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## **EFFECTIVENESS OF THE 2000–2006 NATIONAL ROAD TRAFFIC SAFETY PROGRAMME IMPLEMENTATION IN LATVIA**

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**Abstract.** Road traffic safety programme is one the most important national level documents setting the main goals in road traffic safety work. The First National Road Traffic Safety Programme in Latvia was adopted by the Cabinet of Ministers in 2000. The following article analyses results of the programme implementation within period 2000–2005 and gives a detailed look on the most effective measures under Latvian circumstances. Cost-benefit ratio of the Programme implementation is good – 1,7. However, it has to be mentioned that financing the Programme was carried out only by 63 % and defined goals are only partly achieved.

**Keywords:** road traffic safety, accidents, traffic safety programme, effectiveness.

### **1. Introduction**

Since Latvia regained political independence the nature of traffic has changed very rapidly. There are more vehicles than before, driving behaviour has become much more aggressive and the roads have not been developed at the same rate.

The highest number of the killed in road accidents was registered in 1991. This reason and a fast development of relationships between Latvia and other European countries activated the problem of ensuring the road traffic safety in Latvia on European level. The first Road traffic safety action plan was created in 1994 as a part of Latvian Transport Development Programme. Realizing measures of Road traffic safety action plan, in 1998 number of the killed decreased by 1,47 times in comparison with the year 1991.

Generally the targets of the first Road traffic safety action plan were accomplished at the beginning of 1999. The rapid growth of vehicle fleet as well as desire of Latvia to join the European Union created new targets for road traffic safety. The new safety action plan “The 2000–2006 National Road Traffic Safety Program in Latvia” was approved by Cabinet of Ministers on Jan 25, 2000 [1].

### **2. Brief essence of the national road traffic safety Programme**

The following scenarios, targets and measures were settled in Programme:

- Pessimistic scenario – number of the killed and injured in 2006 will stay at the same level as in 1998, but the risk to be killed in a road accident will decrease by ~10 % due to the increase of traffic volume.
- Optimistic scenario – number of the killed and injured will decrease accordingly by 10 % and 2,5 % every year. Thus risk to be killed in a road accident will decrease by ~ 60 %.

The main goal was to reduce number of the killed in road traffic accidents by 50 % from 652 (in 1999) to 325 (in 2006) and the risk to be killed in road accident by 60 %.

To achieve the settled targets successfully it is necessary to realise activities simultaneously in three main directions:

To ensure principles of road traffic safety:

- Children’s traffic education;
- Drivers’ training and testing;
- Publicity: different road safety information and campaigns on a variety of road subjects;
- Maintenance of roads and reconstruction of “black-spots”;
- Improvement of road safety in darkness;
- Improvement of safety of vulnerable road users.

To ensure control of traffic security:

- Police enforcement of the behaviour of road users;

- Control of the road maintenance – road audit;
- Vehicles' testing and inspection.

To ensure system of reducing consequences of accidents:

- Improvement of rescue services and medical aid;
- Training road users in principles of the first medical aid.

### 3. Monitoring of the national road traffic safety Programme

According to the optimistic scenario [1] of the Programme, number of the killed must be not higher than 360 in 2005, but there were registered 442 [2]. As compared to 1999, number of the killed decreased by 32,2 % (Fig 1). Number of victims per 100 injury accidents also decreased – from 14,7 (in 1999) to 9,9 (2005) (Fig 2). Risk to be killed in a road accident decreased by 48 % from 0,084 (in 1999) to 0,043 (in 2005) (Fig 3).

