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E-ROAD CENSUS 2000

Country notes

Note by the secretariat

Note: The present document contains country notes that accompany the E-Road Census 2000.

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2000 COMBINED CENSUS OF MOTOR TRAFFIC AND INVENTORY OF STANDARDS AND PARAMETERS ON MAIN INTERNATIONAL TRAFFIC ARTERIES IN EUROPE

Introduction

At its sixty-first session, the Inland Transport Committee of the United Nations Economic Commission for Europe (UNECE) adopted resolution No. 247 inviting Governments members of the UNECE to take a combined census of motor traffic and inventory of standards and parameters on the main international traffic arteries in their country (E Roads) in accordance with the European Agreement on Main International Traffic Arteries (AGR), 1975.

As in past years, Governments were requested to transmit to the UNECE secretariat the relevant data in line with the recommendations and considerations set forth in the Ad hoc Meeting on the Road Traffic Census (TRANS/WP.6/AC.2/14 and Add.1), considering 2000 as the reference year.

The secretariat has undertaken the preparation of the results of the 2000 Combined E-Road Census and Inventory in the context of a geographic information system (GIS). The Automation and Geographic Application of the 2000 Combined E-Road Census and Inventory Census was a project conceived jointly by the UNECE secretariat and the Institute for Territorial Studies in Barcelona (IET), with the maps and statistical tables printed by the Cartographic Institute of Catalonia (ICC). The objectives of the project were to facilitate the database management for 2000 and future E Road Censuses and Inventories to enhance the use and presentation of results, and allow for improved spatial analysis by Governments and other users for effective transport planning, land use and infrastructure development on the E-Road network.

The statistical tables and accompanying maps are based on data received from the following countries: Albania, Armenia, Austria, Belarus, Belgium, Bulgaria, Croatia, Czech Republic, Denmark, Estonia, Finland, France, Georgia, Germany, Hungary, Ireland, Italy, Kyrgyzstan, Latvia, Lithuania, Luxembourg, Macedonia (FYROM), the Netherlands, Norway, Poland, Portugal, Romania, Russian Federation, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey, Ukraine, United Kingdom and Yugoslavia.

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In accordance with the Recommendations set forth by Governments in the Ad hoc Meeting on the Road Traffic Census (29-30 October 1998) (TRANS/WP.6/AC.2/14 and Add.1), the results of the 2000 Combined E-Road Census and Inventory consist of the following statistical tables:

Vehicle Categories

Vehicle categories, the number of which was reduced by Governments in 1998 from 5 to 4, are as follows. For purposes of Tables 4 and 4bis, categories A, B constitute "light motor traffic," while categories C and D constitute "heavy motor traffic."

Category A: Motor vehicles with not more than 3 wheels (motor cycles with or without sidecars, including motor scooters, and motor tricycles);

Category B: Passenger and light goods vehicles (vehicles, including station wagons, with not more than nine seats, including the driver's seat, and lights vans with a permissible maximum weight of no more than 3.5 tonnes). Passenger and lights goods vehicles are recorded as such, irrespective of whether they are with or without trailers, including caravans and recreational vehicles;

Category C: Goods road vehicles (lorries with a permissible maximum weight of more than 3.5 tonnes, lorries with one or more trailers; tractors with semi-trailers and one or more trailers; tractors with one or more trailers) and Special vehicles (agricultural tractors, special vehicles such as self-propelled rollers, bulldozers, mobile cranes and army tanks and other road motor vehicles not specified elsewhere);

Category D: Motor buses, coaches and trolley buses

Where possible, data are included for both 1990 and 1995. The non-inclusion of a country in any of the tables indicates that no data were supplied for either year. Some figures may not add up due to rounding.

The following symbols are used:

... = not available
- = magitude zero
0 = magnitude not zero but less than half of the units employed

Country Notes

Country notes accompanying the data supplied are provided on the following pages:

SUMMARY

Country Notes

Bulgaria

Croatia

Czech Republic

Macedonia (FYROM)

Poland

Portugal

Romania

Russian Federation

Spain

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COUNTRY NOTES[1]

BULGARIA

COMMON PROFILE TRAFFIC COUNT

The purpose of the traffic count on the roads is to obtain information about quantity and quality characteristics of traffic flows, which have to be used during planning of the development of the road network, design of road sites, carrying out events for road traffic organization and safety and for solving other tasks in the field of road works. The common profile traffic count covers the roads from the national road network.

1. Method for carrying out of traffic count

The common profile traffic count is carried out by a statistically controllable method. It is based on a full study of road traffic and its regularities of passing in the time through long monitoring carried out at representative counting posts, and transfer of the same over a large number of counting posts on which short-period observations are done.

2. Preparation and carrying out of the count

2.1. Types of counting posts (CP)

1) Posts for determination of regularities of passing of road traffic - main counting posts (MCP).
2) Posts for which the value of annual average daily traffic (AADT) is determined - additional counting posts (ACP).

2.2. Location of counting posts

The road network covered by traffic count is divided into counting sections so that those traffic volumes on each of them have adjacent quantity and quality characteristics. For section borders there are chosen places at which a change is expected in traffic volume and in the composition of traffic flow (intersection, junction, populated place, etc.). On each section a CP is settled, the location of which depends on providing enough visibility.

2.3. Duration of count

The count of motor vehicles at MCP must have a minimum duration of 7 consequent days (from Monday to Sunday) in the months from April to October, and in all the other months of the year - 3 days (from Friday to Sunday). The count of motor vehicles at ACP must have a minimum duration of 6 working days in the year with a continuance of 14 hours per day (Wednesday or Thursday), one day in each of the months from May to October, and also 2 Sundays in July and August.

2.4. Types and groups of motor vehicles

Motor vehicles are classified in 7 groups with a view to determination of design loading of pavements and of design hour volume (table 1).

1 Country notes are provided in French and Russian in a separate document.

Table 1

Group	Type of motor vehicle	Full mass, tons	Symbol
1.Motorcycles	Mopeds and motor-cycles with or without side-car		MOT
2.Cars	Light travel cars of all types and models, mini-buses with up to 10 seats, cars for urgent medical help, light trucks up to 1.5 tons payload	Up to 3.5	CAR
3.Trucks	Trucks of all types and models from 1.5 to 3.5 tons payload without and with a trailer	3.5 to 6.0	T1
4.Trucks	Trucks from 3.5 to 6.0 tons payload	6.0 to 12.0	T2
5.Trucks	Trucks 6 and above 6 tons payload	Above 12	T3
6.Trucks with a trailer	Trucks of all types and models with one or more trailers	Above 12	T4
7.Buses	All kinds of buses		BUS
Tractors with or without a trailer can be related to groups 3,4,5.			

2.5. Forms for recording of count information

Count data are written in specially prepared forms printed for the purpose. The types of motor vehicles that have passed are noted in it, classified according to table 1.

3. Processing of results

3.1. Determination of the characters of passing of the road traffic

During determination of traffic volume on roads, the variations of traffic during the hours of the day, during the days of the week and during the months of the year are taken into account. These variations are determined from the road function and are expressed through the relative values (coefficients of unevenness) of the holiday traffic ψ and of that at the end of the week b_v, and are determined by their basis characteristics of traffic passing.

1) The coefficient ψ indicates the traffic increase in the working days during the tourist season compared with that in the months with average traffic volume (May, June and October) and is determined by the formula:

$$\Psi = \frac{3MADT_{VIII}^{W1}}{MADT_{(V+VI+X)}^{W1}} \qquad (1)$$

where:

$MADT_{VIII}^{W1}$ is the monthly average daily traffic volume in the working days in August, in a total number of motor vehicles per day (MV/24h).

$MADT_{(V+VI+X)}^{W1}$ is the sum of the monthly average daily traffic volume in the working days in May, June and October, in a total number of motor vehicles per day (MV/24h).

2) The coefficient b_v indicates the increase of car traffic in the weekends in August over that in the working days of the same month and is determined by the formula:

$$b_v = \frac{MADT_{VIII}^{W2}}{MADT_{VIII}^{W3}} \qquad (2)$$

where:

$MADT_{VIII}^{W2}$ is the monthly average daily traffic volume of cars in the holidays in August, in a number of cars per day (CAR/24h).

$MADT_{VIII}^{W3}$ is the monthly average daily traffic volume of cars in the working days in July and August, in a number of cars per day (CAR/24h).

For more accurate reporting of traffic during the tourist season and of traffic in the weekend, a differentiation of the values of parameters ψ and b_v, shown in table 2, is permitted.

Table 2

Parameters	1	2	3	4
ψ and b_v	$b_v < 1.0$	$1.0 \leq b_v < 1.5$	$1.5 \leq b_v < 2.0$	$2.0 \leq b_v$
A $\psi<1.5$	A1	A2	A3	A4
B $1.5\leq\psi<2.0$	B1	B2	B3	B4
C $2.0\leq \psi<2.5$	C1	C2	C3	C4
D $2.5\leq \psi$	D1	D2	D3	D4

3.2. Determination of factors for traffic irregularity

1) The hourly factor H_x shows the traffic irregularity during the day (24h) and is determined by the formula:

$$H_x = \frac{DT_{24}}{T_x} \qquad (3)$$

where:

DT_{24} is the daily traffic volume, in a number for each type of motor vehicle per day (MOT/24h, CAR/24h, T1/24h, T2/24h, T3/24h, T4/24h, BUS/24h).

T_x is the traffic volume for x hours, in a number for each type of motor vehicle for x hours (MOT/xh, CAR/xh, T1/xh, T2/xh, T3/xh, T4/xh, BUS/xh). The minimum value of x is 14h.

The hourly factor H_x is determined for each character of traffic, for each type of motor vehicles and month during which a count at ACP is done.

2) The daily factor D_i indicates the irregularity of traffic during the week and is determined by the formula:

$$D_i = \frac{WADT}{DT_i} \qquad (4)$$

where:

WADT is the weekly average daily traffic volume for each of the weeks during which full weekly surveillance is carried out, in a number for each type of motor vehicle per day (MOT/24h, CAR/24h, T1/24h, T2/24h, T3/24h, T4/24h, BUS/24h).
DT_i is the daily traffic volume for the day i of the week, in a number for each type of motor vehicles per day (MOT/24h, CAR/24h, T1/24h, T2/24h, T3/24h, T4/24h, BUS/24h).
i is the index of the day of the week. It has values 1 to 7.
The factor D_i is determined for each character of traffic, type of motor vehicles, month during which a count at ACP is done, and day of the week.

