). The survey investigates the volume of turnover which is not registered in the customs declarations;

– the distance from the place of residence and the place of purchase to the border;

– frequency of crossing the border;

– purpose and duration of a stay,

– country of residence – in the case of foreigners, country of stay – in the case of Poles.

Moreover, foreigners are questioned about possessing the Card of the Pole.

The survey covers the assortment of goods and services which are most popular with, respectively, the Poles and foreigners who cross the border. For this reason, there is a difference in the assortment of goods and services the foreigners and Poles are questioned about.

If the volume of expenses is given by foreigners in foreign currency, it is converted into zlotys according to the average exchange rate of the National Bank of Poland at the day of the survey.

III.   DESCRIPTION OF THE SURVEY METHOD

3.1.   DATA SOURCES

The questionnaires: Questionnaire PL and Questionnaire C, are both the basic and original source of information in surveying goods and services turnover in border traffic. The results of this survey are estimated on the basis of the results of border traffic survey and

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[8] Results of the pilot survey of goods and services turnover in border traffic in 2008 show that about 94% of Poles incurring expenses abroad, and about 89% of foreigners purchasing in Poland, lived at the distance of 170 km from the border, i.e. at a distance similar to the spread of Podkarpackie or Lubelskie voivodships.

supplementary information of the Borders Guards on the border traffic, that was recorder at the days when the survey is carried out.

Data are collected by pollsters of the official statistics from respondents who are covered by the survey. The survey takes place at the border crossings selected for this purpose. Selected persons who cross the border (the Poles and foreigners) are surveyed. The questionnaires are filled in by respondents unaided, or, by pollsters during the interview.

The questionnaire forms (separate for foreigners and the Poles) were given in the appendix no. 1.

3.2.   GUIDLINES ON SAMPLING

Prior to implementation of the survey at the border, it is especially important to understand specificities of border crossings, particularly their location, as well as the nature and organization of the traffic. Subsequently, the crossings at which the survey is being conducted are selected.

The knowledge of the special character of the questionnaire surveys at the border is also significant. Due to practical reasons, which are connected with the costs of the survey and technical potential, the questionnaire survey cannot be carried out throughout the whole period included in the survey. It is necessary for it to be limited to selected days, and, in practice, to time periods several hours long which coincide with the daily shifts of the Border Guards. It is therefore important during planning to set the days at which the survey should be carried out since the traffic intensity and the amount and structure of expenses is changing during the year.

The questionnaire survey is carried out in quarter periods, in selected days of a week chosen from the total number of days in a given period. In each of the quarter, the questionnaire survey in subsequent days of the week is carried out once.

A two-stage scheme for drawing elements for a sample with determining the layers was used. First, the days (time intervals) undergoing survey are drawn, then persons are drawn out of those who cross the border. The layers were determined according to the days of the week as well as the border crossings and kind of traffic. For each of the layer one, selected at random, 12-hour interval in a quarter coinciding with a day shift of the border guards (7.00-19.00) is surveyed. Drawing of a sample is the same for the Poles and foreigners.

For each of the selected shift (a unit of the first stage of drawing which participate in the survey) a sample of persons undergoing survey is selected by means of systematic sampling. In case a selected person rejects to participate in the survey, a successive person is surveyed. For individual border crossings there were sampling intervals selected, including estimated intensity of traveller traffic at individual crossings, as well as pollster's chances for conducting an interview in at given time.

Non-representative days are not included in drawing. e.g. national and religious holidays. Drawing of weekdays in a quarter is performed be means of respective generator.

In each of the selected days, the questionnaire survey is conducted simultaneously at all border crossings covered by the survey.

3.3. METHOD FOR ESTIMATING RESULTS

The results of the survey of goods and services turnover in border traffic are produces for individual quarters, six-month and one-year periods.

Estimation of survey results are based on data gathered from questionnaires and information of the Border Guards on border traffic which concern respective crossings, including the way of crossing the border. These data cover the number of the Poles and foreigners who cross the border according to the crossing, direction and kind of traffic (the way of crossing the border) in a surveyed quarter and in 12-hour shifts during which the questionnaire surveys were carried out.

Data are generalized separately for the Poles and foreigners in each layer. Results for voivodships are calculated on the basis of the results from all layers.

In the survey of goods and services turnover in border traffic, the two-stage drawing scheme with determining the layers was used. The layers were determined according to nationality (the Poles, foreigners), border crossings and kind of traffic (e.g. Korczowa, land crossing).