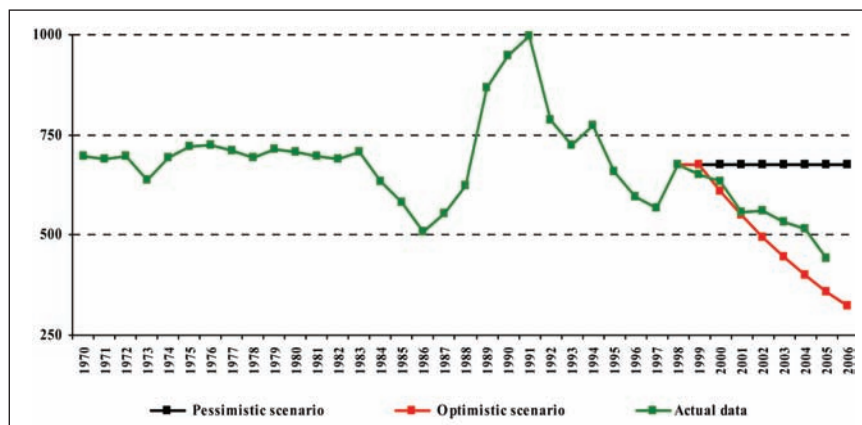


Fig 1. Actual number of the killed and established scenario

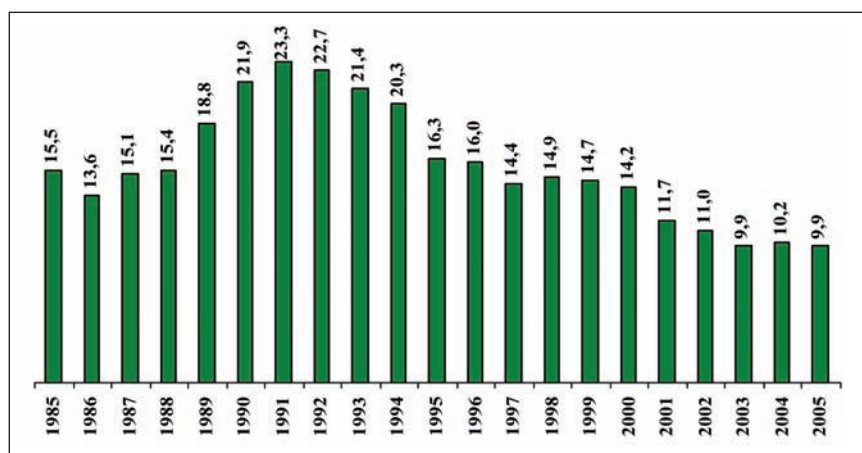


Fig 2. Number of the killed in traffic accidents per 100 injury accidents

Year	Volume, million km	The killed	Risk to be killed, $10^{-6}$ per vehicle km
2000	7577,4	635	0,0838
2001	8392,8	558	0,0665
2002	8029,6	559	0,0697
2003	8666,3	532	0,0614
2004	9494,5	516	0,0543
2005	10 167,8	442	0,0435

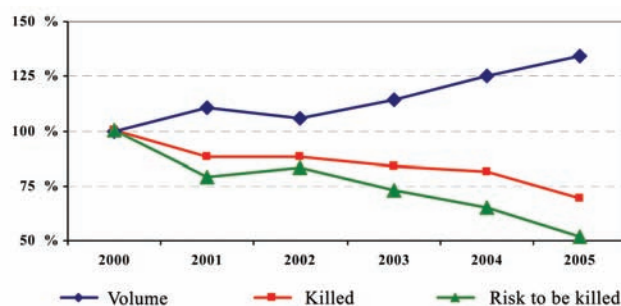


Fig 3. Percentage change in traffic volume, number of the killed persons and road accident involvement risk

In spite of work done for improving road traffic safety number of the killed and injured people is still high and the safety Program is not realised fully.

### 3.1. Principles ensuring road traffic safety

#### 3.1.1. Children's traffic education

Road safety education is not a compulsory subject in the national curriculum. However, schools attempt to provide some road safety education particularly for the younger age groups. In last years road safety literature and an educational film for pupils has been produced to assist teachers in road safety topic, as well as the infrastructure around schools was improved.

As statistics shows (Fig 4), the number of casualties of children-pedestrian has slightly decreased. But the total number of casualties of children has not decreased significantly. It is indicating that it is necessary to create children's road traffic safety education system in the nearest time.

The work to create a unified educational system of road safety for children is initiated, but at present the work is not finished and teaching of road safety varies considerably from school to school.

#### 3.1.2. Drivers' training and testing

The legislation of training of drivers and professional drivers in Latvia is harmonised with EU directives. Changes are introduced in training of drivers. The theory test is computerised and includes 30 questions. Test of skills and behaviour is an one hour driving. Special attention is paid to the legislative system of road safety and to the items of road safety concerning the responsibility of drivers for the violations of road traffic rules. The rehabilitation and re-licensing to improve driver's behaviour within penalty point system are introduced in 2004.