3) The monthly factor M_j indicates the irregularity during the year and is determined by the formula:

$$M_j = \frac{AADT}{MADT_j} \qquad (5)$$

where:
AADT is the annual average daily traffic volume, in a number for each type of motor vehicle per day (MOT/24h, CAR/24h, T1/24h, T2/24h, T3/24h, T4/24h, BUS/24h).
$MADT_j$ is the monthly average monthly daily traffic volume in the month j with dimensions as AADT.
j is the index of the month during which the traffic count is carried out. It has values from 1 to 12.
The monthly factor M_j is determined for each character of traffic, type of motor vehicle and month during which a count at ACP is done.

3.3. Determination of the annual average daily traffic volume
This quantity is determined for the additional counting posts (ACP).
The values of the quantity AADT at ACP are estimated separately on the basis of data for each month during which a count is carried out at them by the formula:

$$AADT^m = H_x^m . D_i^m . M_j^m . T_x^m \qquad (6)$$

where:
$AADT^m$ is the annual average daily traffic volume at ACP on the basis of the data for the month m, in a number for each type of motor vehicle per day.
T_x^m is the hour traffic volume for x hours at a certain ACP during the month m, in a number for each type of motor vehicles for x hours.
m is the index of the months for which AADT is estimated (May, June, September and October).
H_x, D_i, M_j are as in formulas (3), (4) and (5).

The final value of the annual average daily traffic volume (AADT) is obtained such average arithmetical from the estimated values of the quantities $AADT^m$ by the formula:

$$AADT = \frac{\sum_{m=1}^{n} AADT^m}{n} \qquad (7)$$

where:

AADT is the final value of the annual average daily traffic, in a number for each type of motor vehicle per day.
$AADT^m$ is as in formula (6).
n is the number of the quantities $AADT^m$.

3.4. Determination of the traffic volume reduced to passenger cars
The reduction of AADT to passenger cars is made with the help of the passenger car equivalents E_s shown in table 3.

Table 3

Type of motor vehicles, s	Passenger car equivalents E_s
1. MOT	0.5
2. CAR	1.0
3. BUS	2.5
4. T1	2.0
5. T2	2.0
6. T3	2.0
7. T4	3.5

The determination of the average daily traffic volume reduced to passenger car is done by the formula:

$$AADT' = \sum_{s=1}^{7} AADT_s.E_s \qquad (8)$$

where:
$AADT'$ is the reduced to passenger car annual average daily traffic, in a number of passenger cars per day.
$AADT_s$ is the annual average daily traffic of the type s of motor vehicles, in a number for each type of motor vehicle per day.
E_s is the passenger car equivalent for the type s of motor vehicles
s is the index of the type of motor vehicles.

3.5. Determination of the design hour traffic volume
The design hour volume DHV is the highest hour volume reached or overreached during t hours in the year. It is determined by the formula:

$$DHV = PHF_t.AADT' \qquad (9)$$

where:
DHV is the design hour traffic volume, in a number of passenger cars per hour.
$AADT'$ is as in formula (8).
PHF_t is the peak hour factor, which is estimated for each counting post for determination of the regularities of traffic passing by the formula:

$$PHF_t = \frac{HT_t}{AADT} \qquad (10)$$

where:
HT_t is the hour traffic volume for a given main counting post, which is overreached during t hours in the year, in a total number of motor vehicles per hour.

t is the time in hours. It accepts values 30, 50 and 100. When planning the development of the road network and the design of road sites it is used t = 50h. The values 30 and 100 are used during carrying out of special investigations.
AADT is the annual average daily traffic determined for the corresponding counting post, in total number of motor vehicles per day.

Programme for manual traffic counting at main counting posts

Month	**Date**	**Duration**
January	20,21,22	from 6.00 h in 20.01.2000 to 6.00 h in 23.01.2000
February	24,25,26	from 6.00 h in 24.02.2000 to 6.00 h in 27.02.2000
March	23,24,25	from 6.00 h in 23.03.2000 to 6.00 h in 26.03.2000
April	10,11,12,13,14,15,16	from 6.00 h in 10.04.2000 to 6.00 h in 17.04.2000
May	15,16,17,18,19,20,21	from 6.00 h in 15.05.2000 to 6.00 h in 22.05.2000
June	12,13,14,15,16,17,18	from 6.00 h in 12.06.2000 to 6.00 h in 19.06.2000
July	10,11,12,13,14,15,16	from 6.00 h in 10.07.2000 to 6.00 h in 17.07.2000
August	14,15,16,17,18,19,20	from 6.00 h in 14.08.2000 to 6.00 h in 21.08.2000
September	11,12,13,14,15,16,17	from 6.00 h in 11.09.2000 to 6.00 h in 18.09.2000
October	9,10,11,12,13,14,15	from 6.00 h in 09.10.2000 to 6.00 h in 16.10.2000
November	16,17,18	from 6.00 h in 16.11.2000 to 6.00 h in 19.11.2000
December	14,15,16	from 6.00 h in 14.12.2000 to 6.00 h in 17.12.2000

Programme for manual traffic count at additional counting posts

Month	**Date**	**Duration**
May	10 (Wednesday)	from 6.00 h to 20.00 h
June	7 (Wednesday)	from 6.00 h to 20.00 h
July	19 (Wednesday) 23 (Sunday)	from 6.00 h to 20.00 h
August	9 (Wednesday) 13 (Sunday)	from 6.00 h to 20.00 h
September	20 (Wednesday)	from 6.00 h to 20.00 h
October	18 (Wednesday)	from 6.00 h to 20.00 h

CROATIA

TRAFFIC COUNTING ON E-ROADS IN THE YEAR 2000

Technical Report

1. Introduction

In the year 2000, a traffic counting programme was carried out in Croatia, according to the recommendations in TRANS/WP.6/AC.2/14/Add.1 of 26 April, 1999. This particular report has been compiled on the basis of counts gathered at the counting points located on E-Roads. The E-Roads have been defined by the The European Agreement on Main International Traffic Arteries (AGR), signed in 1975, and the consecutive annexes specified therein, up to the year 1999 inclusive.

Traffic counting on other main roads in Croatia was performed along the similar guidelines, described in the annexes concerning E-Roads, which were issued in the year 2000. The complete results of traffic counting performed on Croatian roads are published every year, for the preceding year, in a special edition entitled "Traffic Counting on the Roads of the Republic of Croatia for the Year…"

2. Data Collection Methods

Data collection in the year 2000 comprised these different procedures:

(a) Continuous Automatic Count

Since 1980, there have been a certain amount of sites in Croatia where continuous automatic counts (ACCs) were introduced. That number has been increasing year by year, especially so in recent years. More and more counters having modern improvements are being introduced. At those sites the counts are taken by hour, for each direction separately, day-to-day throughout the year. Earlier, counts were expressed in impulses, while recently real vehicles, even classified by specific groups, have been being used;

(b) Periodical Automatic Count

From 1998 to 2000, manual counts were replaced by the so-called ACPs (Automatic Count, Periodical), each year at approximately one third of the counting points. That way, from 2000 on, manual counts have been entirely superseded by the periodic automatic counts. To that purpose, a geographical timetable has been scheduled for ACPs along with the formal mathematical procedures to compute, or estimate, AADT and ASDT.

(c) Traffic Census on Toll Roads

In 1972, the first highway in Croatia was built and put in service. It was the Zagreb-Karlovac six-lane highway. Later, a couple of others as well as one tunnel and a bridge connecting an island with the mainland were added. At these structures, the tolls were introduced from their inception, and simultaneously the traffic census on toll roads (TTC) programme was initiated.

Therefore, there has been no manual traffic counting in Croatia, at the system level, ever since the year 2000.

3. Computing and/or Estimating AADT and ASDT

a. Continuous Automatic Count

When the total count is accomplished this way, AADT and ASDT are computed as arithmetic mean of the traffic count. Otherwise, the count is filled out, when possible, by making use of time series analyses which, effectively, reduce the problem to the previous case. In those cases in which a time series analysis is not feasible, an adequate estimation procedure is applied, which fits the pattern of the achieved annual count coverage.

b. Periodical Automatic Count

It has been mentioned already that this method of counting requires a time schedule. The schedule itself (spelling out when, how long and how to count), is contingent upon the available resources and defined by the precision of estimation. In terms of multiplicity, one-time, twofold, and threefold periodical counts were utilized during the three years' span, 1998 through 2000. There is a particular mathematical expression, corresponding to each particular schedule and each particular multiplicity of counting, which helps computing (estimating) AADT, or ASDT. Multiplicity expresses how many weeks are encompassed by periodical counting, and week identification actually discriminates between different combinations of the weeks. On a sample of counting points with ACC and good count coverage, it has been established by simulation, that only certain combinations of the weeks (denoted by *cw* further on), and among them only certain combinations of the days of the week (denoted further by *cd*) give estimates of AADT or ASDT with a moderate variability of the relative estimation error within the ACC acceptable level of significance. Generally, ACP itself, or together with ACC, offers two possibilities for estimating AADT or ASDT. The first of these possibilities is estimation of one of these quantities in the year in which ACP was carried through. In a formal mathematical way, the relationship between AADT, or ASDT, and *cw* and *cd*, can be expressed as:

$$\text{AADT} = f(cw\,(cd))\,,$$

$$\text{ASDT} = g(cw\,(cd))\,.$$

This procedure, for the sake of estimating AADT or ASDT, was applied with the ACP counting points, at which the last count was taken in 2000. The fact to be emphasized is that (it emerges as result of a simulation of the same procedure on a sample of counting points with ACC, or ACP):

(i) In more than 95% of the simulated cases the absolute value of the relative error of the AADT estimate does not go beyond 10%.

(ii) In more than 89% of the simulated cases the absolute value of the relative error of the ASDT estimate is not greater than 10%.

Another possibility is estimation of AADT or ASDT in one of the next years (after ACP will have been done) using a relationship between an ACP counting point and a corresponding ACC counting point. That relationship is established through simple linear regression on the basis of data obtained by applying the same schedule on both the ACC, as well as the ACP, counting points, with the condition that related counting points have an equal role in traffic. If during a certain day 'd', according to the ACP schedule, traffic is denoted by y_d, and traffic corresponding to it at the ACC counting point by x_d, then their relationship using the linear regression formalism can be written as:

$$y_d = a + bx_d + \varepsilon,$$

where a,b are the linear regression coefficients; they are determined by the least squares method, and ε is the deviation of the theoretical with respect to the real values. A normal Gaussian distribution is assumed.