Let $N_{ij(s)}$ is the actual number of people crossing the border on j day of the week of i quarter in the layer s, and $n_{ij(s)}$ is the surveyed number of people crossing the borders on j day of the week and i quarter in the layer s, $i=1,2,...,4$, $j=1,2,...,7$. The number of people crossing the border at a given crossing is denoted as $N_{i(s)}$ for a given type of traffic in i quarter.

The values $N_{ij(s)}$ are not known – they are estimated using information on the number of people crossing the border in the s layer, in i quarter and during 12-hour shift, which stands for j day of the week. The value $N_{ij(s)}$ is estimated following the formula

$$N_{ij(s)} = N_{i(s)} \cdot \frac{M_{ij(s)}}{\sum\limits_{j=1}^{7} M_{ij(s)}},$$ (1)

where:

$N_{i(s)}$ – for the s layer, is the number of person crossing the border during entire i quarter (data of the Border Guard)

$M_{ij(s)}$ – is the number of persons in the layer s, who crossed the border on the surveyed j day of the week of the i quarter, in the shift during which the survey was conducted.

By Z we denote a set of all generalization categories. Categorization features of persons crossing the border, according to which generalizations (which determine sets Z) are performed, are the following:

– country of residence (permanent stay) – for foreigners,
– country of stay abroad – for Poles,
– purpose of visit,
– time of stay,
– distance from the place of purchase to the border,
– distance from the place of residence to the border,
– frequency of crossing the border,
– possessing the Card of the Pole – in the case of foreigners.

If $G_{ij(s)}(z)$ is an unknown number of persons crossing the border who are included in the generalization category $z \in Z$, $g_{ij(s)}(z)$ is the number of persons not surveyed who are included in the category z, we can write:

$$\frac{G_{ij(s)}(z)}{N_{ij(s)}} = \frac{g_{ij(s)}(z)}{n_{ij(s)}},$$ (2)

and thus:

$$G_{ij(s)}(z) = \frac{N_{ij(s)}}{n_{ij(s)}} \cdot g_{ij(s)}(z) = w_{ij(s)} \cdot g_{ij(s)}(z).$$ (3)

where:

$$w_{ij(s)} = \frac{N_{ij(s)}}{n_{ij(s)}}$$ – is a generalizing weight assigned to the surveyed persons covered by the

layer *s*, in the *i* quarter and *j* day of the week.

The number of persons crossing the border who are included in the category *z* is generalized using the formula

$$L_s(z) = \sum_i \sum_j G_{ij(s)}(z). \qquad (4)$$

Total number of persons $L(z)$ crossing the border who are included in the category *z*, is the sum of estimates $L_s(z)$ in the whole year, i.e.:

$$L(z) = \sum_s L_s(z). \qquad (5)$$

Generalization of expenses is made for the same categories of the ones crossing the border as the number of people crossing the border, that is:
– country of residence (permanent stay) – for foreigners,
– country of stay abroad – for Poles,
– purpose of visit,
– time of stay,
– distance from the place of purchase to the border,
– distance from the place of residence to the border,
– frequency of crossing the border,
– possessing the Card of the Pole – in the case of foreigners.

If $x_{ij(s)}(k,z)$ is the amount of expenses incurred by *k* respondent, $k=1,2,...,n_{ij(s)}$, covered by the category *z* (e.g. expenses on tobacco products of a person possessing the Card of the Pole)), then the expenses for individual categories of persons crossing the border are generalized in accordance with the formula:

$$T_s(z) = \sum_i \sum_j G_{ij(s)}(z) \cdot \bar{x}_{ij(s)}(z), \qquad (6)$$

where:

$\bar{x}_{ij(s)}(z)$ is the average amount of expenses incurred in *i* day of *j* quarter by a respondent who is falls into category *z*, which is described by:

$$\overline{x}_{ij(s)}(z) = \frac{\sum_{k=1}^{g_{ij(s)}(z)} x_{ij(s)}(k,z)}{g_{ij(s)}(z)}. \tag{7}$$

From here, and from formula (3) we have:

$$T_s(z) = \sum_i \sum_j w_{ij(s)} \cdot g_{ij(s)}(z) \cdot \frac{\sum_{k=1}^{g_{ij(s)}(z)} x_{ij(s)}(k,z)}{g_{ij(s)}(z)}, \tag{8}$$

thus:

$$T_s(z) = \sum_i \sum_j \sum_{k=1}^{g_{ij(s)}(z)} w_{ij(s)} \cdot x_{ij(s)}(k,z). \tag{9}$$

Total number of expenses $T(z)$ of persons crossing the border who are covered by the surveyed category z, is the sum of estimates $T_s(z)$, i.e.:

$$T(z) = \sum_s T_s(z). \tag{10}$$

Due to the special character of the survey at rail crossings, it was necessary to estimate expenses at these crossings in individual way. It is assumed that after the surveys at rail crossings have been carried out during one-two quarters and regularities at a given rail crossing have been identified, a respective subsample from a neighbouring road crossing is used for estimating the results.