#### 3.1.3. Publicity: different road safety information and campaigns on a variety of road subjects

A question of great importance is to create public opinion about safe behaviour in traffic. Part of it is to inform the public about road safety problems and possible solutions to make roads safer for all users. During last years the public opinion of safe behavior was formed with a regular assistance of mass media. Over 10 years a special road safety TV show "ZEBRA" with one of the highest ratings among the audience once a week attracts many persons. All stories are related with road safety.

From 2001 educational and awareness raising campaigns in combination with enforcement are organised on a regular basis (at least twice a year) concerning current road safety issues – drink driving, using seat belts, speed limit violations, road safety for vulnerable users and others (see next paragraphs).

#### 3.1.4. Maintenance of roads and reconstruction of "black-spots"

The work is carried out in all road networks, but the financial problems do not allow paying more attention to improving traffic safety. The main efforts are to keep the condition of roads in the existing level. It's hard to carry out measures for improvement of road traffic safety without sufficient financing. The financing rate per maintenance of 1km of road in average is smaller than in other countries – for example, in Lithuania it is twice higher, but in Finland three times higher.

The following work is done to improve safety on roads:

- Situation in "black spots" was improved achieving a higher level of safety in these places;
- Reconstruction of stretches of VIA BALTICA and other roads was made;
- A Programme for reconstruction of the dangerous road sections or so-called "black spots" has been approved.

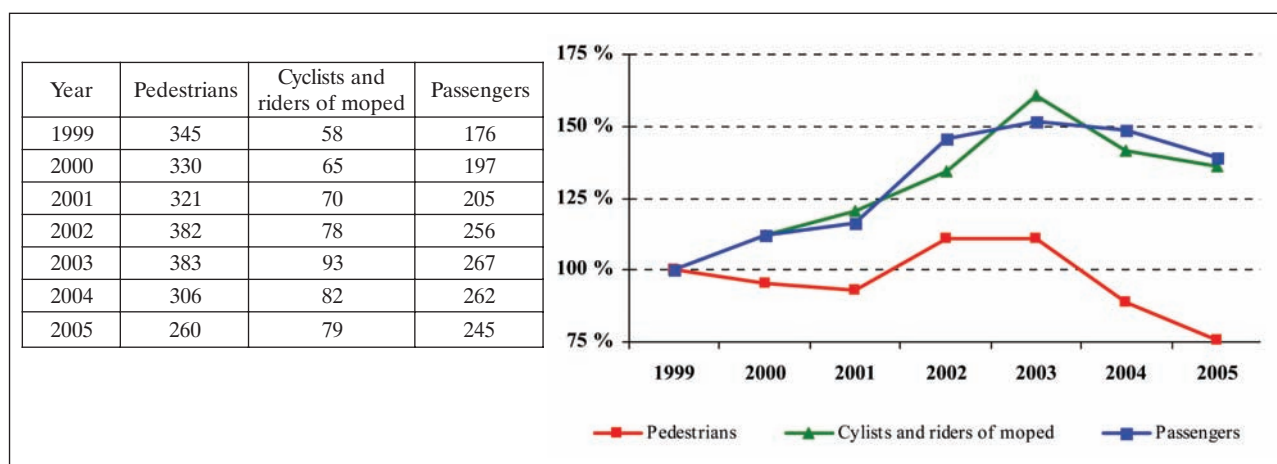


Fig 4. Number of casualties (the killed and injured) of children

### 3.1.5. Improvement of road safety in darkness

The level of seriousness of accidents in darkness or twilight is twice higher than in daylight. The risk of death of pedestrians on roads is four times higher in darkness than in daylight [3].

The reconstruction of street lighting continued and improvement of light conditions on roads and streets is achieved. But it is not enough to approach the necessary level of safety for all road users in darkness.

Campaigns for safety of pedestrians in darkness were carried out at the end of 2004 and 2005. The campaigns' main task was to inform pedestrians about the risk of walking along roads without reflectors in darkness and twilight, about the possible consequences of walking without reflectors. The acceptance of the use of reflectors due to the campaigns increased – all reflectors in post offices (the main seller of them) were sold out in 10 days from the beginning of the campaign in 2004 and 20 % of pedestrians started to use reflectors in darkness and twilight in 2005 [4].

As statistics show (Fig 5), the total number of the killed in darkness and twilight decreased by 29 %, injury accidents also decreased slightly as well as collisions with pedestrians. The most significant decrease of the number of

the killed pedestrians in darkness was in 2005. The safety in darkness and twilight is still one of the most urgent problems of road safety in Latvia.