A procedure of this kind was applied, with the aim of estimating AADT and ASDT, at the ACC counting points at which the last data was collected in 1998 or 1999.

c. Traffic Census on Toll Roads

The toll collection, for the service delivered at the roadway structures, is taking place continually. Hence, counting has the same characteristics as continuous automatic count data collection. Therefore the related procedure for computing AADT or ASDT at the TTC counting points equals the one applied at the ACC sites. However, in the TTC case the results of the count are given in the form of a matrix so that the related procedure is being applied to the matrix.

d. Manual Count

In the technical report about the traffic count on E-roads for the year 1995, all details concerning AADT and ASDT estimates have been presented, on the basis of data acquired by manual counting. Because such counts are out of use now, details concerning the procedure itself are omitted.

4. Counting Points

Data collection design on Croatian roads in the period of 1998-2000 projected 75 counting points on E-Roads. In 2000 the count was obtained at 61 counting points. As far as method of count is concerned, the design included 40 points of automatic continuous, 21 points of automatic periodical, and 14 points of counting by way of toll collection. The entire view of counting points at E-Roads can be seen in Table 4.1.

Table 4.1
List of Counting Points, on E-Roads in Croatia, with their Position and Year of the Last Count

Counting Point	E-Road	Last Year	Method of Count
065	E 59	2000	ACC
031	E 59	2000	ACC
520	E 59	2000	TTC
458	E 61	1998	ACP
045	E 61	2000	ACC
471	E 61	1998	ACP
522	E 65, E71	2000	TTC
456	E 65, E 71	2000	ACP
040	E 65, E 71	2000	ACC
002	E 65, E 70, E 71	2000	ACC
508	E 65, E 71	2000	TTC
041	E 65, E 71	2000	ACC
519	E 65, E 71	2000	TTC
042	E 65	2000	ACC
043	E 65	2000	ACC
521	E 65	2000	TTC
079	E 65	2000	ACC
026	E 65	2000	ACC
470	E 65	1998	ACP
015	E 65	2000	ACC
485	E 65	1999	ACP
016	E 65	2000	ACC
418	E 65	1999	ACP
052	E 65	2000	ACC
017	E 65	2000	ACC
419	E 65	1999	ACP
057	E 65	2000	ACC
018	E 65	2000	ACC
058	E 65	2000	ACC
019	E 65	2000	ACC
027	E 65	2000	ACC
420	E 65	1999	ACP
020	E 65	2000	ACC
495	E 65	1999	ACP
421	E 65	1999	ACP
021	E 65	2000	ACC
477	E 65, E 80	1999	ACP
502	E 70	2000	TTC
004	E 70	2000	ACC
503	E 70	2000	TTC
504	E 70	2000	TTC

Table 4.1
List of Counting Points, on E-Roads in Croatia, with their Position and Year of the Last Count (cont.)

Counting Point	E-Road	Last Year	Method of Count
510	E 70	2000	TTC
088	E 70	2000	ACC
511	E 70	2000	TTC
512	E 70	2000	TTC
513	E 70	2000	TTC
514	E 70	2000	TTC
089	E 70	2000	ACC
007	E 70	2000	ACC
404	E 70	2000	ACP
036	E 71	2000	ACC
452	E 71	1998	ACP
463		1998	ACP
030		2000	ACC
034		2000	ACC
497		1999	ACP
037	E 71	2000	ACC
038	E 71	2000	ACC
090	E 71	2000	ACC
076	E 73	2000	ACC
422	E 73	2000	ACP
085	E 73	2000	ACC
084	E 73	2000	ACC
077	E 73	2000	ACC
472	E 73	2000	ACP
492	E 73	1999	ACP
473	E 73	1999	ACP
490	E 661	2000	ACP
467	E 661	2000	ACP
048	E 661	2000	ACC
468	E 661	2000	ACP
087	E 662	2000	ACC
459	E 751	1998	ACP
056	E 751	2000	ACC
506	E 751	2000	TTC

Legend:

ACC – Automatic Count, Continuous
ACP – Automatic Count, Periodical
TTC – Traffic Census on Toll Roads

5. Appendices

5.1 Vehicle Classification

Generally speaking, different categories of vehicles are used in different schemes of road traffic counting.

When continuous automatic counting is used, three different kinds of automatic devices, with respect to the capability of discriminating between different classes of vehicles, are utilized. The oldest amongst them just count vehicles without classifying them. In that case, the traffic count is calculated by classes on the basis of time samples obtained through manual counts. Another type of automatic counter enumerates vehicle traffic according to the predetermined groups by length (Table 5.1.1.) Finally, a third variety of automatic counters does count vehicle traffic with respect to the fixed classes.

Table 5.1.1
Classes of Motor Vehicles by Length, ACC

Class	Length
1.	Not longer than 5.5m
2.	from 5.5m to 9.1m
3.	from 9.1m to 12.2m
4.	from 12.2m to 16.5m
5.	longer than 16.5m

In the case of traffic census on toll roads, there are four classes of vehicles distinguished with respect to tollage. This is on view in Table 5.1.2.

Table 5.1.2
Classes of Motor Vehicles, TTC

Class	Descriptive Definition
1.	2 axles, not higher than 1.3m, measured at first axle, except vans
2.	3 or more axles, not higher than 1.3m, measured at first axle, including vans
3.	2 or 3 axles, higher than 1.3m, measured at first axle, including vans with trailers
4.	4 or more axles, higher than 1.3m, measured at first axle

In ACP, automatic counters are utilized that count traffic according to the given groups by length, in agreement with the categorization in Table 5.1.1.

5.2 E-Roads in the Republic of Croatia

E-Roads on the territory of the Republic of Croatia are presented as defined in “Annex I of the European Agreement on Main International Traffic Arteries (AGR) of 1975 and in Amendment 2 to the Agreement (ECE/TRANS/16/Amend.2) and in any other amendment which comes into force before 1995” [see Recommendations, item under (a)]. Accordingly, the Croatian sections of E-Roads are shown in Table 5.2.

Table 5.2
E-Roads on the territory of Croatia

E-Road	**Section**
E 59	(Maribor -) Macelj – Zagreb
E 61	(Trieste -) Pasjak – Rijeka
E 65	(Nagykanizsa -) Goričan – Zagreb – Rijeka – Dubrovnik – Debeli Brijeg (- Petrovac)
E 70	(Ljubljana -) Bregana – Zagreb- Slavonski Brod – Lipovac (- Beograd)
E 71	(Nagykanizsa -) Goričan – Zagreb – Karlovac – Knin – Split
E 73	(Mohacs -) Beli Manastir – Osijek – Đakovo – Šamac – Metković – Opuzen
E 80	(Pescara -) Dubrovnik – Debeli Brijeg (- Herceg Novi)
E 661	(Barcs -) Terezino Polje – Virovitica – Stara Gradiška (- Banja Luka)
E 662	(Sombor -) Batina – Bilje – Osijek
E 751	Rijeka – Pula – Buje – Plovanija (- Koper)

Remark

Where an E-Road has not been open for traffic due to renovation or some other reason, an alternative path should be taken if relevant traffic was redirected there [see Recommendations, item under (a)]. Accordingly, on this occasion, as an alternative to the route Grabovac – Bihać – Donji Lapac – Donji Srb – Sučevići, the path Grabovac – Udbina – Gračac – Sučevići has been taken. The reason for this is the closure of the border crossing at Užljebići, on the segment Bihać – Donji Lapac.

CZECH REPUBLIC

Commentary to the national census of motor traffic on E-Roads in the Czech Republic 2000

The data of the national traffic census on E-Roads in the Czech Republic in 2000 are based on results of general traffic counts on the entire motorway network of the country and on a major part of other roads on the Czech territory in the said year. The census was undertaken in the form of statistical samples representing the period April-October, each of the samples comprising four hours of different time periods of a day (a.m. or p.m.). Using these samples and empirical factors, values of average daily traffic (ADT) in 2000 were calculated. Supplementary night counts beyond normal limits of the census were carried out only at selected counting posts on the

E-Roads. Traffic was counted during one counting period in spring and one in summer. Counting posts on the E network were selected in conformity with the data obtained: as a rule, the same locations were used as for the national traffic census in 1995. The earlier numbering of counting posts was also retained. Changes have been made only at places where new road construction projects or road modifications of E-Roads caused substantial changes of condition.
Length of those road sections having changed has been newly measured.

Notes to the tables and the map:

Table 1
The distribution by carriageway width refers to non-urban (rural) E-Roads only.
The length of the E-Roads in urban areas is given in the table as unknown.
Classifications by carriageway width and number of lanes was not available here.

Table 2
The break-up of length of the E-Roads by the traffic roads volumes has been carried out for non-urban roads only.

Table 3
Length of single E-Roads might include sections which are common to other E-Roads. Lengths of common sections are shown in brackets. The same applies to the numbering of counting posts.

Table 4
The values of average traffic have been ascertained for sections of the E-Roads in non-urban (rural) areas.

Table 4 bis
The values of average traffic have been ascertained for sections of the E-Roads in non-urban (rural) areas.
Traffic on motorways was counted by means of automatic traffic counters registering only total numbers of vehicles. Supplementary manual counts by categories of vehicles were executed on selected counting posts to characterize traffic composition on motorways.
In 1995, the night traffic and peak-hour traffic were estimated by different methods as in 2000. The comparison is not 100%. The new method is better and characterizes the traffic composition by peak-hour traffic (not in 1995).

Note:
The Table 4 bis does not, as a matter of fact, provide any better information in comparison with the Table 4 due to the fact that as a rule characteristic traffic features in summer night and peak periods are not typical for a route as a whole. At least the data concerning peak traffic volumes should be better included in the Table 7 for each counting section or a certain homogeneous part of a route.

Table 5
All motorways and most express roads in the Czech Republic form part of the F network. Therefore, there are no data in the rows for motorways in the Table 5, while in the rows for the

express roads only such data are shown which refer to express roads not included in the E network.
Traffic performance was estimated by means of a detailed analysis and comparison of results of national traffic censuses 1990 and 1995 for all motorways and all-purpose roads, including sections in urban areas.

Note:
The classification in table 5 might have been more appropriate within about the same space. For comprehension of importance and quality of the E network, e.g. the following classification could be suitable.

All E-Roads	-	motorways
	-	express roads
	-	other E-Roads
All other roads	-	motorways
	-	express roads
	-	other roads
	-	
All roads	-	motorways
	-	express roads
	-	other roads
Total		

Annex 6
The sections are numbered identically with the 1995 census for the sake of easier comparability of data.
Changes of routes of the E-Roads due to new construction or route modifications (shift to other roads) were included. Therefore, some section numbers have been dropped or cancelled.

Table 7
For the numbering of sections, the same applies as in case of the Annex 6.

Note: We consider to show values of 50th peak hour for each section in the Table 7.