The method for estimating the variance of results includes changeability of values of the surveyed variables between units of the first stage of drawing. Since in one quarter only one unit of the first stage of drawing is surveyed in a given layer, giving precision estimates of the survey results is possible only after the full year cycle of the survey is completed.

By $X_{ij(s)}(k)$ we denote the amount of total expenses incurred by k respondent on j day of the week and i quarter in the layer s, $k=1,2,...,n_{ij(s)}$.

Let

$$W_{ij(s)} = \sum_{k=1}^{n_{ij(s)}} X_{ij(s)}(k) \tag{11}$$

be the sum of total expenses of respondents on j day of the week and in j quarter in the layer s, then:

$$\frac{W_{ij(s)}}{n_{ij(s)}} \tag{12}$$

is an estimation of an average amount of total expenses of a single respondent on j day of the week and in i quarter in the layer s, whereas:

$$T_{ij(s)} = \frac{N_{ij(s)}}{n_{ij(s)}} \cdot W_{ij(s)} \tag{13}$$

is an estimation of amount of total expenses incurred by persons crossing the border on j day of the week and in i quarter for the layer s.

Estimation of total amount of expenses T_s in the layer s is the sum of estimations $T_{ij(s)}$, that is:

$$T_s = \sum_i \sum_j T_{ij(s)} = \sum_i \sum_j \frac{N_{ij(s)}}{n_{ij(s)}} \cdot \sum_{k=1}^{n_{ij(s)}} X_{ij(s)}(k). \tag{14}$$

Estimation of total amount of expenses T during the whole year is the sum of estimations T_s, that is:

$$T = \sum_s T_s. \tag{15}$$

Let us assume that $N_s = \sum_i \sum_j N_{ij(s)}$ is a summary actual number of persons crossing the border in a given year in the layer s and $n_s = \sum_i \sum_j n_{ij(s)}$ is a summary number of persons surveyed in a given year in the layer s.

If a sample is matched is a way that:

$$\frac{N_{ij(s)}}{n_{ij(s)}} = w_{ij(s)} \tag{16}$$

do not depend on i and j, that is if $w_{ij(s)} = \dfrac{N_s}{n_s}$ then T_s is reduced to:

$$T_0 = \frac{N_s}{n_s} \cdot \sum_i \sum_j \sum_{k=1}^{n_{ij(s)}} X_{ij(s)}(k), \tag{17}$$

that is to average amount of total expenses $\dfrac{1}{n_s} \sum_i \sum_j \sum_{k=1}^{n_{ij(s)}} X_{ij(s)}(k)$, multiplied by actual number of persons crossing the border N_s for a given layer s.

In order to estimate the mean square error of estimators T_s and T_0 for observations $X_{ij(s)}(k)$ of total expenses of respondents on j day of a week and in i quarter, in the layer s, we assume, following the two-way classification model, that:

$$X_{ij(s)}(k) = \mu_{ij(s)} + e_{ijk(s)},$$ (18)

where $\mu_{ij(s)}$ is an unknown expected value of total expenses incurred by a single person crossing the border on j day of a week and in j quarter for the layer s, whereas $e_{ijk(s)}$ are random errors of average value 0 and variance σ_s^2. The parameter determining total amount of total expenses of a person crossing the border in a given year in the layer s is defined in the following way:

$$\theta_s = \sum_i \sum_j N_{ij(s)}\mu_{ij(s)}.$$ (19)

Let us consider the above defined (14) and (17) two estimators of the parameter θ

$$T_s = \sum_i \sum_j T_{ij(s)} = \sum_i \sum_j \frac{N_{ij(s)}}{n_{ij(s)}} \cdot \sum_{k=1}^{n_{ij(s)}} X_{ij(s)}(k),$$ (20)

$$T_0 = \frac{N_s}{n_s} \sum_i \sum_j \sum_{k=1}^{n_{ij(s)}} X_{ij(s)}(k).$$ (21)