### 3.1.6. Improvement of safety of vulnerable road users

The safety of vulnerable road users is the main problem in Latvia, because 49,8 % of all the killed were vulnerable road users [2]. The number of casualties of vulnerable road users decreased very slowly (Fig 6).

Five years ago upwards there were many pedestrian crossings created which were not always correctly situated and were dangerous for pedestrians. Now reconstruction of pedestrian crossings according to requirements of road safety are scheduled. The first pedestrian bridges are built.

The number of cyclists increased from year to year much faster than the length of paths or lanes built for cyclists. The financing problems delayed the development of paths for cyclists.

From 1993 the competitions of young bicyclists' at the age of 10 to 12 were organised in Latvia every year. Children-cyclists have an opportunity to demonstrate their cycling skills as well as their theoretical knowledge.

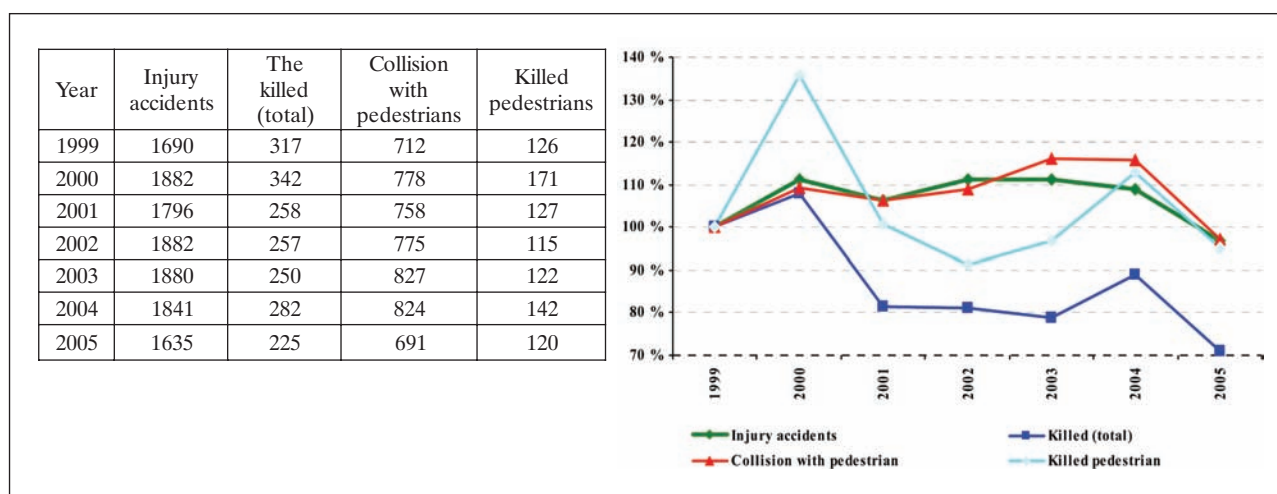


Fig 5. Number of accidents in darkness and twilight

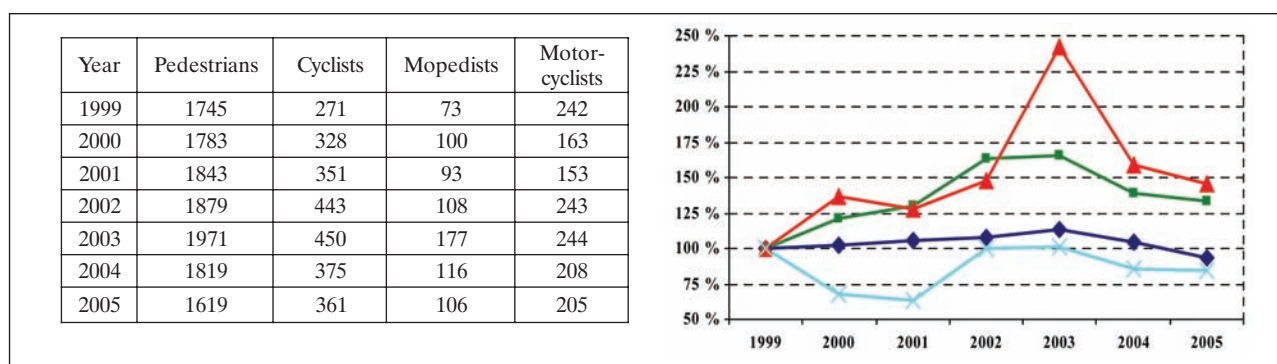


Fig 6. Number of casualties of vulnerable road users



### 3.2. Control of traffic security

#### 3.2.1. Police enforcement of the behaviour of road users

On 01.07.2004 the penalty point system entered into force in Latvia [5]. It means that drivers for committed violations are punished both by fines and by receiving penalty points. The penalty point system besides punishment includes also information, rehabilitation and re-licensing. The aim of the penalty point system is to separate the malicious and regular violators from those who are driving according to the road traffic rules.