REPUBLIC OF MACEDONIA (FYROM)

On the accomplished Census of Motor Traffic on the International the E-Road network and the Inventory of E-Road network in 2000, the total length of the E-Road network in the Republic of Macedonia is 508.2 km. This data does not include the length of road-section that is passing through inhabited places in the country.
When comparing the E-Road network 2000 and E-Road network 1995, there have been some changes on the road E-65 on the road-section Tetovo - Gostivar on a length of 25 km, which has turned into a motorway (see Table 1).
In the total length of motorways, the road-section Stobi - Negotino with a length of 12 km, is not taken into consideration, because the above-mentioned road section was completed at the end of December 2000.

The total length of "non E-Roads" in the country is established as a summary of road sections' length where counting of the transport was conducted, and this data does not include the length of regional and local roads (see Table 5).
In the Republic of Macedonia, a much lower frequency of transport was registered in 1995 compared to transport in 2000 as a result of the economic embargo that the Republic of Macedonia had in 1995 and as a result of which a part of the transport was undertaken through the Republic of Bulgaria. The larger presence of military vehicles in the country in 2000 had influenced the frequency of transport in 2000.
Data comparison is ensured for all of the roads with the data from 1995, except for the road E-852, because during the hand counting in 1995, the counting by hours on that road was not realized. Comparison of data conducted by the control unit of the State Statistical Office has shown some differences, around 3% in the light freight transport, due to inappropriate presentation of data by hours and changes of the counting locations in certain periods of time because of the road reconstruction.
The Census is realized with 8 manual stations counting, 12 automatic counters and 3 counting places from the pay-toll stations.
Automatic counters are modified with regard to those in 1995 and give more qualitative records necessary for the stations.
Data from the pay-toll stations are included in the final results, but they do not present the density of the motor traffic in a qualitative way, because there is no evidence of the vehicles that are free of charge at the pay-toll stations, which are regulated by law.
Basically, the system of counting places is presented with the basic network of 27 counting places. In order that the data from the Census 2000 may be comparable with the data from 1995, the results are presented on the basis of 23 counting places (new counting place MK-23 Podmolje- Struga which increases the total number of counting places to 23 in comparison with 1995 when the total number was 22).

Table of additional counting on E-Roads to obtain traffic structure where there are automatic counters or tool-stations in 2000.

Code of the day	**Date**	**Day**	**Time counting**
D	21 February	Monday	06-08
E	14 May	Sunday	20-22
F	08 July	Thursday	13-15
G	19 July	Wednesday	11-13
J	29 August	Tuesday	08-11
K	16 September	Saturday	15-18
H	22 December	Friday	15-18
HB	21 February	Monday	22-24
HG	20 August	Thursday	00-03
HK	17 September	Sunday	03-06

Persons engaged from the Public Office “Macedonia- Road” conducted the manual counting, and the State Statistical Office, with its own personnel conducted the control of counting by a specified scheme of hour counting.

Automatic counts

In the Republic of Macedonia, the counting of the E-Road network with automatic counters is realized on 12 counting places. There are two types of automatic counters of the roads in the Republic of Macedonia. The first type does not classify the vehicles during the period of counting and it wears mark SBH. The second type is classifying the vehicles on light (shorter than 6 m) and heavy (longer than 6 m) and bears the mark OHIS. The record is realized on every hour for each day in memory chips. To be able to obtain the required structure of traffic, 10 days’ manual counting was conducted over the year, with the following schedule:

Table of manual counting on the national and regional roads during 1995

Daily counting				**Night counting**			
Code	**Date**	**Day**	**Time**	**Code**	**Date**	**Day**	**Time**
1. Hand counting is conducted in 5 days time over the year, with the following schedule							
C	11 March	Saturday	06-22	-	-	-	-
D	12 April	Wednesday	06-22	ND	12/13 April	Wednesday/Thursday	22-06
G	13 June	Friday	06-22	NB	30 June/1 July	Friday/Saturday	22-06
I	06 August	Sunday	06-22	-	-	-	-
M	02 November	Thursday	06-22	-	-	-	-
2. Counting, once a year							
G	30 June	Friday	06-22	NB	30 June/1 July	Friday/Saturday	22-06

Data from the pay-toll stations

Data from the pay-toll stations are gathered through the tickets sold for the 4 categories of vehicles. The number of vehicles, with a support of the statistical calculations, is increased with the main purpose of calculating those vehicles that are free of charge at the pay-toll stations, which are regulated by law. Still, to get the real structure of vehicles, 10 hand counting are realized over the year, named in the table.

Vehicle categorization

Data from the Census of E-Road network shows that there are 10 categories of vehicles:

1. Bicycles and tricycles with or without motor
2. Mopeds, skaters and motor tricycles

3a) Vehicles without trailer
3b) Vehicles with trailer, vans, and vehicles up to 9 seats

4. Buses with or without trailer

5. Light freight vehicles with capacity till 3.5 tonnes
6. Freight vehicles from 3.5-7 tonnes capacity, without trailer
7. Freight vehicles with trailer, heavy freight vehicles from 7.5 tones with and without trailer
8. Agricultural Tractors
9. Special kinds of vehicles, including construction machines and military vehicles

<u>Calculation method</u>

1. An average annual daily traffic (AADT) out of hand counting
   AADT= 1/ 4 (C+ M) + 1/6 (D+G+I)+ 1/3 (ND+NB+ NI).
2. An average annual daily transport (AADT) out of automatic counters is obtained by dividing the total number of vehicles with the number of working days of counters.
3. An average annual daily traffic (AADT) from the pay-tolls is calculated as a quotient between the total number of passed vehicles and 365 days.
4. An average annual daily traffic (AADT) for every E-Road is calculated with collecting of AADT from every counting place on the road divided with the total number of counting places on that road.
5. An average night traffic by counting place during vacations is calculated by dividing the total transport between 20.00h and 06.00h with the number of days that contain data.
6. An average number of vehicles per counting place during vacations is calculated by dividing of the total 24 hour traffic for two months (July and August) with the number of the days from those two months, for the days that contain data.
7. An average number of vehicles in traffic jams is calculated as a maximum hour of transport at 15.00h.

Traffic classification is shown as:
1. Total transport (light + heavy motor traffic).
2. Light motor traffic (A+B).
3. Heavy motor traffic (C+D).

POLAND

In 2000, the census of motor traffic was carried out on the main international arteries in Poland on a total length of 5285 km. The direct counts were performed at 474 counting posts on E-Roads on a total length of 4971 km and 28 counting posts on TINA roads not included in the E-Road network of a total length of 314 km. Vehicles were recorded manually by trained observers under supervision of the local road administration.

All the vehicles using the public roads were recorded in accordance with the UN requirements. Due to money saving purposes the year test cycle complying with the original Geneva formula has been reduced to 9 (nine) "day" periods and 2 (two) "night" periods. The "day" period counts were performed from 08.00h to 16.00h (at some selected locations from 06.00h to 22.00h) and "night" period counts from 22.00h to 06.00h.

Dates of traffic counts were chosen in a way which makes it possible to define the annual average daily traffic with required accuracy. In the table shown below, the schedule of traffic census in 2000 is presented.

Schedule of traffic census in 2000.

Number of count	**Date of counting**	**Day of the week**	**Character of counting**
x_1	27 January	Thursday	day
x_2	28 March	Tuesday	day
x_3	24 May	Wednesday	day
x_4	13 July	Thursday	day
x_5	16 July	Sunday	day
x_6	22 August	Tuesday	day
x_7	27 August	Sunday	day
x_8	27 September	Wednesday	day
x_9	10 December	Sunday	day
x_{10}	24/25 May	Wedn./Thursday	night
x_{11}	27/28 September	Wedn./Thursday	night

METHOD USED FOR CALCULATION OF DAILY AVERAGES

$$AADT = \frac{M_R \text{ x } N_1 + 0{,}8 \text{ x } M_R \text{ x } N_2 + M_N \text{ x } N_3}{N} + R_N$$

where:

AADT - Annual Average Daily Traffic
M_R - average “day” traffic per working day
M_N - average “day” traffic per Sundays and holidays
R_N - average “night” traffic
N_1 - number of working days in year, $N_1 = 247$
N_2 - number of Saturdays and pre-holidays days, $N_2 = 56$
N_3 - number of Sundays and official holidays, $N_3 = 63$
N - number of days in year, N = 366.

$$M_R = \frac{1}{3}\left(\frac{x_1 + x_4}{2} + \frac{x_2 + x_6}{2} + \frac{x_3 + x_8}{2}\right)$$

$$M_N = \frac{1}{2}\left(\frac{x_5 + x_7}{2} + x_9\right)$$

$$R_N = \frac{x_{10} + x_{11}}{2}$$

where:

$x_1, x_2 \ldots\ldots x_9$ – ”day” traffic (6^{00} - 22^{00}),
x_{10}, x_{11} - ”night” traffic (22^{00} - 6^{00}) on the following days of counting (see: Schedule of traffic census).

PORTUGAL

The 2000 Traffic census held in Portugal made it possible to evaluate the Annual Average of Daily Traffic (AADT) and since Portugal held annual traffic counts based on a sample of counters, it was organized like the latest considering four kinds of counting stations:

Principal stations –the counting was carried out following the method recommended by UNECE for the Main International Traffic Arteries, except for the night counts which were estimated;

Covering stations – these stations only counted five days per year during eight hours. The AADT was estimated using sampling methods;

Automatic stations – they registered automatically the various classes of traffic;

Toll stations – these stations only give the total of motor vehicles.

The Portuguese E-Roads’ network is in the following table:

	Designation		**Principal Road**
Reference Roads	E080	Lisboa - Santarém - Leiria - Coimbra - Aveiro - Viseu - Guarda - Vilar Formoso (border)	IP1 IP5
	E090	Lisboa - Montijo - Setúbal - Marateca - Montemor-o-Novo - Évora - Estremoz - Elvas - Caia (border)	IP7
Inter-mediate Roads	E001	Valença - Porto - Aveiro - Coimbra - Lisboa - Setúbal - Marateca - Grândola - Ourique - Faro - Vila Real de St. António (border)	IP1

	E082	Porto - Vila Real - Bragança - Quintanilha (border)	IP4
Connecting Roads	E 801	Coimbra - Viseu - Vila Real - Chaves - Vila Verde de Raia (border)	IP3
	E 802	Bragança - Guarda - Castelo Branco - Portalegre - Évora - Beja - Ourique	IP2
	E 805	(i) Famalicão - Chaves - Vila Verde de Raia	IC5, IP9 e IC25
	E 806	Torres Novas - Abrantes - Castelo Branco - Guarda	IP6

The number of toll motorways has risen significantly and once that in this network, the counting (classes of vehicles) is aggregated differently to the class of vehicles established by TRANS/WP.6/AC.2/12/Add.1, the tables only identify the total number of motor vehicles in referred links with tolls.
Efforts will be made so that, in the future, it is possible to estimate the number of vehicles according to the referred classes, based on a different classification obtained in the motorways with tolls.