Expected value is:

$$E(T_s) = \sum_i \sum_j \frac{N_{ij(s)}}{n_{ij(s)}} \cdot \sum_{k=1}^{n_{ij(s)}} \mu_{ij(s)} = \theta_s,$$ (22)

that is, if T_s is an unbiased estimator of total amount of expenses of persons crossing the border in a given year in the layer s, whereas:

$$E(T_0) = \frac{N_s}{n_s} \sum_i \sum_j \sum_{k=1}^{n_{ij(s)}} \mu_{ij(s)} = \frac{N_s}{n_s} \sum_i \sum_j n_{ij(s)}\mu_{ij(s)},$$ (23)

that is, T_0 is an biased estimator θ_s, and the bias is:

$$E(T_0) - \theta_s = \sum_i \sum_j \left(\frac{N_s \cdot n_{ij(s)}}{n_s} - N_{ij(s)} \right) \cdot \mu_{ij(s)}.$$ (24)

This bias is zero only if $\mu_{ij(s)} = \mu$ is dependent on i and j, that is, when average total expanses of persons crossing the border in the layer s are not dependent on the quarter and days of the

week, or when the sample is matched in a way that $\frac{N_{ij(s)}}{n_{ij(s)}} = \frac{N_s}{n_s}$ are not dependent on i and j.

In the latter case $T_s = T_0$.

Variations of estimators T_s and T_0 are as follows:

$$Var(T_s) = \sum_i \sum_j \frac{N_{ij(s)}^2}{n_{ij(s)}} \cdot \sigma_s^2, \tag{25}$$

$$Var(T_0) = \frac{N_s^2}{n_s} \cdot \sigma_s^2, \tag{26}$$

where σ_s^2 is a variation of observation $X_{ij(s)}(k)$.

Average square risk $MSE(T_0)$, as a sum of bias and variation squared has a form:

$$MSE(T_0) = \left[\sum_i \sum_j \left(\frac{N_s \cdot n_{ij(s)}}{n_s} - N_{ij(s)} \right) \mu_{ij(s)} \right]^2 + \frac{N_s^2}{n_s} \cdot \sigma_s^2. \tag{27}$$

For individual layers, absolute errors:

$$SE_b(T_s) = \sqrt{Var(T_s)}, \tag{28}$$

$$SE_b(T_0) = \sqrt{MSE(T_0)} \tag{29}$$

and non-absolute errors:

$$SE_w(T_s) = \frac{SE_b(T_s)}{T_s} \cdot 100\%, \tag{30}$$

$$SE_w(T_0) = \frac{SE_b(T_0)}{T_0} \cdot 100\% \tag{31}$$

of estimations T_s and T_0 are calculated.

IV. DESCRIPTION OF THE RESEARCH TOOL

In designing each of the two types of the questionnaire (see appendix no. 1) the special character of border surveys was taken into consideration – the questionnaires are short (one-page), comprehensible and usable. They include clearly formulated questions, which are mainly closed questions. The questionnaires are easy to fill in both for single person, and or a group of persons travelling together for whom it is difficult to separate commonly incurred

expenses. The first test surveys of goods and services turnover in border traffic, was carried out with the use of questionnaires adapted individually for respondents according to the way of crossing the border: pedestrians, motorists, rail passengers. Gathered experiences were used for improving questionnaires. The questionnaire was improved in terms of the substance and in technical way and, finally, one questionnaire for the Poles (PL) and one for foreigners (C) were introduced.

The major elements of the questionnaires for the Poles are the following:
– way of crossing the border (on foot, motorized, by rail),
– country of stay abroad,
– main purpose of stay abroad,
– number of persons returning to the country (single person or a group of persons is surveyed, e.g. a family – travelling and crossing the border together, incurring expenses together),
– time of stay abroad (number of days)
– amount spent on the purchase of food products, alcoholic drinks, tobacco and non-food products, with assortment specification
– other expenses connected with staying abroad, of which on, among other things, accommodation and gastronomic services,
– distance from the place of purchase to the border,
– distance from the place of residence to the border,
– frequency of crossing the border.

The major elements of the questionnaires for foreigners are the following:
– way of crossing the border (on foot, motorized, by rail),
– country of residence (permanent stay),
– main purpose of visit in Poland,
– number of persons leaving Poland (single person or a group of persons is surveyed, e.g. a family travelling and crossing the border together, incurring expenses together
– of which number of persons possessing the Card of the Pole,
– time of stay in Poland (number of days),
– amount spent on the purchase of food and non-food products, with assortment specification,
– other expenses connected with staying in Poland, of which on, among other things, accommodation and gastronomic services,
– distance from the place of purchase to the border,

– distance from the place of residence to the border,

– frequency of crossing the border.