Results of introducing the penalty point system – in comparison with the average data of two years before the introduction of penalty point system, two years later all road traffic safety indicators a decrease (Table 1). Benefits of saved lives and of decreasing number of injured people and

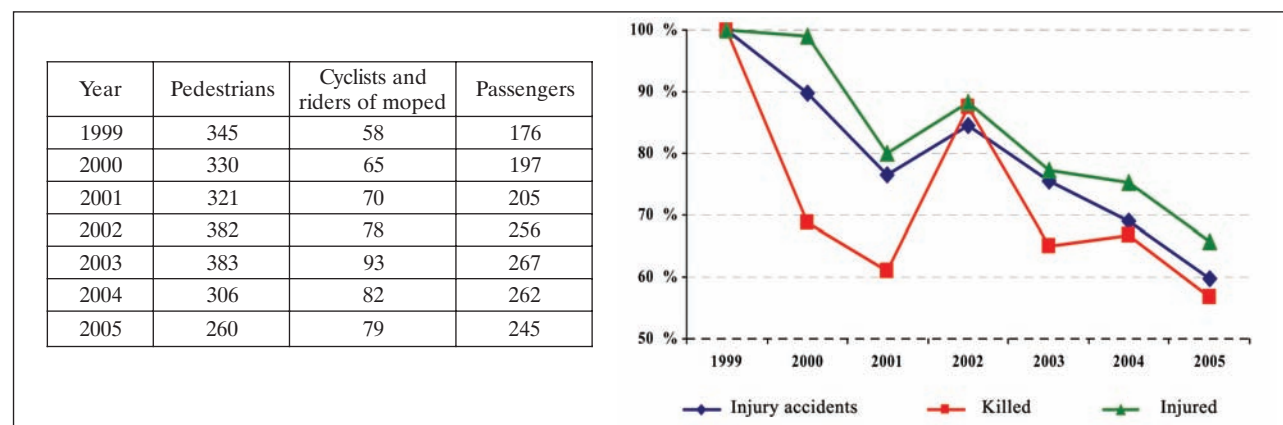
injury accidents were 24,8 million LVL per year. The costs of implementation and maintenance of penalty point system were estimated ~ 0,30 million LVL per year. It means that the cost benefit ratio of introducing the penalty point system is excellent according to estimation rates of the European Thematic Network ROSEBUD [6].

The main problem was drink and drive accidents; and to this problem a vast attention was focused. From 2001 annual drink and drive campaigns were carried out in summer time. The campaigns' main tasks were to inform citizens about the risks of drinking and driving, about the possible consequences of drunk-driving and about possible punishment. The campaigns were combined with intensive enforcement of Road Police, which continued after the campaigns and more intensively within penalty point system. That gave a rapid decrease of all road safety indications (Fig 7).

**Table 1.** Road traffic safety indications before and after penalty point system introduction

	Injury accidents				The killed				The injured			
	Before		After		Before		After		Before		After	
	01.07.2002-30.06.2003	01.07.2003-30.06.2004	01.07.2004-30.06.2005	01.07.2005-30.06.2006	01.07.2002-30.06.2003	01.07.2003-30.06.2004	01.07.2004-30.06.2005	01.07.2005-30.06.2006	01.07.2002-30.06.2003	01.07.2003-30.06.2004	01.07.2004-30.06.2005	01.07.2005-30.06.2006
Number	5128	5557	4811	4049	503	562	491	412	6336	6843	6104	5086
Average per year	5343		4430		533		452		6590		5595	
(+/-) per year	- 913				- 81				- 995			
(%) per year	-17,1 %				-15,2 %				-15,1 %			
ESTIMATION OF EFFECTIVENESS OF PENALTY POINT SYSTEM												
Average costs, LVL per year*	1419				242406				3879			
Total benefits, million LVL per year	24,8											
Total maintenance costs, million LVL per year**	0,30											
Cost benefit ratio	82,5											
* - average for years 2002-2005. ** Source. Road Traffic Safety Directorate and State Police.												