ROMANIA

2000 census of motor traffic on main international traffic arteries (E-Roads) in Romania

In Romania, the census of road traffic on main international traffic arteries (E-Roads) is conducted at regular five-year intervals and is organized on the basis of the recommendations of the United Nations Economic Commission for Europe (TRANS/WP.6/AC.2/14/Add.1 dated 26 April 1999).

The census has been carried out as part of the general census of traffic on the public road system.

The most recent general traffic census, in 2000, covered 48,496 km of roads, including:
- main international traffic arteries (E-Roads);
- all other national roads;
- departmental roads;
- the most heavily used communal roads.

The general road traffic census was carried out at 3,162 posts, of which 320 were on E-Roads.
Romania has the following E-Roads: E60, E70, E58, E68, E85, E79, E81, E87, E574, E576, E581, E583, E584, E671, E673, E675 and E771.

A combined census methodology was adopted, involving both manual and automatic counting.

Counting posts were divided into three categories:
- category 1: main posts;
- category 2: secondary posts;
- category 3: back-up posts.

Manual counts were made at all posts for a total of 14 days distributed throughout the traffic census year on the basis of a sampling plan.

Manual counts were conducted for 8 hours per day on national roads and 14 hours per day on departmental and communal roads, with 24-hour traffic volumes being calculated using statistic correlation coefficients.

Automatic counts using traffic counters were made at category 1 and category 2 posts, as follows:
- category 1: continuous automatic counting with equipments for dynamic classification and weight in motion of vehicles.
- category 2: automatic permanent counting using counters with electromagnetic detection.

Counting posts were sited in accordance with the UNECE recommendations, allowing for variations in traffic distribution over the road system.

Manual counts were made of the following vehicle types:
Bicycles, mopeds, motorcycles.
(a) Bicycles, mopeds, motorcycles.
(b) Passenger and light good vehicles (not exceeding 3.5 t), with or without trailers.
(c) Lorries with two axles.
(d) Lorries with three and four axles.
(e) Articulated vehicles.
(f) Buses with more than nine seats.
(g) Agricultural tractors and special vehicles.
(h) Trailers for lorries and tractors.
(i) Vehicles drawn by animals.

RUSSIAN FEDERATION

Introduction

In accordance with resolutions passed by the UNECE Inland Transport Committee, every five years European States conduct a census of traffic density and composition on the network of E-Roads passing through their territory. With a view to the acquisition of comparable data, the Inland Transport Committee issues recommendations on the basic principles to govern such censuses and the presentation of their findings.

The Russian Federation first participated in such a census in 1995-1996; the census was conducted in accordance with resolution No. 242, adopted by the Inland Transport Committee at its fifty-sixth session which took place from 17 to 21 January 1994. The Russian Federation's report on its findings, containing descriptions of the traffic on the E-Road network, the basic technical specifications of the roads and a map of traffic density, was submitted to UNECE.

The next traffic census was conducted in 2000 by all countries traversed by E-Roads. Recommendations to Governments on the combined census of motor traffic and inventory of standards and parameters on main international traffic arteries in Europe in 2000 were given in the report of the Ad hoc Meeting on the Road Traffic Census held on 29 and 30 October 1998 (TRANS/WP.6/AC.2/14/Add.1 dated 26 April 1999), and it was suggested that census methods, the analysis of the results and the form of the final documents should be tightened up. The fact that, over the period since the previous census, the extent of the E-Road network in the Russian Federation had increased significantly, and the numbering system had changed, was also an important consideration.

On commission from the Russian Highway Agency, the Russian Road Research Institute developed methods for the census of E-Road traffic and interpreted the census results in 2000-2001 on the basis of the UNECE recommendations. The starting point for interpreting the results was information from the highway organizations serving sections of E-Roads. Given that the requisite information was not available for some stretches of road, the results of diagnostic exercises on federal highways over in previous years were used with appropriate corrections so as to provide an estimate of typical traffic volumes in 2000.

The Institute's findings were used to produce a report for the UNECE secretariat on the results of the traffic census on the E-Roads running through the Russian Federation.

In addition, as recommended by the Ad hoc Meeting on the Road Traffic Census (TRANS/WP.6/AC.2/14/Add.1 dated 26 April 1999), an inventory of standards and parameters for international road traffic arteries in Europe in 2000 has been drawn up; it is supplemented by a list of basic standards developed by Russian highway authorities in which the road classification scheme and basic calculation parameters have been harmonized with the road-planning standards adopted in European countries and brought into line with the specifications of modern road vehicles.

1. General provisions

This report presents the results of the E-Road traffic census conducted in the Russian Federation in 2000 pursuant to the decision by the Principal Working Party on Road Transport at its ninety-first session (15-17 October 1999, document TRANS/SC.1/361).

At the end of the report, there is an inventory of standards and parameters on main traffic arteries needed to improve the E-Road network and a list of highway standards and parameters currently under development by the Russian highway authorities (annex 4).

The census was conducted with due regard for the recommendations to Governments on the combined census of motor traffic and inventory of standards and parameters on main international traffic arteries in Europe set forth in the report of the Ad hoc Meeting on the Road Traffic Census held on 29 and 30 October 1998 (TRANS/WP.6/AC.2/14/Add.1, dated 26 April 1999).

It was not entirely possible to compare the findings of the 2000 census with those of the census conducted in 1995 since, over the intervening period, the extent of the E-Road network in the Russian Federation has altered considerably, with changes to the length and numbering of individual "E" roads, the positions of traffic census points and the lengths of highway they cover.

The Ministry of Transport of the Russian Federation has no data on traffic characteristics over the entire public highway network and it was therefore not possible to compare data on traffic volume (vehicle-km) on the E-Road network with traffic volumes on the entire public highway network.

2. Purpose of the traffic census

The purpose of the exercise was to obtain accurate information, comparable with data from other European States, on traffic density and composition on the international E-Road network highways traversing the Russian Federation, with due regard for the division of vehicles into categories and the principles governing the census exercise recommended by UNECE.
The figures obtained can be used to address a variety of tasks:

- Helping to improve and extend the E-Road network in accordance with the standards laid down in Annex II to the 1975 European Agreement on Main International Traffic Arteries (AGR) (ECE/TRANS/16 and Amends.1-7);
- Producing detailed figures on traffic on the E-Road network, which will encourage the growth of goods and passenger traffic between European countries;
- Helping to design international and national road maintenance, repair and reconstruction programmes;
- Helping to deal with the problems associated with traffic delays, studying environmental issues, ensuring traffic safety and saving on energy consumption; and
- Determining how the road network is used by different categories of vehicles.

3. Census methods

3.1 The road network and positioning of census points
The census was conducted on the network of E-Roads listed in Annex I to the European Agreement on Main International Traffic Arteries (AGR) and the Addenda to it adopted up to the year 2000.

The list of highways traversing the Russian Federation which are classified as E-Routes, and the numbers of census points along them, are given in Annex 1 to this report.

The positions of census points were chosen so as to divide the road network into sections on which volumes of traffic would be approximately the same. In most cases, the length of a segment covered by one census point was not less than 50 km nor more than 200 km. Some segments on individual roads forming part of extensive routes on which traffic density did not vary significantly were up to 300 km long, or even longer. On average, one census point covered roughly 160 km of highway. Traffic was not measured on segments of road near (closer than 20-50 km) the capitals of autonomous entities or regional centres where transit traffic was joined by local traffic. Census points were positioned at sites where traffic density was most typical for the entire segment of road covered by a given point.

3.2 Vehicle categories

All vehicles were counted, whether they were registered in the Russian Federation or abroad. For census purposes, vehicles were divided into the following categories:

- Category A: motor vehicles with not more than three wheels (motorcycles with or without sidecars, including motorscooters, and motor tricycles);

- Category B: passenger and light goods vehicles (vehicles, including station wagons, with not more than nine seats including the driver's seat, and light vans with permissible maximum weight not exceeding 3.5 tonnes). Passenger and light goods vehicles were counted irrespective of whether they had trailers, including caravans and recreational vehicles;

- Category C: goods road vehicles (lorries with a permissible maximum weight of more than 3.5 tonnes, lorries with one or more trailers, tractors with semi-trailers and one or more trailers, and tractors with one or more trailers) and special vehicles (agricultural tractors, special vehicles such as self-propelled rollers, bulldozers, mobile cranes and army tanks and other road motor vehicles not specified elsewhere);

- Category D: motor buses, coaches and trolley buses.

Categories A and B constitute “light motor traffic”; categories C and D, “heavy motor traffic”.

3.3 Census procedure

The traffic census itself was carried out by the highway organizations servicing segments of roads in the “E” category, at the traffic census points along the road segments indicated in Annex 2, table 7.

Traffic was counted at each census point for a 24-hour period, from midnight to midnight, local time, every month.

All days of the week, including weekends and holidays, were used for the census. Wherever possible, successive days of the week were used at each census point.

The count was taken by hand and using automatic sensors. Where it was not possible, using sensors, to segregate vehicles into the categories mentioned above, a combined method was used: overall traffic volume during individual hours over the 24-hour period and over the 24-hour period as a whole was obtained by running the sensors round the clock, and vehicles were separated into categories on the strength of a sample manual count.

The sample manual counts encompassed both night-time and day-time hours. The resulting information on the composition of the traffic flow was then used to divide the overall hourly vehicle flow obtained using the automatic sensors into categories for each hour of the day and night.

4. Results of the 2000 census

As recommended by the Working Party on Transport Statistics, the results of the traffic census were interpreted and presented in table form (see Annex 2).
These tables present data on the features of category E-Roads and the traffic they carry, the number of census points and the census methods used, traffic volume and composition on each route and the proportion of the E-Road network capacity used, similar data for each segment covered by a census point, the volume of traffic on such segments, and information about the siting of road signs telling drivers they are driving on E-Roads.