The selection of assortment groups for the survey is based on observation of demand and supply of specific products on both sides of the border. For this reason, it is justified to include different assortment groups of goods and services in the questions for Poles and foreigners.[9] The content is subject to periodic review.

Completion of the survey is voluntary and anonymous. Information from respondent is gathered on the basis of an interview or a questionnaire which the respondent fills in unaided. The questionnaire for foreigners is translated into languages of neighbouring countries the borders of which are the ones where the survey is carried out, and additionally into English, German and French language.

V.   VARIABLES OCCURING IN THE SURVEY

5.1.   DESCRIPTION OF VARIABLES

The following categories of variables are used in the survey of goods and services in the border traffic: measurable, non-measurable, geographic.

Measurable variables are**:**

- number of foreigners leaving Poland (of which possessing the Card of the Pole)/Poles returning to Poland,

- duration of stay,

- amount spent on the purchase of food products (in total and according to the surveyed assortment), non-food products (it total according to the surveyed assortment), alcoholic drinks), tobacco products, and other expenses (in total and according to the surveyed kinds of services),

- distance from the place of purchase to the border,

- distance from the place of residence to the border.

These variables are included in the questionnaires without a sign after a comma.

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[9] Preliminary results of the pilot survey of goods and services turnover in border traffic at the Polish-Ukrainian border in 2008 show that the overwhelming majority of expenses has been assigned to the proposed groups in the survey content: 93.6% of the expenses of Poles and 96.6% of expenses of foreigners. Out of total expenses of Poles, 2.0% was on other food products, 1.1% on other non-food goods and 3.3% on other services. By contrast, in the structure of expenses of foreigners 0.3% was on other food products, 3.0% on other non-food products and 0.1% on other services.

In the case of non-measurable variables, it is possible to chose one variant out of several variants of the answer. Non-measurable variables used in the survey are:

- way of crossing the border,
- main purpose of visit in Poland/stay abroad,
- frequency of crossing the border.

Geographic variables:

- border crossing,
- voivodship,
- country of residence/country of stay abroad.

Variables occurring in the survey are recorded by the pollsters according to the exact date of the survey, individually for foreigners and the Poles. In the base additional information are also recorded, such as: the number of a questionnaire, information on the pollster (full name, card number), day of the week and quarter for which data are calculated, the symbol of local department, assigned weight.

5.2. RATES AND METHODS FOR CALCULATION THEREOF

The answers to the questions included in the questionnaires, which are received by pollster from individual respondents, serve as a basis for generalizing results from the survey. Aggregation of data is done for every question, and consecutive stages provide data for the profiles set in the guidelines for the survey.

Estimated amounts of expenses and categorization characters of persons crossing the border are given in absolute numbers in different profiles. Selected data are presented as dynamics rates and percentage proportions.

Structure rate is the ratio of the estimated number of people according to the surveyed feature (e.g. distance from the place of residence to the border, possessing the Card of the Pole), or the value of the group of expenses (e.g. expenses on the purchase of food products, expenses on fuel) to the size of the surveyed population or the amount of total expenses.

Estimated **average expenses** is the ratio of the estimated expenses in a given category to the number of population. The estimated average expenses are used to characterize expenses incurred by the Poles and foreigners on various assortments of goods and services.

Dynamics rate the ratio of the level of a phenomenon (the number of persons, total expenses) in the surveyed period, to the level of this phenomenon in the period taken as the basis for comparisons.

In the survey of goods and services turnover in border traffic, the aggregation of data consists in calculation of one or many statistics, such as the sum (of people, costs), the arithmetic mean, etc., for observation groups set by the categories of grouping variables. Data are aggregated according to:

– citizenship (Poles, foreigners),

– border crossings, voivodship and kind of traffic,

– distance from the place of residence to the border,

– distance from the place of purchase to the border,

– frequency of crossing the border,

– purpose of crossing the border,

– time of stay,

in the following categories:

– number of persons,

– amount of expenses,

– expenses per one person.

5.3. APPLIED CLASSIFICATION SYSTEMS

In the survey of goods and services turnover in border traffic, great number of questions concern the amount of expenses incurred on a specific purpose, namely on the purchase of the groups of goods listed in the questionnaires as well as on paying for services. Therefore, many of the concepts used in the survey describes the structure of assortment. Concepts included in the questionnaires were systematized according to the Classification of Individual Consumption by Purpose. In order to ensure uniform interpretation of the scope of the surveyed assortment groups, a list and explanation of groups of goods and services included in the questionnaires has been developed.