\* - average for years 2002-2005, \*\* Source. Road Traffic Safety Directorate and State Police.



**Fig 7.** Number of accidents under the influence of alcohol, killed and injured persons in those accidents

Year	The killed				The injured				Accidents				Total benefits [E++M], LVL
	Pessimistic scenario	Actual data	TZb, LVL	Benifits or losses [(B-C)*D], LVL	Pessimistic scenario	Actual data	TZi, LVL	Benifits or losses [(F-G)*H], LVL	Pessimistic scenario	Actual data	TZm, LVL	Benifits or losses [(J-K)*L], LVL	
A	B	C	D	E	F	G	H	I	J	K	L	M	N
1999	652	652	150891	0	5244	5244	3153	0	30614	30614	1229	0	0
2000	652	635	160134	2715873	5244	5449	3328	-682240	30614	30454	1256	200960	2234593
2001	652	558	220727	20668876	5244	5852	3534	-2148672	30614	36468	1286	-7528244	10991960
2002	652	559	230927	21374603	5244	6300	4010	-4234560	30614	39593	1332	-11960028	5180015
2003	652	532	229360	27422282	5244	6600	4046	-5486376	30614	45555	1372	-20499052	1436854
2004	652	516	244744	33285184	5244	6416	4000	-4688000	30614	48912	1408	-25763584	2833600
2005	652	442	264591	55564113	5244	5600	3458	-1231048	30614	47353	1564	-26179796	28153269
TOTAL				161030930				-18470896				-91729744	50830290
Total benifits, million LVL													50,830,290