The following findings were obtained:

1. As table 1 shows, the E-Road network in the Russian Federation now comprises 16,058 km of highway, of which 13,609 km have been added to the network since the 1995 traffic census.
It should be noted that, as some segments of highways serve several routes simultaneously, the total length of all routes is 17,163 km, i.e. 1,105 km more, and this latter figure represents the total length of road segments on which individual routes coincide.
Since the road classification scheme used in the Russian Federation does not match that given in the Glossary of Transport Statistics (2nd ed, 1988, Eurostat, UNECE and the European Conference of Ministers of Transport) or the European Agreement on Main International Traffic Arteries (AGR, 1970, document ECE/TRANS/16), the highway organizations submitting the census findings classified all roads as ordinary roads although, given their specifications, some segments, together totalling 1,292 km (8% of the total), can without doubt be classified as motorways.
As can be seen from table 1, most of the network of ordinary roads consists of two-lane roads – 81.3% of the total extent. Three-lane roads account for 10.3%, four-lane roads for 8%, and roads with five or more lanes, for 0.4%.
Of the roads that can be classified as motorways, 78.5% consist of roads with two, 19.6%, roads with three, and 2.3%, roads with four lanes in either direction.
Of the country's single-carriageway roads, a total of 328 km of two-lane roads have carriageways up to 5.99 m wide, 226 km have carriageways between 6 m and 6.99 m wide, 9,585 km of road with two traffic lanes have carriageways between 7 m and 8.99 m wide, 1,111 km have carriageways between 9 m and 10.49 m wide, 119 km have two-lane carriageways and 1,128 km have three-lane carriageways between 10.5 m and 11.99 m wide and 387 km have three-lane carriageways between 12 m and 13.99 m wide. There are 639 km of two-lane roads with carriageways of 14 m and over, 1,180 km of four-lane roads and 63 km of roads with six or more lanes.
There are 1,009 km of roads with two carriageways of two lanes in each direction and a central dividing strip, 253 km of such roads with three lanes in each direction, and 30 km with four. Given their characteristics, these could be classified as motorways.

2. Traffic density varies over a fairly wide range – from a few hundred to 40,000 vehicles in a 24-hour period (see table 2). It must be said that there is not very much road carrying up to 40,000 vehicles per day, and most of it is on the approaches to Moscow and St. Petersburg. Traffic density exceeds 15,000 vehicles per day on 11.8% of the country's roads.

3. One hundred census points were set up on E-Roads, nine of them being common to more than one route (see table 3). On average, each point covered 160 km of road. The count was essentially taken by hand. The combined method was used at three points, and automatic sensors were used at nine.

4. Analysis of traffic density and composition on E-Roads shows that on average over 7,500 vehicles passed each census point every 24 hours (see table 4). This is 11.6% less than during the 1995 census. The reason is that by the year 2000, roads with lower traffic density than those in the "E-road" network in 1995 had been added to the network.
The highest density, averaged over all census points on the route, was observed on the E 97 (15,927 vehicles/day) and E 58 (14,978 vehicles/day). The lowest was on the E 262 (500 vehicles/day).
Traffic composition varies within fairly wide limits. Light goods vehicles accounted for 70.1% of the overall traffic flow. Category A vehicles amounted to an insignificant proportion of the total flow of light motor traffic: this is typical of roads with high traffic density. On individual routes the proportion varied from 0 to 2.8% (and 8.2% in one instance).
Most of the flow of light motor traffic consisted of category B vehicles (99.3%), though the proportion varied from 92% to 100% on individual routes.
Category C vehicles represented 29.9% of the total vehicle flow. On individual routes this proportion varied between 19% and 50.3%.
Category C vehicles represented 84.6% of heavy motor traffic (varying on individual routes between 39.7% and 98.9%), and category D vehicles, 15.4% (between 1.1% and 60.3% on individual routes).
Holiday traffic density and composition are different from those of weekday traffic (see table 4b). On average, traffic density on all routes is 18.5% higher on holidays than on weekdays. On some routes it rises by 40% (E 115, E 117). Given the substantial unevenness in holiday traffic in different directions on the approaches to major cities, the holiday traffic load in some directions may be said to increase by 60% and more. No increase in traffic density was observed on holidays on some routes (E 50, E 123, E 381, E 592).
Traffic density at night (between 10 p.m. and 6 a.m. local time) is on average 14.1% of the daytime volume (between 3% and 20% on individual routes). The diminution in traffic volume at night was particularly marked on parts of the network traversing the Caucasus and in border regions.
Traffic density at peak hours represents, on average, 8.6% of density over the whole day (between 6% and 14% on individual routes).

5. The transport index (table 5) was defined as the sum of the corresponding indices for each census point. For each census point it was defined as the product of average daily

traffic volume, the number of days in the year and the length of the segment of road covered by that census point. For the entire network the index is 47,060 million vehicle-km per year. Most of this is attributable to category B vehicles: 31,285 million vehicle-km.

6. Table 7 details the characteristics of the road segments covered by each census point. It also gives figures on average daily traffic volume at the census point, the proportion of heavy motor traffic in the traffic flow and permitted driving speeds over the segments concerned. It will be seen that on individual segments the proportion of heavy motor traffic (categories C and D) ranges between 8% and 60%.
A map was produced from the figures in table 7, showing the E-Road network, the siting of all the census points, and average daily traffic volumes over the year on each segment of road covered by a census point (Annex 3). It shows the names of major cities and built-up areas.
The numbers of routes in the E-Road network are placed in rectangles, and repeated as often as is necessary to indicate the course of each route clearly. Where different routes coincide along individual road segments, their numbers are placed inside a single rectangle.
Traffic density on individual road segments is shown by means of a black strip of defined width in accordance with the scale given in table 6 of the annex to document TRANS/WP.6/AC.2/14/Add.1.
Segments of road with a central dividing strip which can be classified as motorways are indicated by means of a thin line down the centre of the black strip.

7. The installation of signs informing drivers that roads belong to the E-Road network is now complete on some roads; on others, work has begun and is scheduled for completion in 2002-2003 (table 8).

Annex 1

List of class-E-Roads in the Russian Federation

No.	E road number	Route	Existing road along route	Number of census points
1	E 18	… Turku - Helsinki - Finnish border - Vyborg – St. Petersburg	M10 Scandinavia	1
2	E 20	… Stockholm (by ferry) - Tallinn - Estonian border - Narva - St. Petersburg	M11 Narva	1
3	E 22	… Sassnitz - Riga – Rezekne - Latvian border - Pustoshka - Velikiye Luki - Moscow - Vladimir - Nizhny Novgorod	M9 Baltic, M7 Volga	7
4	E 28	Gdansk - Elblag - Kaliningrad - Nesterov - Marijampole - Vilnius - Minsk – Gomel	A229 Nesterov - Kaliningrad	1
5	E 30	… London - Hannover - Berlin - Warsaw - Brest – Kobrin - Minsk - Orsha - Belarusian border - Smolensk - Moscow - Ryazan - Shatsk - Penza - Syzran - Samara - Ufa – Chelyabinsk	M1 Belarus, M5 Urals	12
6	E 38	Glukhov - Rylsk - Kursk - Gorshechnoe - Voronezh - Borisoglebsk - Balashov - Saratov - Engels - Ershov - Ozinki - Kazakhstan border - Uralsk - Aktyubinsk - Karabutak - Aralsk - Novokazalinsk - Kzyl-Orda	Krupets - Rylsk - Kursk, A144 Kursk - Voronezh - Borisoglebsk	7
7	E 40	Calais - … Brussels - … - Cologne - Dresden - Wroclaw - Cracow - Przemysl - Mostiska - Lvov - Rovno - Zhitomir - Kiev - Poltava - Kharkov - Lugansk - Ukrainian border - Kamensk-Shakhtinsky - Morozovsk - Volgograd - Astrakhan - Koktyaevka - Kazakhstan border - Atyrau - Beineu - Kungrad - Nukus - Dasshaus - Bukhara - Navoi - Samarkand - Tashkent - Chimkent - Bishkek - Almaty - Sary - Ozek - Taldy - Kurgan - Ucharal - Ayaguz - Georgievka - Ust-Kamenogorsk - Ust-Kan	M21 Volgograd - Kamensk-Shakhtinsky, M6 Caspian (Volgograd - Astrakhan section)	6
8	E 50	Brest - … Paris - … Nuremberg - … - Prague – Brno - Zhilina - Kosice - Vysne-Nemecke - Uzhgorod - Mukachevo - Stry - Ternopol - Khmelnitsky - Vinnitsa - Uman - Kirovograd - Dnepropetrovsk - Donetsk - Ukrainian border - Novoshakhtinsk - Rostov-na-Donu - Pavlovskaya - Armavir - Mineralnye Vody – Makhachkala	M19 Novoshakhtinsk - Maisky, M4 Don (Maisky - Rostov-na-Donu - Krasnodar Territory), M4 Don (border of Krasnodar Territory - Pavlovskaya), M29 Caucasus (Pavlovskaya - Azerbaijan border)	11
9	E 58	Zvolen - Uzhgorod - Mukachevo - Khalmeu - Suseva - Iasi - Leisheny - Chisinau - Tiraspol - Odessa - Nikolaev - Kherson - Melitopol - Mariupol - Ukrainian border - Taganrog - Rostov-na-Donu	M23 Rostov-na-Donu - Taganrog - Ukrainian border	1
10	E 77	Warsaw - Gdansk - Polish border - Kaliningrad - Lithuanian border - Siauliai - Riga - Latvian border – Pskov	A216 Lithuanian border - Neman - Gvardeisk	2
11	E 95	St. Petersburg - Pskov – Pustoshka - Nevel - Belarusian border - Vitebsk - Orsha - Mogilev - Gomel - Chernigov - Kiev - Uman – Odessa	M20 St. Petersburg - Pskov, M20 approach to Pskov from the Baltic, M20 Baltic - Nevel - Belarusian border	3
12	E 97	Kherson - Dzhankoi - Feodosiya - Ukrainian border - Kerch - Novorossiisk - Sochi - Georgian border - Poti	M25 Novorossiisk - Kerch Strait, M4 Novorossiisk - Dzhubga, M27 Dzhubga	3