Some of the questions in the questionnaires are not linked to any specific classifications. Their forms results from the unique character of the survey, e.g. the distance from the place of residence and place of the purchase to the border, the frequency of crossing the border.

VI. ORGANIZATION OF THE SURVEY AND PRESENTATION OF DATA

6.1. ORGANIZATION OF THE SURVEY

The statistical survey is carried out on the basis of the Law issued on 29 June 1995 on official statistics (Journal of Laws 1995 no. 88, item 439 with later amendments) and the programme of statistical surveys of official statistics for a given year.

The survey of goods and services turnover in border traffic – not reported in customs declarations – takes place seven times in each quarter, on days of the week randomly selected from the total number of days in the period. In each of the quarters, the questionnaire survey in subsequent days of the week takes place once. Data are collected by two pollsters per each type of the traffic (way of crossing the border). Detailed timetable of the organization of the survey, that is information processing, production of output tables, publication of results, proceeding with the data sets, is included in survey schedule. Data collected in the questionnaires are transferred to the leading unit within three working days after each questionnaire survey. Output tables are compiled within 30 working days, and the results are made public within 35 working days after the survey period.
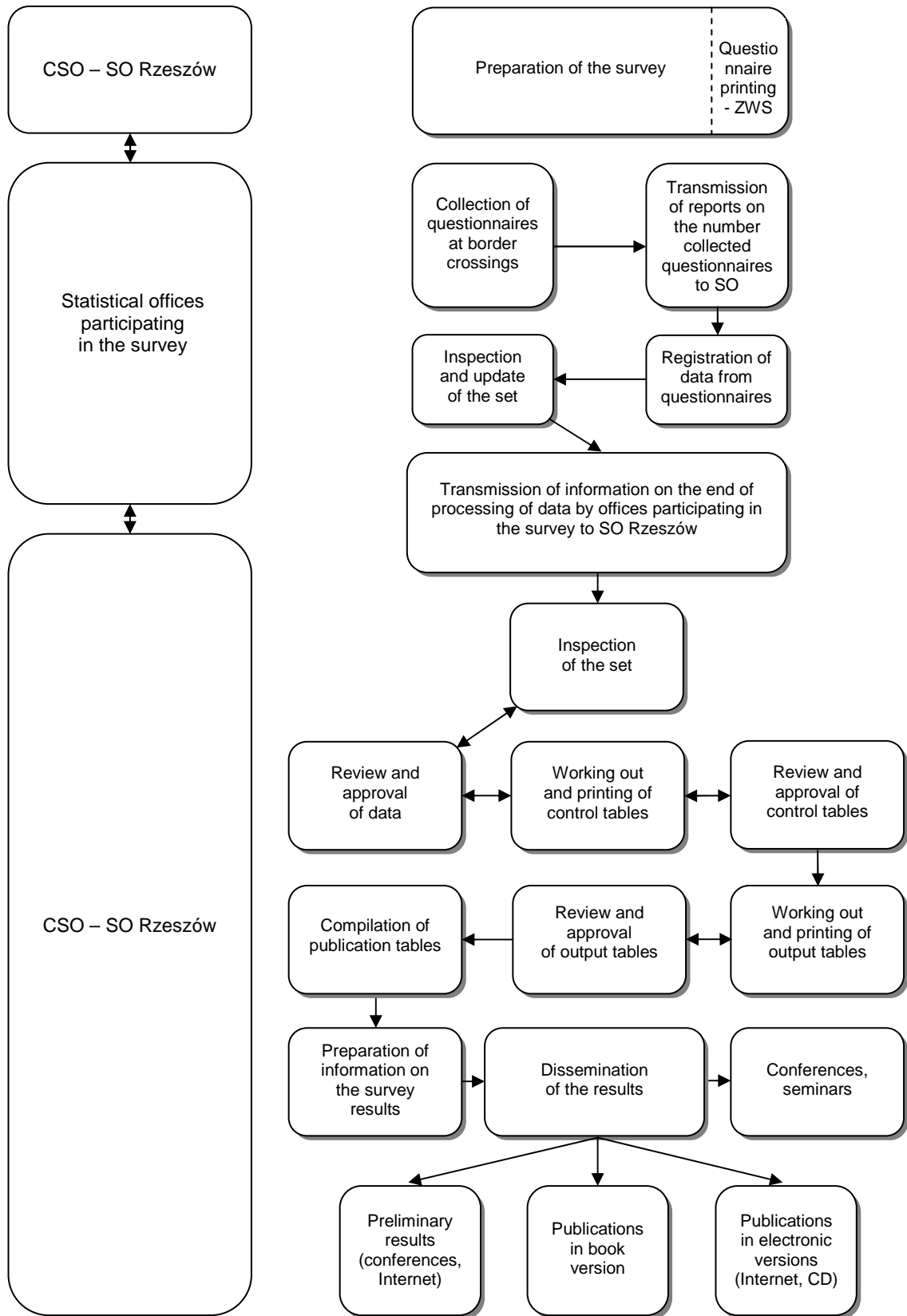
The leading unit in conduct of the survey is the Statistical Office in Rzeszów. It exercises substantial control over the survey and coordinate works associated with it. Co-operating units are statistical offices located in the voivodships in which there are border crossings covered by the survey. Their tasks include, among other things, conducting questionnaire survey at the border crossings, registration of data and initial control, transmission of reports to the leading unit, preparing briefing notes from the survey.