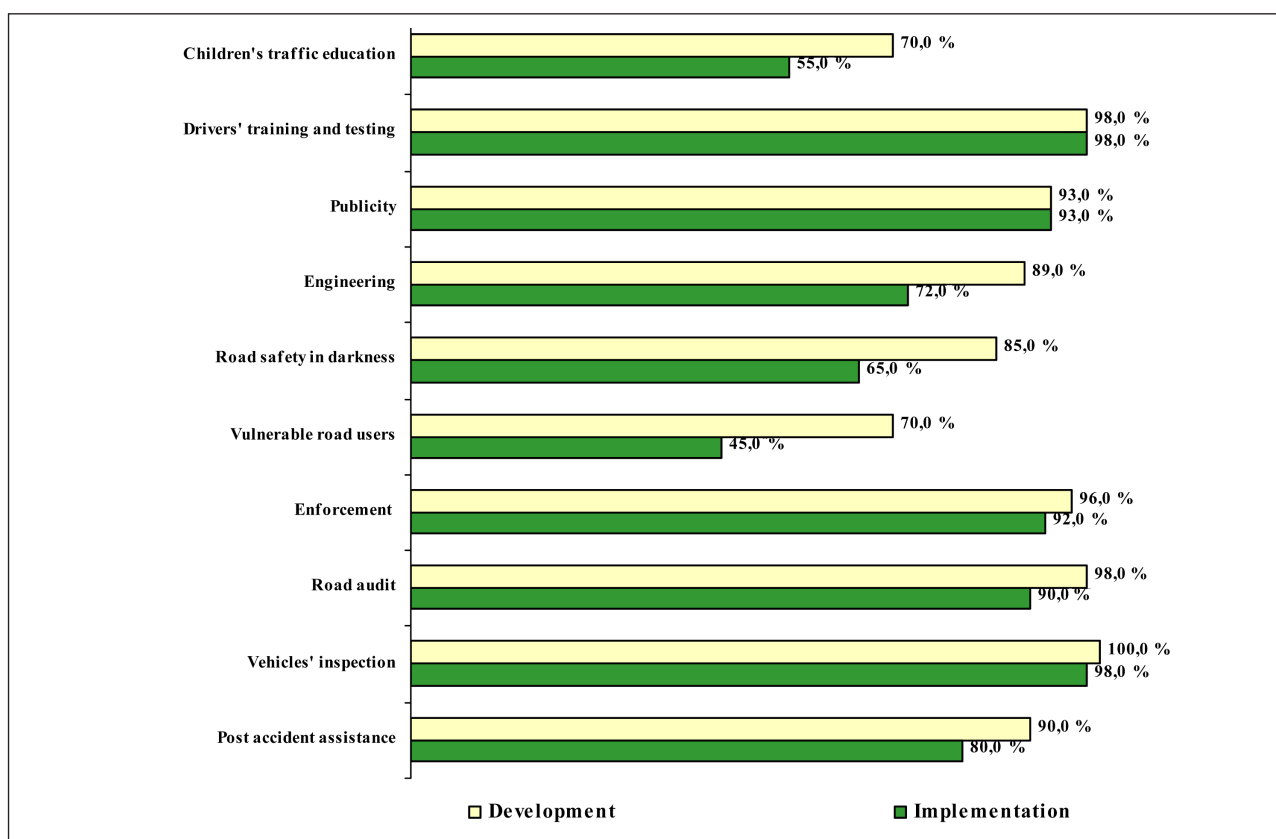


Fig 8. Estimation of the development and implementation of measures of the Programme

by 78 % and the implementation of measures by 73 % [8]. The expert group at the beginning of 2006 estimated that the development of measures is performed by 88 % and the implementation of measures by 79 % [4]. The estimation of separate subprogrammes is shown in Fig 8. The preferable results are not achieved due to the lack of financing.

## 5. Efficiency of the national road traffic safety Programme

Cost-benefit analysis (CBA) evaluated results of financing the implementation of safety measures of the Programme. Cost Benefit Ratio (CBR) is used for the estimation [6]:

$$\text{CBR} = \frac{\text{present value of all benefits}}{\text{present value of implementation costs}}$$

if CBR is < 1, the measure is ranked as poor; if CBR is from 1 to 3, the measure is ranked as acceptable; if CBR is from > 3, the measure is ranked as excellent.

### 5.1. Benefits of the national road traffic safety Programme

$$TZ = TZb \times nb + TZi \times ni + TZm \times nm,$$

where  $TZb$ ,  $TZi$ ,  $TZm$  – accordingly the average losses of a killed person, injured person and losses of an accident, LVL;

$nb$ ,  $ni$ ,  $nm$  – accordingly number of the killed, number of the injured and number of accidents.

Total benefits of realising of the national road traffic safety programme from 2000 till 2005 is 50,83 million LVL.

### 5.2. The implementation costs of realising the national road traffic safety Programme

For implementing the national road traffic safety Programme additional financing 48,4 million LVL (prices of 1999) was designed for years 2000–2006, ie ~ 7 million LVL per year. In the last six years ~ **30,6 million LVL** were assigned from different financial sources, ie 5,1 million LVL per year. Hence, from 2000 till 2005 only 63,1 % of total additional financing for realising the Programme are assigned. It is insufficient to achieve the target to reduce number of the killed by 50 %.

In addition, the total costs of implementation must be increased by 1,25 times because the inflation from 1999 to 2005 has increased by ~ 25 %.

### 5.3. The effectiveness of the national road traffic safety Programme

For evaluating the CBR data estimated in the mentioned paragraphs are used (Table 3).

As the CBR is between 1 and 3, the effectiveness of the national road traffic safety Programme is acceptable. In

**Table 3.** The effectiveness of implementation of the Programme

Total benefits, million LVL	50,83
Total additional expenses for road traffic safety, million LVL	30,6
CBR = benefits per expenses	1,7

addition, the road safety situation significantly improves after introduction of penalty point system. The cost benefit ratio of introducing the penalty point system is excellent, as well as the results of the campaigns combined with intensive enforcement against drinking and driving.

## 6. Conclusions

The national road traffic safety programme is realised by 79 %, but in spite of implemented measures the number of the killed and the injured is still high.

Cost/benefit ratio of the national road traffic safety Programme is acceptable and its numerical value is 1,7.

It is very important to start to teach children how to behave in road traffic in as early ages as possible, because they will be the new road traffic participants in future.

It is very important to form a public attitude to safe moving in road traffic.

As the penalty point system shows, the control over the road traffic participants is still very important.

Special attention must be paid to the measures that improve traffic organisation and road safety in road network.

Much is done in the field of liquidation of the consequences of traffic accidents but the financing problems delayed the efficient development of rescue service and emergency medical aid.

Public financing for road traffic safety has not increased during the reporting period.

Organisation of road safety work in the state is weak, especially in municipalities.

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