No.	E road number	Route	Existing road along route	Number of census points
			- Sochi	
13.	E101	Moscow - Kaluga – Bryansk - Ukrainian border – Glukhov	M3 Ukraine	3
14.	E105	Kirkenes - Norwegian border - Pechenga - Murmansk - Petrozavodsk - Novaya Lagoda - St. Petersburg - Veliky Novgorod - Tver - Moscow - Tula - Orel - Kursk - Belgorod - Ukrainian border - Kharkov - Dnepropetrovsk - Zaporozhye - Melitopol - Simferopol - Alushta – Yalta	M18 Kola, M10 Russia, M2 Crimea	18
15.	E115	Yaroslavl - Moscow - Voronezh – Rostov-na-Donu - Krasnodar – Novorossiisk	M8 Kholmogory, M4 Don, border of Krasnodar Territory - Pavlovskaya, Pavlovskaya - Krasnodar, Krasnodar - Novorossiisk	12
16.	E117	Mineralnye Vody - Nalchik – Vladikavkaz - Georgian border - Tbilisi - Marneuli - Tashir - Stepanavan - Vanadzor - Yerevan - Goris – Megri	M9 Caucasus (Mineralnye Vody - Nalchik - Beslan), A301 Beslan - Vladikavkaz - Georgian border - approach to Vladikavkaz - Vladikavkaz - N. Lars	4
17.	E119	Moscow - Tambov - Povorino - Volgograd - Astrakhan - Makhachkala - Azerbaijan border - Kuba - Baku – Astara	M4 Don, M6 Caspian, A153 Astrakhan - Makhachkala (Astrakhan Oblast - Kalmykia - Dagestan)	11
18.	E121	Samara - Kazakhstan border - Uralsk - Atyrau - Beineu - Shetpe - Dzhetabai - Fetisovo - Bekdash - Turkmenbashi - Gyzylarbat - Iranian border (Gorgan)	M32 Samara - Bolshaya Chernigovka - Kazakhstan border	1
19.	E123	Chelyabinsk - Kazakhstan border - Kustanai - Esil - Derzhavinsk - Arkalyk - Dzheskazgan - Kzyl-Orda - Chimkent - Tashkent - Aini - Dushanbe - Nizhny Pyandzh	M36 Chelyabinsk -Troitsk - Kazakhstan border	1
20.	E127	Omsk - Kazakhstan border - Pavlodar - Semipalatinsk - Georgievka – Maikapshagai	M38 Omsk - Cherlak - Kazakhstan border	1
21.	E262	Kaunas - Ukmerge - Daugavpils - Rezekne - Latvian border – Ostrov	A116 Ostrov - Daugavpils (to Latvian border)	1
22.	E381	Orel - Ukrainian border - Glukhov – Kiev	A142 Trosna - Kalinovka, M3 Ukraine	1
23.	E592	Krasnodar – Dzhubga	M4 Krasnodar - Dzhubga	1

Annex 2

List of standards and parameters relating to international motorways in Europe

The standards which currently specify the parameters of international E-Roads were developed in the 1970s and no longer fully reflect the quantitative and qualitative changes that have occurred in road transport in European countries and especially in the Russian Federation.

Motor vehicle production is increasing rapidly throughout the world. In the next few years it is anticipated that the number of vehicles in Western Europe could reach saturation point, i.e. approximately 850 units per 1,000 of population. In the Russian Federation it is anticipated that by 2005 there will be approximately 200 vehicles per 1,000 of population. It is obvious that the size of the Russian vehicle fleet will grow even more, potentially increasing by 50-100% in the next 20 years.

Because the rate of growth of the vehicle fleet far outstrips the development of the road network, the roads will have to cope with an increased density of traffic.
Not only has there been a quantitative increase in the size of the vehicle fleet, there has also been a qualitative change in its composition. The proportion of heavy goods vehicles in the flow of traffic on the roads has increased considerably. Vehicle loads on the roads and road facilities have increased. Vehicle dynamic values have also changed considerably in the last few decades and have converged in many European countries.

The current standards and regulations for road design, drawn up many years ago, have not kept pace with the quantitative and qualitative development of road transport and traffic flows, and hence they should be improved to take account of this development. This problem is especially acute for roads that act as transport links along international transport corridors.

An extremely important component in the system of regulatory documents is road classification, which should serve as a basis for harmonizing road design standards and trends in road transport development. In developing a system of road classification, the prime considerations should be the growing role of roads in the development of trade and the economy, the inevitability of integrating national road systems into a single European network and the need to maintain continuity by taking account of the historically established road networks in various countries and their characteristics.

Given the fact of inclusion of the principal roads in European countries into an international road network and the prospects for the development of international transport corridors, it would be useful to identify a group of international roads in national normative instruments and refine the parameters used to define their technical standard in the light of developments in road transport.
A series of standards specifying the geometric parameters and characteristics of roads should be elaborated on the basis of road classification. The standards should include only those basic parameters that all countries should bear in mind when designing and developing E-Roads.

These parameters include:

- Width of traffic lanes, shoulders, central dividing strip and stabilizing strips;
- Minimum visibility distance;
- Maximum longitudinal slope.

The design speed of traffic directly affects the quantitative values of the geometric parameters of a road and the cost of building it, as well as expenditure on maintenance and repairs once in use. To a considerable extent it determines the actual average speed of traffic in the transport flow, goods and passenger delivery times, vehicle efficiency, transport costs and other indicators. The convergence of traffic design speeds on the E-road network throughout Europe is an important element in harmonizing the design standards of the roads which make up this network.

An important set of parameters for the efficient operation of the international road network are the permissible loads on the road surface and the size of the vehicles that these roads can carry without obstruction. The adoption by European countries of unified requirements for maximum total mass of vehicles, axle load and vehicle size will make it possible to reduce the costs associated with crossing borders, haulage and highway repair.

To expedite the integration of Russian roads into the pan-European road network and keep track of trends and developments in road vehicle parameters and characteristics, and having regard to the need to harmonize national road design norms with foreign standards, the Russian Federation is currently drawing up a set of road design standards, the most important of which are listed in the table below.

Standard	**Main parameters to be standardized**
Public highways. Technical classification of roads.	Classification of roads by function. Technical classification of roads. Design speeds of traffic. Volume of traffic flow for calculation purposes. Type of intersections with roads and railways.
Public highways. Horizontal and vertical alignment and cross-section of roads.	Maximum longitudinal slope. Minimum visibility distance. Number and width of traffic lanes. Width of safety strip and lateral strip. Width of shoulders. Width of stabilized part of shoulders. Width of dividing strip. Width of stopping strip. Cross-sections of roads of different categories.
Public highways. Standard loads, diagrams indicating notional loading and clearances.	Standard vehicle axle loads. Standard mass of vehicles when fully laden. Clearances in respect of bridges, overpasses, tunnels and galleries.

SPAIN

ORGANIZATION OF COUNTING POST AND METHODOLOGY

The 2000 Census of Motor Traffic on Main International Traffic Arteries was carried out within the National Motor Traffic Census which the Directorate General for Roads designs and undertakes every five years over the whole national network and on some regional roads. The vehicle categories used were those specified in TRANS/WP.6/AC.2/14/Add.1, with the following exception: a new Category E was created in order to include agricultural tractors, which were taken as light vehicles and thus are considered in tables 4, 4bis and 5, that is, they are not counted on Category C.

Counting posts of different types were used and located in such a way that each road section with homogeneous traffic would have at least one post. Several automatic posts, equipped with electronic counters and magnetic loops meters, were implemented in order to collect traffic data from every single hour of the year and to classify this data by light vehicle traffic and heavy vehicle traffic. Complementary manual counts were undertaken during 6 days (in alternate months), in order to break the light and heavy vehicle data down into the specified categories. The primary counting posts were equipped with the same kind of automatic meter as the permanent posts. Data was collected for 6 complete weeks during the year (one week every two months). Information about light and heavy vehicles was continuously recorded during those weeks. As in permanent posts, complementary manual counts were conducted to classify vehicles within the complete range of categories. Secondary posts were equipped with automatic meters as well. Data was collected during 12 working days throughout the year, distributed in six alternate months (two days per month). During those days, information concerning light and heavy vehicles was continuously recorded and, as in permanent and primary posts, complementary manual counts were carried out. Finally, extra traffic data was collected in “coverage” counting posts either manually or by means of traffic meters. In those posts, measurements were conducted during single working days, at different semesters.

In primary counting posts, the methodology is based on a sample of data during the above-mentioned counting days. With this data, an average week of the year, having average traffic for weekdays, Saturdays and Sundays, was calculated. The average annual daily traffic on each counting post was also obtained.

On the other hand, a series of “expansion coefficients” were calculated by using data from permanent and primary counting posts. These coefficients, applied to secondary and “coverage” counting posts through some affinity criteria between posts, were used to calculate with a high degree of accuracy the average annual daily traffic in those posts, as well as its break-down into vehicle categories. Finally, although there are no specific counting posts in toll-motorways, toll-gates have been taken as such posts so that, as a result of their control systems, average daily traffic by vehicle categories can be measured. Such counting posts are those specified as “Other counting posts” in table 3.

In order to fill in Tables 4 and 5, a "road sections" database was used. This database contains information about geometric and functional characteristics of all road sections and about the counting posts located on them. Traffic data measured on these posts allow for calculation of vehicle-km on every E-Road and the remainder of the network. In table 4 "Distribution of motor traffic", vehicle-km figures on each road were taken into account. The average daily traffic for each vehicle category was calculated by dividing those vehicle-km over the E road length. This method produced real data because average daily traffic is weighed by the length of the road section where the post is located. Data in Table 4bis was obtained on average daily traffic values (by vehicle category) in Table 4 and calculated by applying the following ratios to every E-Road (ratios calculated as average values of those measured in permanent counting posts on every E-Road):

- For night traffic, the ratio was that the result of dividing the 8-hour night traffic by the total average annual daily traffic.
- For holiday traffic, the ratio was calculated as the division between the average daily traffic of the "highest" month and the total average annual daily traffic.
- For peak hour traffic, the ratio was the result of dividing the traffic at the fiftieth highest hour of the year by the total average annual daily traffic.

In table 5, the road lengths and vehicle-km figures are shown in the following way:
- Section 1 shows data corresponding to those roads in the National network that depend on the Central Administration, plus data referred to those roads belonging to regional governments which are E-Roads.
- Section 1.1 shows data corresponding to the E-Road network as a whole.
- Section 1.2 shows data corresponding to those roads in the National network which are not E-Roads.
- Section 1.21 shows data corresponding to motorways and express roads in the National network which are not E-Roads.

SWITZERLAND

2000 E-Road Census

General issues

The 2000 E-Road Census in Switzerland was undertaken within the framework of the general motor traffic census in the whole country which is carried out every 5 years. These periodical road traffic censuses provide data on the make-up of traffic and the origin of vehicles. Combined with continuous automatic counts, they are a major source of data for traffic planning at national, cantonal, regional and communal levels.

They not only enable appropriate solutions to be found to road traffic problems but also help to determine criteria for studies of transport safety and economics, pollution and noise control and energy consumption. Regular and comparable counts provide a reference base applicable nationwide, which is a prerequisite for additional surveys. They also provide UNECE's Inland

Transport Committee with the data necessary for coordinated planning of main continental arteries.