Statistical Office in Rzeszów has developed an computer system for production of the survey results. With the aid this system, statistical offices involved in the survey register data from questionnaires and carry out formal, accounting and logical inspection, as well as updates the data (corrections). SO Rzeszow carries out analysis and further inspection of the data sets and produces the results of the survey.

A diagram of the organization of the survey is presented on the page 25.

A diagram of the organization of the survey of goods and services turnover in border traffic

CSO – SO Rzeszów

Preparation of the survey | Questionnaire printing - ZWS

Statistical offices participating in the survey

Collection of questionnaires at border crossings → Transmission of reports on the number collected questionnaires to SO

Inspection and update of the set ← Registration of data from questionnaires

Transmission of information on the end of processing of data by offices participating in the survey to SO Rzeszów

CSO – SO Rzeszów

Inspection of the set

Review and approval of data ↔ Working out and printing of control tables ↔ Review and approval of control tables

Compilation of publication tables ← Review and approval of output tables ↔ Working out and printing of output tables

Preparation of information on the survey results → Dissemination of the results → Conferences, seminars

Preliminary results (conferences, Internet)

Publications in book version

Publications in electronic versions (Internet, CD)

6.2. PRESENTATION OF DATA

In the case of the survey of goods and services turnover in border traffic, data which are collected are anonymous. Pollsters are bound to observe statistical confidentiality.

The results of the survey of goods and services turnover in border traffic are produced for individual quarters, half-year and year periods. They are presented in the cross-section of border crossings and voivodships, thus they can be aggregated in several ways. Disseminated results are given as absolute values, in the form of indexes and percentage proportions.

The tables compiled on the basis of estimated results of the survey include, among other things, the following information:

- total amount of expenses (including geographic structure – countries, voivodships, border crossings):
  - o expenses on food products in total and by assortment,
  - o expenses on non-food products in total and by assortment,
  - o other expenses, of which on accommodation and gastronomic services;
- structure of persons crossing the border according to the purpose of stay, distance from the place of residence and the place of the purchase to the border as well as the frequency of crossing the border.

Estimated results of the survey are presented in the following cross-sections:

Specification	Table layout
Amount and structure of expenses incurred by foreigners in Poland	Total, motorized, pedestrians, rail passengers
Amount of expenses incurred by one foreigner in Poland	Total, motorized, pedestrians, rail passengers
Amount and structure of expenses incurred by motorized foreigners	Total, surveyed voivodships, surveyed crossings
Amount and structure of expenses incurred by pedestrian foreigners	Total, surveyed voivodships
Amount and structure of expenses incurred by foreigners travelling by rail	Total, surveyed voivodships
Percentage structure of foreigners leaving Poland by purpose of visit	Total, surveyed voivodships, surveyed crossings
Percentage structure of foreigners leaving Poland by the frequency of crossing the border	Total, surveyed voivodships, surveyed crossings
Percentage structure of foreigners leaving Poland by the distance from the place of residence and the place of purchase to the border	Total, surveyed voivodships, surveyed crossings

Amount and structure of expenses incurred by the Poles abroad	Total, motorized, pedestrians, rail passengers
Amount of expenses incurred by one Pole abroad	Total, motorized, pedestrians, rail passengers
Amount and structure of expenses incurred by motorized Poles abroad	Total, surveyed voivodships, surveyed crossings
Amount and structure of expenses incurred by pedestrian Poles abroad	Total, surveyed voivodships
Amount and structure of expenses incurred by Poles returning by rail abroad	Total, surveyed voivodships
Percentage structure of Poles by purposes of visit	Total, surveyed voivodships, surveyed crossings
Percentage structure of Poles by the frequency of crossing the border	Total, surveyed voivodships, surveyed crossings
Percentage structure of Poles returning to the country by he distance from the place of residence and the place of purchase to the border	Total, surveyed voivodships, surveyed crossings

VII. PUBLICATION OF RESULTS

The information from the survey of goods and services turnover in border traffic is mainly received by representatives of government and self-government institutions, scientific circles, various institutions, individual person and media. Recipients from neighbouring countries are also interested in the results.[10]

Information with the results are disseminated periodically – according to the plan of publications. A preliminary elaboration which is issued after each quarter on the CSO website (www.stat.gov.pl.) is the first publication which include the survey results. It provides the survey results in the form of description accompanied by graphical illustration and basic information on the survey.

According to the publishing plan, the results are also expected to be published in the book version (in paper and electronic – CD, the Internet). Apart from data in tables, publications include comments, diagrams and maps, as well as methodological notes.

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[10] For example, Committee on Cross-Border Cooperation, acting under the Polish-Ukrainian Intergovernmental Coordination Council for Interregional Cooperation.

GENERAL DEFINITIONS

Delimitation – detailed definition and demarcation of the state boundary by a special committee under an international agreement; demarcation of something, e.g. districts, property (Latin *delimitatio*) [11]

Delimitate – conduct delimitation; demarcate. [12]

Administrative unit – a geographical area with an administrative authority that has the power to take administrative or policy decisions for that area within the legal and institutional framework of the Member State. [13]

Card of the Pole – a document stating adherence to the Polish nation. It may be granted to persons who state adherence to the Polish Nation and meets the conditions set out in the Law on the Card of the Pole. [14]

Local border traffic – the regular crossing of an external land border by border residents in order to stay in a border area, for example for social, cultural or substantiated economic reasons, or for family reasons, for a period not exceeding the time limit laid down in this Regulation. [15]

Region – a separate, relatively homogeneous area with specific natural or acquired features which distinguishes it from the adjacent areas (Latin *regio*). [16]

Border area – an area that extends no more than 30 kilometres from the border. The local administrative districts that are to be considered as the border area shall be specified by the States concerned in their bilateral Agreements as referred to in Article 13. If part of any such district lies between 30 and 50 kilometres from the border line, it shall nevertheless be considered as part of the border area. [17]

Transborder – involving the crossing of state borders, existing over state borders. [18]

Local border traffic permit – a specific document entitling border residents to cross an external land border under the local border traffic regime. For the purposes of implementing the local border traffic regime, Member States shall be authorised to conclude bilateral Agreements with neighbouring third countries in accordance with the rules set out in this Regulation. [19]

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[11] Słownik wyrazów obcych, PWN SA , Warszawa 1995, page 217.

[12] Ibid.

[13] Regulation (EC) No 1059/2003 of the European Parliament and of the Council of 26 May 2003 on the establishment of a common classification of territorial units for statistics (NUTS) (Official Journal L 154 , 21/06/2003 with later amendments).

[14] Law on the Card of the Pole of 7 September 2007 (Journal of Laws of 28 September 2007, no. 180, item 1280, with later amendments).

[15] Regulation (EC) No 1931/2006 of the European Parliament and of the Council of 20 December 2006 laying down rules on local border traffic at the external land borders of the Member States and amending the provisions of the Schengen Convention (Official Journal L 29/3, 21/06/2003).

[16] Słownik wyrazów obcych, PWN SA , Warszawa 1995, page 948.

[17] Regulation (EC) No 1931/2006 of the European Parliament and of the Council of 20 December 2006 laying down rules on local border traffic at the external land borders of the Member States and amending the provisions of the Schengen Convention (Official Journal L 29/3, 21/06/2003).

[18] www.sjp.pwn.pl

[19] Regulation (EC) No 1931/2006 of the European Parliament and of the Council of 20 December 2006 laying down rules on local border traffic at the external land borders of the Member States and amending the provisions of the Schengen Convention (Official Journal L 29/3, 21/06/2003).

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11. Law on the Card of the Pole of 7 September 2007 (Journal of Laws of 28 September 2007, no. 180, item 1280, with later amendments).

12. Law on official statistics of 29 June 1995 (Journal of Laws of 1995 r. no. 88, item 439 with later amendments).

APPENDIX

1. Model questionnaires.