The method used in 2000 to calculate the average traffic has the following characteristics:

1. It uses two data sources: firstly, the results of manual counts conducted at Swiss road traffic counting posts, and secondly the results from automatic continuous counting posts of the Federal Roads Office (OFR) and the cantons;
2. The extrapolation method successfully combines the differentiated data obtained from manual counting posts with the general data recorded by automatic posts throughout the year.
3. Posts not equipped with automatic meters are included in groups of automatic meters with similar annual and daily traffic curve characteristics;

The public works administrations at the cantonal level were responsible for organizing the counting posts and the work related to them.

<u>Development of the national road network from 1995 to 2000</u>

During the last five years, 98 km of national roads have been opened to traffic. This work has originated transfers of traffic. The data below give an overview of the development of the Swiss road network.

Length of the network:

- by the end of 1995: 1,540 km
- by the end of 2000: 1,638 km.

<u>Location of counting posts</u>

The purpose of counting road traffic in Switzerland is to provide a periodic update of traffic trends on main non-urban roads. The number and location of counting posts must therefore be adjusted to take account of major changes, resulting from: coordination with the continuous automatic meters, as the data they provide is an essential part of the count; the opening of road sections on which the traffic volume cannot be determined using existing counting posts.

<u>Counting days and duration of counts</u>

In all counting posts, traffic was counted during 5 days, of which 3 were working days and 2 were Sundays.

On working days, traffic was counted at four periods, that is, from 07.00h to 09.00h., 11.00h to noon, 14.00h to 15.00h and 17.00h to 19.00h. On Sundays, the morning counts were dispensed with, so that vehicles were counted for six hours on working days and four hours on Sundays. These counts have been dispensed on the following days:

Working days: Monday 20 March, Friday 16 June and Wednesday 9 August 2000; Sundays: 23 July and 15 October 2000.

Classification by Vehicle Categories

Vehicle Categories	Vehicles	Limits
Private passenger vehicles	private cars, with or without trailer, minibuses /station wagons, light vans for passenger transport, camping-bus	max. 9 seats
Motor buses and coaches	motor buses with or without trailers, motor coaches (including scheduled services)	
Delivery vehicles	light goods vehicles (with or without trailer)	maximum weight of not more than 3.5 t
Lorries	heavy goods vehicles without trailer or semi-trailer, special vehicles without trailer or semi-trailer	maximum weight not exceeding 3.5 t
Road trains and articulated vehicles	heavy motor vehicles with trailer or semi-trailer, special vehicles with trailer or semi-trailer	total weight of more than 3.5 t
Motor cycles	motor cycles, scooters with or without sidecars, motor tricycles	from 51 to 400 cm3

Experience has shown that, with the growth of traffic, it is increasingly difficult to differentiate the origins of vehicles without interfering with traffic flow and safety. Consequently, the only distinction made is between vehicles registered in Switzerland and those registered abroad.

Automatic meters (automats): These are continuous counting posts which record traffic volume automatically throughout the year. Volume meters record only the total number of passing vehicles, whereas other instruments automatically classify vehicles on the basis of length.

Daily traffic: in the tables, the average annual daily traffic flow (AADT) is shown for four daily periods: traffic throughout the day (24 hours); traffic flow outside the hours when the movement of heavy vehicles is prohibited (05.00h to 20.00h); daily traffic governed by noise abatement regulations (06.00h to 20.00h); and, to provide a comparison with earlier counts, the AADT_14 (07.00h to 21.00h);

Daily working day traffic: the average daily working day traffic (ADWT) represents average daily traffic from Monday to Friday (excluding general public holidays). It is determined for the same times as the AADT;

Daily traffic on Sundays and public holidays: this is the average of all Sundays and public holidays. The figures shown are for midnight to midnight and 07.00h. to 21.00h;

Winter closures: for roads closed in winter, the three average figures are calculated on the basis of the periods when they are open to traffic.

Special counts

Eleven counting posts have undertaken special counts to examine different extrapolation hypothesis. With this aim, goods vehicles and coaches respectively have been counted during 24 and 17 hours of three working days. The comparison of these results and those of automatic counts on the same location by length categories, as well as the conclusions obtained through the extrapolation are including a separate publication.

Analysis of statistics and processing results

The data recorded on counting days were input and checked as they came in and then subjected to a rudimentary plausibility check. The data acquired by counting posts and automatic counters at the same location were then compared. Where major discrepancies were noted, an attempt was made, with the assistance of the cantons, to determine the reasons and make the necessary corrections. A priori, the automatic counter data were used as target values for extrapolation. In many cases, however, it was quite clear that the automats had not recorded motor cycles, so that it was necessary to increase the totals for them on arteries where they represented a substantial proportion of traffic. The differences between the data published here and the automat data are thus not errors, but intentional adjustments.

Extrapolation method

The new method uses, as in 1995, count values to obtain reference data, in four stages:

1. Calculation of annual averages for counting periods;
2. Calculation of average daily traffic on working days, Sundays and public holidays;
3. Calculation of average Saturday traffic;
4. Plotting of curves to be used as a database for reference data.

1. Annual averages for counting periods

First, the values obtained over the different counting periods are extrapolated using an hourly factor (showing the counting days or periods in relation to the relevant annual average) arrived at on the basis of the annual curves provided by the automatic meters. This gives annual averages for each type of day (working or Sunday) over a six hour counting period. We thus have six factors for working day traffic and four for Sunday traffic for each automatic post. Multiplying them by count values gives annual averages for the counting periods. The data from manual counts can be extrapolated only if an annual curve can be attributed to a traffic counting post. This presents no problem when a counting post is located at the same point as an automatic meter, which is not the case for roughly half the counting posts. In such cases, the counting posts are included in automatic meter groups with similar annual traffic profile characteristics, and it is these that are used as a basis for calculation. Groups are created by the cluster method. The group characteristic is taken to be the hourly percentage of the total vehicles recorded over a four or six hour period (Sundays and working days).

2. Average daily traffic by type of day

The second stage is to calculate the average daily curves for each type of day (working day or Sunday). This calculation is based partly on the average daily curves for each type of day provided by the automatic meters in the form of a relative distribution (per cent) over 24 hours and partly on the annual averages arrived at for counting periods in the first stage. Combining these various data gives hourly values for the curve outside counting periods. The comparison method used is based on the relation between absolute vehicle volumes for each counting hour and relative values for the same hours provided by the automats. However, this combination can operate directly only when counting posts are in the same location as automats. In all other cases, as in the first stage, counting posts must be assigned to groups of automats having the same daily traffic profile and allowing a relative distribution to be made.

3. Evaluation of average Saturday traffic

The first two stages produce daily average curves for working days and Sundays. Before curves for all days of the week can be obtained, average Saturday traffic must be calculated, as there is no counting on that day. The method proposed is based on the first stage and simply involves determining, for each group formed during that stage, the percentage breakdown of average Saturday traffic using the automatic counter data. An absolute curve for an average Saturday is then derived for each counting post on the basis of the absolute traffic volumes arrived at in the second stage for working days and Sundays and of factors specific to the Saturday/working day and Saturday/Sunday groups. Finally, this traffic volume is broken down by hours in accordance with the relative curve established for Saturdays. Once the daily curves are available for Saturday, the curve for the days of the week, which is the weighted average of the three others (working days, Saturdays, Sundays) can be obtained.

4. Plotting of curves as a basis for reference data

The result at the end of these three stages is average daily traffic in the form of three types of curve, namely: Curves for working days, for Sundays and for days of the week. This database can now be used to calculate the desired reference data. Extrapolation is applied separately to each category of vehicle and the two types of origin. Depending on the category, volume counter or automatic classification counter data are used. Data from 260 automatic counters was used. Of these, 72 automatically classified vehicles on the basis of the following criteria: Vehicles less than 6.0 m long; Vehicles between 6.0 and 12.5 m long; Vehicles more than 12.5 m long.

This was used as a basis for extrapolation for the “private passenger vehicles” and “motor buses and coaches” categories.

Although private passenger vehicles represent 89 per cent of all traffic, data from direct volume counters were not accepted as representative for the evaluation of this category, as it was done in 1995.

All other categories have been estimated first. The estimated figures have been adjusted according to the change curves of the above-mentioned counting posts. These *reduced volume data* have been the basis for the assessment of the private passenger vehicles traffic.

In the case of motor buses and coaches, the situation is less clear. However, the analysis made on the basis of the data provided by the manual and automatic counts in 1990 showed that this method delivers satisfactory results which could not be improved on by any other method.

For the coaches category, and/or all counting posts, a daily change curve calculated out of a special count has been used. The analysis of the latest data has shown that this method allows for a better assessment.

A specific extrapolation base was created for motor cycles. An annual curve for motor cycles was obtained from a sampling of automatic vehicle classification meters capable of recording vehicles in the smallest class (<2.7 m). The extrapolation base used for the various categories of goods vehicles is made up of data from automatic classification counters.

For all goods vehicles, the annual curve for the over 12.5 m class is used as it is the least influenced by private passenger vehicles with trailers. For the daily curve, a differentiated approach is adopted. The "road train and articulated vehicles" category compares closely with the "over 12.5 m" class, while the "lorries" and "delivery vehicles" categories are more closely akin to the "vehicles between 6.0 and 12.5 m long" class. In both cases, however, only the daily curve for the winter season is used in order to minimize distortions that might be caused by private passenger vehicles with trailers (mainly cars towing caravans or trailers for recreational use).

The foreign vehicles are evaluated by means of the same method as for Swiss vehicles.

<u>Evolution of motor traffic between 1995 and 2000. Swiss road network (non-urban roads)</u>

In some counting posts the change of motor traffic between 1995 and 2000 is due not only to an increase in the number of vehicles, but also to the changes in the road network.

The overall comparison of the evolution of motor traffic between 1995 and 2000 by road categories gives the following results:

Road Categories	Number of counting posts taken into consideration	Change 1995 - 2000 (%)	Average change per year (%)
All road	407	+ 10.9	+ 2.1
National roads	89	+ 13.7	+ 2.6
Other roads	318	+ 7.9	+ 1.5

The traffic is averagely distributed by vehicle categories as follows:

	Working days	Sundays and feast days	All days
Motorcycles	1.5 %	3.6 %	2.0 %
Private passenger vehicles	86.3 %	95.4 %	88.7 %
Motor buses and coaches	0.5 %	0.5 %	0.5 %
Delivery vehicles	4.5 %	0.4 %	3.4 %
Lorries	3.3 %	0.1 %	2.5 %
Road trains and articulated vehicles	3.9 %	0.0 %	2.9 %
14 % of vehicles passing through the counting posts are foreign vehicles.			